SINTEF

SINTEF Certification

No. 2281

Technical Approval

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Amended:	03.07.2020
Valid until:	01.02.2024

Provided listed on www.sintefcertification.no

SINTEF confirms that

Protan Vacuum Roofing System

has been found to be fit for use in Norway and to meet the provisions regarding product documentation given in the regulation relating to the marketing of products for construction works (DOK) and regulations on technical requirements for building works (TEK), with the properties, fields of application and conditions for use as stated in this document

1. Holder of the approval

Protan AS
P.O. Box 420
NO 3002 DRAMMEN
www.protan.com

2. Product description

Protan Vacuum Roofing System is based on the principle of anchoring the membrane airtight to parapet and penetrations in the roof construction. Essential for the function is an airtight layer in combination with the supporting structure in the internal part of the construction. Wind at the outside of the roof creates, with help of the used valves, a negative pressure between airtight layer and roofing membrane. The negative pressure causes the membrane to be held down against the substrate, and load transferred downwards to the supporting structures.

Protan Vacuum Roofing System consists of Protan roofing membranes in combination with Protan steel bars, Protan Airtight seal and Protan vacuum valves.

Protan roofing membrane

Roofing membranes to be used for Protan Vacuum Roofing System are polyester reinforced roofing membranes like Protan SE and EX. The roofing membranes are documented in SINTEF Technical Approval No. 2010.

Protan Steel bars

Protan Steel bars are available in two variants. Principle for both are shown in fig. 2. The bars are made from galvanized steel with a zinc weight of 225 g/m³, which is equivalent to a thickness of approx. 20 µm. The standard variant of the bars is shown in fig. 2. Protan Grip steel bar has in addition through going imprints in approximately 40 mm distance to increase the friction between bar and membrane/sealing. The primary task of Protan's steel bars is the clamping to other building parts to ensure air tightness in the roofing system.

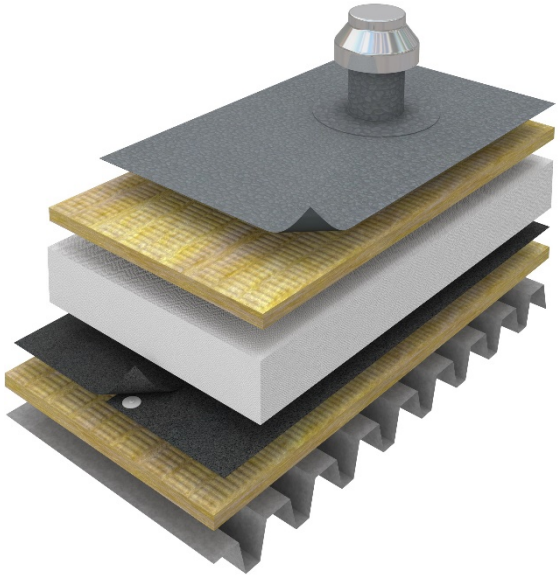

Fig. 1
Principle of Protan Vacuum Roofing System. The membrane is laid with airtight seals along edges and penetrations.
Figure: Protan AS

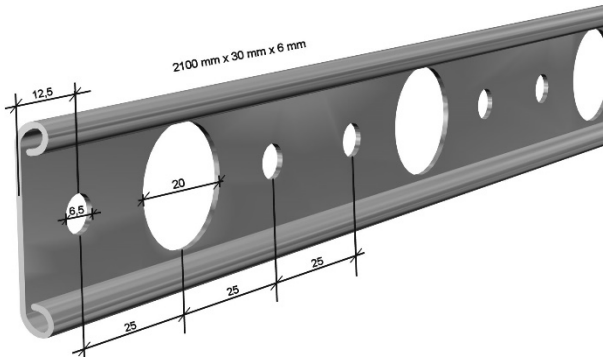

Fig. 2
Protan Steel bar. The bars are supplied in a standard length of 2,1 m.
Figure: Protan AS

Protan Vacuum valve

Protan Vacuum-valve is a one-way valve with an external shell of aluminium and an internal ducting system of expanded polystyrene (EPS); see Fig. 3. The closing mechanism is an EPDM membrane attached to the top of the ducting system of EPS.

