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BBA APPROVAL INSPECTION TESTING CERTIFICATION
TECHNICAL APPROVALS FOR CONSTRUCTION

Agrément Certificate
**08/4532**
**Product Sheet 1**

# SARNAFIL WATERPROOFING SYSTEMS

# SARNAFIL MECHANICALLY FASTENED ROOF WATERPROOFING SYSTEMS

## PRODUCT SCOPE AND SUMMARY OF CERTIFICATE

This Certificate relates to Sarnafil Mechanically Fastened Roof Waterproofing Systems, comprising single-ply polymeric membranes and ancillary components, for use as mechanically fastened systems on flat or pitched roofs with limited access.

### 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 into the building (see section 5).

**Properties in relation to fire** — the membranes will enable a roof to be unrestricted under the Building Regulations (see section 6).

**Resistance to wind uplift** — the systems will resist the effects of any likely wind suction acting on the roof (see section 7).

**Resistance to foot traffic** — the membranes will accept the limited foot traffic and loads associated with installation and maintenance (see section 8).

**Durability** — under normal service conditions the Sarnafil S327-EL and Sarnafil TCS/TS77 roofing systems will provide durable waterproof coverings with service lives in excess of 35 years and 25 years respectively (see section 10).

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

Date of First issue: 14 November 2011
Originally certificated on 31 March 2008

Simon Wroe
Head of Approvals — Materials

Greg Cooper
Chief Executive

*The BBA is a UKAS accredited certification body — Number 113. 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*



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# Regulations

In the opinion of the BBA, Sarnafil Mechanically Fastened 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: | | Tests to BS 476-3 : 2004 indicate that, on suitable substructures, the use of the systems will enable a roof to be unrestricted under the requirements of this Regulation. See sections 6.1 and 6.2 of this Certificate. |
| Requirement: | C2(b) | Resistance to moisture |
| Comment: | | The membranes, 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 10.1 to 10.4 and the *Installation* 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 membranes satisfies the requirements of this Regulation. See sections 9.1 and 9.2, 10.1 to 10.4 and the *Installation* part of this Certificate. |
| Regulation: | 9 | Building standards — construction |
| Standard: | 2.8 | Spread from neighbouring buildings |
| Comment: | | Tests 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 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 10.1 to 10.4 and the *Installation* part of this Certificate. |
| Regulation: | B3(2) | Suitability of materials |
| Comment: | | The systems are acceptable. See sections 9.1 and 9.2 of this Certificate. |
| Regulation: | C4(b) | Resistance to ground moisture and weather |
| Comment: | | The membranes, including joints, will enable a roof to meet the requirements of this Regulation. See section 5.1 of this Certificate. |
| Regulation: | E5(b) | External fire spread |
| Comment: | | Test data to BS 476-3 : 2004 indicate that, on suitable substructures, the use of the membranes will be unrestricted by the requirements of this Regulation. 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.

# Additional Information

## NHBC Standards 2011

NHBC accepts the use of Sarnafil Mechanically Fastened 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

The 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 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.

# Technical Specification

## 1 Description

1.1 Sarnafil Mechanically Fastened Roof Waterproofing Systems comprise:

- Sarnafil S327-EL membrane — manufactured by coating the polyester fabric base on both sides with a PVC plastisol coating, fused into one homogeneous sheet. The coating can be applied in several layers to achieve the required membrane thickness and is then passed through a gelation oven
- Sarnafil TCS membrane — manufactured from a flexible polypropylene alloy (FPO) compound, reinforced with a combination of glassfibre matting and synthetic scrim by extrusion coating
- Sarnafil TS77 membrane — manufactured from a FPO compound, reinforced with a combination of glassfibre matting and synthetic scrim by extrusion coating.

