

Tarmac Ltd

Millfields Road

Ettingshall

Wolverhampton WV4 6JP

Tel: 01902 353522 Fax: 01902 491674

e-mail: info@tarmac.co.uk

website: www.tarmacdry.co.uk

Agrément Certificate

09/H143

Product Sheet 1

TARMAC PERVIOUS PAVEMENT SYSTEM

TARMACDRY

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; the Department for Regional Development, Northern Ireland), 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 SCOPE AND SUMMARY OF CERTIFICATE

This Certificate relates to TarmacDry, a full depth pervious pavement system for use as part of a sustainable drainage system (SUDS) for surface water source control, in lightly trafficked areas such as car parks, residential and urban roads.

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

Mechanical resistance — mix design data relating to rut rate and rut depth indicate that the asphalt layers have a satisfactory resistance to permanent deformation (see section 5).

Sensitivity to water — the asphalt layers have a satisfactory retained stiffness after conditioning in water (see section 6).

Surface characteristics — the surface course of the system has a satisfactory skid resistance (see section 7).

Permeability — the system is permeable and can eliminate surface ponding (see section 8).

Durability — the system has been used in the UK since 1999 available evidence indicates that it will provide a durable pervious pavement (see section 10).

The BBA has awarded this Agrément Certificate to the company named above for the system described herein. The 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: 26 March 2009

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

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HAPAS Requirements

Requirements

The Highways Technical Advisory Committee (HiTAC) has agreed with the BBA the aspects of performance to be used by them in the assessment of TarmacDry. In the opinion of the BBA, TarmacDry, when manufactured and installed in accordance with the provisions of this Certificate can be designed to provide a durable pervious pavement system for lightly trafficked applications such as car parks, residential and urban roads or similar.

Additional requirements of the overseeing organisations for road pavements 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 section: 2 Delivery and site handling (2.1 and 2.2).

General

This Certificate relates to the bituminous materials and unbound aggregate layers used within the TarmacDry system. The system should only be installed by installers who have been trained and approved by the Certificate holder. The records relating to this will be audited by the BBA as part of its programme of surveillance on the Certificate.

Technical Specification

1 Description

1.1 TarmacDry is a full depth, pervious pavement system. Details of the system are:

- bituminous bound surface, binder and base course layers — consisting of aggregate and fillers specified in accordance with BS EN 13043 : 2002, clear synthetic or polymer-modified binders supplied to agreed specifications and/or paving-grade bitumen specified in accordance with BS EN 12591 : 2000, with cellulose fibres
- unbound sub-base and granular layers — consisting of aggregate complying with the physical property requirements in MCHW SHW Clause 801, Table 8/1 and 8/2 for sub-base mixtures
- hot bitumen and cold emulsion bitumen — for use on longitudinal and transverse joints
- geotextiles/geomembranes — a suitable geotextile is selected to meet the requirements of each site taking into account the sub-grade permeability for infiltration systems and the thickness and type of geomembrane for tanked systems.

1.2 Bituminous bound and unbound layer depths are determined in accordance with the design procedures identified in section 3.

1.3 Pigments used for colour purposes may also be used within the surface course. However, colour retention of the surface has not been assessed by the BBA.

2 Manufacture, quality control, delivery and site handling

2.1 The bituminous bound and unbound materials are manufactured, controlled and delivered in accordance with a BBA Agreed Quality Plan which includes requirements for:

- bitumen
- aggregate
- plant suitability
- method of production and process control
- inspection and testing of finished product
- delivery vehicles.

2.2 The system is not classified under *The Chemicals (Hazard Information and Packaging for Supply) Regulations 2002* (CHIP3). Standard material safety data sheets for hot asphalts apply.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on the bituminous bound and unbound materials used, and the TarmacDry design requirements.

3 General

3.1 A TarmacDry pavement design for a specific project must always be preceded by a detailed review of the proposed site to establish:

- use/type of application
- traffic loading (commercial vehicles per day)
- suitability of site conditions for attenuation/infiltration or combination system
- requirements for water harvesting
- nature of the sub-grade/receiving course (porosity – hydraulic conductivity, stability)
- other sources of surface run-off.

3.2 The choice of aggregate type used in the surface course will depend on site specific details including location and contractual requirements for polished stone values. The polished stone value will be measured in accordance with EN 1097-8 : 2000.

3.3 Once the design criteria have been established, there are two main parts to the design procedure: pavement structural design and hydraulic design.

