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Agrément Certificate No 08/4531

BBA BRITISH BOARD OF AGRÉMENT
TECHNICAL APPROVALS FOR CONSTRUCTION

Designated by Government to issue European Technical Approvals

SARNAFIL ADHERED ROOF WATERPROOFING SYSTEMS

Système d'étanchéité
Dachabdichtungen

Product

- *THIS CERTIFICATE REPLACES AND EXTENDS CERTIFICATES Nos 89/2168 AND 01/3866 AND RELATES TO SARNAFIL ADHERED ROOF WATERPROOFING SYSTEMS, COMPRISING SINGLE-PLY POLYMERIC MEMBRANES.*
- *The systems are for use as an adhered system on flat or pitched roofs with limited access.*
- *The membranes are manufactured in Switzerland by SSC AG and marketed in the United Kingdom by Sarnafil Ltd.*

Regulations

1 The Building Regulations 2000 (as amended) (England and Wales)

In the opinion of the BBA, Sarnafil Adhered Roof Waterproofing Systems, if used in accordance with the provisions of this Certificate, will meet or contribute to meeting the relevant requirements.

Requirement:	B4(2)	External fire spread
Comment:		Data obtained from test to BS 476-3 : 2004, indicate that on suitable non-combustible substructures the use of the systems will enable a roof to be unrestricted under the requirements of this Regulation. See sections 11.1 and 11.2 of this Certificate.
Requirement:	C2(b)	Resistance to moisture
Comment:		Data for water resistance on the membrane, including joints, indicate that the material meets this Requirement. See section 8.2 of this Certificate.
Requirement:	Regulation 7	Materials and workmanship
Comment:		The systems are acceptable. See sections 13.1 to 13.5 and the *Installation* part of this Certificate.

continued

• *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 product 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.

2 The Building (Scotland) Regulations 2004 (as amended)

In the opinion of the BBA, Sarnafil Adhered Roof Waterproofing Systems, if used in accordance with the provisions of this Certificate, will satisfy or contribute to satisfying the various Regulations and related Mandatory Standards as listed below.

Regulation:	8(1)(2)	Fitness and durability of materials and workmanship
Comment:		The use of these systems satisfies the requirements of this Regulation. See sections 12, 13.1 to 13.5 and the *Installation* part of this Certificate.
Regulation:	9	Building standards — construction
Standard:	2.8	Spread from neighbouring buildings
Comment:		Test data to BS 476-3 : 2004 indicate that on suitable non-combustible substructures the use of the material will be unrestricted by the requirements of this Standard, with reference to clauses 2.8.1[(1)(2)] and 2.8.2[(1)(2)]. See sections 11.1 and 11.2 of this Certificate.
Standard:	3.10	Precipitation
Comment:		Data for water resistance on the systems, including joints, indicate that its use can enable a roof to satisfy the requirements of this Standard, with reference to clauses 3.10.1[(1)(2)] and 3.10.2[(1)(2)]. See section 8.2 of this Certificate.
Regulation:	12	Building standards — conversions
Comment:		All comments given for these systems under Regulation 9, 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).

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

In the opinion of the BBA, Sarnafil Adhered Roof Waterproofing Systems, if used in accordance with the provisions of this Certificate, will satisfy or contribute to satisfying the various Building Regulations as listed below.

Regulation:	B2	Fitness of materials and workmanship
Comment:		The systems are acceptable. See section 13.1 to 13.5 and the *Installation* part of this Certificate.
Regulation:	B3(2)	Suitability of materials
Comment:		The systems are acceptable. See section 12 of this Certificate.
Regulation:	C4(b)	Resistance to ground moisture and weather
Comment:		Data for water resistance on the systems, including joints, indicate that the use of the membranes can enable a roof to satisfy the requirements of this Regulation. See section 8.2 of this Certificate.
Regulation:	E5	External fire spread
Comment:		Data to BS 476-3 : 2004, indicate that on suitable substructures the use of the systems will be unrestricted by the requirements of this Regulation. See sections 11.1 and 11.2 of this Certificate.