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

*Table 1 Sarnafil Mechanically Fastened Roof Waterproofing Systems — nominal characteristics*

| Characteristics Units) | Sarnafil S327-EL | | | | Sarnafil TCS | | | Sarnafil TS77 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Thickness (mm) | 1.2 | 1.5 | 1.8 | 2.0 | 1.5 | 1.8 | 2.0 | 1.2 | 1.5 | 1.8 | 2.0 |
| Roll length (m) | 20 | 20 | 15 | 15 | 20 | 15 | 15 | 25 | 20 | 15 | 15 |
| Roll width (m) | 2, 3 | 2, 3 | 2, 3 | 2, 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mass per unit area ($kg \cdot m^{-2}$) | 1.6 | 1.9 | 2.4 | 2.6 | 1.45 | 2.0 | 2.2 | 1.2 | 1.45 | 2.0 | 2.2 |
| Roll weight (kg) | 64 | 76 | 72 | 78 | 60 | 60 | 66 | 60 | 60 | 60 | 66 |
| Colours | various | various | various | various | grey | grey | grey | grey | grey | grey | grey |

1.3 Ancillary items for use with the membranes include:

- 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 5000E SA — self-adhered bituminous vapour control layer
- S-Felt types A and S — polypropylene-based felts for use as cushion separation layers
- S-Felt type T — polyester felt for use as a barrier to bitumen and polystyrene insulation boards
- SarnaTherm — a range of thermal insulations, comprising rigid urethane foam, phenolic foam, mineral wool, expanded polystyrene and extruded polystyrene
- Sarnaplast 2235 — an elastomeric, one-part silicone sealant for sealing edges and perimeter upstand flashings
- Primer 110 — surface primer for use on substrates prior to application of Sarnaplast 2235
- Primer T 501 — a surface primer for applying Sarnaplast 2235 on absorbent substrates/metal/Sarnafil T/TC membranes.
- Sarnafil T Prep — for seam preparation prior to hot-air welding and for degreasing metal
- Sarnametal S or TS — a galvanized metal sheet with Sarnafil S or TS factory-laminated to it, for use in prefabricated flashings and drip details
- SarnaDeck — a range of trapezoidal profiled metal decks
- Sarnafil G/S and T Prefabricated Corners — a range of prefabricated internal and external corner flashing pieces
- Sarnafil T Vent Pipe Flashings — prefabricated pipe flashings in a range of diameters
- Sarnafil T Post Flashings — prefabricated post flashings in a range of diameters and forms
- Sarnavap G/S Welding Cord — welding cord used with Sarnabar to increase wind uplift resistance at perimeters, for use with Sarnafil G/S
- Sarnafil T Welding Cord — welding cord used with Sarnabar to increase wind uplift resistance at perimeters, for use with Sarnafil TCS and TS77 membranes
- Sarnabar — 2 mm thick, roll-formed galvanized bar, perforated for mechanical fixing
- Sarnafast Fastening System — approved by the Certificate holder for use with the system
- SarnaTred walkway tiles — for use for roof maintenance.

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*.

*Table 2 Adhesive characteristics*

| Material | Flashpoint (°C) | Classification |
|---|---|---|
| Sarnaplast 2235 | N/A | Irritant |
| Primer T 501 | 7 | Highly flammable/Harmful and Dangerous for the environment |
| Primer 110 | –19 | Highly flammable/Harmful |
| Sarnafil T Prep | –4 | Highly flammable/Irritant |

# Assessment and Technical Investigations

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

# Design Considerations

## 3 General

3.1 Sarnafil Mechanically Fastened Roof Waterproofing Systems are satisfactory for use as a mechanically fixed roof waterproofing layer on flat and pitched roofs with limited access.

3.2 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.

3.3 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 as those having falls 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.

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

3.5 Insulation systems or materials used in conjunction with the system 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.

3.6 The Sarnafil S327-EL membrane can be adversely affected by contact with bituminous or coal tar products, or polystyrene insulation boards. In these cases, a felt-backed membrane or a suitable separating layer must be used. Where doubt arises, the advice of the Certificate holder should be sought.

## 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 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 and 3.10.2.

*Northern Ireland* — Regulation C4(b).

5.2 The membranes are impervious to water and when used as described in this Certificate, will provide a weathertight roof capable of accepting minor structural movement without damage.

