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Agrément Certificate
09/4668
Product Sheet 3

SIKA ROOF WATERPROOFING SYSTEMS

SIKA-TROCAL LOOSE-LAID AND BALLASTED SYSTEM — SIKA-TROCAL SGmA

PRODUCT SCOPE AND SUMMARY OF CERTIFICATE

This Certificate relates to Sika-Trocal SGmA, for use as loose-laid and ballasted waterproofing layers on flat parapeted roofs with limited or pedestrian 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 system and joints in the system, when completely sealed and consolidated, will resist the passage of moisture to the interior of the building (see section 5).

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

Resistance to wind uplift — the system will resist the effects of any wind suction likely to occur in practice (see section 7).

Resistance to foot traffic — the system will accept the limited foot traffic and loads associated with installation and maintenance of the system without damage (see section 8).

Durability — under normal service conditions the system will provide a durable waterproof covering with a service life of at least 30 years (see section 10).

The BBA has awarded this Agrément Certificate to the company named above for the system described herein. The system has been assessed by the BBA as being fit for its intended use provided it is 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

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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

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, Sika-Trocal SGmA 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 2000 (as amended) (England and Wales)

Requirement:	B4(2)	External fire spread
Comment:		On flat roofs when ballasted with a minimum of 50 mm of aggregate, the roof shall be deemed to be of designation AA. See sections 6.1 and 6.2 of this Certificate.
Requirement:	C2(b)	Resistance to moisture
Comment:		Tests for water resistance on the system, including joints, indicate that the system meets this Requirement. See section 5.1 of this Certificate.
Requirement:	Regulation 7	Materials and workmanship
Comment:		The system is acceptable. See section 10 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:		The system can contribute to a construction meeting this Regulation. See sections 9, 10 and the <i>Installation</i> part of this Certificate.
Regulation:	9	Building standards – construction
Standard:	2.8	Spread from neighbouring buildings
Comment:		On flat roofs when ballasted with a minimum of 50 mm of aggregate, the roof shall be deemed to be of designation AA and can be regarded as having a low vulnerability under clause 2.8.1 ⁽¹⁾⁽²⁾ of this Standard. See sections 6.1 and 6.2 of this Certificate.
Standard:	3.10	Precipitation
Comment:		Tests for water resistance of the system, including joints, indicate that the use of the system can 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.
Regulation:	12	Building standards – conversions
Comment:		All comments given for this system 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).



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

Regulation:	B2	Fitness of materials and workmanship
Comment:		The system is acceptable. See section 10 and the <i>Installation</i> part of this Certificate.
Regulation:	B3(2)	Suitability of certain materials
Comment:		The system is acceptable. See section 9 of this Certificate.
Regulation:	C4(b)	Resistance to ground moisture and weather
Comment:		Tests for water resistance on the system, including joints, indicate that the use of the system can enable a roof to satisfy the requirements of this Regulation. See section 5.1 of this Certificate.
Regulation:	E5(b)	External fire spread
Comment:		On flat roofs when ballasted with a minimum of 50 mm of aggregate, the roof shall be deemed to be of designation AA. 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 obligation under these Regulations.

See sections: 1 *Description* (1.3) and 2 *Delivery and site handling* (2.3).

Non-regulatory Information

NHBC Standards 2008

NHBC accepts the use of Sika-Trocal SGmA when installed and used in accordance with this Certificate, in relation to NHBC Standards, as meeting Technical Requirement R3 in relation to *NHBC Standards, Chapter 7.1 Flat roofs and balconies*.

Zurich Building Guarantee Technical Manual 2007

In the opinion of the BBA, Sika-Trocal SGmA, when installed and used in accordance with this Certificate, satisfies the requirements of the *Zurich Building Guarantee Technical Manual, Section 4, Superstructure, Sub-section Flat roofs.*

General

Sika-Trocal SGmA is manufactured in Germany by SSC AG and marketed in the UK by the Certificate holder.

The system should only be installed by contractors who have been trained and approved/registered by the Certificate holder. The Registered Contractors Scheme records will be audited by the BBA as part of its programme of surveillance of the Certificate.

Technical Specification

1 Description

1.1 Sika-Trocal SGmA consists of a PVC roofing membrane with a glassfibre restraint matrix, Trocal THF chemical solvent or hot-air welded joints and ballasted for surface protection. The sheets are manufactured by laminating together two calendared PVC sheets sandwiching a layer of random glassfibres which has been impregnated with plasticised PVC. The sheet is then cut to width and reeled onto cardboard cores.

