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BBA APPROVAL INSPECTION TESTING CERTIFICATION
TECHNICAL APPROVALS FOR CONSTRUCTION

Agrément Certificate
93/2877
Product Sheet 2

PARADIENE/PARAFOR ROOF WATERPROOFING MEMBRANES

PARADIENE S/PARAFOR ROOF COVERING SYSTEMS

This Agrément Certificate Product Sheet(1) relates to Paradiene S/Parafor Roof Covering Systems, for use as two layer, built-up waterproofing systems on flat roofs and pitched roofs, or loose-laid and ballasted on flat roofs.

(1) Hereinafter referred to as 'Certificate'.

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 systems will resist the passage of moisture into the building (see section 6).

Properties in relation to fire — the systems will enable a roof to be unrestricted under the Building Regulations (see section 7).

Resistance to wind uplift — the systems will resist the effects of any likely wind suction acting on the roof (see section 8).

Resistance to foot traffic — the systems will accept the limited foot traffic and loads associated with installation and maintenance (see section 9).

Durability — under normal service conditions the systems will provide a durable waterproofing with a service life of at least 35 years (see section 11).

The BBA has awarded this 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 Fourth issue: 8 October 2015

Originally certificated on 19 February 1993

John Albon — Head of Approvals
Construction Products

Claire Curtis-Thomas
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

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, Paradiene S/Parafor Roof Covering Systems, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements of the following Building Regulations (the presence of a UK map indicates that the subject is related to the Building Regulations in the region or regions of the UK depicted):

The Building Regulations 2010 (England and Wales) (as amended)

Requirement:	B4(2)	External fire spread
Comment:		On suitable substructures, the use of the systems will enable a roof to be unrestricted under this Requirement. See section 7 of this Certificate.
Requirement:	C2(b)	Resistance to moisture
Comment:		The systems, including joints, can contribute to meeting this Requirement. See section 6.1 of this Certificate.
Regulation:	7	Materials and workmanship
Comment:		The systems are acceptable. See section 11.1 and the *Installation* part of this Certificate.

The Building (Scotland) Regulations 2004 (as amended)

Regulation:	8(1)(2)	Durability, workmanship and fitness of materials
Comment:		The use of the systems satisfies the requirements of this Regulation. See sections 10 and 11.1 and the *Installation* part of this Certificate.
Regulation:	9	Building standards applicable to construction
Standard:	2.8	Spread from neighbouring buildings
Comment:		The systems, when applied to suitable substructures, are regarded as having a low vulnerability under clause 2.8.1[1][2] of this Standard. See sections 7.1 and 7.3 of this Certificate.
Standard:	3.10	Precipitation
Comment:		The use of the systems, 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 6.1 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 applicable to conversions
Comment:		Comments made in relation to the systems 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) 2012 (as amended)

Regulation:	23(a)(i)(iii)(b)(i)	Fitness of materials and workmanship
Comment:		The systems are acceptable. See section 11.1 and the *Installation* part of this Certificate.
Regulation:	28(b)	Resistance to moisture and weather
Comment:		The systems, including joints, can contribute to meeting the requirements of this Regulation. See section 6.1 of this Certificate.
Regulation:	36(b)	External fire spread
Comment:		On suitable substructures, the use of the systems will enable a roof to be unrestricted under the requirements of this Regulation. See section 7 of this Certificate.

Construction (Design and Management) Regulations 2015

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

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

See section: 1 *Description* (1.2) of this Certificate.

Additional Information

NHBC Standards 2014

NHBC accepts the use of Paradiene S/Parafor Roof Covering Systems, provided they are installed, used and maintained in accordance with this Certificate, in relation to *NHBC Standards*, Chapters 7.1 *Flat roofs and balconies* and 7.2 *Pitched roofs*.

CE marking

The Certificate holder has taken the responsibility of CE marking the systems in accordance with harmonised standard EN 13707 : 2013. An asterisk (*) appearing in this Certificate indicates that data shown are given in the manufacturer's Declaration of Performance.