## 6 Properties in relation to fire

6.1 When tested in accordance with BS 476-3 : 2004:

- a system comprising 19 mm thick plywood deck, one layer of Sarnavap vapour control layer, one 80 mm Kingspan TR26 insulation and one layer of Sarnafil S327-12EL membrane mechanically fastened with Sarnafast fixings, achieved an EXT.S.AB rating
- system comprising 19 mm thick plywood deck, one layer of Sarnavap vapour control layer, one 85 mm thick PIR insulation and one layer of Sarnafil S327-12EL membrane mechanically fastened with Sarnafast fixings, achieved an EXT.F.AC rating
- a system comprising 19 mm thick plywood deck, one layer of Sarnavap vapour control layer, one 75 mm thick mineral wool insulation and one layer of Sarnafil S327-12EL thick (3 m wide) membrane mechanically fastened with Sarnafast fixings, achieved an EXT.F.AC rating
- a system comprising 18 mm thick plywood deck, one layer of Sarnavap 500E vapour control layer, one layer of 100 mm PIR insulation and one layer of Sarnafil TCS-15 membrane mechanically fastened, achieved an EXT.F.AC rating
- a system comprising 19 mm thick OSB deck, one layer of Sarnavap 1000E vapour control layer, one layer of 140 mm rockwool insulation and one layer of Sarnafil TS77-12E membrane mechanically fastened, achieved an EXT.F.AC rating.

6.2 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 and 2.8.2

*Northern Ireland* — test or assessment by a UKAS-accredited laboratory, BRE or an independent consultant with appropriate experience.

## 7 Resistance to wind uplift

7.1 In mechanically fastened systems, the number of fixings and their position will depend on:

- wind uplift forces to be resisted
- the pull-out strength of fixing screws
- elastic limit of the membrane
- appropriate safety factors.

7.2 The number of fixings used should be established by reference to the wind uplift forces calculated in accordance with BS EN 1991-1-4 : 2005 and the UK National Annex on the basis of the maximum permissible loads.

7.3 The Certificate holder provides a design service which takes into account all the relevant information supplied and provides a specification for the positioning of fastening bars or washers, and the number of fixings required. Liability for the calculations of the design of the mechanically fastened system lies with the Certificate holder.

## 8 Resistance to foot traffic

Results of tests 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, ie maintenance of lift equipment, a walkway should be provided using SarnaTred walkway tiles or concrete slabs on paving support pads.

## 9 Maintenance

9.1 Systems must be the subject of annual inspections to ensure continued performance.

9.2 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 Durability

10.1 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 S327-EL

10.2 Accelerated ageing tests and performance in use confirm that satisfactory retention of physical properties is achieved. All available evidence indicates that a Sarnafil S327-EL roofing system, used in the context of this Certificate, should have a life in excess of 35 years.

10.3 The product has been in use in Switzerland and the UK since 1964 and 1980 respectively. The BBA has examined the oldest available sites where a material of similar composition has been installed. Tests conducted on 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 9.