4 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: 5 *Description* (5.3) and 6 *Delivery and site handling* (6.3).

Technical Specification

5 Description

5.1 Sarnafil Adhered Roof Waterproofing Systems comprise:

- Sarnafil G410-EL — manufactured by the application of plasticised PVC impregnating a glassfibre carrier in a multi-stage operation. Sarnafil G410-EL membrane is also available with a non-woven polyester felt (300 gm^2) laminated to the underside of the membrane as an integral separation layer.
- Sarnafil TG76 membrane — manufactured from flexible polypropylene alloy (FPO) compound and is reinforced with a combination of glassfibre and synthetic scrim. A polyester felt (200 gm^2) is laminated to the underside of the membrane

5.2 The roofing membranes are manufactured to the nominal characteristics given in Table 1.

Table 1 Nominal characteristics

Characteristic (units)	Sarnafil G Standard G410-EL	Sarnafil G Fleece backed G410-ELF	Sarnafil TG76	
Thickness (mm)	1.2, 1.5, 1.8, 2.0	1.2[1], 1.5[1], 1.8[1], 2.0[1]	1.2	1.5
Roll length (m)	20, 15	20, 15, 15, 15	20	20
Roll width (m)	2, 3	2	2, 3	2, 3
Weight (kgm^{-2})	1.6, 2.0, 2.3, 2.6	1.9, 2.3, 2.7, 3.1	1.5	1.8
Roll weight (kg)	64, 80, 69, 78	76	60	72
Colours	a range of colours is available		grey as standard	

(1) Polyester-felt grey 300 gm^{-2}.

5.3 A range of ancillary items for use with the membranes include:

- Sarnacol 2162 — a one-component polyurethane adhesive for bonding insulation boards
- Sarnacol 2170 — adhesive for bonding G410 membrane to substrate
- Sarnacol 2116 — adhesive for bonding ballast in areas of high wind
- Sarnacol 2142S — adhesive for bonding G410-ELF and TG76 membrane to substrate
- Sarnafil T Clean — a cleaning agent for TG76
- Sarnafil G — protection sheet for G410
- Sarnafil TG63-13 — protection sheet for TG76
- Sarnavap 500E, 1000E and 2000E — polyethylene vapour control layers
- Sarnavap jointing tape — a double-sided tape for use in sealing the Sarnavap vapour control layers
- Sarnavap 5000 ESA — self-adhered bituminous vapour control layer
- SarnaPrimer 600 — primer for use with Sarnacol 2162 and Sarnavap 5000 SA subject to substrate requirements
- SarnaTred – a recycled PVC 600 mm by 600 mm by 6 mm walkway tile that is hot-air welded to the Sarnafil membrane
- SarnaSafe demarcation tape — bright yellow tape, hot-air welded to the membrane to highlight areas such as walkways, cable runs for fall arrest systems roof edges and steps
- Sarnaplast 2235 — an elastic one-part silicone sealant for sealing edges and perimeter upstand flashing terminations
- Primer 110 — surface primer for use on substrates prior to application of Sarnaplast 2235
- Sarnametal G or T — a galvanized metal sheet with Sarnafil G or TG factory laminated to it, for use in prefabricated flashings and drip details
- Sarnafil T Prep — seam preparation for use prior to hot-air welding Sarnafil TG and degreasing metal
- SarnaFelt type A, GK, M and S — polypropylene-based felts for use as cushion/separation layers
- Glassmat 120 — glassfibre separation layer for use with polystyrene insulation boards
- SarnaFelt VS 140 — polypropylene filter layer to be used under ballast in inverted roof applications
- Sarnafil Double L rainwater outlet — insulated and sealable outlet for gravity and siphonic systems
- a range of preformed details, trims, leaf guards and outlets is available
- Peelstop — roll-formed galvanized bar for perimeter and angle change restraint
- SarnaTherm — a range of thermal insulations comprising rigid urethane foam, phenolic foam, mineral wool, expanded polystyrene and extruded polystyrene
- SarnaDeck — a range of trapezoidal profiled metal decks
- SarnaLite — a range of rooflight systems
- Sarnafil Constant Force post – cable-based fall arrest and restraint system
- Sarnafil Paving Support Pad and Shim – support and levelling system for pavers.