Technical Specification

1 Description

1.1 Paradiene S/Parafor Roof Covering Systems comprise the following membranes:

- Paradiene S VV — a glassfibre (55 g·m^{-2}) reinforced, polymer-modified bitumen sheet finished on both surfaces with thermofusible film, for use as a base sheet
- Paradiene 35 SR4 — a non-woven, polyester (160 g·m^{-2}) reinforced, polymer-modified bitumen sheet with a thermofusible film on both surfaces, for use as a base sheet or cap sheet with additional protection
- Paradiene S R4 — a polyester-fibre (180 g·m^{-2}) reinforced, polymer-modified bitumen sheet with a thermofusible film on both surfaces, for use as a base sheet or cap sheet with additional protection
- Parafor Solo S — a polyester-fibre (180 g·m^{-2}) reinforced, polymer-modified bitumen sheet with a thermofusible film on both surfaces, for use as a base sheet or cap sheet with additional protection
- Paradiene 30.1 GS — a glassfibre (55 g·m^{-2}) reinforced, polymer-modified bitumen sheet with mineral granule or slate-finished upper surface and a thermofusible film under surface, for use as a cap sheet
- Paradiene 40.1 GS — a glassfibre (100 g·m^{-2}) reinforced, polymer-modified bitumen sheet with mineral granule or slate-finished upper surface and a thermofusible film under surface, for use as a cap sheet
- Parafor 30 GS — a polyester-fibre (180 g·m^{-2}) reinforced, polymer-modified bitumen sheet with mineral granule or slate-finished upper surface and a macro perforated thermofusible film under surface, for use as a cap sheet
- Parafor Solo GS — a polyester-fibre (180 g·m^{-2}) reinforced, polymer-modified bitumen sheet with mineral granule or slate-finished upper surface and a macro perforated thermofusible film under surface, for use as a cap sheet.

1.2 The membranes are manufactured to the nominal characteristics given in Tables 1 and 2.

Table 1 Nominal characteristics of Paradiene S

Characteristic (unit)	S VV	35 SR4	S R4	30.1 GS	40.1 GS
Thickness* (mm)	2.60	3.70	2.60	2.60	3.00
Roll width (m)	1	1	1	1	1
Roll length (m)	10	8	10	10	8
Roll weight (kg)	33	37	34	42/46[1]	40/43[1]
Mass per unit area (kg·m^{-2})	3.3	4.6	3.4	4.2/4.6[1]	5.1/5.4[1]
Tensile strength* (N·50 mm^{-1})					
longitudinal	320	590	590	320	600
transverse	190	500	500	190	300
Elongation at break* (%)					
longitudinal	2.5	40	40	2.5	2.5
transverse	2.0	45	45	2.0	2.5
Low temperature flexibility*(°C)	–15	–15	–15	–15	–15
Flow resistance* (°C)	100	100	100	100	100
Impact – soft substrate* (mm)	700	1250	1500	–[2]	–[2]
Static loading – soft substrate* (kg)	<5	20	20	–[2]	–[2]

(1) Higher weight corresponds to the mineral granules and the lower to the slate flakes.

(2) Certificate holder's technical data sheets do not give a declared value for this property.

Table 2 Nominal characteristics of Parafor

Characteristic (unit)	30 GS	Solo GS	Solo S
Thickness* (mm)	3.00	4.00	4.00
Roll width (m)	1	1	1
Roll length (m)	8	10	8
Roll weight (kg)	36/39(1)	40/42(1)	41
Mass per unit area (kg·m^{-2})	4.6/4.9(1)	5.8/6.2(1)	5.1
Tensile strength* (N·50 mm^{-1})			
longitudinal	740	740	740
transverse	540	540	540
Elongation at break* (%)			
longitudinal	40	40	40
transverse	49	49	49
Low temperature flexibility*(°C)	–15	–15	–15
Flow resistance* (°C)	100	100	100
Impact – soft substrate* (mm)	1250	1500	1500
Static loading – soft substrate* (kg)	20	20	20

(1) Higher weight corresponds to the mineral granules and lower to the slate flakes.

