HAPAS

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BBA APPROVAL INSPECTION TESTING CERTIFICATION
TECHNICAL APPROVALS FOR CONSTRUCTION

HAPAS Certificate
01/H049
Product Sheet 1

LEESON POLYURETHANES HIGH FRICTION SURFACING

D3149 HFS TYPE 1

This HAPAS Certificate is issued by the British Board of Agrément (BBA), supported by 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 D3149 HFS Type 1, a polyurethane-based high-friction surfacing system for use on highways.

HAPAS 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

Durability — the system, when used in an appropriate location as defined in the *Guidelines Document for the Assessment and Certification of High-Friction Surfaces for Highways*, should have a service life of between 5 and 10 years (see section 7).

Performance — the system complies with the requirements for a Type 1 system in accordance with the *Guidelines Document for the Assessment and Certification of High-Friction Surfaces for Highways* (see *Technical Investigations* section, Table 3).

The BBA has awarded this HAPAS 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: 19 March 2012
Originally certificated on 6 March 2001

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.

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Requirements

In the opinion of the BBA, D3149 HFS Type 1 meets the Type 1 requirements of the *Guidelines Document for the Assessment and Certification of High-Friction Surfaces for Highways*. When used in accordance with the provisions of this Certificate, D3149 HFS Type 1 will meet or contribute to meeting the requirements of the *Manual of Contract Documents for Highways Works* (MCHW)[1], Volumes 1 and 2, Series 924.

(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 and 3.2), 9 *Precautions during installation* and 10 (10.1 and 10.2) *Preparation* of this Certificate.

Technical Specification

1 Description

1.1 D3149 HFS Type 1 comprises a two component, hand-applied polyurethane binder incorporating 1 mm to 3 mm graded calcined bauxite aggregates.

1.2 The system may be coloured. The colour retention has not been assessed and is outside the scope of this Certificate.

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

2 Manufacture

2.1 The binder components 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 as part of a surveillance process to verify that the specifications and quality control operated by the manufacturer are being maintained.

3 Delivery and site handling

3.1 The binder components are delivered to site in either 18.9 kg or 31.65 kg pre-weighed composite tubs or Intermediate Bulk Containers (IBCs)

3.2 The 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 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 $mg \cdot m^{-3}$ (long term/short term) as detailed in EH40/2005 *Occupational Exposure Limits*, 2005.

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

3.4 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.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on D3149 HFS Type 1.

Design Considerations

4 General

4.1 D3149 HFS Type 1 is satisfactory for use as a high-friction surfacing on highways with surface texture depths of between 0.5 mm and 2 mm, measured using the sand patch test as defined in BS 598-105 : 2000.

4.2 The system is classified as Type 1, in accordance with the requirements defined in Table 1 of the *Guidelines Document for the Assessment and Certification of High-Friction Surfaces for Highways* and detailed in section 7 of this Certificate.

4.3 The system is suitable for use on bituminous and concrete surfaces only.

5 Practicability of installation

The system is only to be installed by a BBA Approved installer.

6 Maintenance

The system is not subject to any routine maintenance requirements but any damage must be repaired (see section 13).

7 Durability

7.1 The results of the performance tests and the performance of the system in use indicate that the D3149 HFS Type 1, when used in an appropriate location as defined in the *Guidelines Document for the Assessment and Certification of High-Friction Surfaces for Highways*, should have a service life of between 5 and 10 years (see Table 2).

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)
Q	Approaches to and across major junctions and approaches to roundabouts)	3500
G1	Gradient — from 5% to 10%, longer than 50 m	
S1	Bend radius <500 m — dual carriageway	
R	Roundabout	
G2	Gradient — >10%, longer than 50 m	2500
S2	Bend radius <500 m— single carriageway	
K	Approaches to pedestrian crossings and other high-risk situations	2500

(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.

7.2 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.

Installation

8 General

8.1 The ambient and road surface temperatures should be recorded. Installation should not be carried out if the road surface temperature is outside the range of 5°C to 35°C.

8.2 Installation of the D3149 HFS Type 1 is carried out only by BBA Approved installers(1) with trained operatives under competent supervision.

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

8.3 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.

9 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 by the approved installer.

10 Preparation

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

10.2 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 Application

11.1 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.

11.2 The installer must also record the batch numbers of the binder.

11.3 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.

11.4 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.

11.5 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 $kg \cdot m^{-2}$ and 2.5 $kg \cdot m^{-2}$ depending on the surface texture and porosity of the existing surface.

11.6 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.

11.7 After the binder has fully cured, the excess aggregate is removed by vacuum sweeper or other suitable means.

11.8 Rolling of the aggregate is not permitted.

12 After-care

The installer conducts a visual check on the installation for uniform surface texture, surface blemishes and any discernible faults. Any remedial work is conducted as necessary.

13 Repair

Should the system become damaged or debonded from the substrate it must be repaired as follows:

- loose material is cut away back to sound material and the area cut into a rectangular shape
- the prepared area is cleaned using hot compressed air or a propane torch
- the perimeter is masked off and reinstated with material to the original specification.

Technical Investigations

14 Tests

Samples of D3149 HFS Type 1 were prepared by the Certificate holder for testing. Tests were carried out and are summarised in Tables 3 and 4. The results of the tests comply with the requirements for a Type 1 system.

Table 3 Laboratory performance tests on asphalt substrates

Test	Parameter measured	Type 1 requirement	Method in TRL Report 176[1]
Scuffing at 45°C			
initial	Texture depth (mm)	⩾1.4	Appendix G
after 500 wheel-passes	Texture depth (mm)	⩾1.2	Appendix G
	Erosion index	⩽3	
after heat ageing for 112 days at 70±3°C and 500 wheel-passes	Texture depth (mm)	⩾1.2	Appendix G
	Erosion index	⩽5	
Wear			
initial	Texture depth (mm)	⩾1.4	Appendix H
	SRV	⩾65	
after 100 000 wheel-passes	Texture depth (mm)	⩾1.1	Appendix H
	Erosion index	⩾3	
	SRV	⩾70	
Tensile adhesion	Stress at −10±2°C (N·mm^{-2})	⩾1.0	Appendix J
	Stress at 20±2°C (N·mm^{-2})	⩾0.5	Appendix J

(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 evaluated, 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*

Guidelines Document for the Assessment and Certification of High-Friction Surfaces for Highways, March 2008

HD 28/04 *Design Manual for Roads and Bridges : Volume 7, Pavement Design and Maintenance : Section 3, Pavement Maintenance Assessment : Part 1, 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*

16 Conditions

16.1 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.

16.2 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.

16.3 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.

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

16.5 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
- individual 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.

16.6 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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