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**HAPAS**  
Roads and Bridges  
Agrément Certificate  
No 01/H052

Second issue\*

Designated by Government  
to issue  
European Technical  
Approvals

## MASTERPAVE THIN SURFACING SYSTEM FOR HIGHWAYS

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; 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



• THIS CERTIFICATE RELATES TO THE MASTERpave THIN SURFACING SYSTEM FOR HIGHWAYS, COMPRISING A PENETRATION GRADE BITUMEN BINDER, CELLULOSE FIBRES, LIMESTONE FILLER AND GRADED COARSE AND FINE AGGREGATES.

• The system is used in conjunction with a polymer-modified bond coat, to enhance the adhesion to the substrate. A K1-40 tack coat conforming to BS 434-1 : 1984 may also be used in low stress situations and where the thickness of Masterpave is >30 mm.

• The system is for use as a thin road surfacing laid at nominal thicknesses of 20 mm to 50 mm, covering the Classifications B and C defined in Table 1 of the Guidelines Document for the Assessment and Certification of Thin Surfacing Systems For Highways, July 2004.

• The system can only be laid by Tarmac Limited National Contracting using conventional paving equipment.

These Front Sheets must be read in conjunction with the relevant Detail sheets, which provide information specific to Masterpave systems.

## HAPAS Requirements — Detail Sheet 1

### 1 Requirements

The Highways Technical Advisory Committee (HiTAC) and HAPAS Specialist Group 3 (Thin Surfacing) have agreed with the British Board of Agrément the aspects of performance to be used by the BBA in assessing the compliance of Thin Surfacing Systems with the Guidelines Document. In the opinion of the BBA, the Masterpave System, when manufactured and laid in accordance with the provisions of this Certificate can be designed to meet the relevant requirements and can achieve the levels of performance given in Table 1 of the relevant Detail Sheet.

## Regulations

### 2 Construction (Design and Management) Regulations (England and Wales) 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 section:

4 Manufacture, quality control, delivery and site handling (4.3) of these Front Sheets.

## Technical Specification

### 3 Description

3.1 The Masterpave Thin Surfacing System for Highways comprises a series of mixtures principally consisting of a blend of 40/60 pen paving grade bitumen to BS EN 12591 : 2000, cellulose fibres, graded crushed rock, coarse and fine aggregates and limestone filler. 70/100 pen and 100/150 pen bitumen may also be used when requested by the purchaser. The system is used in conjunction with a polymer-modified bond or tack coat to enhance adhesion to the substrate. Where MasterPhalt 10 mm is laid less than 30 mm thick or where any material is laid on concrete, a polymer-modified tack coat is used, otherwise a K1-40 tack coat is used.

3.2 The choice of aggregates, types and size used will depend on site specific details, including location, and contractual requirements for Polished Stone Value (PSV), texture depth and/or other properties.

3.3 The petrological types of aggregates approved for use in the Masterpave system include gritstone, basalt, granite and artificial (steel and blastfurnace slag).

3.4 The system can be coloured by the addition of pigments. However, the assessment of colour durability and the effect of pigmentation on the properties of the product have not been assessed.

3.5 Reference should be made to the appropriate Detail Sheet for information on particular Masterpave variants.

### 4 Manufacture, quality control, delivery and site handling

4.1 The product is manufactured, controlled and delivered in accordance with Tarmac Limited *Quality Plan and Best Practice Guide for*

Masterpave (Issue 1, dated July 2001) which includes requirements for:

- binder
- aggregate selection and approval
- plant suitability and approval
- process control of mixing
- inspection and testing of finished product
- suitability of delivery vehicles and release agents.

4.2 Bond coats and tack coats may be delivered to site either in bulk by tanker or in 200 kg drums.

4.3 The products are not classified under the Chemicals (Hazard Information and Packaging for Supply) Regulations 2002 (CHIP3). Standard material safety data sheets for hot asphalts apply.

## Installation

### 5 General

Masterpave Thin Surfacing System for Highways is a machine-laid thin surfacing system installed by Tarmac Limited in accordance with procedures detailed in the *Quality Plan and Best Practice Guide for Masterpave* which includes requirements for:

- site inspection and assessment
- surface preparation and cleanliness
- acceptable weather conditions and road surface temperatures
- minimum paver and rolling temperatures
- application of bond coat
- paving equipment type and operation
- joint making
- compaction procedure
- precautions during installation
- record keeping.

### 6 Maintenance and repair

#### Motorways, trunk roads and other major repairs

6.1 The damaged area is removed by planing to the full width of the existing mat to provide a length of at least 15 m for resurfacing. The planed area is resurfaced using material to the same specification, unless otherwise agreed with the purchaser, using the techniques described under the *Installation* part of this Certificate using conventional paving equipment. Handlaying is not permitted.

