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Agrément Certificate

08/4530

Product Sheet 1

SARNAFIL WATERPROOFING SYSTEMS

SARNAFIL PROTECTED ROOF WATERPROOFING SYSTEMS

PRODUCT SCOPE AND SUMMARY OF CERTIFICATE

This Certificate relates to Sarnafil Protected Roof Waterproofing Systems, comprising single-ply polymeric sheets, for use in loose-laid and ballasted roof waterproofing applications, inverted roofs, green roofs and roof gardens and terraces on flat roofs.

AGRÉMENT CERTIFICATION INCLUDES:

- factors relating to compliance with Building Regulations where applicable
- factors relating to additional non-regulatory information where applicable
- independently verified technical specification
- assessment criteria and technical investigations
- design considerations
- installation guidance
- regular surveillance of production
- formal three-yearly review.



KEY FACTORS ASSESSED

Weathertightness — the membranes will resist the passage of moisture to the inside of the building (see section 5).

Properties in relation to fire — in the opinion of the BBA, the systems, when used in a suitable specification, will enable a roof to be unrestricted under the Building Regulations (see section 6).

Resistance to wind uplift — tests results indicate that the systems will enable a roof to be unrestricted under the Building Regulations (see section 7).

Resistance to foot traffic — the systems will accept regular foot traffic and associated loads without damage (see section 8).

Resistance to penetration of roots — the membranes will adequately resist plant root penetration (see section 9).

Durability — under normal service conditions, Sarnafil G and Sarnafil TCG/TG66 roofing systems will provide durable waterproof coverings with service lives in excess of 35 years and 25 years respectively (see section 11).

The BBA has awarded this Agrément Certificate to the company named above for the systems described herein. These systems have been assessed by the BBA as being fit for their intended use provided they are installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrément

Simon Wroe
Head of Approvals — Materials

Greg Cooper
Chief Executive

Date of First issue: 13 January 2012

Originally certificated on 27 March 2008

The BBA is a UKAS accredited certification body — Number 1113. The schedule of the current scope of accreditation for product certification is available in pdf format via the UKAS link on the BBA website at www.bbacerts.co.uk

Readers are advised to check the validity and latest issue number of this Agrément Certificate by either referring to the BBA website or contacting the BBA direct.

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Regulations

In the opinion of the BBA, Sarnafil Protected Roof Waterproofing Systems, if used in accordance with the provisions of this Certificate, will meet or contribute to meeting the relevant requirements of the following Building Regulations:



The Building Regulations 2010 (England and Wales)

Requirement: B4(2)	External fire spread
Comment:	Flat roofs covered with the systems and ballasted with a minimum of 50 mm of aggregate shall be deemed to have an 'AA' fire classification. See sections 6.1 and 6.2 of this Certificate.
Requirement: C2(b)	Resistance to moisture
Comment:	The membrane, including joints, will enable a roof to meet this Requirement. See section 5.1 of this Certificate.
Requirement: Regulation 7	Materials and workmanship
Comment:	The membranes are acceptable. See sections 11.1 to 11.4 and the <i>Installation</i> part of this Certificate.



The Building (Scotland) Regulations 2004 (as amended)

Regulation: 8(1)(2)	Fitness and durability of materials and workmanship
Comment:	Use of the systems satisfies the requirements of this Regulation. See sections 10.1, 10.2, and 11.1 to 11.4 and the <i>Installation</i> part of this Certificate.
Regulation: 9	Building standards – construction
Standard: 2.8	Spread from neighbouring buildings
Comment:	Flat roofs covered with the systems and ballasted with a minimum of 50 mm of aggregate shall be deemed to have an 'AA' fire classification, with reference to clauses 2.8.1 ⁽¹⁾⁽²⁾ and 2.8.2 ⁽¹⁾⁽²⁾ . See sections 6.1 and 6.2 of this Certificate.
Standard: 3.10	Precipitation
Comment:	The membranes, including joints, will enable a roof to satisfy the requirements of this Standard, with reference to clauses 3.10.1 ⁽¹⁾⁽²⁾ and 3.10.7 ⁽¹⁾⁽²⁾ . See section 5.1 of this Certificate.
Standard: 7.1(a)	Statement of sustainability
Comment:	The membranes can contribute to meeting the relevant requirements of Regulation 9, Standards 1 to 6 and therefore will contribute to a construction meeting a bronze level of sustainability as defined in this Standard.
Regulation: 12	Building standards – conversions
Comment:	Comments made in relation to the membranes under Regulation 9, Standards 1 to 6, also apply to this Regulation, with reference to clause 0.12.1 ⁽¹⁾⁽²⁾ and Schedule 6 ⁽¹⁾⁽²⁾ . (1) Technical Handbook (Domestic). (2) Technical Handbook (Non-Domestic).



