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Agrément Certificate
10/H164
Product Sheet 1

PmB BRIDGEDECK WATERPROOFING SYSTEM

This Certificate is issued under the Highway Authorities' Product Approval Scheme (HAPAS) by the British Board of Agrément (BBA) in conjunction with the Highways Agency (HA) (acting on behalf of the overseeing organisations of the Department for Transport; the Scottish Executive; the Welsh Assembly Government and the Department for Regional Development, Northern Ireland), the Association of Directors of Environment, Economy, Planning and Transport (ADEPT), the Local Government Technical Advisers' Group and industry bodies. HAPAS Agrément Certificates are normally each subject to a review every five years.

PRODUCT SCOPE AND SUMMARY OF CERTIFICATE

This Certificate relates to the PmB Bridgedeck Waterproofing System, for use as a bridgedeck waterproofing system for concrete decks of highway bridges.

AGRÉMENT CERTIFICATION INCLUDES:

- factors relating to compliance with HAPAS requirements
- factors relating to compliance with Regulations where applicable
- independently verified technical specification
- assessment criteria and technical investigations
- design considerations
- installation guidance
- regular surveillance of production
- formal five-yearly review.



KEY FACTORS ASSESSED

Performance — the system meets the requirements of the *Guidelines Document for the Assessment and Certification of Waterproofing Systems for Use on Concrete Decks of Highway Bridges* (see section 5).

Durability — the system will provide an effective waterproof layer to the concrete bridgedeck, provided it is not damaged during subsequent resurfacing (see section 8).

The BBA has awarded this Agrément 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 First issue: 22 September 2010

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

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.

HAPAS Requirements

Requirements

The Highways Technical Advisory Committee (HiTAC) and HAPAS Specialist Group 7 (Bridgedeck Waterproofing) have agreed with the BBA the aspects of performance to be used by them in assessing the compliance of Bridgedeck Waterproofing Systems with the Guidelines Document. In the opinion of the BBA, the PmB Bridgedeck Waterproofing System when applied to concrete decks of highway bridges, in accordance with the provisions of this Certificate, will meet the relevant requirements.

Additional requirements of the overseeing organisations are given in the Manual of Contract Documents for Highway Works (MCHW)⁽¹⁾, Volumes 1 and 2, Series 900.

(1) The MCHW is operated by the Overseeing Organisations: The Highways Agency (HA), Transport Scotland, The Welsh Assembly Government and The Department for Regional Development (Northern Ireland).

Regulations

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* (3.1, 3.2), and 10 *Precautions* of this Certificate.

Technical Specification

1 Description

1.1 The PmB Bridgedeck Waterproofing System comprises:

- Pitchmastic PMCS/01 Primer — a single component, solvent-based primer containing di-phenylmethane di-isocyanate
- PmB Waterproofing — a two-part, solvent-free, blue pigmented polyurethane elastomer, comprising; Part A, PmB PU 0308/catalyst/ blue pigment and Part B, Desmodur PU 0309
- Pitchmastic Pm2/03 Tack Coat — a single component, solvent-based polymer-modified bitumen tack coat, for use with additional protective layer (APL) of sand asphalt surfacing
- PmB Tack Coat System Type 1 — for use with hot-rolled asphalt (HRA) surfacing. A two-component tack coat system comprising:
 - PmB Binder — a two-part polyurethane elastomer, comprising; base, 08S.TC polyol and hardener, 09S.TC isocyanate
 - Dark Green Basalt Aggregate — BW 2.0 mm to 4.5 mm
- Pm2/03 Tack Coat System Type 2 — for use with hot-rolled asphalt (HRA) surfacing. A three-component tack coat system comprising:
 - PmB Binder — a two-part polyurethane elastomer, comprising; base, 08S.TC polyol and hardener, 09S.TC isocyanate
 - Dark Green Basalt Aggregate — BW 2.0 mm to 4.5 mm
 - Pm2/03 Tack Coat — a single component, solvent-based, polymer-modified bitumen emulsion
- Pm2/02 HC Tack Coat System Type 3 — for use with hot-rolled asphalt (HRA) surfacing. A three-component tack coat system comprising:
 - PmB Binder — a two-part polyurethane elastomer, comprising; base, 08S.TC polyol and hardener, 09S.TC isocyanate
 - Dark Green Basalt Aggregate — BW 2.0 mm to 4.5 mm
 - Pm2/02 HC Tack Coat — a single component, polymer-modified bitumen emulsion
- Pm-HM/01 Tack Coat System Type 4 — for use with hot-rolled asphalt (HRA) surfacing. A three-component tack coat system comprising:
 - PmB Binder — a two-part polyurethane elastomer, comprising; base, 08S.TC polyol and hardener, 09S.TC isocyanate
 - Dark Green Basalt Aggregate — BW 2.0 mm to 4.5 mm
 - Pm-HM/01 Tack Coat — a polymer-modified, bituminous-based, hot melt adhesive.

