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BBA APPROVAL INSPECTION TESTING CERTIFICATION
TECHNICAL APPROVALS FOR CONSTRUCTION

Agrément Certificate
06/4359
Product Sheet 1

SIKA LIQUID PLASTICS WATERPROOFING SYSTEMS

DECOTHANE ROOT RESISTANT WATERPROOFING SYSTEM

This Agrément Certificate Product Sheet(1) relates to the Decothane Root Resistant Waterproofing System, comprising one-component, reinforced aliphatic polyurethane, liquid-applied roof waterproofing membranes. The system is for use in warm ballasted roof, inverted roof, green roof and roof garden specifications with limited or pedestrian access, for new or existing 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 system will resist the passage of moisture into the building (see section 6).

Properties in relation to fire — the system will enable a roof, when used with a suitable protection, to be unrestricted under Building Regulations (see section 7).

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

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

Resistance to penetration of roots (membrane) — the waterproofing layers will resist the penetration of roots (see section 10).

Durability — under normal service conditions the system will provide a durable roof waterproofing with a service life of in excess of 25 years (see section 12).

The BBA has awarded this Certificate to the company named above for the system described herein. This 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

Date of Fourth issue: 22 November 2013
Originally certificated on 24 August 2006

Simon Wroe
Head of Approvals — Materials

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, Decothane Root Resistant Waterproofing System, if installed, used and maintained in accordance with this Certificate, will meet or contribute to meeting 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 a suitable substructure, the use of the system will enable a roof to be unrestricted under this Requirement. See sections 7.1, 7.2 and 7.4 of this Certificate.
Requirement:	C2(b)	Resistance to moisture
Comment:		The membrane component will enable a roof to meet this Requirement. See section 6.1 of this Certificate.
Regulation:	7	Materials and workmanship
Comment:		The system is acceptable. See section 12.1 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:		The use of this system satisfies the requirements of this Regulation. See sections 11.2 and 12.1 and the *Installation* part of this Certificate.
Regulation:	9	Building standards applicable to construction
Standard:	2.8	Spread from neighbouring buildings
Comment:		The system, when applied to a suitable substructure, is regarded as having low vulnerability under clause 2.8.1[1][2] of this Standard. See sections 7.1, 7.2 and 7.4 of this Certificate.
Standard:	3.10	Precipitation
Comment:		The use of the membrane component will enable a roof to meet 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 system 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 system 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 system is acceptable. See section 12.1 and the *Installation* part of this Certificate.
Regulation:	28(b)	Resistance to moisture and weather
Comment:		The membrane component will enable a roof to meet the requirements of this Regulation. See section 6.1 of this Certificate.
Regulation:	36(b)	External fire spread
Comment:		On a suitable substructure, the use of the membranes will enable a roof to be unrestricted under the requirements of this Regulation. See sections 7.1, 7.2 and 7.4 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: 3 *Delivery and site handling* (3.2 and 3.3), 13 *General* (13.2) and 14 *Precautions* of this Certificate.

Additional Information

NHBC Standards 2013

NHBC accepts the use of the Decothane Root Resistant Waterproofing System, when installed and used in accordance with this Certificate, as meeting Technical Requirement R3 in relation to *NHBC Standards*, Chapter 7.1 *Flat roofs and balconies*.

CE marking

The Certificate holder has taken the responsibility of CE marking the products in accordance with European Technical Approval 07/0004, issued by the BBA and ETAG 005 : 2005, Parts 1 and 6. An asterisk (*) appearing in this Certificate indicates that data shown are given in the manufacturer's Declaration of Performance.

Registered office

The registered office of the Certificate Holder is Sika Ltd, Watchmead, Welwyn Garden City, Hertfordshire, AL7 1BQ.
Registered in England: 226822

Technical Specification

1 Description

1.1 The Decothane Root Resistant Waterproofing System comprises:

- Decothane Root Resistant Base Coat and Top Coat — a root-resistant, single component, liquid-applied, moisture-triggered, aliphatic polyurethane membrane for use in the main waterproofing layer
- Decothane Root Resistant Detail Coat — a root-resistant, single component, liquid-applied, moisture-triggered, aliphatic polyurethane for use as a topcoat in exposed areas of the system (eg upstands)
- Sika Reemat Premium reinforcing mat — a non-woven, glassfibre reinforcing mat for use as a reinforcement embedded in the polyurethane layer while still wet, and available for use in strips to cover individual cracks, joints or details.