The Building Regulations (Northern Ireland) 2000 (as amended)

Regulation: B2	Fitness of materials and workmanship
Comment:	The membranes are acceptable. See sections 11.1 to 11.4 and the <i>Installation</i> part of this Certificate.
Regulation: B3(2)	Suitability of certain materials
Comment:	The systems are acceptable. See sections 10.1 and 10.2 of this Certificate.
Regulation: C4(b)	Resistance to ground moisture and weather
Comment:	The membranes, including joints, will enable a roof to satisfy the requirements of this Regulation. See section 5.1 of this Certificate.
Regulation: E5(b)	External fire spread
Comment:	Flat roofs covered with the systems and ballasted with a minimum of 50 mm of aggregate shall be deemed to have an 'AA' fire classification. See sections 6.1 and 6.2 of this Certificate.

Construction (Design and Management) Regulations 2007

Construction (Design and Management) Regulations (Northern Ireland) 2007

Information in this Certificate may assist the client, CDM co-ordinator, designer and contractors to address their obligations under these Regulations.

See sections: 1 *Description* (1.2) and 2 *Delivery and site handling* (2.3) of this Certificate.

Non-regulatory Information

NHBC Standards 2011

NHBC accepts the use of Sarnafil Protected Roof Waterproofing Systems, when installed and used in accordance with this Certificate, in relation to *NHBC Standards, Part 7 Roofs, Chapter 7.1, Flat roofs and balconies*.

General

Sarnafil membranes are manufactured in Switzerland by SSC AG and marketed in the UK by Sika Limited.

The Certificate holder operates a Registered Contractors Scheme⁽¹⁾ for this product under which the contractors are trained, registered and regularly reviewed by the Certificate holder to demonstrate that they are competent to carry out installation of the product in accordance with this Certificate. Details of Registered Contractors are available from the Certificate holder. Registered Contractors are responsible for each installation of the products they undertake.

(1) The Certificate holder's records relating to their Registered Contractors Scheme will be audited annually by the BBA as part of its programme of surveillance.

Technical Specification

1 Description

1.1 Sarnafil Protected Roof Waterproofing Systems comprise:

- Sarnafil G410 — manufactured by the application of plasticised PVC impregnating a glassfibre carrier in a multi-stage coating operation. The G410 membrane is also available with a non-woven polyester felt (300 g·m⁻²) laminated to the underside of the membrane as an integral separation layer
- Sarnafil G476 — manufactured by the application of plasticised PVC impregnating a glassfibre carrier in a multi-stage coating operation
- Sarnafil TCG — manufactured from flexible polypropylene alloy (FPO) compound and reinforced with a glassfibre scrim
- Sarnafil TG66 — manufactured from FPO compound and reinforced with a glassfibre scrim.

1.2 The roofing membranes are manufactured to the nominal parameters given in Table 1.

Characteristic (units)	Sarnafil G410			Sarnafil TCG	Sarnafil TG66
	Standard G410-EL	Fleece backed G410-ELF	Sarnafil G476		
Thickness (mm)	1.5, 1.8, 2.0	1.5 ⁽¹⁾ , 1.8 ⁽¹⁾ , 2.0 ⁽¹⁾	2.0	1.5, 1.8, 2.0	1.5, 1.8, 2.0
Roll length (m)	20, 15	15, 15, 15	15	20, 15, 15	20, 15, 15
Roll width (m)	2, 3	2	2	2, 2, 2	2, 2, 2
Weight (kg·m ⁻²) ⁽¹⁾	2.0, 2.3, 2.6	2.3, 2.7, 3.1	2.0	1.5, 1.8, 2.0	1.5, 1.8, 2.0
Roll weight (kg)	64, 80, 69, 78	69, 81, 93	60	60, 54, 60	60, 54, 60
Colour	A range of colours are available		Red	standard RAL 7040 Window Grey	

(1) Polyester-felt grey 300 g·m⁻³.

1.3 Ancillary items for use with the membranes include:

- Sarnacol 2162 — one-component polyurethane adhesive for bonding insulation boards
- Sarnacol 2170 — adhesive for bonding the G410 membrane to the substrate
- Sarnacol 2116 — adhesive for bonding ballast in areas of high wind
- Sarnacol 2142S — adhesive for bonding G410-ELF membranes to the substrate
- Sarnafil T Clean — cleaning agent for TCG/TG66
- Sarnafil G445-13 — protection sheet for G410
- Sarnafil TG63-13 — protection sheet for TCG/TG66
- Sarnavap 500E, 1000E and 2000E — polyethylene vapour control layers
- Sarnavap double-sided jointing tape — for sealing Sarnavap vapour control layers
- Sarnavap 5000E SA — self-adhered bituminous vapour control layer
- Sarnafil Primer 600 — for use with Sarnacol 2162 and Sarnavap 5000E SA, subject to substrate requirements
- SarnaFelt Type T — polyester felt for use as a barrier to bitumen and polystyrene insulation boards
- SarnaFelt Type GK — polypropylene-based felts for use as cushion separation layers
- SarnaFelt VS 140 — polypropylene filter layer to be used under ballast in inverted roof applications
- Sarnafil Double L — insulated and sealable rainwater outlet for gravity and siphonic systems
- SarnaVert — intensive and extensive planted roof greening systems
- Gravel Stop — stainless steel gravel stop/guard for ballasted roof applications
- Aquadrain — protection and drainage mat with an integral filter fleece to the top surface, made from polyethylene waste recycled to produce a new product suitable for use in green roof applications.