Pavement structural design

3.4 The structural design of the system must take into account the anticipated traffic loading and ground conditions, and the mechanical properties of the bituminous bound and unbound layers. For the design of lightly trafficked roads, including car parks, the analytical approach to pavement design described in TRRL Laboratory Report LR 1132 *The structural design of bituminous roads* is used.

Hydraulic design

3.5 The hydraulic design of the system is carried out in accordance with the principles of CIRIA C697 : 2007 *The SUDS Manual* and takes into account: the anticipated maximum rainfall at the location, the design storm event requirement (30, 50, 100 year), the sub-grade permeability and the required water outflow characteristics for the pavement.

3.6 The Certificate holder will liaise with the specifier or appointed hydraulic engineer for adequate hydraulic design.

4 Practicability of installation

The system must only be installed by installers who have been trained and approved by the Certificate holder.

5 Mechanical resistance

Test results for design and site void content, rut rate and depth were reviewed. The results indicate that a satisfactory resistance to permanent deformation can be attained, see section 13, Tables 1 and 3.

6 Sensitivity to water

Sensitivity to water tests have been completed on the surface course. A retained stiffness to a minimum 80% can be achieved, see section 13, Table 1.

7 Surface characteristics

The texture depth of the surface course measured in accordance with BS 598-105 : 2000, indicates that a satisfactory skid resistance can be achieved, see section 13, Table 2.

8 Permeability

A review of initial and retained in-situ hydraulic conductivity test results completed on various site trials indicate that water will flow through each layer and the complete system at or in excess of the design rate of 5000 mm/h, see section 13, Tables 1 and 3.

9 Maintenance

The surface should be cleaned periodically using a sweeper fitted with water jetting and vacuuming equipment. Power washing or mechanical brushing must not be used to clean the laid asphalt as this will result in the detritus becoming ingrained in the surfacing.

10 Durability

The system has been used in the UK since 1999. The available evidence suggests that provided adequate maintenance is carried out in accordance with the recommendations of section 9, the system will provide a durable pervious pavement for use as part of a sustainable drainage system (SUDS).

11 General

11.1 TarmacDry is installed by the Certificate holder's installers in accordance with procedures detailed in their Quality Plan and Best Practice Guide for TarmacDry and the relevant Clauses of BS 594987 : 2007 which includes requirements for:

- site inspection and assessment
- acceptable weather conditions
- site specific toolbox talks
- joint making
- precautions during installation
- installation method statement.
- surface preparation and cleanliness
- minimum paver and rolling temperatures (asphalt only)
- equipment type and operation
- compaction procedure
- record keeping

11.2 When the geomembrane or geotextile is used this must be installed in accordance with the supplier's recommendations.

Unbound layers

11.3 For large areas it is recommended that a paver is used. During compaction vibration is not used.

Bituminous bound layers

11.4 The asphalt should be delivered and compacted within four hours of manufacture. Prior to compaction, the asphalt should be visually inspected and the temperature checked to confirm that the rolling temperature can still be achieved.

11.5 The minimum surface temperature prior to laying must be -1°C on a rising thermometer providing the surface is dry and free from ice. Laying must be suspended when the air temperature reaches 0°C on a falling thermometer. TarmacDry must not be laid during periods of heavy rainfall.

11.6 Due to the open-graded nature of the unbound layers some disturbance of the sub-base surface will occur during the installation of the base course. To minimise this, the following is carried out in accordance with site work instructions, supplemented by toolbox talks:

- base course material can be compacted in a thin layer extending 1.5 m from the edges of areas such as kerbs, structures or bends to stabilise the sub-base. This practice can be completed the day before asphalt layers are installed
- the sub-base should be continuously monitored for any major disturbance. If this occurs, the paver is stopped, the delivery vehicle is pulled off the paver and the sub-base is re-compacted before continuing with the installation.

Joints

11.7 All bituminous bound longitudinal and transverse joints will be prepared in accordance with BS 594987 : 2007.

11.8 Joints must not be overbanded with bitumen.

12 Repair

Major repairs

12.1 The damaged area is removed by planing to the full depth of the affected layer. The planed area is reinstated using material to the same specification, unless otherwise agreed with the purchaser, using the procedures identified within section 11.

12.2 If pre-treatment of the substrate to maintain the hydraulic conductivity is required, then the use of a sweeper fitted with water jetting and vacuuming equipment is recommended. This is followed with hydraulic conductivity tests to confirm water flow and should be at least 75% of the hydraulic conductivity requirement for the site.

Minor repairs

12.3 Minor repairs can be carried out by cutting out the damaged section and replacing it with a material of suitable specification agreed between the Certificate holder and the purchaser. Normally, pre-treatment of the receiving course is not necessary.