1.3 Other products used with Paradiene S/Parafor roof covering include:

- Perfader — perforated felt used as a partially bonded layer
- Verecran 100 — a glassfibre (100 g·m^{-2}) mat separating layer
- Parafor Solo GS — flashing membranes
- Parevapo — metal-lined, bitumen vapour barrier
- Parevapo SBS — double-reinforced, metal-lined, bitumen vapour barrier
- Neodyl — expansion joint membrane
- Gravifilter — a polyester (200 g·m^{-2}) separating layer for use beneath heavy protection.

2 Manufacturing

2.1 The membranes are manufactured by saturating and coating the reinforcement with SBS (styrene-butadiene-styrene) modified bitumen, then calendering to the correct thickness. The surfaces are finished by the application of sand and/or mineral granules or slate flakes. The sheets are cooled, trimmed and rolled for packaging.

2.2 As part of the assessment and ongoing surveillance of product quality, the BBA has:

- agreed with the manufacturer the quality control procedures and product testing to be undertaken
- assessed and agreed the quality control operated over batches of incoming materials
- monitored the production process and verified that it is in accordance with the documented process
- evaluated the process for management of nonconformities
- checked that equipment has been properly tested and calibrated
- undertaken to carry out the above measures on a regular basis through a surveillance process to verify that the specifications and quality control operated by the manufacturer are being maintained.

2.3 The management system of Siplast has been assessed and registered as meeting the requirements of EN ISO 9001 : 2008 by Bureau Veritas (Certificate 1.927.221/C).

2.4 The products are imported and marketed in the UK by Langley Waterproofing Systems Ltd, Langley House, Lamport Drive, Heartlands Business Park, Daventry, Northants NN11 8YH, tel: 01327 704778, fax: 01327 704845, website: www.langley.co.uk.

3 Delivery and site handling

3.1 The membranes are delivered to site in wrapped rolls and on pallets. Roll labels are colour coded and bear the product name, marketing company name and the BBA logo including the number of this Certificate.

3.2 The rolls must be stored on end, on a clean, level surface and kept under cover.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Paradiene S/Parafor Roof Covering Systems.

Design Considerations

4 General

4.1 Paradiene S/Parafor Roof Covering Systems are satisfactory for use as:

- a fully-or partially-bonded waterproofing system, as part of a built-up specification
- a loose-laid, two layer roof waterproofing system, ballasted with aggregate, on flat roofs with limited access, or under heavy protection (eg concrete tiles) on flat roofs with pedestrian traffic.

4.2 Limited access roofs are defined for the purpose of this Certificate as those subjected only to pedestrian traffic for maintenance of the roof covering, cleaning of gutters, etc. Where traffic in excess of this is envisaged, additional protection to the membrane must be provided (see section 9).

4.3 Flat roofs are defined for the purpose of this Certificate as those 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 a fall greater than 1:6.

4.4 Decks to which the membranes are to be applied must comply with the relevant requirements of either BS 6229 : 2003 or BS 8217 : 2005 and, where appropriate, *NHBC Standards* 2014, Chapter 7.1.

4.5 Insulation materials to be used in conjunction with the membranes must be in accordance with the Certificate holder's instructions and be either:

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

5 Practicability of installation

The systems are designed to be installed by a competent roofing contractor experienced with these types of system.

6 Weathertightness

6.1 The membranes, including joints, when completely sealed and consolidated will adequately resist the passage of moisture into the building enable a roof to comply with the requirements of the national Building Regulations.

6.2 The membranes are impervious to water and will achieve a weathertight roof capable of accepting minor structural movement.

7 Properties in relation to fire

7.1 Tests indicate that a system comprising a 20 mm thick chipboard deck, a 40 mm thick layer of mineral wool (138 kg·m^{-3}), one layer of Paradiene S VV (torch-applied) and one layer of Paradiene 30.1GS (torch-applied) will be unrestricted under the national Building Regulations.

7.2 When used on flat roofs with the surface finishes defined in Part iii of Table 5 of Appendix A of Approved Document B of the Building Regulations (England and Wales), or Technical Booklet E, Table 4.6 of Part IV of the Building Regulations (Northern Ireland) (listed below), the roof is deemed to be unrestricted:

- bitumen-bedded stone chippings covering the whole surface to a depth of not less than 12.5 mm
- bitumen-bedded tiles of a non-combustible material
- sand/cement screed
- macadam.