Protan Airtight seal

Protan Airtight seal, made of PVC with a closed cell structure, can be delivered as a supplementary product for the vacuum system.

Supplementary products which are not a part of the system

An airtight layer needs to be a part of the construction. Materials and possible supplementary products used for tightening of the airtight layer are not a part of this approval. If supplementary sealing compounds are in contact with Protan´s products, Protan´s recommendations regarding chemical compatibility and durability must be followed

3. Fields of application

Protan Vacuum Roofing System can be used for new roofing and refurbishing, with and without additional insulation, provided that good air tightness can be established to prevent leakage both from outside and inside.

Roofs must have adequate slope to drain water from rain and melting snow. SINTEF Building and Infrastructure recommends that all roofs have an inclination of minimum 1:40.

4. Properties

Material properties

The properties of Protan SE and EX are shown in SINTEF Technical Approval No. 2010, table 2.

Safety in case of fire

Classification for Protan SE and Protan EX roofing membranes are shown in SINTEF Technical Approval no. 2010 in paragraph concerning safety in case of fire.

Load-carrying capacity

The capacity of the roofing system is determined by the substrate capacity. The substrate must be designed for the relevant wind loads.

5. Environmental aspects

Substances hazardous to health and environment

Protan Vacuum Roofing System contains no hazardous substances with priority in quantities that pose any increased risk for human health and environment. Chemicals with priority include CMR, PBT or vPvB substances.

Effect on soil, surface water and ground water

The leaching properties of the products are evaluated to have no negative effects on soil or water.

Waste treatment/recycling

Protan Vacuum Roofing System shall be sorted residual waste. The product shall be delivered to an authorized waste treatment plant for energy recovery. The product can by ended service life be delivered to material recycling in recycling system.