1.2 The liquid-applied components have the nominal characteristics given in Table 1.

Table 1 Nominal characteristic of liquid-applied components

Characteristic (units)	Grade		
	Decothane Root Resistant Base Coat	Decothane Root Resistant Top Coat	Decothane Root Resistant Detail Coat
Dry time at 20°C/50% RH (hours)			
touch dry	2	2	2
through cure	4–6	4–6	4–6
Standard colour	red	black	white, slate grey, shale grey

1.3 The waterproofing component of the system is the subject of ETA 07/0004, issued by the BBA. The levels of use categories in accordance with ETAG 005 : 2000 are:

External fire performance	NPD[1]*
Reaction to fire	Euroclass F*
Categorisation by working life	W3 (25 years)*
Categorisation by climatic zones	M (moderate) and S (severe)[2]*
Categorisation by imposed loads	P4*
Categorisation by roof slope	S1 (<5%)*
Categorisation by surface temperature	
lowest	TL1 (5°C)*
highest	TH2 (60°C)*
Resistance to roots[3]	Satisfactory

(1) When the kit is fully covered by the inorganic coverings listed in the Annex of Commission Decision 2000/553/EC it can be considered to satisfy the requirements regarding external fire performance without the need for testing in accordance with the Commission Decision 2000/553/EC.
(2) Kit is always under protection.
(3) Tested to DIN 4062 : 1978.

1.4 Ancillary items for use with the system are:

- Reemat Flexitape — a nylon mesh available in light- and heavy-duty grades for use in reinforcing over cracks or joints in substrate
- Decotrim roof trims — a range of prefabricated edge and corner details.

1.5 Ancillary items for use with the system that are outside the scope of the Certificate are:

Warm Ballasted Roof

- S-Vap 5000E SA – a multi-layer self-adhesive vapour control layer
- Decotherm – a tissue-faced PIR thermal insulation
- Carrier Membrane SA – a multi-layer self-adhesive carrier membrane
- S-Felt VS140 – a white/UV stable filter layer for use under ballast.

Inverted Roof

- Liquid Plastics Inverted Roof Board – an extruded polystyrene (XPS) insulation board
- Min fx Separation Layer – a spun-bonded polyethylene geotextile for use in reducing the rainwater cooling effect and preventing fines washing from the ballast onto the waterproofing layer
- Liquid Plastics Carrier Membrane – a reinforced bituminous membrane for the prevention of substrate outgassing
- Decostik – a twin-pack polyurethane adhesive for bonding of Liquid Plastics Carrier Membrane
- Deco-Drainage Composite Mat – a polyethylene, three-dimensional net structure faced on both sides with geotexile bonded together by thermal lamination.

General

- Decopad – for use in supporting paving above the membrane

1.6 Ancillary items for green roofs and roof gardens are determined by the individual project specification.

2 Manufacture

2.1 The liquid components of the system are manufactured by a batch blending process.

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 Sika Liquid Plastics has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2008 and ISO 14001 : 2004 by BSI (Certificates FM 588020 and EMS 588023 respectively).

3 Delivery and site handling

3.1 Decothane Root Resistant Base Coat and Top Coat and Decothane Root Resistant Detail Coat are delivered to site in 15 litre tins bearing the product's name, batch number and the BBA logo incorporating the number of this Certificate.

3.2 The Decothane components should be stored in a dry, shaded area, above freezing point and away from ignition sources. Storage temperatures of 10°C to 20°C will give the products a shelf-life of 12 months. At higher temperatures the shelf-life will reduce progressively. Once opened, tins should be used within two days.

3.3 The Decothane components are classified under *The Chemicals (Hazard Information and Packaging for Supply) Regulations 2009* (CHIP4)/*Classification, Labelling and Packaging of Substances and Mixtures (CLP Regulation) 2009* and bear the appropriate hazard warning label. The flashpoints and classifications are given in Table 2.

Table 2 Flashpoints and hazard classification

Material	Flashpoint (°C)	Classification
Decothane Root Resistant Base Coat	62	harmful, irritant
Decothane Root Resistant Top Coat	62	harmful, irritant
Decothane Root Resistant Detail Coat	62	harmful, irritant

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on the Decothane Root Resistant Waterproofing System.