#### Minor repairs

6.2 Minor repairs can be carried out by cutting out the damaged section and replacing it with a material of suitable specification agreed between Tarmac Limited and the purchaser. A K1-40 bond coat shall be used on the receiving course.

6.3 The minimum width of reinstatement shall be 1.5 m and care should be taken to ensure that the existing wearing course is removed to its full depth.

6.4 Joints must be saw-cut to a vertical face and painted with hot bitumen.

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## Additional information

The quality management systems of Tarmac Limited have been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2000 by the British Standards Institution Quality Assurance for 'The production and supply of asphalt mixes (macadams, hot rolled asphalt, stone mastic asphalt, coated stone, bituminous materials) to sector scheme 14 as published by the Sector Scheme Advisory Committee for the Quality Assurance of the Production of Asphalt Mixes'. The certificate number that applies is FM 503516.

## Bibliography

BS 434-1 : 1984 *Bitumen road emulsions (anionic and cationic) — Specification for bitumen road emulsions*

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

BS EN ISO 9001 : 2000 *Quality management systems — Requirements*

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

### 7 Conditions

7.1 This Certificate:

- (a) relates only to the product that is named, 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.

7.2 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.

7.3 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.

7.4 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.

7.5 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.



In the opinion of the British Board of Agrément, the Masterpave Thin Surfacing System for Highways is fit for its intended use provided it is installed, used and maintained as set out in this Certificate. Certificate No 01/H052 is accordingly awarded to Tarmac Limited.

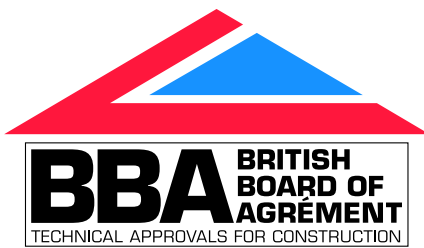
On behalf of the British Board of Agrément

Date of Second issue: 27th March 2006

A handwritten signature in black ink, appearing to read 'G. A. Cooper'.

Chief Executive

*\*Original Certificate issued on 5th September 2001. This amended version issued to include a revised HAPAS statement, updated Regulations, Standard and Bibliography and new Conditions of Certification.*



Tarmac Limited

**MASTERpave 14 mm THIN SURFACING  
SYSTEM FOR HIGHWAYS**
**H A P A S**
**Roads and Bridges  
Certificate No 01/H052  
DETAIL SHEET 2**

## Product



• THIS DETAIL SHEET RELATES TO THE MASTERpave 14 mm THIN SURFACING SYSTEM FOR HIGHWAYS.

• The system is for use as a thin road surfacing laid at nominal thicknesses between 30 mm and 40 mm<sup>(1)</sup>, covering Classification C defined in Table 1 of the Guidelines Document for the Assessment and Certification of Thin Surfacing Systems for Highways.

(1) The system can be laid up to 50 mm thick (see section 3.3).

*This Detail Sheet must be read in conjunction with the Front Sheets which give additional information on the HAPAS Requirements, Regulations and Conditions of Certification.*

## Design Data

### 1 General

1.1 Masterpave 14 mm Thin Surfacing System for Highways is satisfactory for use as a thin surfacing system on highways.

1.2 The product can be designed and laid to give an initial texture depth which exceeds the minimum requirement of 1.5 mm for high speed trunk roads.

1.3 The product is suitable for use on existing bituminous or concrete surfaces at a minimum temperature of  $-1^{\circ}\text{C}$ , measured on a rising thermometer, provided the substrate is free from standing water or ice and that the minimum specified rolling temperature can be maintained.

1.4 A K1-40 bond coat is used in all cases except where Masterpave 14 mm is laid to a concrete base course, in which case Mastertack is used.

1.5 The product, when manufactured and laid in accordance with the provisions of this Detail Sheet, can be designed to achieve the levels of performance given in Table 1.

**Table 1** Levels of performance achieved on trial installations

Test parameter	Performance Level achieved <sup>(1)</sup>	Requirement
Texture depth	3	
untrafficked (mm)		≥ 1.5
after two year trafficking (mm)		≥ 1.0
loss between first and second year (%)		≤ 40
Wheel tracking	3	
rate (mean/max individual) (mm h <sup>-1</sup> )		≤ 5.0/≤ 7.5
rut depth (mean/max individual) (mm)		≤ 7.0/≤ 10.5

(1) Performance Levels are defined in Appendix B of the Guidelines Document.

## 2 Durability

2.1 The product has been used in the United Kingdom since 1994 and available evidence suggests that it will provide a durable wearing surface suitable for use on all classes of road.