1.4 Quality control checks are carried out on incoming raw materials, during production and on the products.

2 Delivery and site handling

2.1 Membranes are delivered to site in rolls packaged in polythene bearing a label with product identification, stock number, lot number, bulk roll number, area, date code and the BBA identification mark incorporating the number of this Certificate.

2.2 Rolls should be stored in a cool, dry area on a clean, level surface, and kept under cover. Rolls should only be unwrapped from packaging at the time of installation and unused membrane returned to its packaging until required.

2.3 The properties of the adhesives in relation to *The Chemicals (Hazard Information and Packaging for Supply) Regulations 2009 (CHIP4)/Classification, Labelling and Packaging of Substances and Mixtures (CLP Regulations) 2009* are given in Table 2. These products should be stored in accordance with *The Dangerous Substances and Explosive Atmospheres Regulations 2002*.

Product	Flashpoint (°C)	Classification
Sarnacol 2142S	-18	Highly flammable/Harmful
Sarnafil T Clean	30	Flammable/Irritant
Sarnacol 2170	-4	Highly flammable/Irritant
Sarnacol 2162	<3	Highly flammable/Harmful
Sarnafil Primer 600	-20	Highly flammable/Irritant

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Sarnafil Protected Roof Waterproofing Systems.

Design Considerations

3 General

3.1 Sarnafil Protected Roof Waterproofing Systems are satisfactory for use as waterproofing on flat roofs with limited or pedestrian/amenity access as follows:

- loose-laid and ballasted roofs
- warm ballasted roofs
- inverted roofs
- green and garden roofs.

3.2 The membranes must be mechanically fixed at upstands and edges.

3.3 Limited access roofs are defined for the purpose of this Certificate as those roofs subjected only to pedestrian traffic for maintenance of the roof covering and cleaning of gutters. Where traffic in excess of this is envisaged, special precautions, such as additional protection to the membrane, must be taken (see section 8).

3.4 Flat roofs are defined for the purpose of this Certificate as those roofs having a minimum finished fall of 1:80. Pitched roofs are defined as those having a fall in excess of 1:6. For design purposes, twice the minimum finished fall should be assumed, unless a detailed analysis, including such details as overall and local deflection and direction of falls, is available.

3.5 For the purposes of this Certificate the finished falls of the roof bearing the drainage layer should be between 1:80 and 1:20. The falls are provided by the substrate.

3.6 Decks to which the membranes are to be applied must comply with the relevant requirements of BS 6229 : 2003, BS 8217 : 2005 and, where appropriate, *NHBC Standards 2011*, Chapter 7.1, *Flat roofs and balconies*.

3.7 Insulation systems or materials used in conjunction with the membranes must either be as described in the relevant clauses of BS 8217 : 2005, or be the subject of a current BBA Certificate and be used in accordance with, and within the limitations of, that Certificate.

3.8 The Sarnafil G410 and G476 membranes can be adversely affected by contact with bituminous or coal tar products and polystyrene insulation boards. In these cases, the G410 felt-backed version or a suitable separating layer such as SarnaFelt Type T must be used. Where doubt arises, the advice of the Certificate holder should be sought.

3.9 Sarnafil TCG and TG66 membranes should not come into direct contact with new bituminous or coal tar products or plasticised PVC. In these cases, a suitable separating layer such as SarnaFelt Type T must be used.

3.10 The membranes must not be laid directly onto timber substrates impregnated with substances containing solvents or oil (eg oil-based preservatives). In these cases, a felt-backed version or a suitable separating layer such as SarnaFelt Type T must be used.

3.11 Recommendations for the design of green roofs and roof garden specifications are available within *The GRO Green Roof Code — Green Roof Code of Best Practice for the UK 2011*.

3.12 For green and inverted roof gardens, structural decks to which the system is to be applied must be suitable to transmit the dead and imposed loads experienced in service.

3.13 Imposed loads, dead loading and wind load specifications are calculated in accordance with BS EN 1991-1 : 2002, BS EN 1991-1-3 : 2003, BS EN 1991-1-4 : 2005 and their respective UK National Annexes.