Design Considerations

4 General

4.1 The Decothane Root Resistant Waterproofing System is satisfactory for use in:

- warm ballasted roof specifications using pavers or other suitable protection on flat roofs with limited or pedestrian access
- inverted roof specifications using aggregate ballast on flat roofs with limited access
- protected inverted roof specifications using pavers or other suitable protection on flat roofs with limited or pedestrian access
- green roof specifications (defined as extensive, lightweight systems composed typically of succulents, such as sedum, or other hardy plant species) on flat roofs with limited or pedestrian access or pitched with limited access
- roof garden specifications (defined as intensive systems designed primarily for recreational use and requiring structural consideration to accommodate the additional weight) on flat roofs with limited or pedestrian access
- Biodiverse specifications (similar in composition to an extensive roof but designed specifically to create a habitat) on flat roofs with limited or pedestrian access or pitched with limited access.

4.2 Where applicable, roof drainage should be designed in accordance with BS EN 12056-3 : 2000.

4.3 Limited access roofs are defined for the purpose of this Certificate as those roofs subjected only to pedestrian traffic for maintenance of the roof covering, cleaning of gutters, etc. Where traffic in excess of this is envisaged, additional protection to the membrane in the form of Decopad supported paving must be provided.

4.4 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 for the purpose of this Certificate as those having a fall greater than 1:6. Recommendations for the design of roof falls are available in LRWA Guidance Note No. 7 : *Specifier guidance for flat roof falls*.

4.5 Insulation used with the system must be an XPS insulation board of a suitable specification for use in inverted roof systems, as a Liquid Plastics Inverted Roof Board, and must be allowed to perform as designed in accordance with BBA Information Bulletin No. 4 : Inverted Roofs : Drainage and U-Value corrections. The roof must be free of ponding water to ensure the intended insulation values are achieved.

4.6 Recommendations for the design of green roofs and roof garden specifications are available within *The GRO Green Roof Code — Green Roof Code of Best Practice for the UK 2011*, issued by The Green Roof Organisation (GRO).

4.7 Structural decks to which the systems are to be applied must be suitable to transmit the dead and imposed loads experienced in service. Allowance needs to be made for loading deflections to ensure that the free drainage of water is maintained.

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

4.9 The drainage system for green roofs or roof gardens must be correctly designed, and provision made for access for maintenance purposes. Dead loads for green roofs and roof gardens can increase if the drains become partially or completely blocked causing waterlogging of the drainage layer.

4.10 Concrete decks to which the product is to be applied must comply with the relevant requirements of BS 6229 : 2003 Section 8.4, BS 8217 : 2005 Sections 5.1.2 and 6.7, and, where appropriate, *NHBC Standards*, Chapter 7.1. Attention is drawn to the requirements of these Standards to ensure that reinforced concrete roof slabs are finished to an acceptable standard, allow free drainage of water and are allowed to dry prior to the installation of the waterproofing. When these conditions are not met, appropriate remedial treatment is essential.

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

5 Practicability of installation

The system should only be installed by specialist roofing contractors who have been trained and approved by the Certificate holder.

6 Weathertightness

6.1 The membrane component, when completely sealed and consolidated, will adequately resist the passage of moisture to the inside of the building and so meet or satisfy the relevant requirements of the national Building Regulations:

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

Scotland — Mandatory Standard 3.10, with reference to clauses 3.10.1 and 3.10.7

Northern Ireland — Regulation 28(b).

6.2 The membrane component is impervious to water and will achieve a weathertight roof capable of accepting minor structural movement.

7 Properties in relation to fire

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

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

England and Wales — Requirement B4(2)

Scotland — Mandatory Standard 2.8, with reference to clause 2.8.1

Northern Ireland — Regulation 36(b).

7.3 If allowed to dry, the plants used may allow flame spread across the roof. This should be taken into consideration when selecting suitable plants for the roof. Appropriate planting irrigation and/or protection should be applied to ensure the overall fire-rating of the roof is not compromised.

7.4 The designation of other specifications should be confirmed by:

England and Wales — Test or assessment in accordance with Approved Document B, Appendix A, Clause 1

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.

8 Resistance to wind uplift

General

8.1 Results of test data indicate that the adhesion of the waterproofing component of the system is sufficient to resist the effects of wind suction, thermal cycling or other minor structural movements likely to occur in service.