5.5 Quality control checks are carried out on incoming raw materials, during production and on the finished product. Checks on the final product include:

- thickness
- lamination
- tensile strength and elongation
- heat resistance test
- mechanical impact test
- gelation test.

6 Delivery and site handling

6.1 Membranes are delivered to site in rolls packaged in polyethylene 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.

6.2 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 time of installation and unused membrane returned to its packaging until required.

6.3 The properties of the adhesives in relation to *The Chemicals (Hazard Information and Packaging for Supply) Regulations 2002* (CHIP3) are given in Table 2. The materials should be stored in accordance with Highly Flammable Liquids and Petroleum Gases Regulations 1997.

Table 2 Adhesive characteristics

Product	Flashpoint (°C)	Classification
Sarnacol 2142S	–4	Highly flammable/Harmful
Sarnafil T Prep	<21	Highly flammable/Irritant
Sarnacol 2170	<21	Highly flammable
Sarnacol 2162	36	Harmful
Primer 110	–10	Extremely flammable/Harmful

Design Data

7 General

7.1 Sarnafil Adhered Roof Waterproofing Systems are satisfactory for use as adhered waterproofing on flat and pitched roofs with limited access.

7.2 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.

7.3 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 for the purpose of this Certificate 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 of the roof is available, including overall and local deflection, direction of falls.

7.4 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* 2007, Chapter 7.1 or the *Zurich Building Guarantee Technical Manual* 2007, Section 4 *Superstructure*, Sub-section *Flat roofs* (pages 266 and 268).

7.5 Insulation systems or materials used in conjunction with the membranes must either be:

- as described in BS 8217 : 2005, or
- the subject of a current BBA Certificate and be used in accordance with, and within the limitations of, that Certificate
- for use in adhered systems, the thermal insulation to be used must be included in the Certificate holder's list of Insulation boards for use with the Sarnafil Fully Adhered System. The insulation must be attached independently to the substrate.

7.6 The Sarnafil G410 membrane can be adversely affected by contact with bituminous or coal tar products or polystyrene insulation boards. The felt-backed membrane or a suitable separating layer must be used. Where doubt arises, the advice of the Certificate holder should be sought.

7.7 The Sarnafil G410 membrane must not be laid directly onto expanded or extruded polystyrene or on timber substrates impregnated with substances containing solvents or oil (eg oil-based preservatives). The felt-backed membrane or a suitable separation layer must be used. Where doubt arises, the advice of the Certificate holder should be sought.

8 Weathertightness

8.1 The membranes are impervious to water and, when used in the systems described, will give a weathertight roof covering capable of accepting minor structural movements without damage.

8.2 Data confirm that the membranes and joints in the membranes, when completely sealed and consolidated, will adequately resist the passage of moisture to the inside of the building and so meet the requirements of the national Building Regulations:

England and Wales

Approved Document C, Requirement C2(b), Section 6.0

Scotland

Mandatory Standard 3.10, clauses 3.10.1[1][2] and 3.10.2[1][2]

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).

Northern Ireland

Regulation C4(b).

9 Resistance to wind uplift

When used in an adhered specification, the adhesion of the membranes will be limited by the cohesive strength of the substrate. On substances with high cohesive strength, the adhesion of the membrane or of a fleece-backed version of the membrane, is sufficient to resist the effect of wind suction, thermal cycling or minor structural movements occurring in practice. The Certificate holder takes the liability for the calculations of the design of the adhered system. The Certificate holder provides a design service which takes into account all the relevant information supplied.

10 Resistance to foot traffic

Data indicate that the membranes can withstand, without damage, the limited foot traffic and light concentrated loads associated with the installation and maintenance operations. Reasonable care should be taken, however, to avoid sharp objects or concentrated loads. Where regular traffic is envisaged, a walkway should be provided using Sarnatred Walkway pads or concrete slabs on paving support pads.