Technical Investigations

13 Tests

A series of tests were carried out at, or on samples taken from a TarmacDry trial site. See Tables 1 to 3.

Table 1 Results from tests carried out on the 10 mm surface course material

Test	Mean result	Method ⁽¹⁾
Wheel tracking at 45°C ⁽²⁾ rate (mm h ⁻¹)	0.8	BS 598-110
rut depth (mm)	0.45	
Torque bond strength at 20±2°C (kPa)	557 ⁽³⁾	Guidelines document, Appendix A.3
Sensitivity to water retained stiffness (ITSM _{ε3}) ⁽⁴⁾ (%)	104	Guidelines document, Appendix A.2 BS DD 229
Hydraulic conductivity (mm/hr)	14997 ⁽⁵⁾	BS EN 12697-8
Voids (%)	23 ⁽⁶⁾	
	25 ⁽⁷⁾	

- (1) The Guidelines document is referenced in the *Bibliography*.
 (2) Laboratory prepared samples. Mean core thickness = 50 mm.
 (3) Mode of failure = Failure in substrate. Age at time of test unknown.
 (4) Laboratory prepared samples. Retained indirect stiffness modulus at 20±0.50°C after 3 water conditioning cycles.
 (5) Mean hydraulic conductivity for full pavement depth.
 (6) Voids measured 1 month after installation.
 (7) Voids measured 9 months after installation.

Table 2 Surface characteristics results for TarmacDry 10 mm surface course

Test	Result ⁽¹⁾⁽²⁾	Method
Texture depth (mm) trafficked	1.9	BS 598-105

- (1) Mean result. Measured approximately 8 months after installation.
 (2) Limestone aggregate.

Table 3 Results from tests carried out on the 32 mm base course material

Test	Mean result	Method
Wheel tracking at 45°C ⁽¹⁾ rate (mm h ⁻¹)	1.4	BS 598 : 110
rut depth (mm)	3.1	
Hydraulic conductivity (mm/hr)	24890 ⁽²⁾	BS DD 229
	7172 ⁽³⁾	
Voids (%)	26 ⁽⁴⁾	BS EN 12697-8
	18 ⁽⁵⁾	
	18 ⁽⁶⁾	

- (1) Laboratory prepared samples. Mean core thickness = 88 mm.
 (2) Hydraulic conductivity measured 1 month after installation.
 (3) Hydraulic conductivity measured 7 months after installation. Construction traffic caused reduction in hydraulic conductivity. Remedial work resulted in final hydraulics being satisfactory (see Table 1).
 (4) Voids measured 1 month after installation.
 (5) Voids measured 7 months after installation.
 (6) Voids measured 13 months after installation.

14 Investigations

14.1 An installation of TarmacDry was witnessed by the BBA to confirm the practicability of the installation and on-site quality control procedures.

14.2 A user/specifier survey relating to the performance in use was carried out which confirmed the system performance and durability in applications typical of those quoted within this Certificate.

14.3 The manufacturing process was examined by BBA inspection and the methods adopted for quality control, and the quality and composition of the materials used. The inspection confirmed that the plant operated in accordance with requirements of the Quality Plan and Quality System agreed with the BBA.

14.4 Visits to existing sites were conducted by the BBA to confirm the systems performance in use.

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*
 BS 598-110 : 1998 *Sampling and examination of bituminous mixtures for roads and other paved areas — Methods of test for the determination of wheel-tracking rate and depth*
 BS 812-114 : 1989 *Testing aggregates — Method for determination of the polished-stone value*
 BS 594987 : 2007 *Asphalt for roads and other paved areas — Specification for transport, laying and compaction and type testing protocols*
 BS DD 229 : 1996 *Method for determination of the relative hydraulic conductivity of permeable surfacings*

BS EN 12591 : 2000 *Bitumen and bituminous binders — Specifications for paving grade bitumens*

BS EN 12697-8 : 2003 *Bituminous mixtures. Test methods for hot mix asphalt. Determination of void characteristics of bituminous specimens*

BS EN 13036-1 : 2002 *Road and airfield surface characteristics — Test methods — Measurement of pavement surface macrotexture depth using a volumetric patch technique*

BS EN 13043 : 2002 *Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas*

EN 1097-8 : 2000 *Tests for mechanical and physical properties of aggregates — Determination of polished stone value*

Guidelines Document for the Assessment and Certification of Thin Surfacing Systems for Highways, July 2004

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)

Conditions of Certification

15 Conditions

15.1 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.

15.2 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.

15.3 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 Highways Authorities' Product Approval Scheme.

15.4 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.

15.5 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.