### Sarnafil TCS/TS77

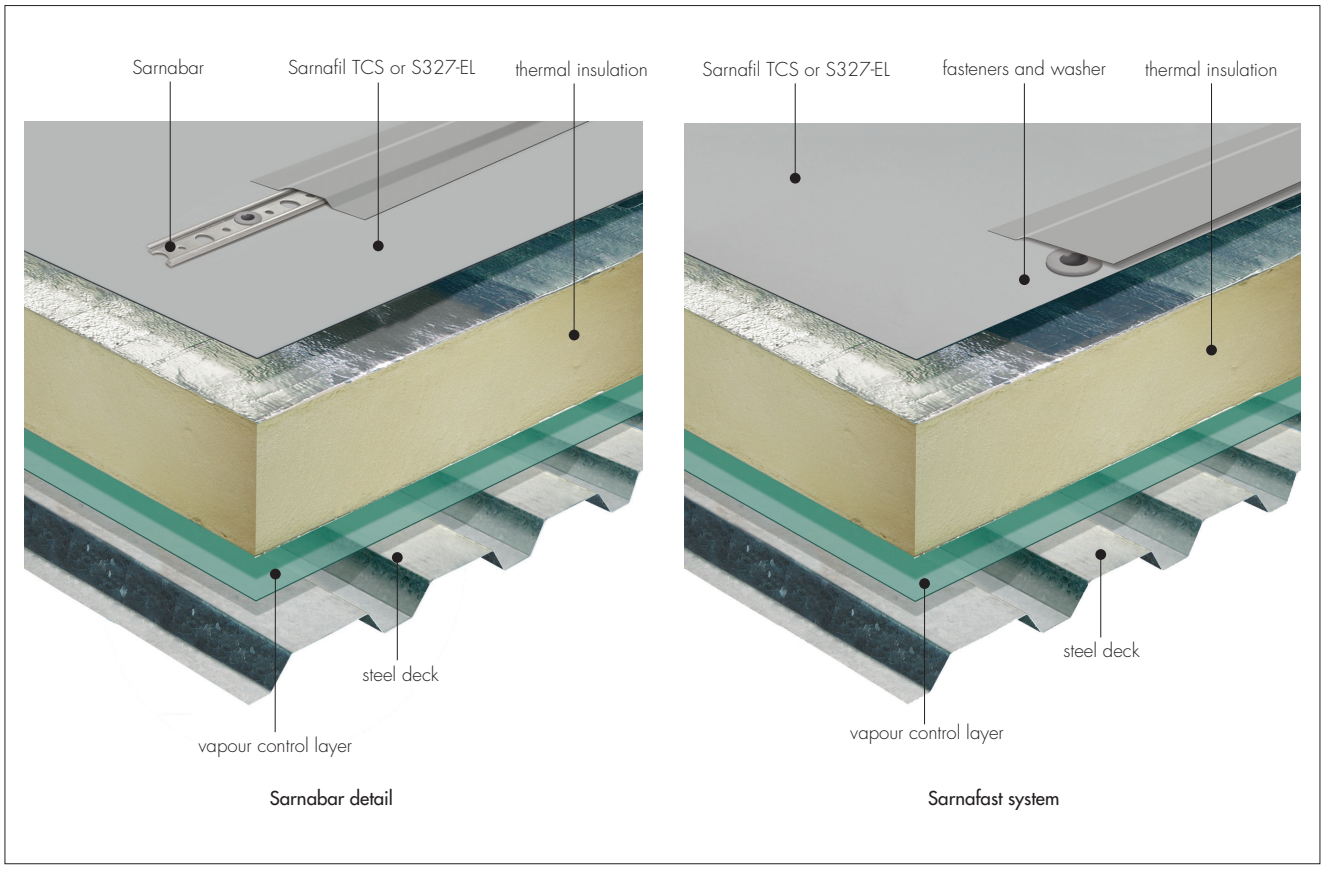
10.4 Sarnafil TCS/TS77 have been used in Switzerland and the UK since 1989 and 1992 respectively. Accelerated weathering tests and performance in use confirm satisfactory retention of physical properties is achieved. All available evidence indicates that Sarnafil TCS/TS77 should have a life in excess of 25 years.

# Installation

## 11 General

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

*Figure 1 Fixing details*




11.2 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 substrate, a suitable protection layer should be laid first.

11.3 In all cases, a vapour control layer should be used directly over the deck. When internal temperatures and humidity conditions will exceed 22°C with 50% relative humidity, special precautions should be taken and the Certificate holder should be consulted.

11.4 Insulation boards should be fixed to the substrate in such a way as not to impair the performance of the waterproofing membrane.

11.5 Installation should not be carried out during wet weather (ie rain, fog or snow).

## 12 Procedure

12.1 The membrane should be laid flat onto the substrate without folds or ripples, and fixed to the deck either using Sarnabars fixed by screws through the membrane or by the Sarnafast system (see Figure 1) through the overlap of the membrane.

12.2 The position of the bars or washers and the number of fixing screws required must be in accordance with the fixing specifications provided by the Certificate holder.

12.3 The Sarnabar is weatherproofed by heat welding 200 mm wide strips of Sarnafil membrane over the bar onto the main membrane (see Figure 1).

12.4 At a vertical flashing, and penetration of the roof, the horizontal membrane requires additional fastening bars. On the perimeter, the membrane must be secured against tearing by welding a 4 mm diameter G/S or T Welding Cord to the membrane beyond the last fastening.

