**HAPAS**
**Roads and Bridges**

**Trustseal Ltd**
Unit 10
Southfield Industrial Estate
Southfield Lane
Whitwell, Worksop
Nottinghamshire S80 4NW
Tel: 01909 722662 Fax: 01909 720228
e-mail: info@trustseal.co.uk
website: www.trustseal.co.uk

BBA APPROVAL INSPECTION TESTING CERTIFICATION
TECHNICAL APPROVALS FOR CONSTRUCTION

Agrément Certificate
**00/H039**
**Product Sheet 1**

# TRUSTSEAL HIGH-FRICTION SURFACING SYSTEM

# KEYGRIP EPOXY 924

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 Keygrip Epoxy 924, a high-friction surfacing system for use on bituminous highways.

### 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 complies with the requirements for a Type 1 system in accordance with the *Guidelines Document for the Assessment and Certification of High-Friction Surfacing for Highways* (see Table 2).

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

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: 25 May 2011
Originally certificated on 2 October 2000

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.*

British Board of Agrément
Bucknalls Lane
Garston, Watford
Herts WD25 9BA
tel: 01923 665300
fax: 01923 665301
e-mail: mail@bba.star.co.uk
website: www.bbacerts.co.uk

# HAPAS Requirements

## Requirements

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, Keygrip Epoxy 924, when applied to suitable bituminous surfaces, in accordance with the provisions of this Certificate, will meet the relevant requirements and is deemed to be of Type 1.

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, Clause 924 (08/08) *High Friction Surfaces*.

(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) and 9 *Precautions during installation* of this Certificate.

# Technical Specification

## 1 Description

Keygrip Epoxy 924 comprises a two-component, modified epoxy binder and a graded nominal 1 mm to 3 mm calcined bauxite aggregate.

## 2 Manufacture and quality control

The Keygrip Epoxy 924 binder components are manufactured by batch-blending process. 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.

## 3 Delivery and site handling

3.1 The Keygrip Epoxy 924 binder components are delivered to site in dedicated heated tanks, located on the installation vehicle or in 22 kg pre-weighed combination packs.

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 classifications are given in Table 1.

*Table 1 Flashpoint and hazard classification*

| Component | Flashpoint (°C)[1] | Classification |
|---|---|---|
| Part A | 150 | irritant/harmful |
| Part B | 100 | toxic/corrosive |

(1) Closed cup.

3.3 When stored in accordance with the Certificate holder's instructions the unopened components have a shelf-life of at least 12 months.

# Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Keygrip Epoxy 924.

# Design Considerations

## 4 General

4.1 Keygrip Epoxy 924 is satisfactory for use as a high-friction surfacing system 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.

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 Surfacing for Highways* and detailed in section 7 of this Certificate.

4.3 The suitability of the system for use on highways with concrete surfaces and the in-service colour retention of the system have not been assessed and are outside the scope of this Certificate.

## 5 Practicability of installation

The system is installed by BBA Approved Installer(1). Operatives must be trained and approved by the Certificate holder.

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

## 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 Keygrip Epoxy 924 when used in an appropriate location as defined in the *Guidelines Document for the Assessment and Certification of High-Friction Surfacing 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 28/04) | Site definition | Maximum traffic levels(2) Type 1 |
|---|---|---|
| Q | Approaches to and across major junctions and approaches to roundabout | 3500 |
| G1 | Gradient from 5% to 10%, longer than 50 m | 3500 |
| S1 | Bend radius <500 m – dual carriageway | 3500 |
| R | Roundabout | 3500 |
| G2 | Gradient >10%, longer than 50 m | 2500 |
| S2 | Bend radius <500 m – single carriageway | 2500 |
| K | Approach to pedestrian crossing 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.

(2) Commercial vehicles per lane per day.

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 Keygrip Epoxy 924 is carried out only by BBA Approved Installers(1) with trained operatives under competent supervision.

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

10.3 Surface contamination may be removed using any suitable method agreed between the installer and purchaser including grit blasting, high-pressure water jetting, scabbling and hot compressed air. Oil contamination is removed by washing with a suitable detergent followed by flushing with clean water and dried.

10.4 Existing road markings, iron works and studs must be masked.

## 11 Application

### Material from dedicated heated tanks

11.1 The two components are batched from the tanks into calibrated containers ensuring a mix ratio of 50:50 ± 2% by volume at a temperature between 20°C and 50°C.

11.2 The components (up to 13 kg of each) are mixed for at least two minutes, or until homogeneous, using a high-torque drill fitted with a helical mixing blade.

### Material from pre-weighed combination packs

11.3 The pre-weighed components, Part A and Part B, are heated to a temperature between 20°C and 50°C then mixed individually for at least one minute. Part B is added to Part A and the two parts mixed for at least two minutes, or until homogeneous, using a high-torque drill fitted with a helical mixing blade.

### Application of the binder and calcined bauxite aggregate

11.4 The mixed binder can be applied by squeegee onto the prepared surface at a minimum coverage rate, which will vary according to the texture and porosity of the surface but must not be less than 1.35 $kg \cdot m^{-2}$.

11.5 After the binder is applied, an excess of calcined bauxite aggregate is broadcast over the binder and is evenly spread out using a broom or squeegee.

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

11.7 Rolling of the aggregate is not permitted.

## 12 After-care

The installer should conduct 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 be damaged or become debonded from the substrate it is repaired by cutting the damaged area back to firmly bonded material, cleaning the prepared area, masking the perimeter and reinstating to the original specification.

# Technical Investigations

## 14 Tests

Laboratory performance tests were carried out on Keygrip Epoxy 924 (see Tables 3 and 4). The results of the tests complied with the requirements for a Type 1 system.

*Table 3 Laboratory performance tests*

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

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

*Table 4 Additional tests*

| Test | Parameter measured | Result | Method in TRL Report 176[1] |
|---|---|---|---|
| Resistance to freeze/thaw | Texture depth<br>Erosion index | satisfactory | Appendix L |
| Resistance to diesel | Texture depth<br>Erosion index | satisfactory | Appendix M |
| Thermal movement | Thermal expansion coefficient | satisfactory | Appendix N |

(1) Including any agreed amendments detailed in Appendix D of the *Guidelines Document for the Assessment and Certification of High-Friction Surfacing 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 Surfacing for Highways* March 2008

*Guidelines Document for the Assessment and Certification of High-Friction Surfacing 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, Series 900 Road pavements — bituminous bound materials*

Manual of Contract Documents for Highway Works, Volume 2 *Notes for Guidance on the Specification for Highway Works, Series 900 Road pavements — bituminous bound materials*

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 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.

16.2 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.

16.3 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.

16.4 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.

16.5 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.

British Board of Agrément
Bucknalls Lane
Garston, Watford
Herts WD25 9BA



tel: 01923 665300
fax: 01923 665301
e-mail: mail@bba.star.co.uk
website: www.bbacerts.co.uk