1.2 The nominal characteristics of the membranes are:

Thickness (mm)	1.5, 2.0
Roll length (m)	20, 15
Roll width (m)	2.0
Weight (kgm ⁻²)	1.5, 1.9, 2.5
Colour	beige

1.3 Ancillary items for use with Sika-Trocal SGmA sheets include:

- Sika-Trocal THF Welding Agent — tetrahydrofuran (THF) for the cold welding of laps between individual sheets and securing the discs to the underside of the membrane
- Sika-Trocal PVC Solution — consists of plasticised PVC dissolved in tetrahydrofuran, used for sealing lap joints
- Sika-Trocal metal sheets — used to produce profiles for perimeter flashings, connections and fixings. Sheets consist of 0.6 mm thick sheet, galvanized steel with upper side coated with a 0.8 mm thick layer of plasticised PVC, coloured light grey, slate grey and anthracite
- Sika-Trocal polyester fleece (Type T) — a needle-punched non-woven layer (300 gm⁻²) for use as a protective and separating layer preventing contact between the waterproofing sheets and any rough/abrasive surfaces or incompatible materials
- Sika-Trocal polypropylene fleece (Type A) — (300 gm⁻²) for use as a protective and separating layer preventing contact between the waterproofing sheets and any rough/abrasive surfaces or incompatible materials, only suitable for use under membranes
- Sika-Trocal SBV — a PVC-skinned polyester fleece for use as a heavy-duty protective sheet between membrane and ballast
- Sika-Trocal S Vap 500E vapour check — a polyethylene sheet, offering resistance to the passage of water vapour into the roof construction from below
- Sika-Trocal corner pieces — SGmA membrane moulded in corner pieces, for ensuring the waterproofing integrity of the corner details.

1.4 Quality control checks are carried out during production and on the final product. Checks on the final product include:

- tensile strength and elongation
- dimensions
- dimensional stability.

2 Delivery and site handling

2.1 The membranes are delivered to site in rolls on pallets either with a corrugated cardboard outer or wrapped in polyethylene film. The wrapper bears the manufacturer's name, product identification, width of roll, length of roll, colour and the BBA identification mark incorporating the number of this Certificate.

2.2 Rolls should be stored horizontally under cover and on a clean, level surface in a dry environment. Pallets may be stacked to a maximum of three high.

2.3 Items containing THF are flammable with a flashpoint below 32°C and are all classified as 'highly flammable' under *The Chemicals (Hazard Information and Packaging for Supply) Regulations 2002* (CHIP3), and bear the appropriate hazard warning and should be stored accordingly. THF has a short-term exposure limit of 200 parts per million and there must be adequate ventilation when these products are used in confined spaces.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Sika-Trocal SGmA.

Design Considerations

3 General

3.1 Sika-Trocal SGmA is satisfactory for use as a loose-laid roof waterproofing covering, ballasted to prevent wind uplift, on parapeted flat roofs with limited or pedestrian 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, etc. Where traffic in excess of this is envisaged special precautions, such as additional protection to the sheets, 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. 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, etc. Pitched roofs are defined as those having falls in excess of 1:6.

3.4 Pedestrian access roofs are defined for the purpose of this Certificate as those suitable for foot traffic at any time, eg, terraces, balconies, patios. The trafficked layer consists of dense or precast interlocking pavers bedded onto sand, dry mix, or other suitable protection. Special precautions must be taken to protect the membrane.

3.5 Decks to which the system is to be applied must comply with the relevant requirements of BS 6229 : 2003, BS 8217 : 2005 and, where appropriate, *NHBC Standards 2008, Chapter 7.1 Flat roofs and balconies* and Chapter 7.2 *Pitched roofs* or the *Zurich Building Guarantee Technical Manual 2007, Section 4, Superstructure, Sub-sections Flat roofs*, pages 268 to 270.

3.6 Insulation materials used in conjunction with the membranes must meet the requirements stated by the Certificate holder and must be one of the following:

- as described in the relevant Clauses of BS 8217 : 2005, and/or
- the subject of a current BBA Certificate and be used in accordance with, and within the limitations of, that Certificate.

3.7 The membranes must not be laid directly onto certain materials, eg, bituminous felts, certain insulation boards or on timber substrates which have been impregnated with oil-based preservatives. If contact with such products is likely, a separating layer should be used. Where doubt arises, the advice of the Certificate holder should be sought.

4 Practicability of installation

The system 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 on the Certificate.

5 Weathertightness



5.1 Tests confirm that the membrane and joints in the membrane 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 (see section 14, Table 1 *Physical properties — general*):

England and Wales — Approved Document C, Requirement C2(b), Section 6

Scotland — Mandatory Standard 3.10, clauses 3.10.1 and 3.10.7

Northern Ireland — Regulation C4(b).

5.2 The membrane is impervious to water and, when used in the system described, will achieve a weathertight roof capable of accepting minor structural movement without damage.