3.14 The drainage system for green roofs or roof gardens must be correctly designed and provision made for access for maintenance purposes. Dead loads for green roofs and roof gardens can increase if the drains become partially or completely blocked, causing waterlogging of the drainage layer. Gravel guards should therefore be used on rainwater outlets and inspected annually.

3.15 For inverted roof specifications, the ballast requirements should be calculated in accordance with the relevant parts of BS EN 1991-1-4 : 2005 and the UK National Annex. Additional guidance for inverted roof specifications is given in BBA Information Bulletin No 4 *Inverted roofs — Drainage and U valued corrections*.

4 Practicability of installation

The systems should only be installed by installers who have been trained and approved by the Certificate holder. The records relating to this will be audited by the BBA as part of its programme of surveillance within the terms of the Certification.

5 Weathertightness

 5.1 Results of tests confirm that the membranes and joints between them, when completely sealed and consolidated, will adequately resist the passage of moisture to the inside of the building and so meet the following requirements of the national Building Regulations (see also Tables for *Physical properties — general*):


England and Wales — Approved Document C, Requirement C2(b), Section 6.0

Scotland — Mandatory Standard 3.10, clauses 3.10.1 and 3.10.2.

Northern Ireland — Regulation C4(b).

5.2 The membranes are impervious to water and will adequately resist penetration by roots. When used in one of the systems described, they will provide a weathertight roof covering capable of accepting minor structural movement without damage.

6 Properties in relation to fire

 6.1 In the opinion of the BBA, the systems will be deemed to satisfy the requirements of BS 476-3 : 2004, fire designation EXT.F.AA, when used as follows:

- in a loose-laid and ballasted specification, including a minimum surface finish of 50 mm of aggregate
- in a roof garden covered with a drainage layer of gravel 100 mm thick and a soil layer of minimum 300 mm thick
- in a green roof incorporating the membranes covered with an Aquadrain drainage layer and a growing medium of minimum 60 mm thick.

6.2 In the opinion of the BBA, the membranes, when used in irrigated roof gardens or green roofs, will be unrestricted under the following national Requirements:

England and Wales — Requirement B4(2)

Scotland — Mandatory Standard 2.8, clause 2.8.1

Northern Ireland — Regulation E5(b).

6.3 The membranes, when used in protected or inverted roof specifications, including an inorganic covering listed in the Annex of Commission Decision 2000/553/EC can be considered to be unrestricted under national Requirements.

6.4 If allowed to dry, plants used in roof gardens may allow flame spread across the roof. This possibility should be taken into consideration when selecting the plants for the garden. Appropriate protection should be applied to ensure the overall fire-rating of the roof is not compromised by its use.

7 Resistance to wind uplift

7.1 In loose-laid and ballasted systems, the precise ballast requirements should be calculated in accordance with the relevant parts of BS EN 1991-1-4 : 2005 and its UK National Annex.

7.2 The use of concrete slabs on suitable supports should be considered in areas of high wind exposure and the advice of the Certificate holder should be sought. In such areas, the gravel may be bonded at the edges for a distance of one metre using Sarnacol 2116. The membranes should always be ballasted with a minimum depth of 50 mm of aggregate. Soil used in green and garden roofs should be of a type that will not be removed or become localised by wind scour experienced on site.

7.3 It should be recognised that the type of plants used in roof gardens could significantly affect the expected wind loads experienced in service.

8 Resistance to foot traffic


8.1 Where regular traffic is envisaged, eg maintenance of lift equipment, a walkway must be provided by using concrete slabs on bearing pads. When pavements are used, a protective sheet such as Sarnafil G445-13 or TG63-13, or a filter layer such as SarnaFelt Type GK must be laid over the waterproofing, prior to installation of the pavements on paving pad supports. For inverted applications, Sarnafil Type VS140 should be used on the insulation.

8.2 Once the green roof or roof garden is installed it can be regarded as a suitable protection for the membrane in use. However, it should be recognised that the membrane is taken up beyond the level of the soil (at least 150 mm) and is therefore vulnerable to damage in those areas.

9 Resistance to penetration of roots


Results of tests on the membranes indicate that they are resistant to root penetration and can be used in a roof waterproofing system for roof gardens and green roofs.

10 Maintenance

 10.1 A planned maintenance cycle, including inspections by the Certificate holder at minimum intervals of every five years, should be introduced if an extended service life is required. The Certificate holder can advise on methods of extending the service life. This could include the use of thicker membranes, specific maintenance requirements or localised replacement or repair (see section 14).

10.2 It is imperative that the drainage system of the green roof or roof garden is designed correctly, and provision is made for access for maintenance purposes. Inspection of the drains should be carried out regularly to avoid waterlogging of the garden and the subsequent increase in dead weight load.