8.2 The ballast requirements for the insulation in inverted roof specifications component should be calculated in accordance with the relevant parts of BS EN 1991-1-4 : 2005 its UK National Annex. The insulation should always be ballasted with a minimum depth of 50 mm of aggregate or paving. In areas of high-wind exposure, the Certificate holder's advice should be sought.

Roof gardens

8.3 The soil used in roof gardens must not be of a type that will be removed, or become delocalised, due to wind scour experienced on the roof.

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

9 Resistance to foot traffic

When covered with aggregate, the system can accept the limited foot traffic and light concentrated loads associated with installation and maintenance operations. Superficial damage to the insulation component that may occur can be reduced with the use of a filter layer laid directly over the insulation boards. Where pedestrian access is required inverted roof specifications incorporating pavers or other suitable protection can be used.

10 Resistance to penetration of roots (membrane)

Results of test data indicates that when used in green roofs and roof gardens the waterproofing will adequately resist penetration by plant roots.

11 Maintenance

11.1 The system must be the subject of annual inspections and maintenance to ensure continued performance.

11.2 Maintenance should include checks and operations to ensure the following where applicable:

- adequate ballast is in place and evenly distributed over the membrane
- protection layers are in good condition
- exposed membrane is free from the build-up of silt and other debris and unwanted vegetation are cleared

11.3 Where damage has occurred it should be repaired in accordance with section 18 and the Certificate holder's instructions.

11.4 Green roofs must be the subject of regular inspections, particularly in autumn after leaf fall and in the spring, to ensure unwanted vegetation and other debris are cleared from the roof and drainage outlets (see section 4.9). Guidance is available within *The GRO Green Roof Code, Green Roof Code of Best Practice for the UK 2011*.

12 Durability

12.1 The Decothane Roof Waterproofing System has been used since 1980, and evidence from tests confirm that exposed waterproofing membranes will have a life of least 25 years. When fully protected and subject to normal service conditions in an inverted roof specification with an open covering (eg aggregate/pavers), the system can provide an effective barrier to the transmission of liquid water and water vapour for the design life of the roof in which it is incorporated.

12.2 In situations where maintenance or repair of any of the components in the roof structure are necessary (eg protection layer, insulation), the durability of the membrane may be reduced. In these circumstances, the Certificate holder should be consulted.

12.3 An estimate cannot be given for the life of green roof and roof garden specifications due to the nature of use. However, under normal circumstances it should be significantly greater than for open coverings.

Installation

13 General

13.1 Installation of the Decothane Root Resistant Waterproofing System must be carried out in accordance with the Certificate holder's instructions and this Certificate.

13.2 Any bulk materials (eg soil for roof gardens, aggregate, slabs), should not be stored on one area of the roof substrate prior to installation, to ensure that localised overloading does not occur.

13.3 Insulation boards may be installed in any weather but, due to their light weight, care must be taken in high winds. Installers must not carry boards near to parapets or apertures in the deck and, once placed, the boards must be loaded immediately.

14 Precautions

14.1 Vapours from the liquid components may cause sensitisation and irritation to the respiratory system, eyes and skin. The system should be used only in areas with sufficient ventilation to prevent the build-up of vapours. Contact with the skin, eyes and clothing must be avoided. The supplier's instructions and relevant safety regulations for working procedures must be adhered to at all times.

14.2 The liquid components must not be allowed to get into the waste drainage system. Care must also be taken to prevent vapours entering the inside of the building, eg by closing doors and windows.

15 Site and surface preparation

15.1 Substrates on which the waterproofing component of the system is applied must be properly prepared in accordance with the Certificate holder's instructions.

15.2 Adhesion to substrates will depend on the condition and cleanliness of the substrate. Substrates must be visibly dry, sound and free from loose materials or contamination (eg moss, algae).

15.3 High pressure sand-blasting or water-jetting may be used to remove loose or flaking materials, but the substrate must be visibly dry before the application of the waterproofing.

15.4 Deck surfaces must be free from sharp projections, such as protruding fixing bolts, concrete nibs. All inverted roof applications over concrete decks must incorporate Liquid Plastics Carrier Membrane to prevent any pinholes due to substrate outgassing.