11 Properties in relation to fire

11.1 When tested in accordance with BS 476-3 : 2004, a system comprising:

- 18 mm thick OSB deck, one layer of bitumen vapour control layer, 100 mm thick PIR insulation and one layer of Sarnafil G410-12EL fully bonded using Sarnacol 2170 achieved an EXT.S.AB rating
- 18 mm thick OSB deck, one layer of bitumen vapour control layer, one layer of 100 mm PIR insulation and one layer of Sarnafil G410-12EL fully bonded using Sarnacol 2170 achieved on EXT.F.AC rating
- 18 mm thick OSB deck, one layer of bitumen vapour control layer, one layer of 75 mm thick mineral wool insulation and one layer of Sarnafil G410-12EL felt fully bonded using Sarnacol 2170 achieved an EXT.F.AC rating
- 18 mm thick OSB deck, one layer of bitumen vapour control layer, one layer of 95 mm thick PIR insulation and one layer of Sarnafil G410-12EL felt fully bonded using Sarnacol 2170 achieved an EXT.F.AC rating
- a system comprising an 18 mm thick plywood deck, bitumen vapour control layer, 75 mm thick mineral wool insulation and polyester fleece backed Sarnafil TG76 fully adhered using Sarnacol 2142S adhesive achieved a rating of EXT.F.AC
- a system comprising an 18 mm thick plywood deck, bitumen vapour control layer, 100 mm thick PIR insulation and polyester fleece backed Sarnafil TG76 fully adhered using Sarnacol 2142S adhesive achieved a rating of EXT.F.AC.

11.2 The designation of other specifications (eg on combustible substrates) should be confirmed by:

England and Wales

Test or assessment in accordance with Approved Document B, Appendix A, Clause A1

Scotland

Test to conform to Mandatory Standard 2.8, clauses 2.8.1[1][2] and 2.8.2[1][2].

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).

Northern Ireland

Test or assessment by a UKAS accredited laboratory or an independent consultant with appropriate experience.

12 Maintenance

In the event of damage, repair should be carried out in accordance with the Certificate holder's instructions. Repair should be carried out with a piece of the membrane sized to extend at least 50 mm beyond the defect in all directions. The damaged area should be cleared back to unweathered material and the piece of the membrane hot-air welded to the original membrane.

13 Durability

13.1 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 of any coating.

Sarnafil G410

13.2 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.

13.3 A planned maintenance cycle, and inspections by the Certificate holder under the Sarnafil Quality Management System 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, for example maintenance coating or localised replacement or repair (see section 12).

13.4 Sarnafil G has been in use in Switzerland and the United Kingdom 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 conditions, confirm satisfactory retention of properties indicating that a life in excess of 40 years can be achieved with periodic maintenance as stated in section 13.3.

Sarnafil TG76

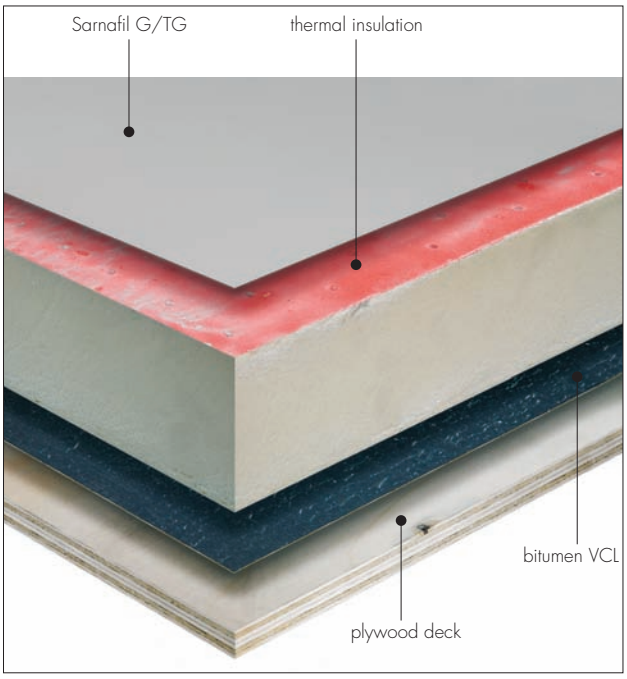
13.5 Sarnafil TG76 has been used in Switzerland and the UK since 1989 and 1992 respectively. Accelerated weathering tests and performance in use confirm satisfactory retention of physical properties is achieved. All available evidence indicates that Sarnafil TG76 should have a life in excess of 25 years.