2.2 Results from a monitored contract on the M40 showed that Masterpave 14 mm, when laid at a nominal thickness of 35 mm on a road of Stress Level 1<sup>(1)</sup> and measured traffic level of 4600 cv/l/d, met the Level 3<sup>(2)</sup> performance requirement for retained texture.

2.3 The results of this trial, when assessed in accordance with Appendix C of the Guidelines Document, indicate that Masterpave 14 mm is suitable for use to achieve Performance Levels 1, 2 and 3<sup>(3)</sup> retained texture on sites with traffic levels  $C_{max}$ :

Site Stress Levels 1 and 2	>5000 cv/l/d <sup>(2)</sup>
Site Stress Levels 3 and 4	>2500 cv/l/d <sup>(2)</sup>

(1) Site Stress Levels are defined in Appendix C of the Guidelines Document.

(2) Traffic levels (cv/l/d) are defined as numbers of commercial vehicles/lane/day.

(3) Performance Levels are defined in Appendix B of the Guidelines Document.

## Technical Investigations

The following is a summary of the technical investigations carried out on the Masterpave 14 mm Thin Surfacing System for Highways.

### 3 Tests

#### Mandatory laboratory and road tests

3.1 A series of tests was carried out on a mixture based on gritstone coarse aggregate and 50 pen bitumen binder laid on the M2 motorway. The results of the tests are given in Tables 2 and 3.

3.2 Test data at the design binder content indicates that mixtures based on gritstone, basalt, granite, dolerite, hornfels and artificial (blast furnace slag) can be designed to give retained stiffness of greater than 80%.

**Table 2** Mandatory laboratory tests carried out on the coarse aggregate and cores taken from the M2 motorway installation

Test	Method	Results <sup>(1)</sup>	Performance level
Coarse aggregate properties:			
PSV	BS 812-114 : 1989	69	n/a
AAV	BS 812-113 : 1990(1995)	6.9	n/a
Wheel tracking at 60°C <sup>(2)</sup> :	Appendix A.1 draft Guidelines Document		
rate (mm h <sup>-1</sup> )		0.99	3
rut depth (mm)		2.38	
Torque bond strength at 20±2°C on 99.5 mm diameter cores (kPa)	Appendix A.3 draft Guidelines Document	>1050 (plate detached, no failure at bond interface)	n/a
Sensitivity to water: retained stiffness (ITSM <sub>3</sub> ) <sup>(3)</sup> (%)	Appendix A.2 draft Guidelines Document	116	n/a

(1) Results relate to a mixture based on Gelligaer gritstone.

(2) Mean core thickness = 39 mm.

(3) Retained indirect tensile stiffness modulus at 20±0.5°C after three water conditioning cycles carried out on cored samples.

n/a = Not applicable.

**Table 3** Mandatory checks and tests carried out on the M2 motorway installation

Test	Method	Result	Specification
Initial texture depth (sand patch) (mm)	BS 598-105 : 2000		
mean (all sections) <sup>(1)</sup>		1.88	≥ 1.50
minimum recorded (section)		1.67	≥ 1.20
maximum recorded (section)		2.01	n/a
Visual observations <sup>(2)</sup>		Good uniform surface with no significant faults or abnormalities noted	

(1) Junctions 4–5 eastbound (lanes 2 and 3) (chainage 3300–4345).

(2) Observations relate to a monitored installation trial on the M1 motorway, northbound (north of Junction 22).

n/a = Not applicable.

3.3 Wheel tracking test data on core samples show that Masterpave can maintain Level 3 performance for wheel tracking and be resistant to deformation at thicknesses at least up to 50 mm.

#### Additional tests

3.4 A series of optional tests was carried out on the Masterpave 14 mm. The results of these tests are given in Table 4.

**Table 4** Optional tests

Test	Method	Result
Noise RSI <sub>H</sub> [dB(A)] <sup>(1)</sup>	Statistical pass-by method Guidelines Document, Appendix A.8	-3.7 <sup>(2)</sup>
age of site when tested (months)		2
Stiffness (mPa)	Guidelines Document, Appendix A.2	3687 <sup>(3)</sup>

(1) The high speed Road Surface Influence (RSI<sub>H</sub>) is a measure of the difference in noise, that could be expected if compared against a theoretical hot-rolled asphalt surface with 2 mm texture depth. A negative result indicates a reduction in noise level. Noise levels will vary according to specific site conditions and system characteristics including texture, age of installation, voids content, etc.

(2) Mean result of two measurements -3.3 and -4.1 made on the northbound carriageway on the M40.

(3) Initial indirect tensile stiffness modulus measured during water sensitivity testing on laboratory prepared cores (mean of 8 sets of measurements ranging from 2659–4908 MPa).