2 Manufacture and quality control

The components of the system are manufactured by a batch-blending process. Quality control checks are carried out on the incoming materials, during production and on the finished components.

3 Delivery and site handling

3.1 The components of the system are delivered as detailed in Table 1. The waterproofing components are transferred into bulk storage vessels, located on the spray vehicle, and maintained at 50°C to 80°C prior to spraying.

Table 1 Weights and packaging

Component	Weight (kg)	Container	Shelflife (months)
Pitchmastic PMCS/01 Primer	25	Metal/plastic drums	6
PmB Waterproofing Part A	1000	Plastic IBC's	6
PmB Waterproofing Part B	1000	Plastic IBC's	6
PmB Binder (Base)	17.38	Metal drums	6
PmB Binder (Hardener)	7.67	Metal drums	6
Pm2/03 Tack Coat	60, 200	Metal/plastic drums/1 tonne IBC's	6
Pm2/02 HC Tack Coat	60, 200	Metal/plastic drums/1 tonne IBC's	6
Pm-HM/01 Tack Coat	18	Paper sacks	N/A
Dark Green Basalt	25	Paper sacks	N/A

3.2 The components are classified under *The Chemicals (Hazard Information and Packaging for Supply) Regulations 2009 (CHIP4)* and all containers bear the appropriate hazard warning label(s). Flashpoints and hazard classification are given in Table 2.

Table 2 Flashpoint and hazard classification

Component	Flashpoint (°C)	Classification
Pitchmastic PMCS/01 Primer	3	Highly flammable ⁽¹⁾ /Harmful
PmB Waterproofing Part A	165	Harmful
PmB Waterproofing Part B	>200	Harmful
PmB Binder (Base)	>65	Harmful
PmB Binder (Hardener)	>200	Harmful
Pm2/03 Tack Coat	<21	Highly flammable ⁽¹⁾ /Harmful
Pm2/02 HC Tack Coat	N/A	Non-flammable

(1) The product should be stored in accordance with the *Highly Flammable Liquids and Liquefied Petroleum Gases Regulations (1972)*.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on the PmB Bridgedeck Waterproofing System.

Design Considerations

4 Use

The PmB Bridgedeck Waterproofing System is suitable for use on highway concrete bridge decks as part of new and maintenance applications with APL or HRA surfacing. The deck surface should have a Class U4 (in accordance with Specification for Highway Works, Volume 1, Clause 1708.4), formed or tamped surface finish and be at least 28 days old (or minimum 7 days where agreed in consultation with the purchaser) with a maximum surface moisture content of 6%.

5 Performance

The system meets the requirements of the *Guidelines Document for the Assessment and Certification of Waterproofing Systems for Use on Concrete Decks of Highway Bridges* (see section 1.5).

6 Practicability of installation

The system should only be installed by installers who have been trained and approved by the Certificate holder (see section 9.2).

7 Maintenance

The system is not subject to any routine maintenance requirements but any damage must be repaired before being overlaid (see section 1.3).

8 Durability

8.1 The system will provide an effective waterproof layer to the concrete bridgedeck, provided that care is taken to ensure that the system is not damaged during subsequent resurfacing work.

8.2 The durability of the system is dependent on the surfacing and this will vary on a number of factors; including traffic load, location and environmental conditions.

9 General

9.1 Installation of the PmB Bridgedeck Waterproofing System must only be carried out by contractors authorised and trained by the Certificate holder.

9.2 The Certificate holder is responsible for training and monitoring its authorised contractors to ensure that the system is installed in accordance with the BBA Agreed Method Statement and this Certificate.

10 Precautions

Health and Safety Data Sheets and the *Control of Substances Hazardous to Health Regulations 2002* (COSHH) risk assessments for the works should be deposited with the purchaser and be maintained on site.