Installation

14 General

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

Figure 1 Typical installation



14.2 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 and concrete nibs. When used over a rough or bitumen substrate, a suitable protection layer should be placed over the substrate.

14.3 Where the Sarnafil G410/TG76 membrane is to be laid over rough decks, a protective layer must first be installed. When used in remedial work, stone surface protection should be removed. Where this is not possible, ie over a mineral-surfaced embedded bitumen felt, a protective layer will also be required.

14.4 The Sarnafil G410/TG76 membrane may be laid in conditions normal to roofing work and should not be laid in wet or damp weather conditions, nor at temperatures below 5°C, unless suitable precautions are taken.

15 Procedure

Sarnafil G410

15.1 Sarnacol 2170 should be applied to the substrate and allowed to dry. Sarnafil G410-12EL should be unrolled onto the surface and approximately one-third of its length folded back to expose the underside. Sarnacol 2170 should be applied to the membrane (200 gm^2), and substrate (300 gm^2 to 800 gm^2) depending on texture. When the adhesive has dried to the point that strings are formed on touching with a finger, the two adhesive-coated surfaces should be brought into contact and pressed firmly together. This should then be repeated over the rest of the sheet.

15.2 When the adhered system is used over insulation products, the resistance to wind uplift will be limited by the cohesive strength of the insulation, and the method of attachment. These factors should be taken into account when selecting the insulation material. Insulation boards can be either fully adhered, using Sarnacol 2162 or hot bitumen, or be mechanically fastened. Sarnacol 2170 must not be used directly on polystyrene products.

15.3 The membrane is mechanically fixed at the perimeter. The membrane should then be lap jointed.

Sarnafil G410-ELF

15.4 Sarnafil G410-ELF felt can be fully adhered using Sarnacol 2170 or Sarnacol 2142S adhesives, depending upon the substrate.

15.5 When using Sarnacol 2170 adhesive, a primer coat of the adhesive is applied to the substrate and allowed to dry. The membrane is unrolled onto the surface and approximately half of its length folded back to expose the underside. Sarnacol 2170 is applied to the previously primed area. The membrane should be immediately unrolled directly onto the wet adhesive. The surface of the membrane should be rolled with a water-filled roller. The other half of the membrane is folded back and the procedure is repeated.

15.6 When using Sarnacol 2142S, the membrane is unrolled onto the substrate and approximately half of its length rolled back to expose the underside. A coat of Sarnacol 2142S is applied to the substrate, covering only the area where the membrane is to be laid. The membrane should be immediately rolled onto the wet adhesive, ensuring that the weld area is kept adhesive-free. The membrane should be rolled with a water-filled roller. The other half of the membrane is folded back and the procedure repeated.

Sarnafil TG76

15.7 The membrane is unrolled onto the substrate and approximately half of its length rolled back to expose the underside.

15.8 A coat of Sarnacol 2142S is applied to the substrate, covering only one area where the membrane is to be laid.

15.9 The membrane should be immediately rolled onto the wet adhesive, ensuring that the weld area is kept adhesive-free. The membrane should be rolled with a water-filled roller. The other half of the membrane is folded back and the procedure repeated.

16 Jointing and flashing

16.1 Jointing is electrically heated by hot-air welding. The temperature should be set in accordance with the Certificate holder's instructions.

16.2 The welding area should be dry and clean. If the membrane in the welding area is oxidised due to prolonged outdoor exposure, or contaminated, it should be cleaned in the prescribed manner. Sarnafil T Prep should be allowed to flash off totally prior to welding.

16.3 The welded width of the joint must be a minimum of 25 mm. Care should be taken that overheating of the membrane does not occur, as scorching and carbonisation of the membrane will result.