11 Durability

 11.1 The durability of all roofing materials is dependent on the roof design, installation, immediate environment, maintenance and use. Other specific factors assessed by the BBA relating to the durability of individual products include formulation, thickness, and life to first maintenance.

Sarnafil G410 and G476

11.2 Accelerated ageing tests and performance in use confirm that satisfactory retention of physical properties is achieved. All available evidence indicates that a Sarnafil G roofing system, used in the context of this Certificate, should have a life in excess of 35 years.

11.3 The product has been in use in Switzerland and the UK since 1968 and 1980 respectively. The BBA has examined the oldest available sites where the material has been installed. Tests conducted on the naturally aged material taken from existing sites and naturally aged material which has been subjected to further ageing confirm satisfactory retention of properties indicating that a life in excess of 40 years can be achieved with periodic maintenance as stated in section 10.1.

Sarnafil TCG and Sarnafil TG66

11.4 Sarnafil TCG and Sarnafil TG66 have been used in Switzerland and the UK since 1985 and 1992 respectively. Accelerated weathering tests and performance in use confirm satisfactory retention of physical properties is achieved. All available evidence indicates that Sarnafil TCG/TG66 should have a life in excess of 25 years.

Installation

12 General

12.1 Installation of Sarnafil Protected Roof Waterproofing Systems (see Figure 1) must be carried out by trained and approved installers (see section 4), working in accordance with the relevant clauses of the Certificate holder's instructions and BS 8000-4 : 1989.

12.2 Conditions on site should be those for normal roof waterproofing work. Deck surfaces must be dry, clean, and free from sharp projections such as nail heads or concrete nibs. When used over a rough or bitumen substrate, a suitable protection layer must be laid first.

13 Procedure

13.1 Horizontal laps should be a minimum of 80 mm wide with all flashings raised a minimum of 150 mm above the finished roof level.

13.2 The membranes are mechanically fixed at perimeters, at all penetrations and at changes of level, and the laps welded together. Finally, the detail work is carried out.

13.3 The membranes should be covered with a protective sheet such as Sarnafil G445-13 or TG63-13, or a filter layer such as SarnaFelt Type GK. For inverted roof applications, SarnaFelt Type VS 140 should be used prior to the application of at least 50 mm of washed, well-rounded gravel. In areas of high wind exposure, a heavier gravel may be used and/or the gravel may be bonded at the edges for a distance of one metre using Sarnacol 2116. Alternatively, paving slabs set on suitable supports may be considered.

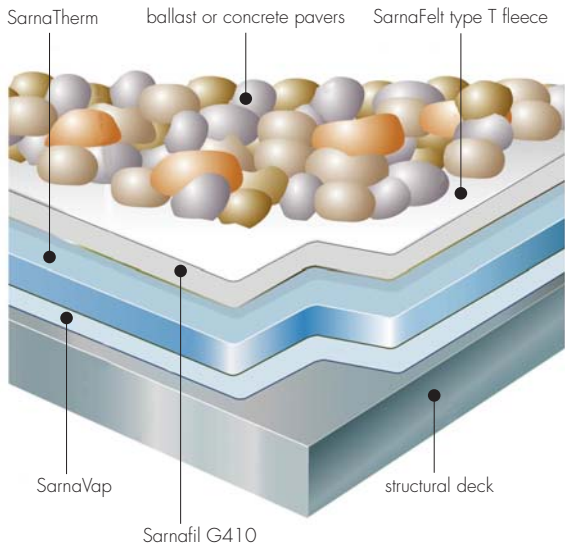
13.4 Sarnafil G410 membrane with SarnaFelt Type VS 140 filter layer is also suitable for use in an inverted roof construction.

13.5 When using a loose-laid application, normal account should be taken in the design of the deck of the extra dead loading due to the weight of the aggregate and/or paving.

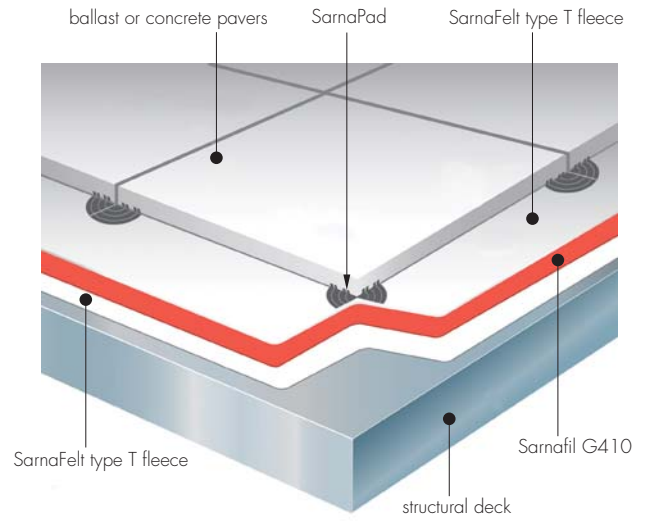
13.6 For green roof or garden roof applications, the Certificate holder's instructions should be strictly followed.