15.5 Gutters and outlets should be checked to ensure that they are, and remain, clear of all debris.

15.6 All points of potential weakness such as splits, cracks, joints and crazed surfaces must be reinforced with additional Reemat Premium reinforcing mat or Reemat Flexitape prior to the application of the waterproofing. The Reemat Premium reinforcing mat must first be embedded in an initial application of Decothane Root Resistant Base Coat applied at a rate of 1.0 $l \cdot m^{-2}$.

16 Application

16.1 Prior to application, checks should be made to ensure the substrate is dry (ie free from rainwater, surface condensation, frost) and that the prevailing weather and site conditions are correct. The following normal limitations apply:

- application must not take place when the relative humidity is in excess of 95%, or in fog. The temperature/humidity should be such that there is no risk of surface condensation occurring before or during application
- air and substrate temperatures must be in excess of 2°C
- Decothane Root Resistant Base Coat and Top Coat and Decothane Root Resistant Detail Coat are conditioned at a temperature of 10°C or greater, for use in airless spray applications
- special precautions may be necessary when temperatures exceed 35°C, as described in the Certificate holder's *Product Data sheets*
- primer, where used, must be cured
- wind speed should be such that it does not interfere with the application or cause overspray. No attempt to spray should be made if the wind speed exceeds 6.7 $m \cdot s^{-1}$ (15 mph), unless precautions such as the use of wind barriers are taken.

16.2 Application can be by brush, roller or spray, but brush application is typically used only for embedding Sika Reemat Premium reinforcing mat in localised detail.

16.3 Only areas that can be sprayed to the full thickness before weather changes occur should be attempted.

16.4 Areas requiring extra Sika Reemat Premium reinforcing mat or Reemat Flexitape, eg details and upstands, should be treated as described in section 15.6. The substrate, once dry, will be ready for the main application of Decothane Root Resistant Base Coat.

16.5 The first coat is applied at a rate of 1.5 $l \cdot m^{-2}$, into which the Sika Reemat Premium reinforcing mat is embedded while the membrane is still wet. Once cured, the topcoat is applied at a rate of 1.0 $l \cdot m^{-2}$. The finished dry thickness should be not less than 1.9 mm.

16.6 Random tests may be carried out on the finished coating surface by cutting out small areas to measure finished cure thickness. Test areas must be repaired after the sample is taken.

16.7 At exposed areas, such as upstands, Decothane Root Resistant Detail Coat must be substituted for the topcoat at the same application rate.

16.8 Detailing (eg upstands) must be carried out in accordance with the Certificate holder's instructions.

Insulation

16.9 The roof waterproof covering must be clean and free from extraneous matter and fully cured.

16.10 During installation of the insulation the installers must take care not to damage the waterproofing layer.

16.11 Exposure of the waterproofing must be kept to a minimum and installation of the insulation must take place as soon as possible after the curing of the waterproofing.

17 Protective finishes

17.1 The top of the ballast/protective layer must be a minimum of 150 mm from the top of parapets, details and services.

Gravel

17.2 To prevent flotation, wind uplift and UV degradation, inverted insulation boards up to 50 mm thick must be loaded with at least a 50 mm deep covering of river-washed, rounded stones of nominal size 20 mm to 32 mm, or round washed broken stone of similar size.

17.3 It is essential that the depth and size of gravel are such that complete cover and protection are afforded to the system.

17.4 The proportion of fines in the aggregate must be kept to a minimum to prevent the risk of gullies being blocked and to discourage organic growth.

17.5 In a warm ballasted system, S-Felt VS140 must be placed between the waterproof membrane and the ballast, to prevent potential damage to the membrane from fine grit particles and blocking of the rainwater drainage and outlets. For inverted roofs, the Min fx Separation Layer must be placed between the aggregate and the insulation boards to reduce the rainwater cooling effect and similarly prevent damage or problems associated with fine grit particles and roof drainage. Additionally, Deco-Drainage Composite Mat is inserted between the inverted roof board and the waterproofing to allow free drainage of the roof assembly.

17.6 The dead load imposed by 50 mm of gravel is approximately 80 $kg \cdot m^{-2}$. The deck must be capable of withstanding this as well as any additional loads, static or imposed.

17.7 The gravel loading specification is used on roofs in sheltered regions or low- to medium-rise buildings up to ten storeys. When laid in moderate exposure zones, or on buildings of up to fifteen storeys, this gravel specification is permitted but the perimeter should be loaded with paving. For severe exposure zones or tall buildings, specialist advice should be sought. BRE Digest 311 *Wind scour of gravel ballast on roofs* should be used when a calculation is required for a specific building project.