16.4 The seam should be tested with a suitable metal probe and any weakness immediately repaired.

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

Technical Investigations

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

17 Tests

Samples of the membranes were obtained from the manufacturer for testing. The results of the tests carried out by the BBA, which show typical values for the material, are summarised in Tables 3 to 8.

Table 3 Physical properties (general) — Sarnafil G410

Test (units)	Method[1]	Mean result
Apparent density (kgm^{-3})	direct measurement	1250
Water vapour permeability ($gm^{-2}day^{-1}$)	BS 3177 (25°C/75% RH)	2.1
Water vapour resistance ($MNsg^{-1}$)	BS 3177 (25°C/75% RH)	97
Ash content (%)	MOAT 29 : 4.5	5.7

(1) Test documents are detailed in the *Bibliography*. Numbers in the table refer to sections/parts of the various documents.

Table 4 Physical properties (directional) — Sarnafil G410

Test (units)	Method[1]	Mean results	
		Longitudinal	Transverse
Tensile strength (Nmm^{-2})	BS 2782-3.320A (speed: 200 mm min^{-1})		
unaged		11.99	11.18
heat aged[2]		12.42	12.39
UV aged[3]		12.11	11.69
Elongation (%)	BS 2782-3.320A		
unaged	(speed: 200 mm min^{-1})	210	200
heat aged[2]		200	190
UV aged[3]		200	190
Tear strength (Nmm^{-1})	BS 2782-3.308A (speed: 300 mm^{-1})	57.6	61.9
Dimensional free stability (%)	MOAT 27 : 5.1.6.1	–0.06	–0.02

(1) Test documents are detailed in the *Bibliography*. Numbers in the table refer to sections/parts of the various documents.

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

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

Table 5 Service performance —Sarnafil G410

Test (units)	Method[1]	Mean result
Resistance to water pressure (6 metre head)	MOAT 27 : 5.1.4	pass
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
Resistance to wind uplift (kPa)	MOAT 27 : 5.1.2	
Sarnacol 2170 (chipboard)		>8
Thermal shock	MOAT 27 : 5.1.5	
Sarnacol 2170 (chipboard)		pass
Resistance to cyclic movement	MOAT 27 : 5.1.8	
unaged (500 cycles)		pass
heat aged (500 cycles)[2]		pass[3]
Low temperature flexibility (°C)	MOAT 27 : 5.4.2	≤–30
Resistance to sliding (at angle of 90°)	MOAT 27 : 5.1.7	pass
Resistance to peel (N per 50 mm)	MOAT 27 : 5.1.3	
Sarnacol 2170 (Sarnafil G410-12EL)		
chipboard		82
concrete		56
perlite board		7.7
polyisocyanurate (asbestos faced)		10.4
Sarnacol 2170 (Sarnafil G410-ELF)		
concrete		
unaged		40
heat aged[3]		69
water soak[4]		67
Sarnacol 2142S (Sarnafil G410-ELF)		
unaged		146
heat aged[3]		125
water soak[4]		96

(1) Test documents are detailed in the *Bibliography*. Numbers in the table refer to sections/parts of the various documents.

(2) Heat aged 28 days at 80°C.

(3) Heat aged 56 days at 80°C.

(4) Water soak 28 days at 20°C.

Table 6 Tests on joints – Sarnafil G410

Test (units)	Method[1]	Mean result
Peel strength of weld joint (N)	MOAT 29 : 4.17.2 (speed: 200 mm min^{-1})	301
Tensile strength of weld joint[2] (N)	MOAT 27 : 5.2.2/4 speed: 200 mm min^{-1})	
unaged		
long[3]		562
trans[4]		552
heat aged[5]		
long[3]		563
trans[4]		563
water soak[6]		
long[3]		621
trans[4]		580
Air pressure (10 kPa)	MOAT 27 : 5.2.1	pass

(1) Test documents are detailed in the *Bibliography*. Numbers in the table refer to sections/parts of the various documents.
(2) Overlaps of 50 mm hot-air welded.
(3) Longitudinal direction.
(4) Transverse direction.
(5) Heat aged 28 days at 80°C.
(6) Water soak 7 days at 60°C.

