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HAPAS
Roads and Bridges
Agrément Certificate
No 01/H049
*Second issue**

BBA BRITISH BOARD OF AGRÉMENT
TECHNICAL APPROVALS FOR CONSTRUCTION

Designated by Government to issue European Technical Approvals

D3149 HIGH-FRICTION SURFACING SYSTEM

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

Product

- *THIS CERTIFICATE RELATES TO THE D3149 HIGH-FRICTION SURFACING SYSTEM, COMPRISING A TWO-COMPONENT POLYURETHANE BINDER AND A GRADED (1 mm to 3 mm) CALCINED BAUXITE AGGREGATE.*
- *The system is for use as a high-friction surfacing on highways with bituminous and concrete surfaces and is classified as Type 1 in accordance with the* Guidelines Document for the Assessment and Certification of High-Friction Surfaces for Highways.
- *The system is installed only by BBA Approved Installers.*

HAPAS Requirements

1 Requirements

1.1 The Highways Technical Advisory Committee (HiTAC) and HAPAS Specialist Group 1 (High-Friction Surfacing) have agreed with the British Board of Agrément the aspects of performance to be used by the BBA in assessing the compliance of high-friction surfacing systems with the Guidelines Document. In the opinion of the BBA, the D3149 High-Friction Surfacing System, when applied to a suitable bituminous or concrete surface in accordance with the provisions of this Certificate, will meet the relevant requirements and is deemed to be of Type 1.

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

Regulations

2 Construction (Design and Management) Regulations 1994 (as amended)

Construction (Design and Management) Regulations (Northern Ireland) 1995 (as amended)

Information in this Certificate may assist the client, planning supervisor, designer and contractors to address their obligations under these Regulations.

See sections: *5 Delivery and site handling*, (5.1 to 5.3) and *7 Precautions during installation*.

Technical Specification

3 Description

3.1 The D3149 High-Friction Surfacing System comprises a two-component, hand-applied polyurethane binder and a graded (1 mm to 3 mm) Chinese or Guyanan calcined bauxite aggregate.

3.2 A pre-weighed catalyst is also available for use on site when reduced cure times are required.

4 Manufacture and quality control

The binder components are manufactured by batch processes. A series of quality control checks is conducted on each batch of individual components and on the combined components. The combinations tested are identified by batch numbers and detailed on a Certificate of Conformity prior to delivery to site.

5 Delivery and site handling

5.1 The binder components are delivered to site in either 18.9 kg or 31.65 kg pre-weighed composite tubs.

5.2 The components are classified under the Chemicals (Hazard Information and Packaging for Supply) Regulations 2002 (CHIP3) and all containers bear the appropriate hazard warning label(s). Flashpoints and hazard classifications are given in Table 1.

Table 1 Flashpoint and hazard classification

Component	Flashpoint (°C)[1]	Classification
Part A	>150	N/A
Part B	>200	harmful[1]
Catalyst	>140	irritant

(1) Contains isocyanate which is subject to maximum exposure limits (MEL) of 0.02/0.07 mgm^{-3} (long term/short term) as detailed in EH40.

5.3 When stored in accordance with the Certificate holder's instructions the unopened components have a shelf-life of at least six months.

5.4 The calcined bauxite aggregate is delivered to site in bags and/or bulk, and stored on board a suitable vehicle or other suitably protected location prior to use. The aggregate must be protected from wet conditions.

Design Data

6 General

6.1 The D3149 High-Friction Surfacing System is satisfactory for use as a high-friction surfacing on highways with surface texture depths of between 0.5 mm and 2.0 mm, measured using the sand patch test as defined in BS 598-105 : 2000.

6.2 The system is classified as Type 1, in accordance with the results of the performance tests as defined in Table 1 of the *Guidelines Document for the Assessment and Certification of High-Friction Surfaces for Highways*.

6.3 Installation of the system should be carried out only when the road surface temperature is between 5°C and 35°C.

6.4 The system may be coloured. However, the in-service colour retention has not been assessed and is outside the scope of this Certificate.

7 Precautions during installation

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.

8 Maintenance and repair

Should the system be damaged or become debonded from the substrate it may be repaired by cutting the damaged area back to firmly bonded material, cleaning the prepared area using hot compressed air, masking the perimeter and reinstating to the original specification.