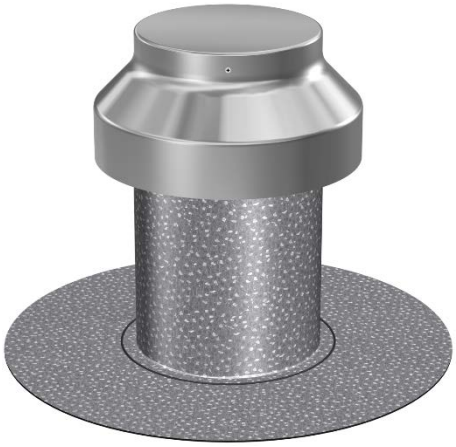

Figure: Protan AS

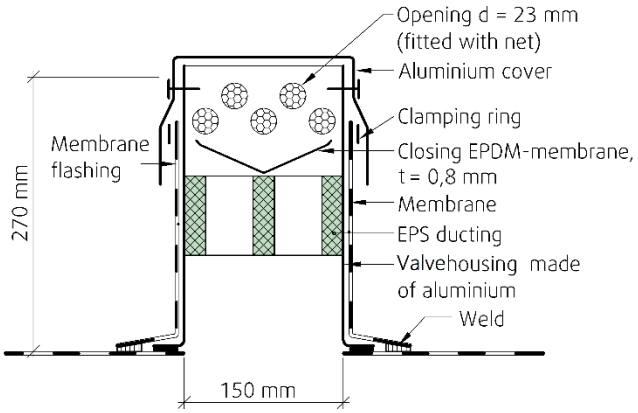

Fig. 3
Protan Vacuum-valve

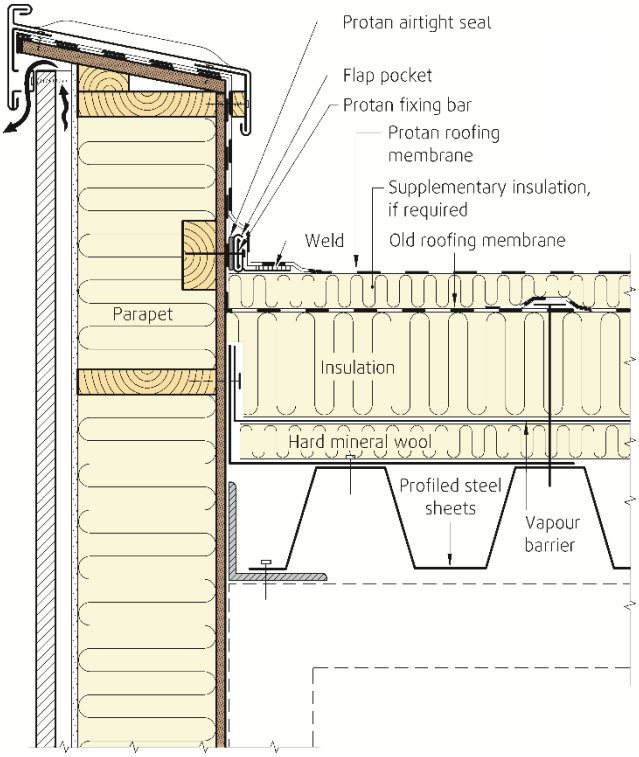

Fig. 4
Sealing principle for edges on a roof with supporting profiled steel sheets. Reroofing.

Environmental declaration

An environmental declaration (EPD) has been worked out according to EN 15804 for Protan SE. For complete documentation see EPD nr. NEPD-32-203-NO og NEPD-323-203-NO, https://www.epd-norge.no/.

No environmental declaration (EPD) has been worked out for the remaining products.

6. Special conditions for use and installation

Design considerations

Evaluation of suitability of Protan Vacuum Roofing System at the actual roofs and the dimensioning should be done in cooperation and/or under support of Protan AS.

Dimensioning mainly involves the number of vents, positioning, and, if required, calculation of the substrate capacity. The roofing system should only be installed by specialized personal who have undergone Protan´s roofing school and a special training program for the vacuum system. On all roofs covered with Protan Vacuum Roofing System, a final control shall be reported.

The membrane must also be applied in accordance with Protan´s Instructions for design and application and SINTEF Building Research Design Guide:

- *525.207 Kompakte tak*
- *544.202 Takfolie. Egenskaper og tekking*
- *544.204 Tekking med asfalttakbelegg eller takfolie. Detaljløsninger*

Substrate and joints

A basic requirement for the system is that the substrate and connections of the membrane to the substrate have good air tightness.

The substrate may be a lightweight roof structure with a waterproof layer with good mechanical strength, which can be used as vapour barrier in finished roof. The membrane should be mounted mechanically fixed, with welded, airtight, joints (see Fig. 1). Relevant substrates are also solid concrete roof deck or a roof with an existing roofing membrane.

Migration barrier and/or separation layer shall be used in accordance with paragraph *Special conditions of use and installation* in SINTEF Technical Approval no. 2010

Inspection during reroofing

In conjunction with reroofing, any existing membrane must be inspected for leakage in the membrane and any weaknesses in the existing anchoring, and if necessary, these must be repaired. The membrane is normally inspected visually using non-destructive equipment. In case of doubt, parts of the roof can be opened to investigate the airtightness and the condition of the existing anchoring.

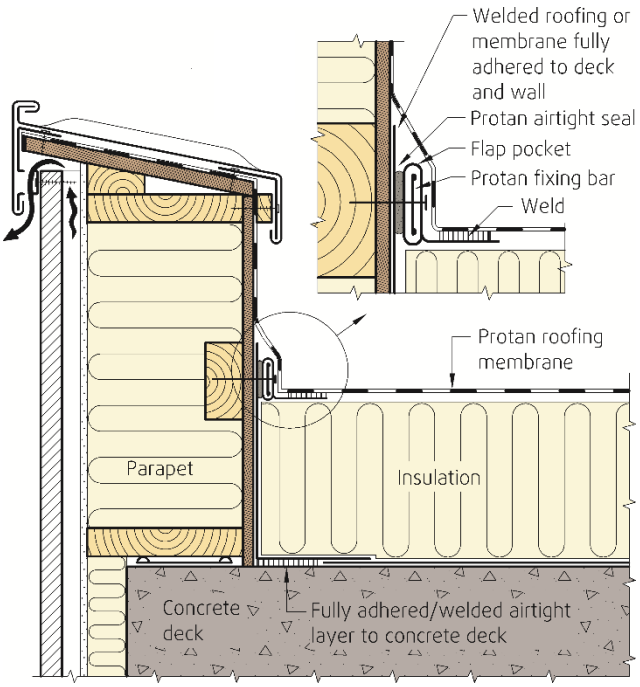

Fig. 5
Sealing principle for edges on a concrete roof deck. New building or reroofing.