## Noise

3.5 Noise measurements on the M40 motorway indicate that the product can significantly reduce noise levels<sup>(1)</sup> generated by vehicle tyres acting on the road surface. The installation was two months old when the noise measurements were made, and a change in noise levels could occur with time. However, it is expected that the installation will maintain a significant negative  $RSI_H$  during its useful service life.

(1) Noise levels will be affected by site specific conditions including location and the condition of the existing road and, therefore, the  $RSI_H$  values determined on the M40 motorway installation may not be reproduced on other installations.

## Surface regularity

3.6 Test data from installations on the M2 motorway indicate that Masterpave 14 mm can be laid to give a surface with few irregularities. Test results relating to changes in longitudinal irregularities and initial changes in maximum transverse irregularities are given in Table 5. However, the initial irregularity and initial rut depth values were not numerous or severe enough respectively to allow claims to be made on improvement capabilities under the requirements of the Guidelines Document.

*Table 5 Longitudinal and transverse surface regularity measured on the M2 motorway*

Test	Method	Result
Changes in longitudinal irregularities:	Guidelines Document, Appendix A.6	
initial irregularity value ( $\text{mm m}^{-1}$ )		0.26
final irregularity value ( $\text{mm m}^{-1}$ )		0
profile improvement value (%)		100
Initial changes in maximum transverse irregularities:	Guidelines Document, Appendix A.7	
initial rut depth <sup>(1)</sup> (mm)		1.8
residual rut depth (mm)		0
rut improvement value <sup>(1)</sup> (%)		100

(1) The initial irregularity and initial rut depth values were not sufficiently numerous and severe for the results to be used to claim regulating ability and rut improvement ability respectively, as required under the current Guidelines Document (working draft 4, dated 10 January 2000). The requirements for initial irregularity and initial rut depth where improvement claims are made are  $\geq 1.0 \text{ mm m}^{-1}$  and  $\geq 6 \text{ mm}$  respectively.

## 4 Other investigations

4.1 An installation trial was carried out to assess the practicability of the installation and on-site quality control procedures. A visual inspection of the site concluded that it was free from significant abnormalities.

4.2 A user/specifier survey relating to existing sites that were at least two years old was carried out to confirm the product's performance in use. The sites surveyed included the A148 (Holt bypass), A12/M11 link, M40 motorway and A1085 (Middlesbrough).

4.3 Information relating to the A635 (Doncaster) and other sites reported in TRL Report PR/CE/119/97 provided additional evidence of acceptable performance.

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

## Bibliography

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

BS 812 *Testing aggregates*  
BS 812-113 : 1990(1995) *Method for determination of aggregate abrasion (AAV)*  
BS 812-114 : 1989 *Method for determination of the polished-stone value*

*Guidelines Document for the Assessment and Certification of Thin Surfacing Systems for Highways* (working draft 4, dated 10 January 2000)



On behalf of the British Board of Agrément

Date of issue: 5th September 2001

*P. Q. NEWTON*  
Chief Executive

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Tarmac Limited

**MASTERpave 10 mm THIN SURFACING  
SYSTEM FOR HIGHWAYS**

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**H A P A S**

Roads and Bridges

Certificate No 01/H052

**DETAIL SHEET 3**

## Product



- THIS DETAIL SHEET RELATES TO THE MASTERpave 10 mm THIN SURFACING SYSTEM FOR HIGHWAYS.
- The system is for use as a thin road surfacing laid at nominal thicknesses between 25 mm and 40 mm covering Classification C defined in Table 1 of the Guidelines Document for the Assessment and Certification of Thin Surfacing Systems for Highways.

*This Detail Sheet must be read in conjunction with the Front Sheets which give additional information on the HAPAS Requirements, Regulations and Conditions of Certification.*

## Design Data

### 1 General

- 1.1 Masterpave 10 mm Thin Surfacing System for Highways is satisfactory for use as a thin surfacing system on highways.
- 1.2 The product can be designed and laid to give an initial texture depth which meets or exceeds the minimum requirements for Performance Level 2 untrafficked and trafficked texture depth.
- 1.3 The product is suitable for use on existing bituminous or concrete surfaces at a minimum temperature of  $-1^{\circ}\text{C}$ , measured on a rising thermometer, provided the substrate is free from standing water or ice and that the minimum specified rolling temperature can be maintained.
- 1.4 A K1-40 bond coat is used in all cases except where Masterpave 10 mm is laid less than 30 mm thick or onto a concrete base course in which case Mastertack is used.
- 1.5 The product, when manufactured and laid in accordance with the provisions of this Detail Sheet, can be designed to achieve levels of performance in Table 1.