11 Preparation

11.1 Imperfections in the concrete deck must be reinstated by the purchaser with a material agreed in consultation with the authorised contractor.

11.2 The concrete deck must be clean, dry, and free from ice, frost, laitance, loose aggregate, oil, grease, moss, algae growth, dust and other debris, and where the adhesion to the concrete would be impaired, free from curing liquids, compounds and membranes.

11.3 The air and substrate temperature together with relative humidity should be recorded and the installation of the waterproofing system only carried out on concrete bridge decks when either:

- the minimum air and substrate temperature is at 0°C and rising with the air temperature at least 3°C above the dew-point for decks which are a minimum of 28 days old, or
- the minimum air and substrate temperature is at 4°C and rising with the air temperature at least 3°C above the dew-point for decks which are a minimum of 7 days old.

12 Application

Primer

12.1 Pitchmastic PMCS/01 Primer should be applied by airless spray at a coverage rate of 40 g·m⁻² to 65 g·m⁻², or by roller or brush at a coverage rate of 65 g·m⁻² to 110 g·m⁻² dependent on the porosity of the concrete deck.

12.2 The primer should be over-sprayed with PmB Waterproofing membrane within 24 hours of application, provided the primed surface is clean and dry.

12.3 If the 24 hours is exceeded or the primed surface becomes wet due to rain or condensation, the primer should be abraded and the area re-primed.

Waterproofing membrane

12.4 The PmB Waterproofing, components Part A and Part B are stored in temperature controlled tanks, maintained at 50°C to 80°C, within the spray equipment plant during application.

12.5 The spray equipment is computer controlled, and maintains a Part A : Part B mix ratio of 100:96 ±5% by weight.

12.6 The PmB Waterproofing membrane (pigmented blue), is spray applied in one coat or two or multiple coats at a coverage rate of 2.7 kg·m⁻² on a U4 surface to give a minimum total thickness of 2.0 mm overall, including peaks, arrises and irregularities in the concrete deck. The coverage rate will increase with surface irregularity.

12.7 In the two-coat system, a minimum thickness of 1.0 mm is applied in the first coat and allowed to dry. Within four hours, the second coat is applied to bring the total minimum thickness to 2.0 mm. In the multiple coat system, each coat is applied within four hours of the previous coat to bring the total minimum thickness to 2.0 mm. Where the four hour interval in the two-coat and multiple coat system is exceeded, an additional coat of Pitchmastic PMCS/01 Primer will be required before applying the next coat.

Lapping

12.8 Where a new waterproofing membrane is to be joined to an existing PmB Waterproofing membrane and at day joints, the new application must be lapped onto the existing joint by a minimum of 100 mm.

12.9 Where the existing membrane is clean and less than four hours old, no additional preparation is necessary.

12.10 Where the existing membrane is clean but over four hours old, Pitchmastic PMCS/01 Primer must be applied to give a minimum margin of 20 mm greater than the lap and allowed to dry.

12.11 Where the existing membrane is dirty or contaminated, the surface must be cleaned using a suitable solvent, eg acetone.

Sealing into parapet chase

12.12 The PmB Waterproofing membrane should be terminated into a primed chase when provided.

Tack coat

12.13 The appropriate tack coat should be applied to the fully cured waterproofing membrane only in areas due to receive the APL or HRA surfacing.

12.14 When APL surfacing is to be applied directly onto the system, Pitchmastic Pm2/03 Tack Coat is applied by spray, roller or brush at a coverage rate of 0.2 l·m⁻² to 0.3 l·m⁻², after one hour of initial membrane application.

12.15 When HRA surfacing is to be applied directly onto the system, either PmB Tack Coat System Type 1, Pm2/03 Tack Coat System Type 2, Pm2/02 HC Tack Coat System Type 3 or Pm-HM/01 Tack Coat System Type 4 are used.

12.16 Initially, for all four tack coat systems PmB Binder is prepared by adding the entire contents of Hardener container to the Base container. These are mixed until homogenous and applied after one hour of initial membrane application either by roller or squeegee at a coverage rate of 0.7 kg·m⁻² to 1.0 kg·m⁻².

12.17 While the PmB Binder is still wet, Dark Green Basalt Aggregate is applied by hand at a coverage rate of 2 kg·m⁻² to 3 kg·m⁻², to achieve an approximate coverage of 80% over the PmB Binder.