7.3 The designation of other specifications should be confirmed by:

England and Wales — test or assessment to Approved Document B, Appendix A, Clause A1

Scotland — tests 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.

8 Resistance to wind uplift

8.1 The adhesion of the bonded systems is sufficient to resist the effects of wind suction, thermal cycling and other minor structural movements likely to occur in service.

8.2 The ballast requirement for loose-laid systems should be calculated in accordance with the relevant parts of BS EN 1991-1-4 : 2005 and its UK National Annex. The membrane should always be ballasted with a minimum depth of 50 mm of aggregate. In areas of high-wind exposure, the Certificate holder's advice should be sought. Alternatively, concrete slabs on suitable protective supports can be used.

9 Resistance to foot traffic

The systems can accept the limited foot traffic and light concentrated loads associated with installation and maintenance. Reasonable care should be taken to avoid puncture by sharp objects or concentrated loads. Where traffic in excess of this is envisaged, such as for maintenance of lift equipment, a walkway should be provided, for example, using concrete slabs supported on bearing pads.

10 Maintenance

Roofs covered with the systems must be subject of annual inspections to ensure continued performance.

11 Durability

11.1 The systems will have a service life of at least 35 years.

11.2 When using the mineral-finished membrane, it is possible that some localised loss of the mineral surfacing may occur after some years in areas where complex detailing of the roof design is incorporated.

12 Reuse and recyclability

The system components are made from bitumen, polyester and glass, which can be recycled.

Installation

13 General

13.1 Installation of Paradiene S/Parafor Roof Covering Systems must be in carried out by installers trained and approved by the Certificate holder in accordance with the relevant clauses of BS 8000-4 : 1989, BS 8000-0 : 2014 and BS 8217 : 2005, the Certificate holder's instructions and this Certificate.

13.2 Substrates to which the roof waterproofing membranes are applied must be sound, dry and clean, and free from sharp projections such as nail heads and concrete nibs.

13.3 Installation should not be carried out during inclement weather (eg rain, fog or snow), nor when the temperature is below 5°C, unless suitable precautions against surface condensation are taken.

13.4 If the roof is likely to be subjected to uncontrolled pedestrian access, the substructure must meet the requirements of BS 8217 : 2005, and to prevent damage to the roof covering one of the appropriate surface finishes referred to in Clauses 8.19 and 9.2 of the Code must be used.

13.5 At falls in excess of 1:11, the provision for mechanical fixings as required by BS 8217 : 2005 should be observed.

13.6 On completion of the roof, the sanded finished membrane, when used as a top layer, may have a surface finish applied in accordance with BS 8217 : 2005, Clauses 8.19 and 9.2. Surface finishes in the Code of Practice include:

- stone aggregate in dressing compound
- precast concrete paving slabs
- proprietary tiles on bonding compound.

13.7 When using the mineral-finished membrane on roofs with limited access, further surface protection is not required .

14 Application

Loose-laid applications — flat roof

14.1 A separating layer of Verecran 100 is loose-laid over the substructure, with 100 mm loose overlapping joints, and terminating around the perimeter and upstands for a minimum distance of 500 mm.

14.2 A layer of Paradiene S VV, Paradiene 35 SR4 or Paradiene S R4 base sheet is laid with 50 mm side laps and 75 mm head laps. Bonding of the laps is by torching.

14.3 A layer of Paradiene 35 SR4 or Paradiene S R4 is fully torch bonded directly to the base sheet. Side laps should be 50 mm, and end laps should be 75 mm and offset a minimum 300 mm in relation to those of the base sheet.

14.4 A minimum 50 mm depth of aggregate is loaded onto the roof covering. Where roofs are likely to be subjected to uncontrolled pedestrian traffic a concrete tile finish should be used.

14.5 Where concrete tiles are required, the waterproof system is first covered with either a layer of sand or two layers of Gravifilter. Only Paradiene 35 SR4 or Paradiene S R4 cap sheets, in conjunction with a layer of Gravifilter, are suitable for use under permanent heavy protection such as paving slabs.