**Table 1** Levels of performance achieved on installations and/or laboratory-prepared core samples

Test parameter	Performance Level achieved <sup>(1)</sup>	Requirement
Texture depth	2	
untrafficked (mm)		≥1.2
after 2 years trafficking (mm)		≥0.8
loss between first and second year (%)		≤40
Wheel tracking at 60°C	3	

(1) Performance levels are defined in Appendix B of the Guidelines Document.

## 2 Durability

2.1 The product has been used in the United Kingdom since 1994 and the available evidence suggests that it will provide a durable wearing surface suitable for use on roads with traffic levels restricted in accordance with section 2.3.

2.2 Results from the A41 (Moxley Lane, West Midlands) installation showed that Masterpave 10 mm when laid at a nominal thickness of 30 mm on a road of Stress Level 1 and measured traffic level of 1200 cv/l/d met Performance Level 2 performance requirements for retained texture.

2.3 The results of this trial, when measured in accordance with Appendix C of the Guidelines Document indicate that Masterpave 10 mm is suitable for use to achieve Performance Levels 1 and 2<sup>(1)</sup> retained texture on sites with traffic levels<sup>(2)</sup> of  $C_{max}$  (cv/l/d).

(1) Traffic levels (cv/l/d) are defined as numbers of commercial vehicles per lane per day.

(2) Performance Levels are defined in Appendix B of the Guidelines Document.

**Table 2** Maximum traffic levels (cv/l/d) maintaining Performance Levels 1 and 2

	Site Stress Level <sup>(1)</sup>			
	1	2	3	4
Texture level 1	>5000	4000	>2500	2000
Texture level 2	>5000	3500	>2500	1500

(1) Site Stress Levels are defined in Appendix C of the Guidelines Document.

## Technical Investigations

The following is a summary of the technical investigations carried out on Masterpave 10 mm Thin Surfacing System<sup>(1)</sup>.

(1) Masterpave 10 mm and Masterpave 14 mm share common binder, aggregate sources and bond coats. Test data relating to Masterpave 14 mm, where applicable, has been used to complete technical investigations on Masterpave 10 mm.

## 3 Tests

### Mandatory laboratory and road tests

#### Wheel tracking at 60°C

3.1 Wheel tracking data on laboratory-prepared cores show that Masterpave 10 mm can be designed to meet the Level 3 performance requirements for rate of rutting and rut depth. The results are given in Table 3.

#### Sensitivity to water

3.2 Water sensitivity test data relating to a range of Masterpave 10 mm mixtures is given in Table 3. The data shows that, at the design binder content, mixtures based on gritstone, quartzite and basalt can be designed to give retained stiffness of greater than 80%. The values obtained are consistent with the data reported for Masterpave 14 mm.

**Table 3** Wheel tracking at 60°C and sensitivity to water

Test	Method	Result <sup>(1)</sup>	Performance Level
Wheel tracking at 60°C:	Appendix A.1 draft Guidelines Document		3
rate (mm h <sup>-1</sup> )		0.62 <sup>(1)</sup>	
rut depth (mm)		2.14 <sup>(1)</sup>	
Sensitivity to water: retained stiffness (ITSM <sub>c3</sub> ) (%)	Appendix A.2 draft Guidelines Document	109 <sup>(2)</sup>	n/a

(1) Mean of five sets of measurements made on laboratory-prepared samples incorporating 50 pen binder.

(2) Mean of five sets of measurements made on laboratory-prepared samples based on a range of coarse aggregates including hornfels, gritstone, quartzite and basalt. Values ranged from 84% to 121%.

n/a = Not applicable.

3.3 Wheel tracking test data at 60°C indicates that mixtures based on 100 pen binder can also be designed to meet the Level 3 performance requirement for wheel tracking rate and rut resistance.

#### Torque bond

3.4 Masterpave 10 mm shares common bond coat, binder and aggregates with Masterpave 14 mm and therefore a similar level of performance would be expected. In addition, the polymer-modified base coat Mastertack may be used when Masterpave 10 mm is laid less than 30 mm thick. Torque bond test data obtained on cores taken from an installation on Lines Road, Wokenham are given in Table 4.

**Table 4** Torque bond test results

Test	Method	Result <sup>(1)</sup>	Performance level
Torque bond strength at 20±2°C on 152 mm diameter cores (kPa)	Appendix A.3 draft Guidelines Document	>435 (no failure at max test load of 400 Nm)	n/a

(1) Result relates to Masterpave 10 mm, 50 pen bitumen binder and Mastertack bond coat.

n/a = Not applicable.

## Texture depth

3.5 Sand patch texture depth measurements made on an installation on the A41 (Moxley Lane) showed that Masterpave 10 mm can be designed and laid to achieve initial texture depth of greater than or equal to  $\geq 1.2$  mm. The results are given in Table 5.

