

SINTEF Building and Infrastructure confirms that

Sarnafil G 411 PVC roofing and waterproofing membrane

meets the provisions regarding product documentation given in Norwegian building regulations, with properties, fields of application and conditions as stated in this document

1. Holder of the approval

SIKA NORGE AS

Sanitetsveien 1

NO-2026 Skjetten

www.sika.no

2. Manufacturer

Sika Manufacturing AG,

Sarnen, Switzerland

3. Product description

Sarnafil G 411 is a flexible PVC roofing and waterproofing membrane with a base of glassfibre. Stabilisers are added to make the membrane resistant against UV radiation, high and low temperatures, atmospheric pollution, and to reduce spread of flames.

Standard surface colour is light grey. The underside is dark grey.

Table 1

Measures and tolerances for Sarnafil G 411 PVC roofing and waterproofing membrane

Designation	G 411-15E	Unit
Thickness ¹⁾	1.5	mm
- Tolerance	+10/-5	%
Weight	1.84	kg/m ²
- Tolerance	+10/-5	%
Width	2,0	m
- Tolerance	-0.5/+1	%
Roll length	20	m
- Tolerance	+5/-0	%
Weight of base	50	g/m ²

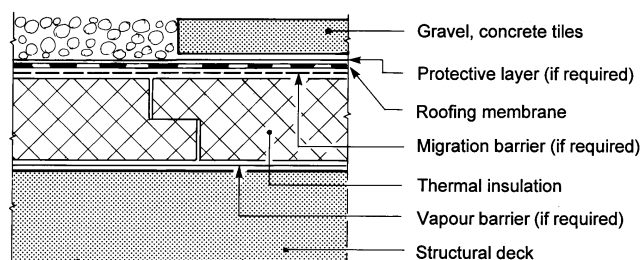
¹⁾Sarnafil G 411 is also available in thickness 1.8 and 2.0 mm


Fig. 1
Example of Sarnafil G 411 used as roofing with ballast covering

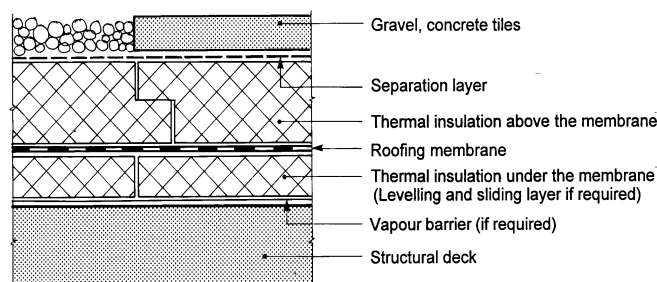


Fig. 2
Example of application in roof with thermal insulation positioned partly above the membrane

4. Fields of application

Roofs, terraces and parking decks

Sarnafil G 411 is used as roofing membrane on flat roofs. The membrane is laid loosely with a ballast weight. Sarnafil G 411 with thickness ≥ 1.5 mm may also be used as waterproofing membrane. Examples of intended use are shown in Fig. 1 – 4.

The membrane cannot be used in mechanically fastened applications.

Roofs must have adequate slope in order to drain water from rain and melting snow. SINTEF Building and Infrastructure recommends in general a minimum slope of 1:40 for all roofs.

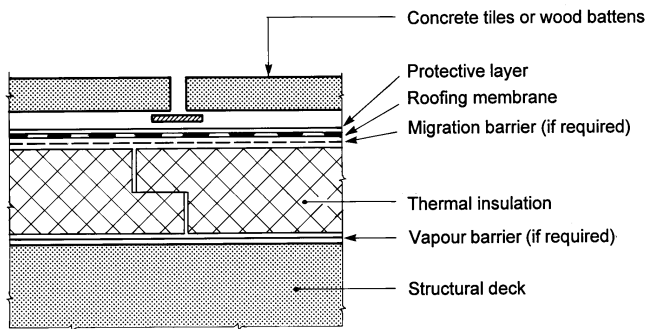


Fig. 3
Example of use in roof with light traffic (walking)

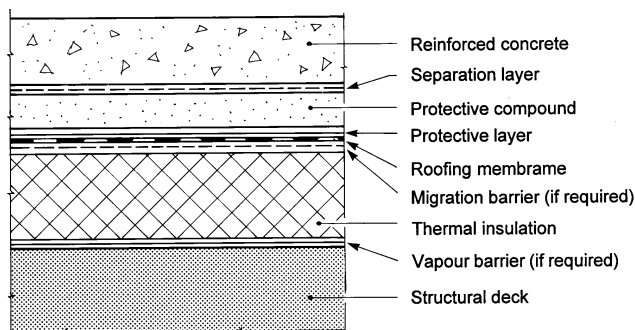


Fig. 4
Example of use in roof with heavy traffic

Wet rooms

Sarnafil G 411 may also be used as waterproofing membrane in wet room floors, see Fig. 5. The membrane may be installed on concrete or on suitable subfloor boarding. Sarnafil G 411 must always be covered by a protection layer, plus a concrete slab or a levelling compound suitable as underlay for tiles or other suitable flooring.