13.7 Flashing and detailing should be formed in accordance with the Certificate holder's instructions.

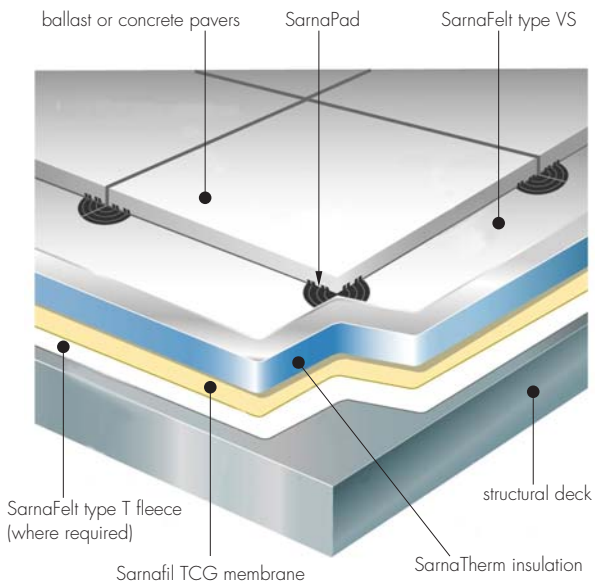
Figure 1 Typical installations



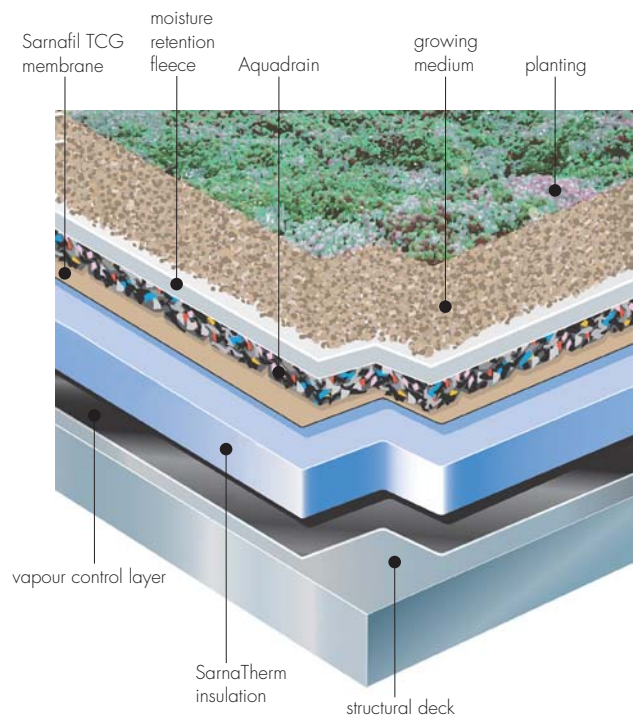
Sarnafil G410 – ballasted roof



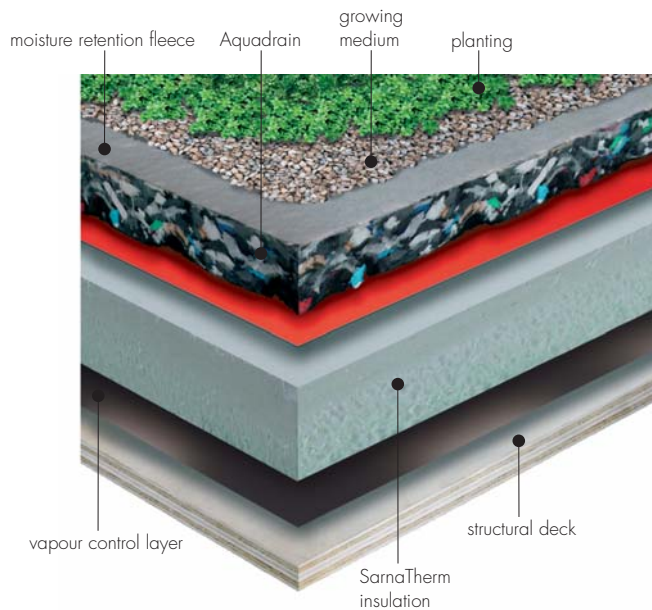
Sarnafil G410 – loose-laid



Sarnafil TCG – inverted roof



Sarnafil TCG – green roof



Sarnafil G410 – green roof

14 Repair

In the event of accidental damage, repairs can be carried out by cleaning the area around the damage and applying a patch as described in the Certificate holder's instructions.

