

SINTEF Building and Infrastructure confirms that

Protan RadonSafe

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
 Postboks 420 Brakerøya
 3002 Drammen
www.protan.no

2. Product description

Protan RadonSafe is a 0,8 mm thick TPO reinforced radonmembrane. The membrane is jointed with hot air in the overlap. Dimension and tolerances for Protan RadonSafe are shown in Table 1.

Table 1
 Dimension and tolerances for Protan RadonSafe

Designation	Value
Thickness	0.8 mm ± 10 %
Weight	650 g/m ² ± 5 %
Width	2.0 m ± 2 %
Roll length	20 m -0 % / + 5 %

3. Fields of application

Protan RadonSafe can be used as protection towards radon in applications type A, B and C as shown in SINTEF Building Research Design guide 520.706, provided that the conditions as described in chapter 6 in this document are followed. Alternative positioning of radon membranes are shown in Fig. 1.

4. Properties

Material properties

Product characteristics for fresh material are shown in Table 2.

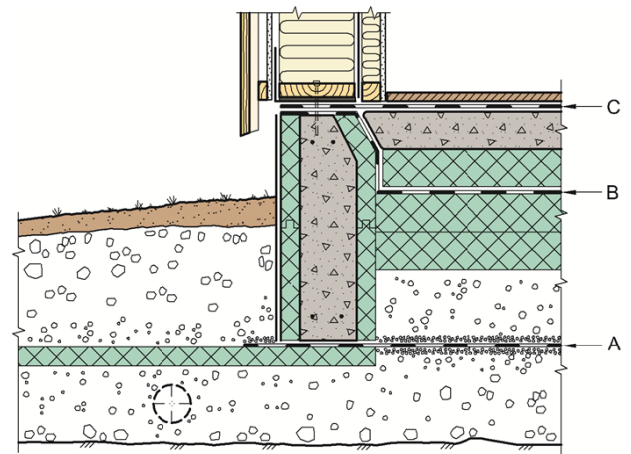


Fig. 1
 Alternative positioning of radon membranes in different applications type.

Air tightness

Protan RadonSafe is tested for performance in relation to air tightness for joints and details with satisfactory results as shown in Table 2.

Properties related to fire

Protan RadonSafe is not classified according to EN 13501-1.

Durability

Protan RadonSafe is assessed as having satisfactory durability when the product is used as specified in this Technical Approval document.

Table 2 Product characteristics for Protan RadonSafe

Property	Test-method	Control limits ¹⁾	Unit
Radontransmission ²⁾ Radon resistance	SP-method 3873 ³⁾	$\leq 2 \cdot 10^{-8}$ $\geq 5 \cdot 10^7$	m/s s/m
Air tightness – construction ⁴⁾	NBI-method 167/01 ²⁾	≤ 5	l/min
Flexibility at low temperature	EN 495-5:2001	≤ -30	°C
Dimensional stability - longitudinally - transverse	EN 1107-2:2001	$\pm 1,0$ $\pm 0,5$	% %
Resistance to tearing - longitudinally - transverse	EN 12310-2:2000	≥ 150 ≥ 150	N N
Tensile strength - longitudinally - transverse	EN 12311-2:2000(B)	≥ 500 ≥ 500	N/50 mm N/50 mm
Elongation - longitudinally - transverse	EN 12311-2:2000(B)	≥ 30 ≥ 30	% %
Shear resistance of joints	EN 12317-2:2000	≥ 500	N/50 mm
Water vapour transmission properties ²⁾	EN ISO 12572:2001	$\geq 50 \cdot 10^{10}$ ≥ 100	m ² sPa/kg m ekv. air layer
Resistance to impact Soft underlay - cylinder Hard underlag-12,7 mm bale	EN 12691:2001 EN 12691:2006(A)	≤ 15 400	mm diameter mm
Resistance to static loading	EN 12730:2001(A)	≥ 15	kg

1) Control limit is the value the product must satisfy for internal control at the producer and for supervising control

2) Result from type testing

3) Test method from RISE

4) Calculated at a pressure difference of 30 Pa

5. Environmental aspects

Substances hazardous to health and environment

The product 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 indoor environment

The product is not regarded as emitting any particles, gases or radiation that have a perceptible impact on the indoor climate, or to have any significant impact on health.