*Table 5 Sand patch texture depth measurements made on the A41 (Moxley Lane)*

Test	Method	Result	Specification
Initial texture depth (sand patch) (mm)	BS 598-105 : 2000		
mean (all sections) <sup>(1)</sup>		1.27	n/a
minimum recorded (section)		1.20	n/a
maximum recorded (section)		1.34	n/a

(1) Mean of two sections measured on lane 2, southbound.  
n/a = Not available.

## Additional tests

3.6 Indirect tensile stiffness modulus data on Masterpave 10 mm is given in Table 6.

*Table 6 Stiffness*

Test	Method	Result
Stiffness <sup>(1)</sup> (MPa)	Guidelines Document Appendix A.2	3683 <sup>(2)</sup>

(1) Unconditioned indirect tensile stiffness modulus on laboratory-prepared cores.

(2) Mean of five sets of measurements made on laboratory-prepared samples. Values ranged from 2346 to 4518 MPa — mixtures based on 50 pen binder.

## 4 Other investigations

4.1 Information relating to an installation trial and a survey of users and/or specifiers of Masterpave provided additional evidence of acceptable performance. The sites surveyed included the A148 (Holt bypass) and the A25 (Seal, Kent).

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

## Bibliography

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

*Guidelines Document for the Assessment and Certification of Thin Surfacing Systems for Highways* (working draft 4, dated 10 January 2000)



On behalf of the British Board of Agrément

Date of issue: 5th September 2001

*P. Q. NEWTON*  
Chief Executive

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Tarmac Limited

**MASTERpave 6 mm THIN SURFACING SYSTEM FOR HIGHWAYS****Product**

• THIS DETAIL SHEET RELATES TO THE MASTERpave 6 mm THIN SURFACING SYSTEM FOR HIGHWAYS.

• The system is for use as a thin road surfacing laid at nominal thicknesses between 20 mm and 40 mm covering classifications B and C defined in Table 1 of the Guidelines Document for the Assessment and Certification of Thin Surfacing Systems for Highways.

*This Detail Sheet must be read in conjunction with the Front Sheets which give additional information on the HAPAS Requirement, Regulations and Conditions of Certification.*

**Design Data****1 General**

1.1 Masterpave 6 mm Thin Surfacing System for Highways is satisfactory for use as a thin surfacing system on highways.

1.2 The product can be designed and laid to give an initial texture depth which meets the minimum requirements for Performance Level 1 untrafficked and trafficked texture depth.

1.3 The product is suitable for use on low speed, lightly trafficked roads such as urban residential streets.

1.4 The product is suitable for use on existing bituminous surfaces at a minimum temperature of  $-1^{\circ}\text{C}$ , measured on a rising thermometer, provided the substrate is free from standing water or ice and that the minimum specified rolling temperature can be maintained.

1.5 A K1-40 bond coat is used in all cases.

1.6 The product, when manufactured and laid in accordance with the provisions of this Detail Sheet, can be designed to achieve levels of performance in Table 1.

**Table 1** Levels of performance achieved on installations and/or laboratory-prepared core samples

Test parameter	Performance Level achieved <sup>(1)</sup>	Requirements
Texture depth	1	
untrafficked (mm)		≥1.0
after 2 years trafficking (mm)		≥0.7
Wheel tracking at 60°C	3	

(1) Performance levels are defined in Appendix B of the Guidelines Document.

## 2 Durability

2.1 The product has been used in the United Kingdom since 1998 and the available evidence suggests that it will provide a durable wearing surface suitable for use on roads with traffic levels restricted in accordance with section 2.3.

2.2 Results from an installation at Westbury-on-Trym showed that Masterpave 6 mm when laid at a nominal thickness of 25 mm on a road of Stress Level 2<sup>(1)</sup> and measured traffic level of 250 cv/l/d met level 1 performance requirements<sup>(2)</sup> for retained texture.

2.3 The results of this trial, when measured in accordance with Appendix C of the Guidelines Document indicate that Masterpave 6 mm is suitable for use to achieve Performance Level 1<sup>(2)</sup> retained texture on sites with traffic levels of C<sub>max</sub> given in Table 2.

(1) Site Stress Levels are defined in Appendix C of the Guidelines Document.

(2) Performance Levels are defined in Appendix B of the Guidelines Document.

**Table 2** Maximum traffic levels (cv/l/d) maintaining Performance Level 1

Site Stress Level	C <sub>max</sub> (cv/l/d) <sup>(1)</sup>
1	2000
2	1000
3	700
4	500

(1) Traffic levels (cv/l/d) are defined as numbers of commercial vehicles per lane per day.