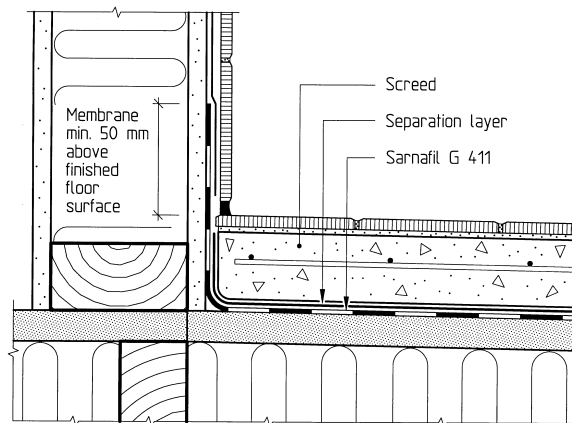


Fig. 5
Example of Sarnafil G 411 used in wet room floor

5. Properties

Material properties

Product properties of fresh material are shown in table 2. Properties measured after artificial ageing are shown in Table 3.

Table 2
Product properties for fresh material of Sarnafil G 411 PVC roofing and waterproofing membrane

Property	Test method	Control limits ¹⁾	SINTEF's recommended minimum performance ²⁾	Unit
		Sarnafil G 411 1.5 mm		
Foldability at low temperature	EN 495-5:2001	≤ - 30	≤ - 30	°C
Dimensional stability L/T	EN 1107-2:2001	± 0.2 / ± 0.1	± 0,5	%
Watertightness (10 kPa)	EN 1928:2000 (A)	Tight	Tight	-
Watertightness (150 kPa)	EN 1928:2000 (B)	Tight	-	-
Tear resistance	EN 12310-2:2000	≥ 120	≥ 80	N
Tensile strength L/T	EN 12311-2:2000 (A)	≥ 700/600	≥ 380	N/50mm
Elongation	EN 12311-2:2000 (A)	≥ 200	≥ 180	%
Average peel resistance of joints	EN 12316-2:2000	≥ 150	-	N/50mm
Shear resistance of joints	EN 12317-2:2000	≥ 550	≥ 380	N/50mm
Resistance to puncture				
- by impact at +23 °C	EN 12691:2006 (A)	≥ 600	≥ 400	mm
- by impact at -10 °C	EN 12691:2001	≤ 15	≤ 20	mm diam.
- by static loading	EN 12730:2001 (A)	≥ 20	≥ 20	kg
Water vapour resistance	EN ISO 12572:2001	75 · 10 ⁹	-	m ² sPa/kg
Water vapour resistance as equivalent air layer thickness, s _d -value	EN ISO 12572:2001	15	-	m

¹⁾ The stated values are control limits existing for internal control at the producer and by supervising control. If nothing else is mentioned, the control limits concern both directions of the product where relevant.

²⁾ SINTEF's recommended minimum performance in SINTEF Technical Approval for ballasted roofing membranes

Table 3
Product properties for Sarnafil G 411 after ageing

Property	Test method	Values	Unit
		Sarnafil G 411 t = 1.5 mm	
Foldability at low temperature after 8 weeks ageing in hot water	NS 3531/EN 495-5	≤ -30	°C
Foldability at low temperature after 12 weeks climatic aging	EN 1297/EN 495-5	≤ -30	°C

Properties related to fire

Sarnafil G 411 fulfils the requirements for class B_{ROOF} (t2) according to EN 13501-5 on underlay as shown in table 4. Testing is performed according to CEN/TS 1187-2.

Table 4
The roofing membrane fulfils the requirements for class B_{ROOF} (t2) on these underlayments

Underlay	G 411 1,5 mm
EPS	No
EPS and ≥ 120 g/m ² glass felt	Yes
Stone woll	Yes
Wooden underlay	Yes
Concrete /silika plate	Yes
Old roofing on EPS	No
Old roofing and ≥ 120 g/m ² glass felt on EPS	Yes
Old roofing on stone woll	Yes
Old roofing on wooden underlay	Yes
Old roofing on concrete /silika plate	Yes

Wet room membrane

Sarnafil G 411-15E with thickness 1.5 mm has been tested according to test method NT Build 230 "Bathroom floors: Watertightness" with satisfactory results.