Technical Investigations

15 Tests

Tests were carried out on samples of the membranes and the results assessed. These are summarised in Tables 3 to 8.

Table 3 Physical properties — directional — Sarnafil G410

Test (units)	Mean results		Method
	Longitudinal	Transverse	
Tensile strength (N·mm ⁻²)			BS 2782-3.320A (speed: 200 mm·min ⁻¹)
unaged	12.0	11.2	
heat aged ⁽¹⁾	12.5	12.4	
UV aged ⁽²⁾	12.1	11.7	
SO ₂ immersion ⁽³⁾	11.6	11.7	
Elongation (%)			BS 2782-3.320A (speed: 200 mm·min ⁻¹)
unaged	210	200	
heat aged ⁽¹⁾	200	190	
UV aged ⁽²⁾	200	190	
SO ₂ immersion ⁽³⁾	190	200	
Tear strength (N·mm ⁻¹)	58	62	BS 2782-3.320A (speed: 300 mm·min ⁻¹)
Dimensional free stability (%)	-0.06	-0.02	MOAT 27 : 5.1.6.1

(1) Heat aged 56 days in an oven at 80°C

(2) UV aged 500 light hours using UVB 313 lamps cycling 4 hours UV/45°C, followed by 4 hours condensation at 40°C

(3) 56 days exposure SO₂ at 40°C (see BS 1391).

Table 4 Physical properties — general — Sarnafil G410

Test (units)	Mean result	Method
Apparent density (kg·m ⁻³)	1250	direct measurement
Water vapour permeability (g·m ⁻² ·day ⁻¹)	2.1	BS 3177 (25°C/75% RH)
Water vapour resistance (MN·s·g ⁻¹)	97	BS 3177 (25°C/75% RH)
Ash content (%)	5.7	MOAT 29 : 4.5
Water absorption (mg)	20.4	BS 2782-5 : 502F
Cold flex temperature (°C)	-50	BS 2782-1 : 150B

Table 5 Physical properties — general — Sarnafil G410 and G476

Test (units)	Mean result	Method
Resistance to water pressure (6 m head)	pass	MOAT 27 : 5.1.4
Dynamic indentation		MOAT 27 : 5.1.10
chipboard	I ₃	
expanded polystyrene	I ₃	
perlite board	I ₂	
Static indentation		MOAT 27 : 5.1.9
concrete	L ₄	
fibre board	L ₄	
expanded polystyrene	L ₄	
Low temperature flexibility (°C)	≤-30	MOAT 27 : 5.4.2

Table 6 Physical properties — directional — Sarnafil TG66

Test (units)	Mean results		Method
	Longitudinal	Transverse	
Tensile strength (N·50 mm ⁻¹)			BS 2782-3.320E (100 mm·min ⁻¹)
unaged	712	605	
water soak ⁽¹⁾	671	583	
Elongation at maximum load (%)			
unaged	1125	980	
water soak ⁽¹⁾	927	872	
Dimensional stability (%)	-0.08	-0.06	MOAT 27 : 5.1.6
Tear strength (nail) (N)	379	368	MOAT 27 : 5.4.1

(1) Water soak at 60°C for 28 days.

Table 7 Physical properties — general — Sarnafil TG66

Test (units)	Mean result	Method
Static indentation		MOAT 27 : 5.1.9
concrete	L ₄	
EPS	L ₂	
Dynamic indentation		MOAT 27 : 5.1.10
perlite	I ₃	
EPS	I ₂	
Water vapour permeability (g·m ⁻² ·day ⁻¹)	0.24	BS 3177 (25°C/75% RH)
Water vapour resistance (MN·s·g ⁻¹)	848	BS 3177 (25°C/75% RH)

Table 8 Physical properties — general — Sarnafil TCG

Test (units)	Mean result	Method
Static indentation		MOAT 27 : 5.1.9
concrete	L ₄	
EPS	L ₂	
Dynamic indentation		MOAT 27 : 5.1.10
perlite	I ₂	
EPS	I ₂	
Tensile strength of joints (N)		MOAT 27 : 5.2.2/3/4 (200 mm·min ⁻¹)
control	431	

16 Investigations

16.1 Test data obtained from tests on a material of similar formulation to the Sarnafil TG66/TCG material were assessed to determine:

- tensile strength and elongation
- resistance to water pressure
- resistance to nail tear
- resistance to folding at low temperature
- resistance to leakage at joints
- tensile strength of joints
- peel strength of joints.

16.2 Existing data relating to resistance of the membranes to root and sprout penetration were evaluated.

16.3 The manufacturing processes were evaluated, including methods of quality control. Details were also obtained of the quality and composition of the materials used.

16.4 A survey of known users was carried out to assess the performance of the systems in use.

16.5 A reassessment of the *Durability* statement was based on visits to existing sites in Switzerland and in the UK and the results of tests conducted on Sarnafil G410 unaged, naturally-aged and accelerated aged material.