Paving slabs

17.8 Depending on access to the roof and wind effects, the following arrangements should be used:

- standard pressed concrete paving slabs to BS EN 1340 : 2003 on appropriate spacers, (see section 17.9), or
- standard pressed concrete paving slabs or paving bricks on 20 mm depth of either gravel graded 4 mm to 8 mm, or sand or small gravel, on a slip sheet of non-woven, synthetic fibre fleece or fine polyethylene mesh, aperture 2 mm or less.

17.9 The paving should have a minimum thickness of 50 mm. Ballast requirements should be calculated in accordance with the relevant parts of BS EN 1991-1-4 : 2005 and its UK National Annex.

17.10 The deck must also safely carry the additional static load of approximately 25 $kg \cdot m^{-2}$ for 50 mm thick slabs. When laid in conjunction with an intermediate layer of sand to a depth of 20 mm, a further static load of approximately 40 $kg \cdot m^{-2}$ must be taken into account.

17.11 The method of laying and bedding will depend upon the form of the roof, and the Certificate holder's advice should be sought.

Green roofs and roof gardens

17.12 Green roofs and roof gardens should be of a suitable design. In cases of doubt the Certificate holder's advice should be sought.

18 Repair

18.1 In the event of damage, repairs can be carried out by cleaning the area around the damage and repairing in accordance with section 16 and the Certificate holder's instructions.

18.2 Should a leak occur in the waterproofing layer, access to it is achieved by removing all layers above the waterproofing layer.

Technical Investigations

19 Tests

19.1 Tests were conducted on the Decothane Root Resistant Waterproofing System and the results assessed to determine:

- delamination strength from concrete, asphalt and mineral finished roofing felt
- fatigue movement
- static indentation
- dynamic indentation at –20°C, 5°C and 23°C
- water exposure to EOTA TR 012 : 2004 for 180 days at 60°C followed by delamination strength from concrete and static indentation testing
- heat ageing 100 days at 80°C followed by fatigue cycling.

19.2 An assessment was carried using the test data from previous assessments of Decothane products to determine:

- fatigue cycling
- water vapour permeability
- low temperature flexibility
- tensile strength.

20 Investigations

20.1 The manufacturing process was evaluated, including the methods adopted for quality control, and details were obtained of the quality and composition of the materials used.

20.2 Test data on root resistance for the membrane were assessed.

Bibliography

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

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

BS EN 1340 : 2003 *Concrete kerb units — Requirements and test methods*

BS EN 1991-1-1 : 2002 *Eurocode 1 : Actions on structures — General actions— Densities, self-weight, imposed loads for buildings*
NA to BS EN 1991-1-1 : 2002 *UK National Annex to Eurocode 1 : Actions on structures — General actions— Densities, self-weight, imposed loads for buildings*
BS EN 1991-1-3 : 2003 *Eurocode 1 : Actions on structures — General actions — Snow loads*
NA to BS EN 1991-1-3 : 2003 *UK National Annex to Eurocode 1 : Actions on structures — General actions — Snow loads*
BS EN 1991-1-4 : 2005 *Eurocode 1 : Actions on structures — General actions — Wind actions*
NA to BS EN 1991-1-4 : 2005 *UK National Annex to Eurocode 1 : Actions on structures — General actions — Wind actions*

BS EN 12056-3 : 2000 *Gravity Drainage Systems inside Buildings — Roof drainage, layout and calculation*

ISO 14001 : 2004 *Environmental management systems — Requirements with guidance for use*

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

EOTA Technical Report TR 012 (May 2004), *Exposure procedure for accelerated ageing by hot water [Liquid Applied Roof Waterproofing Kits (LARWK)]*

ETAG 005 : 2005 *Guideline for European Technical Approval of Liquid Applied Roof Waterproofing Kits*
Part 1 *General*
Part 6 *Specific Stipulations for Kits Based on Polyurethane*

Commission Decision 2000/553/EC *Commission Decision of 6 September implementing Council Directive 89/106/EEC as regards the external fire performance of roof coverings*

21 Conditions

21.1 This Certificate:

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

21.2 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.

21.3 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.

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

21.5 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.

21.6 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. satisfying the requirements of the 1974 Act or of any statutory, common law or other duty of care.

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