Durability

Properties after artificial ageing are given in Table 3. The products have shown satisfying properties after artificial ageing in connection with type-testing and audit testing performed by SINTEF Building and Infrastructure.

6. Environmental aspects

Substances hazardous to health and environment

Sarnafil G 411 contains no hazardous substances with priority in quantities that pose any 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 product are evaluated to have no negative effects on soil and ground water.

Waste treatment/recycling

Sarnafil G 411 shall be sorted as mixed waste on the building/demolition sit. The products shall be delivered to an authorized waste treatment plant for energy recovery.

Environmental declaration

No declaration according to NS-EN 15804 has been prepared for Sarnafil G 411.

7. Special conditions for use and installation

General

Sarnafil G 411 should be stored in a dry location.

Installation in general

Sarnafil G 411 is welded by hot air, and shall be installed by an authorised installer/contractor according to the manufacturer's instructions.

The underlay shall be thoroughly cleaned before installation, and without sharp edges that may puncture the membrane. In particular it must be checked that the membrane is not damaged by impacts from sharp objects, or objects being trampled into the membrane during installation.

Ballast

Necessary ballast is calculated according to SINTEF Building Research Design Sheet 544.202 and "TPF Informs no. 5", clause. 6.1.

Roofs, terraces and parking decks

Application in roofs, terraces and parking decks shall be in accordance with the principles shown in SINTEF Building Research Design Sheets no. 525.207, 525.304, 525.306, 525.307, 544.202 and 544.204.

Wet room floor membrane

Sarnafil G 411 applied in wet rooms shall be installed on concrete or on subfloor sheathing in accordance with SINTEF Building Research Design Sheet no. 522.861.

A fully covering protection layer consisting of PVC, or minimum 0.2 mm PE- or PP-foil must be placed between the membrane and the screed. On slab-on-ground there shall also be a fully covering protection layer consisting of PVC, or minimum 0.2 mm PE- or PP-foil below the membrane.

The floor screed must be laid as soon as possible after the membrane and a protection layer has been installed.

Construction details for connections to walls, and details for penetrating components like pipes etc., shall be in accordance with the design principles shown in SINTEF Building Research Design Sheet no. 541.805.

Underlay

When the membranes are installed on old asphalt roofing without additional insulation, or directly on EPS or XPS insulation a separate migration barrier of approx. 150 g/m² shall be used.

When the membranes are applied directly on rough underlay, without additional insulation, a protection layer of polyester felt or similar shall be used. SINTEF Building and Infrastructure recommends use of approx. 250 g/m² felt when applied directly on concrete underlay and minimum 300 g/m² felt on concrete underlay in constructions with heavy traffic.

Traffic on the roof

If more traffic on the roof than what is necessary for inspection and maintenance is to be expected special measures to protect the membrane should be taken.

Inspection and maintenance

The roofing must be cleaned before welding when carrying out necessary repair works.

8. Factory production control

The quality system at Sika Manufacturing AG is certified according to ISO 9001:2000 and ISO 14001:2004 by Swiss Association for Quality and Management Systems, certificate no. 10720.

Sarnafil G 411 is subject to supervisory factory production and product control according to contract between SINTEF Building and Infrastructure and Sika Supply Center AG concerning Technical Approval.

9. Basis for the approval

Material and design data have been verified by tests which are mainly documented in the following reports:

- Norwegian Building Research Institute. Report no. O 8125 dated 08.07.96 (material properties).
- Norwegian Building Research Institute. Report no. O 8440 dated 18.12.98 (wet room membrane).
- Norwegian Building Research Institute. Report no. O 8440-3 dated 15.03.99 (material properties).
- Danish Institute of Fire Technology. Report F10079aE no. 5803 dated 29.06.99 (fire tests)
- Swedish National Testing and Research Institute. Report 99R2 3567 dated 18.05.99 (audit testing, fire)
- SINTEF Byggeforsk. Rapport SBF2014F0026 av 14.02.2014 (leaching properties)

10. Marking

All rolls shall be marked with the manufacturer's production code. All pallets/packages shall be marked with the product designation and the date of production. The approval mark for SINTEF Technical Approval No. 2112 may also be used.



Approval mark

11. 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

12. Technical management

Project manager for this approval is Knut Noreng, SINTEF Building and Infrastructure, Trondheim

for SINTEF Building and Infrastructure

Hans Boye Skogstad
Approval Manager