Effect on soil, surface water and ground water

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

Waste treatment/recycling

The product shall be sorted as residual waste. The product shall be delivered to an authorized waste treatment plant for energy recovery.

Environmental declaration

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

6. Special conditions for use and installation

Application type A (fig. 2)

The membrane has to be installed in the construction pit on an even underlay of crushed stone or gross sand with

flatness and stability at least as compressed sandy soil, and preferably under the pipes- and wire penetrations. The membrane shall be installed with an air-tight connection towards the sole foundation or the base plate. Installation in application type A requires that the sole foundation is designed as an air-tight construction, and also that any pipe penetrations through the sole foundation are airtight.

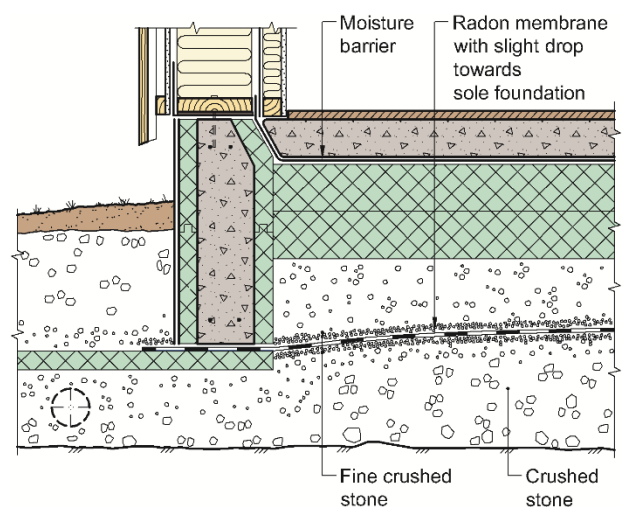


Fig. 2
Example of positioning of radon barrier in application type A. Slab on ground together with the foundation.

Application type B (fig. 3 and 4)

The membrane has to be installed on a pre-leveled surface of insulation. The membrane has then to be protected with insulation also at the top side, and the insulation has finally to be protected with a plastic film, or the membrane has to be protected with another protection type of film or an antifriction layer, at the top. At least two third of the insulation thickness should be installed at the underside of the membrane. The membrane has to be installed continuous over the top of the foundation to ensure air tight connections between the foundation and the floor.

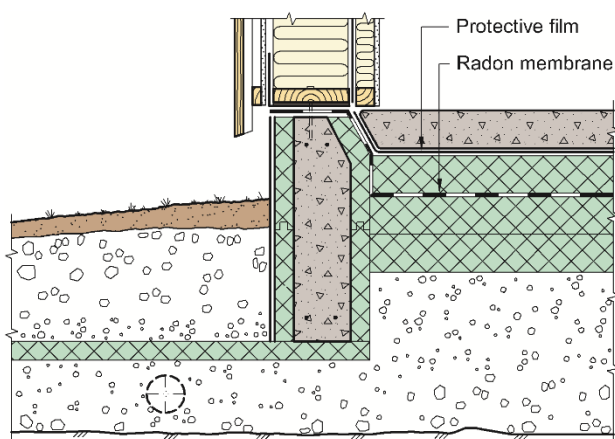


Fig. 3
Example of positioning radon barrier in application type B. Slab on ground together with the foundation

Application type C (fig. 4)

The membrane has to be installed on leveled concrete slab or similar with clamped glued (sealed) connections towards all construction parts and penetrations. The need to protect the membrane must be considered in each case.

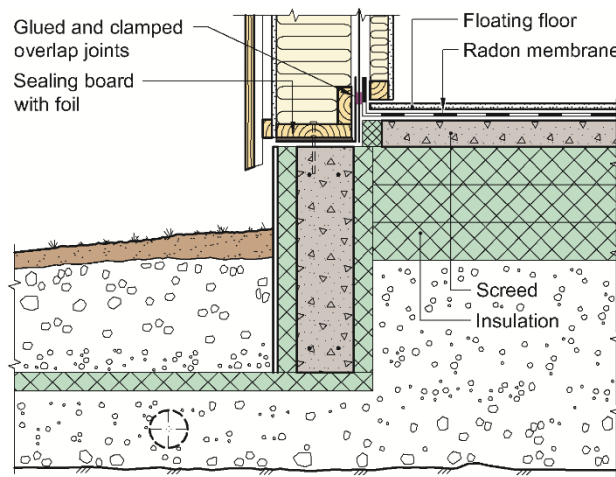


Fig. 4
Example of positioning radon barrier in application type C. Slab on ground together with the foundation.