9 Durability

9.1 The results of the performance tests and the performance of the system in use indicate that when used in an appropriate location as defined in the *Guidelines Document for the Assessment and Certification of High-Friction Surfaces for Highways*, it should have a service life of between 5 and 10 years (see Table 2).

9.2 If the system is used in other locations or at different traffic levels then the expected life will be increased or decreased in relation to the severity of the site.

Table 2 Area[1] of application by type classification

Site category (as defined in HD 28/94)	Site definition	Maximum traffic levels (number of commercial vehicles per lane per day)		
		Type		
		1	2	3
F	Approaches to and across major junctions (all limbs)	3500	1000	250
G1	Gradient — from 5% to 10%, longer than 50 m			
H1	Bend — not subject to 40 mph or lower speed limit, radius from 100 m to 250 m			
L	Roundabout			
G2	Gradient — >10%, longer than 50 m	2500	750	175
H2	Bend — not subject to 40 mph or lower speed limit, radius <100 m			
J/K	Approach to hazard, such as roundabout, traffic signals, pedestrian crossing, railway level crossing	2500	500	100

(1) Suitable areas for use of systems classified in accordance with Table 1 of the Guidelines Document to give an expected service life of 5 to 10 years.

Installation

10 General

10.1 Installation of the D3149 High-Friction Surfacing System is carried out only by BBA Approved Installers[1] with trained operatives under competent supervision.

(1) *See also Assessment and Surveillance Scheme for Installers of High-Friction Surfaces for Highways.*

10.2 The Certificate holder is responsible for training and monitoring the BBA Approved Installers to ensure the system is installed in accordance with the BBA Agreed Method Statement and this Certificate.

11 Preparation

11.1 All imperfections in the road surface not acceptable to the installer should be reinstated with a material approved by the purchaser in consultation with the installer.

11.2 The road surface must be clean, dry, and free from ice, frost, loose aggregate, oil, grease, road salt and other loose matter likely to impair adhesion of the system to the road surfacing.

11.3 The ambient and road surface temperatures should be recorded. Installation should not be carried out if either the ambient or the road surface temperatures are outside the range of 5°C to 35°C.

12 Application

12.1 The installer must check and record the air temperature, road surface temperature and relative humidity. The installation should not proceed if:

- relative humidity is greater than 80%
- road surface and/or air temperature is/are outside the range (5°C to 35°C)
- road surface temperature is less than 2°C above the dew-point of the measured air temperature and relative humidity.

12.2 The installer shall also record the batch numbers of the binder.

12.3 The binder components and catalyst are supplied in pre-weighed packs. Part B is decanted into Part A and thoroughly incorporated using a slow-speed drill fitted with a helical mixing blade until a uniform coloured product is obtained free from streaks. Care should be taken to scrape the sides of the container.

12.4 If the catalyst is required to be added then it should be decanted into Part A prior to adding Part B and thoroughly incorporated using a slow-speed drill fitted with a helical mixing blade.

12.5 The mixed material is then poured onto the road surface within 10 minutes of mixing, and spread using a serrated squeegee to give an even coverage of between 1.5 kgm^{-2} and 2.5 kgm^{-2} depending on the surface texture and porosity of the existing surface.

12.6 Within five minutes of the application of the binder, excess calcined bauxite aggregate is broadcast and spread over its surface and the system allowed to cure.

12.7 After the binder is sufficiently cured, the excess aggregate is removed by vacuum sweeper or other suitable means.

12.8 Rolling of the aggregate is not permitted.

13 Aftercare

The installer shall conduct a visual check for uniform surface texture, surface blemishes and any discernible faults and carry out any remedial work, as necessary.

Technical Investigations

The following is a summary of the technical investigations carried out on the D3149 High-Friction Surfacing System.

14 Tests

Laboratory performance tests were carried out on the system (see Tables 3 and 4).