12.18 When using Tack Coat System Type 1, after one hour of initial PmB Binder application, (typical drying time for PmB Binder is one hour at 20°C), the application of HRA can then be carried out.

12.19 When using either Tack Coat Systems Type 2, 3 or 4, after one hour of initial PmB Binder application (typical drying time for PmB Binder is one hour at 20°C), either Pm2/03, Pm2/02 HC or Pm-HM/01 Tack Coats are applied before the application of HRA.

12.19 The Pm2/02 HC Tack Coat must only be applied at a minimum air temperature of 7°C, in one coat by roller or brush at a coverage rate of 0.3 l·m⁻² to 0.8 l·m⁻². Precautions must be taken against applying Pm2/02 HC Tack Coat when rainfall is likely.

12.20 The Pm-HM/01 Tack Coat is preheated to between 160°C and 180°C, and applied by squeegee at a coverage rate of 2.0 kg·m⁻² to 2.2 kg·m⁻².

12.21 The applied tack coat must be dry prior to the application of the APL or HRA. Drying time of the tack coat will depend upon site conditions. Typical drying time for the tack coats is given in Table 3.

Table 3 Tack coats drying times

Component	Duration (mins)
PmB Binder Coat	60 at 20°C
Pitchmastic Pm2/03 Tack Coat	30 at 20°C
Pm2/02 HC Tack Coat	120 at 20°C
Pm-HM/01 Tack Coat	60 (allowed to cool)

12.22 The APL or HRA surfacing should be applied without undue delay and preferably no more than seven days after the tack coat application. Should this period be exceeded or the tack coated areas become contaminated or damaged, the Certificate holder should be contacted for advice.

13 Repair of defects

Pin/blow holes

13.1 Within four hours of membrane application, identified pin/blow holes are over-sprayed with PmB Waterproofing membrane to a minimum thickness of 2.0 mm.

13.2 After four hours of membrane application, the area over and around any pin/blow holes should be cleaned using a suitable solvent, ensuring a minimum 150 mm lap. The repair area should be abraded and Pitchmastic PMCS/01 Primer applied by brush or spray.

13.3 A minimum of 30 minutes must be allowed for the primer to dry and the PmB Waterproofing membrane then applied to a minimum thickness of 2.0 mm, ensuring a minimum peripheral lap of 100 mm around the repair. The membrane is allowed to cure prior to the application of the appropriate tack coat.

Blisters and damage

13.4 These are to be made good by cutting back to sound material and repairing as described in sections 13.1 to 13.3.

14 Surfacing

The rolling temperature of the surfacing must not fall below the minimum reactivation temperature requirement for the tack coats given Table 4.

Table 4 Minimum tack coat reactivation requirement

Component	Temperature (°C)
Pm2/03 Tack Coat,	100
PmB Tack Coat System Type 1	100
Pm2/03 Tack Coat System Type 2	100
Pm-HM/01 Tack Coat System Type 4	100
Pm2/02 HC Tack Coat System Type 3	120

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on the PmB Bridgedeck Waterproofing System.

15 Tests

Laboratory performance tests were carried out on the system by the BBA in accordance the requirements of the *Guidelines Document for the Assessment and Certification of Waterproofing Systems for Use on Concrete Decks of Highway Bridges*, the results were satisfactory. The tests (which were also part of an assessment resulting in the previous Certificate 98/R101) carried out on the system achieved the Guidelines Document requirements as detailed in Tables 5 and 6.

Table 5 Tests on waterproofing membrane

Test	Requirement	Method ⁽¹⁾
Resistance to water penetration membrane	satisfactory	Section 3.2.2.10

(1) *Guidelines Document for the Assessment and Certification of Waterproofing Systems for use on Concrete Decks of Highway Bridges* March 2005