## Technical Investigations

The following is a summary of the technical investigations carried out on Masterpave 6 mm Thin Surfacing System<sup>(1)</sup>.

(1) Masterpave 6 mm and Masterpave 14 mm share common binder, aggregate sources and bond coats. Test data relating to Masterpave 14 mm, where applicable, has been used to complete technical investigations on Masterpave 6 mm.

## 3 Tests

### Mandatory laboratory and road tests

#### Wheel tracking at 60°C

3.1 Wheel tracking data on laboratory-prepared cores show that Masterpave 6 mm can be designed to meet the Level 3 performance requirements for rate of rutting and rut depth. The results are given in Table 2.

#### Sensitivity to water

3.2 Water sensitivity test data relating to a Masterpave 6 mm mixture based on granite is given in Table 3.

**Table 3** Wheel tracking at 60°C and sensitivity to water

Test	Method	Results	Performance level
Wheel tracking at 60°C:	Appendix A.1 draft Guidelines Document		
rate (mm h <sup>-1</sup> )		1.4 <sup>(1)</sup>	3
rut depth (mm)		3.1 <sup>(1)</sup>	
Sensitivity to water: retained stiffness (ITSM <sub>23</sub> ) (%)	Appendix A.2 draft Guidelines Document	130	n/a

(1) Mean of two measurements made on laboratory-prepared cores incorporating 50 pen binder

n/a = Not applicable.

#### Torque bond

3.3 Masterpave 6 mm shares common bond coat, binder and aggregates with Masterpave 14 mm and, therefore, a similar level of performance would be expected. Torque bond test data obtained on cores taken from an installation at Ettiingshall, Wolverhampton are given in Table 4.

**Table 4** Torque bond test results

Test	Method	Results	Performance level
Torque bond strength at 20±2°C on 1.54 mm diameter cores (kPa)	Appendix A.3 draft Guidelines Document	>418 (no failure at max test load of 400 Nm)	n/a

(1) Result relates to Masterpave 6 mm 50 pen bitumen binder and K1-40 bond coat.

n/a = Not applicable.

#### Texture depth

3.4 Sand patch texture depth measurements made on an installation on the High Road, Westbury-on-Trym showed that Masterpave 6 mm can be designed and laid to achieve initial texture depths of ≥1.0 mm. The results are given in Table 5.

**Table 5** Sand patch texture depth measurements made on the High Street, Westbury-on-Trym

Test	Method	Result	Specification
Initial texture depth (sand patch) (mm)	BS 598-105 : 2000		
mean (all sections)		1.0	n/a
minimum recorded (section)		n/a	n/a
maximum recorded (section)		n/a	n/a

n/a = Not available.

## Additional tests

3.5 Indirect tensile stiffness modulus data on Masterpave 6 mm is given in Table 6.

Table 6 Stiffness

Test	Method	Result
Stiffness <sup>(1)</sup> (MPa)	Guidelines Document Appendix A.2	3253

(1) Unconditioned indirect tensile stiffness modulus on laboratory-prepared cores.

## 4 Other investigations

4.1 Information relating to an installation trial and a survey of users and/or specifiers of Masterpave provided additional evidence of acceptable performance.

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

## Bibliography

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

*Guidelines Document for the Assessment and Certification of Thin Surfacing Systems for Highways* (working draft 4, dated 10 January 2000)



On behalf of the British Board of Agrément

Date of issue: 5th September 2001

Chief Executive

# Electronic Copy





Tarmac Limited

**MASTERpave 0/10 D THIN SURFACING  
SYSTEM FOR HIGHWAYS**

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**HAPAS**

Roads and Bridges

Certificate No 01/H052

**DETAIL SHEET 5**

## Product



• THIS DETAIL SHEET RELATES TO THE MASTERpave 0/10 D THIN SURFACING SYSTEM FOR HIGHWAYS.

• The system is for use as a thin road surfacing laid at nominal thicknesses between 25 mm and 45 mm covering Classification C defined in Table 1 of the Guidelines Document for the Assessment and Certification of Thin Surfacing Systems for Highways.

*This Detail Sheet must be read in conjunction with the Front Sheets which give additional information on the HAPAS Requirements, Regulations and Conditions of Certification.*

## Design Data

### 1 General

1.1 Masterpave 0/10 D Thin Surfacing System for Highways is satisfactory for use as a thin surfacing system on highways.

1.2 The system is suitable for use on existing bituminous or concrete surfaces at a minimum temperature of  $-1^{\circ}\text{C}$ , measured on a rising thermometer, provided the substrate is free from standing water or ice and that the minimum specified rolling temperature can be maintained.

1.3 A K1-40 bond coat is used in all cases except where the system is laid less than 30 mm thick or onto a concrete base course in which case Mastertack is used.