6 Properties in relation to fire



6.1 When used in a loose-laid and ballasted specification including a minimum surface finish of 50 mm of aggregate, the membranes shall be deemed to satisfy BS 476-3 : 2004 designation EXT.F.AA.

6.2 The designation of other specifications (eg when used 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, clause 2.8.1

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

7 Resistance to wind uplift

The precise ballast requirements for loose-laid and ballasted systems should be calculated in accordance with the relevant parts of BS 6399-2 : 1997, but should not be below the minimum thickness of 50 mm. In areas of high wind exposure the use of the concrete pavers should be considered.

8 Resistance to foot traffic

Tests indicate that the membranes can withstand, without damage, the limited foot traffic and light concentrated loads associated with the installation and maintenance operations. Where traffic in excess of this is envisaged, eg, maintenance of roof-mounted plant or regular access to plant rooms, walkways must be provided and as recommended by the Certificate holder. However, reasonable care should be taken to avoid puncture by sharp objects or concentrated loads (see section 14, Table 1 *Physical properties – general*).

9 Maintenance



Roofs covered with the system should be the subject of annual inspections, as is good practice with all roof waterproofing systems, to ensure continued security and performance.

10 Durability



Sika-Trocal SGmA has been used in the United Kingdom since 1972. Accelerated weathering tests and performance in use confirm that satisfactory retention of physical properties is achieved. All available evidence indicates that the sheets should have a life in excess of 30 years.

Installation

11 General

11.1 Installation of Sika-Trocal SGmA must be carried out by trained and licensed installers in accordance with the Certificate holder's instructions and the relevant Clauses of BS 8000-4 : 1990.

11.2 The membranes may be laid in conditions normal to roofing work and should not be laid in wet or damp weather, or at temperatures below 5°C, unless suitable precautions are taken.

11.3 Deck surfaces should be clean, dry, and free from sharp projections such as nail heads, concrete nibs. Where the membrane is laid over a rough deck, Sika-Trocal polyester fleece (Type A) should be used as a separating layer. The requirement of a vapour barrier should be established in accordance with BS 6229 : 2003 and the Certificate holder's instructions.

11.4 The membranes may be applied over insulation boards, provided the insulation material has been fixed to the substructure by methods that will not impair the performance of the membranes. Rigid, plastic foam insulation boards require a suitable isolating layer to prevent the risk of plasticiser migration. The boards must be firm, of uniform density and where appropriate, capable of spanning the deck flute space under foot traffic.

11.5 Parapet edges should be a minimum of 150 mm above the proposed ballast level to reduce the risk of ballast movement.

11.6 In renovation of existing roofs, blisters should be opened and flattened or removed, and hollows should be filled and levelled off.

12 Procedure

12.1 Installation of the roofing system should commence from the roof perimeters with sufficient amounts of underlays and insulation boards being installed to permit the fixing of the Sika-Trocal metal profiles.

12.2 Sika-Trocal metal sheets should be fixed in place, over any roof insulation when present, at the roof perimeters, and internal corners and penetrations as work progresses.

12.3 The installation of the membranes should be started from a suitable Sika-Trocal metal section at the perimeter. The system should be installed in stages, and not by completing one layer totally before starting the next layer.

12.4 The membrane should be unrolled, over the substrate and on top of any separating layers, taking care not to stretch it. Edge and end laps should be a minimum of 50 mm.

12.5 The membrane is then secured to the Sika-Trocal metal sheets at edges and upstands. The lap joints are made by cold or hot-air welding in the manner described in section 12.7. Prefabricated corner sections should be used where possible for detail work.

12.6 Sika-Trocal polyester fleece Type T or Sika-Trocal SBV protective sheet should be laid over the membrane, prior to the application of the ballast.

Solvent welding

12.7 Welding of the lap joints must be achieved using Sika-Trocal THF Welding Agent in accordance with the manufacturer's instruction as follows:

- the lap joint area should be clean, if not, the area must be cleaned back a minimum of 50 mm and allowed to dry
- both surfaces are then coated with the Sika-Trocal THF Welding Agent, to a minimum width of 30 mm (the minimum width of the welded area must be 30 mm), for approximately 400 mm along the seam
- the welded laps should be consolidated by the application of firm, even pressure to ensure a watertight seal
- after welding, all laps must be tested with a metal probe drawn along the seam edge to confirm the integrity of the welded areas. Rectification should be carried out using a hot-air welder and a hand roller.

Tee joints

12.8 The welding operation is carried out as described in section 12.7. Where multiple sheet overlaps occur, the void created along the edge of the middle sheet should be sealed by hot-air welding the capillary.

Flashing

12.9 A range of profiles and shapes can be fabricated from Trocal metal sheets to deal with parapet, edge and gully details. These are mechanically fixed to the substructure and the membranes are continuously welded to them.