Table 3 Laboratory performance tests on asphalt substrates

Test		Parameter	Method in TRL Report 176[1]	Type 1 requirement
Scuffing at 45°C (Hot applied and Handlay BT)	Initially	Texture depth (mm)	Appendix G	≥1.4
	After 500 wheel-passes	Texture depth (mm) Erosion index	Appendix G	≥1.2 ≤3
	After heat ageing for 112 days at 70±3°C and 500 wheel-passes	Texture depth (mm) Erosion index	Appendix G	≥1.2 ≤5
Wear (Hot applied)	Initially	Texture depth (mm) SRV	Appendix H	≥1.4 ≥65
	After 100,000 wheel-passes	Texture depth (mm) Erosion index SRV	Appendix H	≥1.1 ≤3 ≥70
Tensile adhesion		Stress at −10±2°C (Nmm^{-2})	Appendix J	≥1.0
		Stress at 20±2°C (Nmm^{-2})	Appendix J	≥0.5

(1) Including any agreed amendments detailed in Appendix D of the *Guidelines Document for the Assessment and Certification of High-Friction Surfaces for Highways.*

Table 4 Additional tests

Test	Parameter	Method in TRL Report 176[1]	Result
Resistance to freeze/thaw	Texture depth Erosion index	Appendix L	satisfactory
Resistance to diesel	Texture depth Erosion index	Appendix M	satisfactory
Thermal movement	Thermal expansion coefficient	Appendix N	satisfactory
Concrete substrate test	Texture depth Erosion index Tensile adhesion at 20±2°C	Appendix P	satisfactory

(1) Including any agreed amendments detailed in Appendix D of the *Guidelines Document for the Assessment and Certification of High-Friction Surfaces for Highways.*

15 Investigations

15.1 An installation trial was carried out to assess the practicability of the installation and quality control/assurance procedures.

15.2 A user/specifier survey relating to existing sites, at least two years old, was carried out to assess the system's performance and durability.

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

Bibliography

BS 598-105 : 2000 *Sampling and examination of bituminous mixtures for roads and other paved areas — Methods of test for the determination of texture depth*

Assessment and Surveillance Scheme for Installers of High-Friction Surfaces for Highways, 16th November 1998

Guidelines Document for the Assessment and Certification of High-Friction Surfaces for Highways, 16th November 1998

HD 28/94 *Design Manual for Roads and Bridges : Volume 7, Pavement Design and Maintenance : Skid Resistance*

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)

TRL Report 176 : 1997 *Laboratory tests on high-friction surfaces for highways*

Conditions of Certification

16 Conditions

16.1 This Certificate:

(a) relates only to the product that is described, installed, used and maintained as set out in this Certificate;

(b) is granted only to the company, firm or person identified on the front cover — no other company, firm or person may hold or claim any entitlement to this Certificate;

(c) is valid only within the UK;

(d) has to be read, considered and used as a whole document — it may be misleading and will be incomplete to be selective;

(e) is copyright of the BBA;

(f) is subject to English law.

16.2 References in this Certificate to any Act of Parliament, Regulation made thereunder, Directive or Regulation of the European Union, Statutory Instrument, Code of Practice, British Standard, manufacturers' instructions or similar publication, are references to such publication in the form in which it was current at the date of this Certificate.

16.3 This Certificate will remain valid for an unlimited period provided that the product and the manufacture and/or fabrication including all related and relevant processes thereof:

(a) are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA;

(b) continue to be checked as and when deemed appropriate by the BBA under arrangements that it will determine;

(c) are reviewed by the BBA as and when it considers appropriate; and

(d) remain in accordance with the requirements of the Highway Authorities Product Approval Scheme.

16.4 In granting this Certificate, the BBA is not responsible for:

(a) the presence or absence of any patent, intellectual property or similar rights subsisting in the product or any other product;

(b) the right of the Certificate holder to market, supply, install or maintain the product; and

(c) the actual works in which the product is installed, used and maintained, including the nature, design, methods and workmanship of such works.

16.5 Any recommendations relating to the use or installation of this product which are contained or referred to in this Certificate are the minimum standards required to be met when the product is used. They do 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 or in the future; nor is conformity with such recommendations to be taken as satisfying the requirements of the 1974 Act or of any present or future 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 installation and use of this product.

BBA BRITISH BOARD OF AGRÉMENT
TECHNICAL APPROVALS FOR CONSTRUCTION

In the opinion of the British Board of Agrément, the D3149 High-Friction Surfacing System is fit for its intended use provided it is installed, used and maintained as set out in this Certificate. Certificate No 01/H049 is accordingly awarded to Leeson Polyurethanes Ltd.

On behalf of the British Board of Agrément

Date of Second issue: 11th August 2004

Chief Executive

**Original Certificate issued on 6th March 2001. This amended version includes reference to a change of name to the Certificate holder, an addition to the CDM Regulations, revised CHIP Regulations, changes to the* Bibliography *and new* Conditions of Certification.

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