1.4 The system, when manufactured and laid in accordance with the provisions of this Detail Sheet, can be designed to achieve levels of performance in Table 1.

**Table 1** Performance levels achieved on both installations and/or laboratory-prepared core samples

Test parameter	Performance Level achieved <sup>(1)</sup>	Requirement
Texture depth initial (mm)	1	≥1.0
after 2 years trafficking (mm)		≥0.7
Wheel tracking rate (mean/max individual) (mm h <sup>-1</sup> )	3	≤5.0/≤7.5
rut depth (mean/max individual) (mm)		≤7.0/≤10.5

(1) Performance levels are defined in Appendix B of the Guidelines Document.

## 2 Durability

2.1 The system has been used in the United Kingdom since 2001 and the available evidence suggests that it will provide a durable wearing surface suitable for use on classes of road where a Performance Level 1 for texture depths is required.

2.2 Results from the Ogle Hay Road installation showed that the system, when laid at a nominal thickness of 35 mm on a road of Stress Level 1 will meet the Performance Level 1 performance requirements for initial and retained texture.

## Technical Investigations

The following is a summary of the technical investigations carried out on Masterpave O/10 D Thin Surfacing System.

### 3 Tests

#### Mandatory laboratory and road tests

##### Wheel tracking at 60°C

3.1 Wheel tracking data on laboratory-prepared cores showed that the system can be designed to meet the Level 3 performance requirements for rate of rutting and rut depth. Typical results are given in Table 2.

**Table 2** Wheel tracking at 60°C and sensitivity to water

Test	Method	Result <sup>(1)</sup>
Wheel tracking at 60°C rate (mm h <sup>-1</sup> )	Appendix A.1 Guidelines Document	0.9 <sup>(1)</sup>
rut depth (mm)		3.9 <sup>(1)</sup>
Sensitivity to water retained stiffness (ITSM <sub>c3</sub> ) (%)	Appendix A.2 Guidelines Document	113

(1) Mean of two sets of measurements made on laboratory-prepared samples incorporating 50 pen binder.

##### Sensitivity to water

3.2 Water sensitivity test data from laboratory-prepared cores, at the design binder content, using gritstone and basalt, show retained stiffness of

greater than 80%. The values obtained are consistent with the data reported for Masterpave 10 mm and 14 mm in Detail Sheets 2 and 3 of this Certificate.

### Torque bond

3.3 The system shares common bond coat, binder and aggregates with Masterpave 10 mm and 14 mm and, therefore, a similar level of performance would be expected. In addition, the polymer-modified bond coat Mastertack may be used when the system is laid less than 30 mm thick. Torque bond test data obtained on cores taken from an installation on Lines Road, Wokenham are given in Table 3.

**Table 3** Torque bond test results

Test	Method	Result <sup>(1)</sup>
Torque bond strength at 20±2°C on 152 mm diameter cores (kPa)	Appendix A.3 Guidelines Document	>435 (no failure at max test load of 400 Nm)

(1) Result relates to Masterpave 10 mm, 50 pen bitumen binder and Mastertack bond coat.

### Texture depth

3.4 Sand patch texture depth measurements carried out on an installation on the Ogle Hay Road showed that the system can be designed and laid to achieve the texture depth results given in Table 4.

**Table 4** Sand patch texture depth measurements made on the Ogle Hay Road

Test	Method	Result
Initial texture depth (sand patch) (mm)	BS 598-105	
mean (all sections)		1.0
minimum recorded (section)		0.81
maximum recorded (section)		1.19

### 4 Investigations

4.1 A survey of users and/or specifiers of the system provided additional evidence of acceptable performance.

4.2 The manufacturing process was investigated, including the methods adopted for quality control, and details were confirmed of the quality and composition of materials used. The investigation confirmed that the plant operated in accordance with the requirements of the Quality Plan and Quality System, as agreed with the BBA for the system.

4.3 Masterpave O/10 D, 10 mm and 14 mm share common binder, aggregate sources and bond coats. Test data relating to Masterpave 10 mm and 14 mm, where applicable, has been used as supporting evidence to complete technical investigations on the system.

## Bibliography

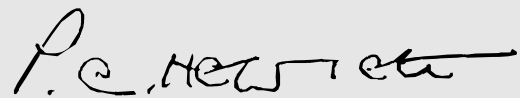
BS 598-105 : 2000 *Sampling and examination of bituminous mixtures for roads and other paved areas — Methods of test for the determination of texture depth*

*Guidelines Document for the Assessment and Certification of Thin Surfacing Systems for Highways* (Working Draft, Draft 4, 10th January 2000)



On behalf of the British Board of Agrément

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Chief Executive

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