Ballast requirement

12.10 The membrane should be ballasted using a minimum rate of 80 kg per square metre of aggregate (grade 20 mm to 40 mm) or concrete pavers. In areas of high wind loads, additional ballast such as concrete pavers set on a suitable protective layer may be necessary.

13 Repair

In the event of accidental damage, repairs should be carried out in accordance with the Certificate holder's instructions. Repair is by applying a patch of the relevant membrane extending at least 50 mm beyond the defect. The damaged area should be cleaned back to the unweathered material and the patch hot-air or solvent welded to the roofing sheet.

Technical Investigations

14 Tests

Details of tests on Sika-Trocal SGmA carried out by the BBA or assessed by the BBA, which show typical results for the materials, are summarised in Tables 1 and 2.

Test (units)	Mean result		Method ⁽¹⁾
	1.2 mm	1.5 mm	
Weight per unit area (kgm ⁻³)	1.42	1.86	Direct measurement
Ash content (%)			Direct measurement
top layer	3.17	3.32	
bottom layer	3.14	3.37	
Plasticiser content (%)			MOAT 29 : 4.6
unaged			
top layer	39.9	39.9	
bottom layer	38.2	38.2	
heat aged ⁽²⁾			
top layer	39.4	39.4	
bottom layer	38.8	38.8	
Water vapour transmission (gm ⁻² day ⁻¹)			BS 3177
top layer	1.4	–	
bottom layer	1.3	–	
Dynamic indentation			MOAT 27 : 5.1.10
concrete substrate	I ₃	I ₃	
EPS substrate	I ₂	I ₃	
Static indentation			MOAT 27 : 5.1.9
hard substrate	L ₄	–	
soft substrate	L ₄	–	
Low temperature flexibility (°C)	–30	–30	MOAT 27 : 5.4.2
Air pressure on joints	no penetration		MOAT 27 : 5.2.1
Tensile strength of joints (Nmm ⁻²)			MOAT 27 : 5.2.2/3/4
unaged	164	160	
heat aged ⁽³⁾	162	172	
water soak ⁽⁴⁾	159	175	
Weldability of joints (T-Peel) (Nmm ⁻²)	–	5	MOAT 24 : 1.7.2

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

(2) heat aged for 180 days at 80°C.

(3) heat aged for 28 days at 80°C.

(4) Water soak for 7 days at 60°C.

Table 2 *Physical properties — directional*

Test (units)	Mean result		Method ⁽¹⁾
	1.2 mm	1.5 mm	
Tensile strength (Nmm ⁻²)			MOAT 29 : 4.8
unaged			
longitudinal	13.0	13.2	
transverse	11.8	11.6	
heat aged ⁽²⁾			
longitudinal	—	—	
transverse	11.6	—	
Elongation (%)			MOAT 29 : 4.8
unaged			
longitudinal	320	340	
transverse	300	300	
heat aged ⁽²⁾			
longitudinal	—	—	
transverse	305	—	
Tear propagation (Nmm ⁻¹)			MOAT 29 : 4.1.2
longitudinal	45.0	—	
transverse	43.4	—	
Dimensional stability (%)			MOAT 29 : 4.1.5
free			
unaged			
longitudinal	-0.02	-0.02	
transverse	-0.01	-0.02	
heat aged ⁽²⁾			
longitudinal	-0.03	—	
transverse	-0.02	—	

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

(2) Heat aged for 180 days at 80°C.

15 Investigations

15.1 A re-examination was made of the data and investigations on which the previous Certificate 94/3060 was based.

15.2 The manufacturing process was assessed, including the method adopted for quality control, and details were obtained of the quality and composition of the materials used.

15.3 Visits were made to sites in progress to assess the methods of application.

15.4 Visits were made to existing sites to assess the products' performance in use.

15.5 A survey of known users of Sika-Trocal SGmA was carried out to assess the performance in United Kingdom conditions.

15.6 A reassessment of the Durability statement was made based on visits to old existing sites and results of tests conducted on unaged and natural-aged materials.

Bibliography

BS 476-3 : 2004 *Fire tests on building materials and structures — Classification and method of test for external fire exposure to roofs*

BS 2782-3.360B : 1991 *Methods of testing plastics — Mechanical properties — Determination of tear resistance of plastics film and sheeting by the trouser tear 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 6399-2 : 1997 *Loading for buildings — Code of practice for wind loads*

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 *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*

16 Conditions

16.1 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.

16.2 Publications and documents referred to in this Certificate are those that the BBA deems to be relevant at the date of issue or re-issue of this Certificate and include any: Act of Parliament; Statutory Instrument; Directive; Regulation; British, European or International Standard; Code of Practice; manufacturers' instructions; or any other publication or document similar or related to the aforementioned.

16.3 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.

16.4 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.

16.5 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.