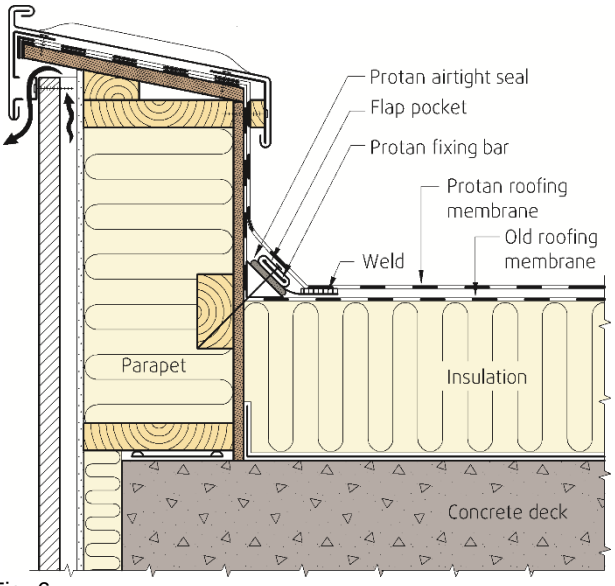

Fig. 6
Sealing principle for edges on roof with use of triangle lath. Reroofing.

Sealing at edges and penetrations

All edges and penetrations in the membrane must be performed with airtight construction details, using Protan steel bars, airtight seal and supplementary products. The steel bar shall be screwed to the substrate.

Figures 4 to 7 show examples of sealing principles at the connections with an external wall or a top edge/parapet. Distances between fasteners need to be considered during wind load analysis but should never be bigger than 150 mm to ensure the clamp for the air tightness. Figure 8 shows sealing at a roof outlet.

Positioning of valves
Valves are normally placed in the corners and the perimeter area along free edges. Where the roof abuts against adjacent high walls, the membrane is attached as shown in fig. 4, 5 or 6. The following general instructions are applicable when positioning and installing valves, see fig. 9:

- two valves in external corners
- two valves in internal corners
- maximum distance between valves along free edges is 15 m
- for pitched roofs with a fall > 1:6, valves should be used at the roof ridge, both close to gables and on the centre section.

Roof traffic
When roof traffic may be expected to exceed what is required for normal inspection visits and maintenance, special measures should be taken to protect the roofing membrane.

Inspection and maintenance
When doing repair work, the roofing membrane must be cleaned locally before starting any welding of joints. An appropriate cleaning agent must be used. It should be checked at regular intervals whether the roof has permanent blisters which may indicate leakages in the surface, roofing or valves.

7. Factory production control

The product is produced by Protan AS, P.O. Box 420, 3002 Drammen, Norway.

The holder of the approval is responsible for the factory production control in order to ensure that the product is produced in accordance with the preconditions applying to this approval.

The manufacturing of the product is subject to continuous surveillance of the factory production control in accordance with the contract regarding SINTEF Technical Approval.

The manufacturer Protan AS has a quality system which is certified by Det Norske Veritas according to ISO 9001, certificate no. 95-OSL-AQ-6343.

8. Basis for the approval

Material and performance data for the roofing membranes have been determined by type testing and regular audit testing performed by SINTEF Building and Infrastructure and the Norwegian Fire Research Laboratory during the years 1975 – 2017; see SINTEF Technical Approval No. 2010.

The properties of the roofing system are based on type testing and pilot projects documented in the following reports from the Norwegian Building Research Institute:

- O 8346 dated 22.12.98
- N 8351-P3/P4 dated 14.04.2000
- O 8348 dated 30.06.2000.