Installation

The radon membrane shall be welded by hot air with minimum 30 mm overlap joints.

The performance shall ensure that all joints, penetrations and transitions are airtight. See SINTEF Building Research Design Guide 520.706.

Designation shall follow SINTEF Building Research Design Guide 520.706.

Underlay and protection

It is important to avoid that the radon membrane is damaged by sharp objects or objects that are being trampled down in the membrane during the construction period. In application type A it shall be used a layer of minimum 0,8 mm thick plastic membrane between the foundation and the membrane. In application type B, if the membrane is installed right below the concrete slab, it shall be used a protection layer of minimum 0,8 mm thick plastic membrane on the top of the membrane. The membrane has to be installed in such way that it's not stucked and, in turn, teared to pieces by smaller movements.

Radon membrane as vapour barrier

Radon membrane in use group B and C and will replace the plastic membrane as vapour barrier, because the radon membrane will work both as vapour barrier and radon membrane. The plastic membrane with function as protection must still be used as described.

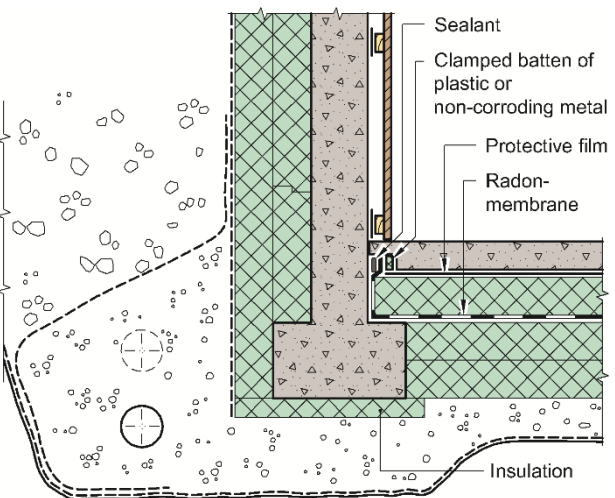


Fig. 4
Example of positioning of radon barrier in application type B. Concrete floor and concrete wall

Water in the construction pit

When the insulation is placed above the radon membrane it is a risk of accumulation of water in the construction pit during the construction period. It must therefore be taken action to avoid such water accumulation. Alternatively, actions can be made to drain the water. To secure air- and radontightness, it is important that the drainage solution can be closed when the construction period is finished.

Backfill in use group A

In order to avoid that backfill above the membrane submits dangerous concentration of radon to the indoor air, the backfill must have documented low radon emittance, see SINTEF Building Research Design Guide 520.706.

Floor heating

Heating cables shall not be placed directly on the membrane, and there shall be a minimum of 5 mm non-combustible material between the heating cables and the membrane.

Storage

Protan RadonSafe shall be stored dry and protected against UV-radiation.

7. Factory production control

The product is produced by Protan as, Postboks 420, Brakerøya, 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.

Protan have a quality assurance system which is certified according to ISO 9001 and an environmental management system which is certified according to ISO 14001.

8. Basis for the approval

The approval is based on product characteristics which are documented in the following reports:

- SINTEF Byggforsk, report 3D0772, dated 24.06.2011 (air tightness)
- SINTEF Byggforsk, report 3D0772, dated 03.10.2011 (material properties, FTIR)
- SINTEF Byggforsk, report 3D0772B, dated 18.01.2012 (material properties)
- SP Sveriges Provnings- och Forskningsinstitut: Report P907585 dated 17.12.2009. (radon resistance)
- SINTEF Byggforsk, report 102000649-2B, dated 03.11.2016 (durability)
- SINTEF Byggforsk, report 102000649-2C, dated 10.03.2017 (material properties)
- SINTEF Byggforsk, report 774 og 775 (102000649-2, dated 11.05.2017 (water vapour transmission)

9. Marking

All rolls are made with the producers name, product description, dimensions and production time. The approval mark for SINTEF Technical Approval No. 20179 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

A handwritten signature in blue ink that reads 'Hans Boye Skogstad'.

Hans Boye Skogstad
Approval Manager