Partially-bonded applications — flat and pitched roofs

14.6 A layer of Perfader perforated bitumen underlay with 50 mm laps is loose-laid over the substrate. It should be terminated 500 mm from the edge and around all penetrations.

14.7 A layer of Paradiene S VV, Paradiene 35 SR4 or Paradiene S R4 is fully torched onto the surface of Perfader. Bonding should occur regularly through the perforations to ensure even bonding of the membrane onto the substrate. Edge laps a minimum of 50 mm and end laps a minimum of 75 mm are required.

14.8 A layer of Paradiene 30.1 GS, Paradiene 40.1 GS, Parafor 30 GS or Parafor Solo GS is fully torch bonded directly to the base sheet. Side laps are determined by the exposed selvedge, and end laps should be 100 mm and offset a minimum 300 mm in relation to those of the base sheet.

14.9 On nailable substructures a layer of Paradiene R4 is fastened in accordance with the relevant clauses of BS 8217 : 2005, and an underlay of either Paradiene 35 SR4 or Paradiene S R4 is fully torch-bonded to the base sheets. A cap sheet of Paradiene 30.1 GS, Paradiene 40.1 GS, Parafor 30 GS or Parafor Solo GS is fully torch bonded to the underlay.

Fully-bonded applications — flat and pitched roofs

14.10 A first layer of Paradiene S VV, Paradiene 35 SR4 or Paradiene S R4 is fully torch bonded to the substrate with side laps a minimum of 50 mm and end laps a minimum 75 mm.

14.11 A top layer of Paradiene 30.1 GS, Paradiene 40.1 GS, Parafor 30 GS or Parafor Solo GS is fully torch bonded to the first layer. Side laps are determined by the exposed selvedge, and end laps should be a minimum 100 mm. Joints should be offset 300 mm in relation to those of the base sheet.

15 Repair

In the event of damage, the membranes can be effectively repaired after cleaning by applying a patch of the same membrane, torch bonded to the damaged area with suitable overlap.

Technical Investigations

16 Tests

An assessment was made of test data in relation to:

- low temperature flexibility of coating mass
- elastic recovery of coating mass
- ring and ball of coating mass
- low temperature flexibility unaged and heat aged for 90 days at 80°C
- heat resistance unaged and heat aged for 90 days at 80°C
- dimensional stability
- static indentation
- resistance to sliding
- dynamic indentation
- fatigue resistance unaged and heat aged for 28 days at 80°C
- peel from support unaged and heat aged for 28 days at 80°C.

17 Investigations

17.1 Independent laboratory data were evaluated in the context of UK roofing practice and Building Regulations.

17.2 UK data on the fire performance of the system were assessed.

17.3 Visits to existing sites were carried out to assess performance in use and system durability.

Bibliography

BS 6229 : 2003 *Flat roofs with continuously supported coverings — Code of practice*

BS 8000-0 : 2014 *Workmanship on construction sites introduction and general principles*

BS 8000-4 : 1989 *Workmanship on building sites — Code of practice for waterproofing*

BS 8217 : 2005 *Reinforced bitumen membranes for roofing — Code of practice*

BS EN 1991-1-4 : 2005 *Eurocode 1 : Actions on structures — General actions — Wind actions*
NA to BS EN 1991-1-4 : 2005 UK National Annex *to Eurocode 1 : Actions on structures — General actions — Wind actions*

EN 13707 : 2013 *Flexible sheets for waterproofing — Reinforced bitumen sheets for roof waterproofing — Definitions and characteristics*

EN ISO 9001 : 2008 *Quality management systems — Requirements*

Conditions of Certification

18 Conditions

18.1 This Certificate:

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

18.2 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.

18.3 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.

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

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

- the presence or absence of any patent, intellectual property or similar rights subsisting in the product/system or any other product/system
- the right of the Certificate holder to manufacture, supply, install, maintain or market the product/system
- actual 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
- any claims by the manufacturer relating to CE marking.

18.6 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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