Table 6 Tests on waterproofing membrane/system bonded to concrete

Test (units)	Requirement	Method ⁽¹⁾
Tensile adhesion (N·mm ⁻²)		Section 3.3.2.1
at -10°C	0.3 min	
at 23°C	0.3 min	
at 40°C	0.2 min	
Resistance to chloride ion penetration (%)	0.04 max	Section 3.3.2.2
Resistance to freeze/thaw		Section 3.3.2.3
tensile adhesion (N·mm ⁻²)	0.3 min	
chloride ion penetration (%)	0.04 max	
Resistance to heat ageing		Section 3.3.2.4
tensile adhesion (N·mm ⁻²)	0.3 min	
chloride ion penetration (%)	0.04 max	
Resistance to chisel impact		Section 3.3.2.5
at -10°C		
chloride ion penetration (%)	0.04 max	
at 23°C		
chloride ion penetration (%)	0.04 max	
at 40°C		
chloride ion penetration (%)	0.04 max	
Resistance to aggregate indentation	satisfactory	Section 3.3.2.6
at 40°C		
chloride ion penetration (%)	0.04 max	
Resistance to aggregate indentation	satisfactory	Section 3.3.2.7
at 80°C		
chloride ion penetration (%)	0.04 max	
Thermal shock, heat ageing and crack cycling	satisfactory	Section 3.3.2.8
at -10°C		
chloride ion penetration (%)	0.04 max	
at 23°C		
chloride ion penetration (%)	0.04 max	
at 40°C		
chloride ion penetration (%)	0.04 max	
Sand asphalt surfacing to waterproofing system interface shear adhesion (N·mm ⁻²)		Section 3.3.2.9
Pitchmastic Pm2/03 Tack Coat		
at -10°C	0.2 min	
at 23°C	0.2 min	
at 40°C	0.1 min	
Sand asphalt surfacing to waterproofing system interface tensile bond (N·mm ⁻²)		Section 3.3.2.10
Pitchmastic Pm2/03 Tack Coat	0.1 min	
Surface finish of concrete substrate		Section 3.3.2.11
tensile adhesion (N·mm ⁻²)		
tamped	0.3 min	
timber formed	0.3 min	
Age of concrete substrate (7 days)		Section 3.3.2.12
tensile adhesion (N·mm ⁻²)	0.3 min	

Table 6 Tests on waterproofing membrane/system bonded to concrete (continued)

Test (units)	Requirement	Method ⁽¹⁾
Overlapping time (6 months) tensile adhesion (N·mm ⁻²)		Section 3.3.2.13
covered	0.3 min	
uncovered	0.3 min	
Resistance to aggregate indentation at 125°C		Section 3.3.3.1
chloride ion penetration (%)	0.04 max	
HRA surfacing to waterproofing system interface shear adhesion (N·mm ⁻²)		Section 3.3.3.2
Tack Coat System Type 1		
at -10°C	0.2 min	
at 23°C	0.2 min	
at 40°C	0.1 min	
Tack Coat System Type 2		
at -10°C	0.2 min	
at 23°C	0.2 min	
at 40°C	0.1 min	
Tack Coat System Type 3		
at -10°C	0.2 min	
at 23°C	0.2 min	
at 40°C	0.1 min	
Tack Coat System Type 4		
at -10°C	0.2 min	
at 23°C	0.2 min	
at 40°C	0.1 min	
HRA surfacing to waterproofing system interface tensile bond (N·mm ⁻²)		Section 3.3.3.3
Tack Coat System Type 1	0.1 min	
Tack Coat System Type 2	0.1 min	
Tack Coat System Type 3	0.1 min	
Tack Coat System Type 4	0.1 min	
Installation temperature test (0°C) tensile adhesion (N·mm ⁻²)	0.3 min	Section 3.3.3.4

(1) *Guidelines Document for the Assessment and Certification of Waterproofing Systems for use on Concrete Decks of Highway Bridges* March 2005.

16 Investigations

An evaluation of existing data from the previous Certificate 98/R101 was taken and includes:

- an assessment of the practicability of the installation and quality control/assurance procedures at an installation site trial
- examination of the manufacturing process, including the methods adopted for quality control, and details of the quality and composition of materials used.

Bibliography

Guidelines Document for the Assessment and Certification of Waterproofing Systems for use on Concrete Decks of Highway Bridges, March 2005

Manual of Contract Documents for Highway Works, Volume 1 *Specification for Highway Works*, August 1998 (as amended)

Manual of Contract Documents for Highway Works, Volume 2 *Notes for Guidance on the Specification for Highway Works*, August 1998 (as amended)

17 Conditions

- 17.1 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.

17.2 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.

- 17.3 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.
 - remain in accordance with the requirements of Highway Authorities' Product Approval Scheme.
- 17.4 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.

17.5 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.