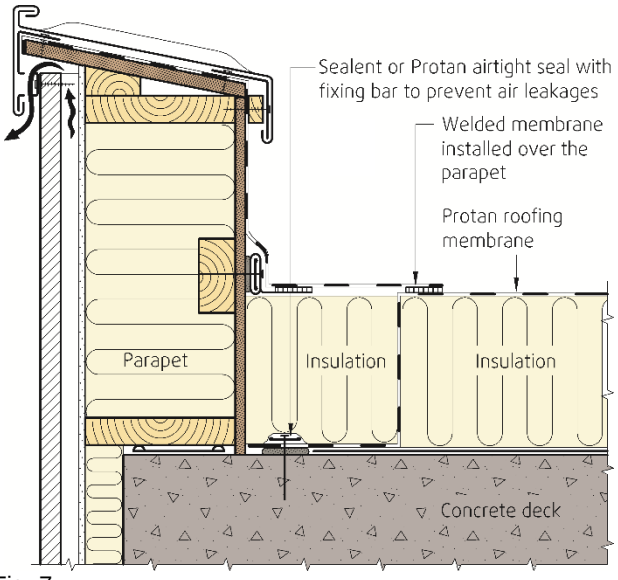

Fig. 7
Sealing principle for edges on a roof with an airtight concrete deck. New building. Suitable if movements are expected between the wall and the deck.

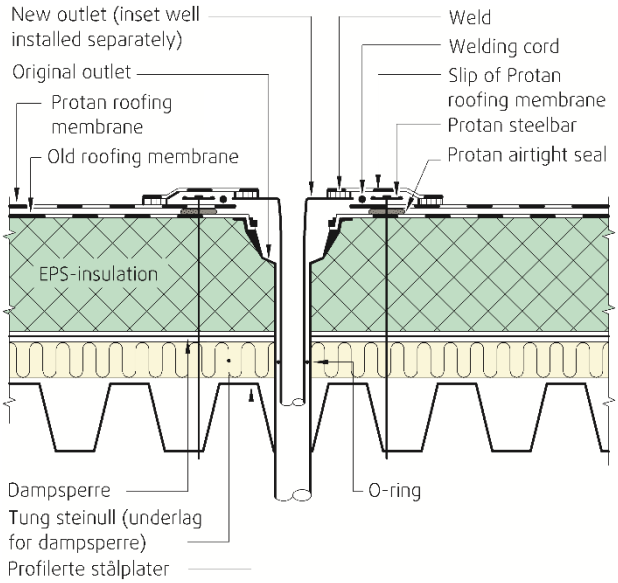

Fig. 9
Principle for sealing at an outlet

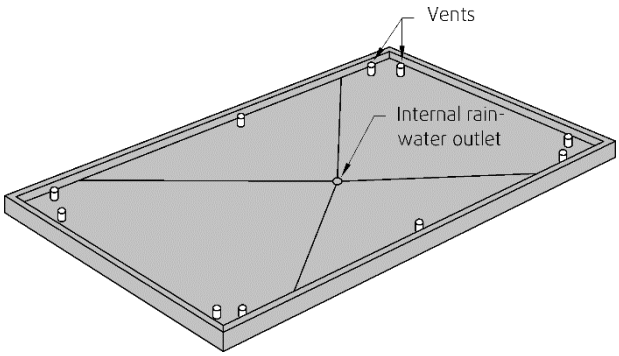

Fig.9
Typical placing of valves. Distances to edges, to corner and to each other shall be considered for each project and shall be calculated of Protan.

9. Marking

All paletts/package for roofing membranes, vacuum valves and steel bars need to be marked with name of manufacturer, name of product and time of manufacturing. All roofing membranes shall also be marked with production code and CE mark in accordance with EN 13956.

The approval mark for SINTEF Technical Approval No. 2281 may also be used.

Approval mark

10. Liability

The holder/manufacturer has sole product responsibility according to existing law. Claims resulting from the use of the product cannot be brought against SINTEF beyond the provisions of Norwegian Standard NS 8402

for SINTEF Byggforsk

Hans Boye Skogstad
Approval Manager