16.6 A reassessment of the *Durability* statement was based on visits to existing sites in Europe and on the results of tests conducted on a material of similar formulation to Sarnafil TCG/TG66 unaged and natural-aged material.

Bibliography

- BS 476-3 : 2004 *Fire tests on building materials and structures — Classification and method of test for external fire exposure to roofs*
- BS 1391 : 1952 *Specification for performance tests for protective schemes used in the protection of light-gauge steel and wrought iron against corrosion*
- BS 2782-1.150B : 1976 *Methods of testing plastics — Thermal properties — Determination of cold flex temperature of flexible polyvinyl compound*
- BS 2782-3.308A : 1970 *Methods of testing plastics — Mechanical properties — Tear strength of flexible unsupported polyvinyl chloride sheet*
- BS 2782-3.320A to 320F : 1976 *Methods of testing plastics — Mechanical properties — Tensile strength, elongation and elastic modulus*
- BS 2782-5.502F : 1970 *Methods of testing plastics — Optical and colour properties, weathering— Water absorption — Procedure A of ISO method*
- BS 3177 : 1959 *Method for determining the permeability to water vapour of flexible sheet materials used for packaging*
- BS 6229 : 2003 *Flat roofs with continuously supported coverings — Code of practice*
- BS 8000-4 : 1989 *Workmanship on building sites — Code of practice for waterproofing*
- BS 8217 : 2005 *Reinforced bitumen membranes for roofing — Code of practice*
- BS EN 1991-1-1 : 2002 *Eurocode 1 : Actions on structures — General actions— Densities, self-weight, imposed loads for buildings*
- NA to BS EN 1991-1-1 : 2002 *UK National Annex to Eurocode 1 : Actions on structures — General actions— Densities, self-weight, imposed loads for buildings*
- BS EN 1991-1-3 : 2003 *Eurocode 1 : Actions on structures — General actions — Snow loads*
- NA to BS EN 1991-1-3 : 2003 *UK National Annex to Eurocode 1 : Actions on structures — General actions — Snow loads*
- BS EN 1991-1-4 : 2005 *Eurocode 1 : Actions on structures — General actions — Wind actions*
- NA to BS EN 1991-1-4 : 2005 *UK National Annex to Eurocode 1 : Actions on structures — General actions — Wind actions*
- MOAT No 27 : 1983 *General Directive for the Assessment of Roof Waterproofing Systems*
- MOAT No 29 : 1984 *Directives for the Assessment of Roofing Systems using PVC sheets without reinforcement, loose laid under heavy protection and not compatible with bitumen*

17 Conditions

17.1 This Certificate:

- relates only to the product/system that is named and described on the front page
- is issued only to the company, firm, organisation or person named on the front page — no other company, firm, organisation or person may hold or claim that this Certificate has been issued to them
- is valid only within the UK
- has to be read, considered and used as a whole document — it may be misleading and will be incomplete to be selective
- is copyright of the BBA
- is subject to English Law.

17.2 Publications, documents, specifications, legislation, regulations, standards and the like referenced in this Certificate are those that were current and/or deemed relevant by the BBA at the date of issue or reissue of this Certificate.

17.3 This Certificate will remain valid for an unlimited period provided that the product/system and its manufacture and/or fabrication, including all related and relevant parts and processes thereof:

- are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA
- continue to be checked as and when deemed appropriate by the BBA under arrangements that it will determine
- are reviewed by the BBA as and when it considers appropriate.

17.4 The BBA has used due skill, care and diligence in preparing this Certificate, but no warranty is provided.

17.5 In issuing this Certificate, the BBA is not responsible and is excluded from any liability to any company, firm, organisation or person, for any matters arising directly or indirectly from:

- the presence or absence of any patent, intellectual property or similar rights subsisting in the product/system or any other product/system
- the right of the Certificate holder to manufacture, supply, install, maintain or market the product/system
- individual installations of the product/system, including their nature, design, methods, performance, workmanship and maintenance
- any works and constructions in which the product/system is installed, including their nature, design, methods, performance, workmanship and maintenance
- any loss or damage, including personal injury, howsoever caused by the product/system, including its manufacture, supply, installation, use, maintenance and removal.

17.6 Any information relating to the manufacture, supply, installation, use, maintenance and removal of this product/system which is contained or referred to in this Certificate is the minimum required to be met when the product/system is manufactured, supplied, installed, used, maintained and removed. It does not purport in any way to restate the requirements of the Health and Safety at Work etc. Act 1974, or of any other statutory, common law or other duty which may exist at the date of issue or reissue of this Certificate; nor is conformity with such information to be taken as satisfying the requirements of the 1974 Act or of any statutory, common law or other duty of care.