12.5 For continuous fixing the fastening bars should be positioned with a 10 mm gap to allow for expansion. Ends of the bars should be fixed with screws.

12.6 If the laps are to be hand welded, fastening bars should run at 90° to the side laps.

### Steel decks

12.7 Steel decks must be manufactured from galvanized steel with a minimum thickness of 0.7 mm.

12.8 On main roof areas Sarnabars must always run at 90° to the profiled metal deck corrugations, and mechanically fastened using self-drilling and self-tapping screws and tubes in accordance with the Certificate holder's instructions.

### Reinforced concrete decks

12.9 Concrete decks will require pre-drilling. The diameter of the holes should not be less than 6 mm and nylon dowels or self-tapping anchors are recommended. Fastening must be installed in accordance with the Certificate holder's instructions.

12.10 When re-roofing on concrete decks, fastening must be into the concrete. This should be noted particularly when using cement screeds or intermediate layers.

### Timber decks

12.11 Fastening bars should be positioned above and fixed to beams or joists. If this is not possible, fastening bars must be positioned across the direction of timber planks, provided the planks are sufficiently fastened to withstand the imposed wind loads.

12.12 Fastening bars must be fixed by the Certificate holder's approved fasteners (nails are not suitable for this purpose). Acceptable loads on each fastener and corresponding space between fasteners in each case are calculated before installation.

## 13 Jointing and flashing

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

13.2 The welding area should be dry and clean. If Sarnafil T Prep is used, then it should be allowed to flash off totally prior to welding. If the membrane in the weld area has become contaminated, it should be cleaned in accordance with the Certificate holder's instructions.

13.3 The welded width of the joint must be a minimum of 25 mm. Care should be taken to ensure overheating of the membrane does not occur, as possible damage to the membrane may result.

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

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

## 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 7.

*Table 3 Physical properties — directional — Sarnafil S327-EL*

| Test (units) | Mean results | | Method |
|---|---|---|---|
| | Longitudinal | Transverse | |
| Tensile strength (N·mm$^{-2}$) | | | BS 2782-3.320A (speed: 200 mm·min$^{-1}$) |
| unaged | 20.1 | 16.9 | |
| heat aged[1] | 20.6 | 23.5 | |
| UV aged[2] | 23.7 | 17.7 | |
| water soak[3] | 20.1 | 17.7 | |
| Elongation (%) | | | BS 2782-3.320A (speed: 200 mm·min$^{-1}$) |
| unaged | 20 | 20 | |
| heat aged[1] | 10 | 10 | |
| UV aged[2] | 20 | 20 | |
| water soak[3] | 20 | 20 | |
| Resistance to tearing (N) | 430 | 405 | MOAT 27 : 5.4.1 |
| Dimensional change (free) (%) | –0.06 | –0.02 | MOAT 27 : 5.1.6.1 |

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

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

(3) Water soak 28 days water soak at 23 ± 2°C.

*Table 4 Physical properties — general — Sarnafil S327-EL*

| Test (units) | Mean result | Method |
|---|---|---|
| Apparent density (kg·m$^{-3}$) | 1250 | BS 2782-6.620A |
| Water vapour permeability (g·m$^{-2}$·day$^{-1}$) | 3.5 | BS 3177 (at 25°C/75% RH) |
| Ash content (%) | 5.3 | ISO 1270 |
| Resistance to water pressure | no penetration | MOAT 27 : 5.1.4 |
| Dynamic impact | | |
| hard substrate | $I_4$ | MOAT 27 : 5.1.10 |
| soft substrate | $I_4$ | |
| Static indentation | | |
| hard substrate | $I_4$ | MOAT 27 : 5.1.9 |
| soft substrate | $I_4$ | |
| Low temperature flexibility (20 mm ø mandrel to –20°C) | satisfactory | MOAT 27 : 5.4.2 |
| Effectiveness of joints | satisfactory | MOAT 27 : 5.2.1 |