Table 7 Physical properties (directional) — Sarnafil TG76

Test (units)	Method[1]	Mean results	
		Long[2]	Trans[3]
Tensile strength (N 50 mm^{-1}) (100 mm min^{-1})	BS 2782-3.320E		
TG76 unaged		948	728
Elongation at maximum load (%)			
unaged		52	67
Dimensional stability (%)	MOAT 27 : 5.1.6	–0.11	–0.07
Tear strength (nail) (N)	MOAT 27 : 5.4.1	748	698

(1) The test documents are detailed in the *Bibliography*. Numbers in the table refer to sections/parts of the various documents.
(2) Longitudinal direction.
(3) Transverse direction.

Table 8 Service performance – Sarnafil TG76

Test (units)	Method[1]	Mean result
Static indentation	MOAT 27 : 5.1.9	
concrete		L_4
EPS		L_4
Dynamic indentation	MOAT 27 : 5.1.10	
perlite		I_3
EPS		I_3
Water vapour permeability ($gm^{-2}day^{-1}$)	BS 3177 (25°C/75% RH)	0.24
Water vapour resistance ($MNsg^{-1}$)	BS 3177 (25°C/75% RH)	848
Resistance to cyclic movement	MOAT 27 : 5.1.8	
unaged (500 cycles)		pass
heat aged[2] (200 cycles)		pass
Resistance to peel (N per 50 mm)	MOAT 27 : 5.1.3	
concrete		
unaged		110
heat aged[2]		120
water soak[3]		41

(1) The test documents are detailed in the *Bibliography*. Numbers in the table refer to sections/parts of the various documents.
(2) Heat aged 28 days at 80°C.
(3) Water soak 28 days at 30°C.

18 Investigations

18.1 Data obtained on tests on a material of similar formulation to Sarnafil TG76 were examined on:

- 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.

18.2 The manufacturing processes were examined, including methods of quality control. Details were also obtained of the quality and composition of the material used.

18.3 An examination was made of existing data on fire performance to BS 476-3 : 2004.

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

18.5 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.

18.6 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 TG76 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 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 3177 : 1959 *Method for determining the permeability of 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*

MOAT No 27 : 1983 *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*

Conditions of Certification

19 Conditions

19.1 This Certificate:

- relates only to the product/system that is named and described on the front page
- is granted only to the company, firm or person named on the front page — no other company, firm or person may hold or claim any entitlement to this Certificate
- 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.

19.2 References in this Certificate to any Act of Parliament, Statutory Instrument, Directive or Regulation of the European Union, British, European or International Standard, Code of Practice, manufacturers' instructions or similar publication, are references to such publication in the form in which it was current at the date of this Certificate.

19.3 This Certificate will remain valid for an unlimited period provided that the product/system and the manufacture and/or fabrication including all related and relevant 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.

19.4 In granting this Certificate, the BBA is not responsible for:

- 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 the nature, design, methods and workmanship of or related to the installation
- the actual works in which the product/system is installed, used and maintained, including the nature, design, methods and workmanship of such works.

19.5 Any information relating to the manufacture, supply, installation, use and maintenance 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 and maintained. It does not purport in any way to restate the requirements of the Health & Safety at Work etc Act 1974, or of any other statutory, common law or other duty which may exist at the date 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. In granting this Certificate, the BBA does not accept responsibility to any person or body for any loss or damage, including personal injury, arising as a direct or indirect result of the manufacture, supply, installation, use and maintenance of this product/system.

BBA BRITISH BOARD OF AGRÉMENT
TECHNICAL APPROVALS FOR CONSTRUCTION

In the opinion of the British Board of Agrément, Sarnafil Adhered Roof Waterproofing Systems are fit for their intended use provided they are installed, used and maintained as set out in this Certificate. Certificate No 08/4531 is accordingly awarded to Sarnafil Ltd.

On behalf of the British Board of Agrément

Head of Approvals — Material

Chief Executive

Date of issue: 28th March 2008

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