*Table 5 Physical properties — directional — Sarnafil TS77*

| Test (units) | Mean results | | Method |
|---|---|---|---|
| | Longitudinal | Transverse | |
| Tensile strength (N·50 mm$^{-1}$) | | | MOAT 60 : 4.8 (200 mm·min$^{-1}$) |
| unaged | 1240 | 1199 | |
| heat aged[1] | 1104 | 1192 | |
| UV aged[2] | 1238 | 1150 | |
| Strain at maximum load (%) | | | MOAT 60 : 4.8 (200 mm·min$^{-1}$) |
| unaged | 19 | 21 | |
| heat aged[1] | 21 | 22 | |
| UV aged[2] | 20 | 21 | |
| Water absorption (%) | 4.4 | – | MOAT 46 : 6J |
| Dimensional stability (%) | –0.12 | –0.04 | MOAT 27 : 5.1.6 |
| Tear strength (nail) (N) | | | MOAT 55 : 4.231 (100 mm·min$^{-1}$) |
| –10°C | 510 | 600 | |
| +18°C | 540 | 620 | |
| +40°C | 420 | 490 | |

(1) Heat aged 90 days at 80°C.

(2) UV aged in accordance with ASTM G53 : 1996 UVB 313 lamps, 4 hours at 45°C and 4 hours condensation at 50°C for 1000 light hours.

*Table 6 Physical properties — general — Sarnafil TS77*

| Test (units) | Mean result | Method |
|---|---|---|
| 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 ($g \cdot m^{-2} \cdot 24\ h^{-1}$) | 0.55 | BS 3177 (25°C/75% RH) |
| Water vapour resistance ($MN \cdot s \cdot g^{-1}$) | 373 | BS 3177 (25°C/75% RH) |
| Water pressure | pass | MOAT 27 : 5.1.4 |
| Resistance to folding at low temperature (°C)(1) | | DIN 53361 |
| unaged | | |
| UV aged(2) | –25 | |
| heat aged(3) | –25 | |
| Air pressure on joint | pass | MOAT 27 : 5.2.1 |
| Tensile strength of joints (N 50 $mm^{-1}$) | | MOAT 27 : 5.2.2/3/4 (200 $mm \cdot min^{-1}$) |
| control | 910 | |
| heat aged(4) | 880 | |
| water soak(5) | 700 | |
| 'T' peel (N) | | MOAT 46 : 6P |
| unaged | 414 | |
| heat aged(4) | 418 | |

(1) Lowest temperature tested –40°C.
(2) UV aged 1000 hours in the UV 313, UV at 45°C, condensation at 50°C.
(3) Heat aged 84 days at 80°C.
(4) Heat aged 28 days at 80°C.
(5) Water soak 28 days at 60°C.

*Table 7 Physical properties — general — Sarnafil TCS*

| Test (units) | Mean result | Method |
|---|---|---|
| Dynamic impact | | MOAT 27 : 5.1.10 |
| hard substrate | $I_3$ | |
| soft substrate | $I_3$ | |
| Static indentation | | MOAT 27 : 5.1.9 |
| hard substrate | $L_4$ | |
| soft substrate | $L_3$ | |
| Tensile strength of joints (N) | | MOAT 27 : 5.2.2/3/4 (200 $mm \cdot min^{-1}$) |
| control | 728 | |

## 16 Investigations

16.1 Existing data on fire performance to BS 476-3 : 2004 was evaluated.

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

16.3 A visit to a site in progress was carried out to assess the practicability of installation of the Sarnafil S327-EL and Sarnafil TS77 systems.

16.4 Visits were made to existing sites in the UK to assess the performance in use of Sarnafil S327-EL system.

16.5 Wind uplift data on mechanically fixed systems from WSP Aachen, tested in accordance with MOAT No 55 : 1991, were assessed.

16.6 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 a material of similar formulation to Sarnafil S327-EL unaged, naturally-aged and accelerated aged material.

16.7 A reassessment of the Durability statement was based on visits to existing sites in Europe and on the results of tests conducted on Sarnafil TS77 unaged and naturally-aged material.

# Bibliography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MOAT No 46 : 1988 *Special Directives for the Assessment of Roof Waterproofing Systems with Non-reinforced Vulcanized EPDM*

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MOAT No 60 : 1997 *UEAtc Technical Guide for the approval of reinforced and/or backed roof waterproofing systems made of plasticised PVC Sheeting incompatible 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
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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:

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- 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.

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