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Surface treatments – Guidance on the use of BS EN 12271 and BS EN 12273

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Foreword

Publishing information

This Published Document is published by BSI and came into effect on 31 May 2009. It was prepared by Technical Committee B/510, *Road materials*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

This Published Document supersedes PD 6689:2006, which is withdrawn.

Relationship with other publications

This Published Document provides guidance on the use of BS EN 12271 and BS EN 12273 which were implemented in the UK in January 2008.

Presentational conventions

The provisions of this Published Document are presented in roman (i.e. upright) type. Its recommendations are expressed in sentences in which the principal auxiliary verb is "should".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a Published Document cannot confer immunity from legal obligations.

0 Introduction

0.1 BS EN 12271 – Surface dressing

BS EN 12271 specifies a range of categories for properties of surface dressing to enable users to select appropriate limiting values for a wide range of uses within Europe.

The specifier needs to define BS EN 12271 categories for properties relevant to the particular end-use of the surface dressing. Some example specifications for different end-uses are given in Annex A.

BS EN 12271 covers surface dressing specified by performance of the finished product. It does not cover surface dressing works carried out to the purchaser's design, commonly called a recipe specification. This type of specification can continue to be used, but purchasers are responsible for the performance of the surface dressing provided that the works have been executed correctly.

Performance categories set out in BS EN 12271 should not be included as part of a recipe specification as this might result in the recipe being correctly placed, but the performance categories not being met.

NOTE The body responsible for the design is responsible for the performance of the surface dressing (provided that the works have been correctly executed).

0.2 BS EN 12273 – Slurry surfacing and microsurfacing

BS EN 12273 specifies a range of categories for properties of slurry surfacing and microsurfacing to enable users to select appropriate limiting values for a wide range of uses within Europe.

Specifiers need to define BS EN 12273 categories for properties relevant to the particular end-use of the slurry surfacing and microsurfacing. Some example specifications for different end-uses are given in Annex B.

1 Scope

This Published Document gives guidance on the use of BS EN 12271 and BS EN 12273 in the United Kingdom. BS EN 12271 specifies the properties of surface dressing whilst BS EN 12273 specifies the properties of slurry surfacing and microsurfacing.

This Published Document gives guidance on the performance requirements and control procedures for the installation of both surface treatments as products for the maintenance of roads and other trafficked areas.

The Published Document does not apply to the following:

- surface dressings designed by the purchaser; i.e. the recipe approach for which the contractor is instructed as to the rates of spread, chipping size, etc., and therefore is not responsible for performance requirements;
- surface treatments in tunnels where fire regulations apply;
- small areas under 500 m^2 which are not contiguous, such as patch repair;
- airfield pavements covered by international regulations (e.g. International Civil Aviation Organization regulations).

NOTE In BS EN 12271 "other trafficked areas" include footways and cycleways.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 434-2, *Bitumen road emulsions – Part 2: Code of practice for the use of cationic bitumen emulsions on roads and other paved areas*

BS EN 12271:2006, *Surface dressing – Requirements*

BS EN 12272-1, *Surface dressing – Test methods – Part 1: Rate of spread and accuracy of spread of binder and chippings*

BS EN 12272-2:2003, *Surface dressing – Test methods – Part 2: Visual assessment of defects*

BS EN 12273:2008, *Slurry surfacing – Requirements*

BS EN 12274-2, *Slurry surfacing – Test methods – Part 2: Determination of residual binder content*

BS EN 12274-8, *Slurry surfacing – Test methods – Part 8: Visual assessment of defects*

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

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

BS EN 13588 (BS 2000-522), *Bitumen and bituminous binders – Determination of cohesion of bituminous binders with pendulum test*

BS EN 13808:2005, *Bitumen and bituminous binders – Framework for specifying cationic bituminous emulsions*

prEN 15322, *Bitumen and bituminous binders – Framework for specifying cut-back and fluxed bituminous binders*

BS EN ISO 11819-1, *Acoustics – Measurement of the influence of road surfaces on traffic noise – Part 1: Statistical pass-by method*

PD 6682-2:2009, *Aggregates – Part 2: Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas – Guidance on the use of BS EN 13043*

3 Terms and definitions

For the purposes of this Published Document, the terms and definitions given in BS EN 12271 and BS EN 12273 and the following apply.

3.1 producer
organization or entity responsible for the design and construction of the surface treatment

NOTE The producer is often called the "contractor" in the UK.

3.2 product
surface dressing or slurry surfacing and microsurfacing

NOTE Microsurfacing is sometimes known as microasphalt. "Slurry seal" is a term no longer used.

3.3 purchaser
organization or person buying the product

NOTE The purchaser is sometimes known as the "overseeing organization" in the UK and this might be a local highway authority.

3.4 road type (UK)/road grade
method used to link the frequency of testing to the different categories of road

NOTE 1 In this Published Document road grades have been defined by reference to the Highways Authorities' and Utilities Committees (HAUC) New Roads and Street Works Act 1991 "Road Type" [1]. See also Road Note 39 [2] for a link to surface dressing traffic categories. For clarity the term "road type" is used throughout this document instead of "road grade".

NOTE 2 In Northern Ireland, for HAUC see The Street Works (Northern Ireland) Order 1995 [3].

NOTE 3 Although the road type has been defined in terms of the HAUC New Roads and Street Works Act 1991 [1] it is always preferable to use actual traffic counts where these are available.

3.5 specifier
organization or person specifying the product who might or might not be directly employed by the purchaser or the contractor

3.6 supplier
organization or entity providing the constituent materials to the producer

NOTE The supplier can also provide the binder and the aggregate and any other minor constituent that might be incorporated into the product.

4 Overview

4.1 General

BS EN 12271 covers all varieties of surface dressing including single, racked-in, double and sandwich types. It also covers more complex surface dressings, such as two layers of binder plus three layers of chippings and inverted surface dressing, in which a single surface dressing is followed immediately by, for example, a racked-in surface dressing.

BS EN 12273 covers all varieties of slurry surfacing including microsurfacing, as defined in the National Foreword.

Both BS EN 12271 and BS EN 12273 are based on product performance categories, although the purchaser might have some limited control on components, such as minimum requirements for peak binder cohesion and maximum chipping size. It is recommended that the purchaser relies on the defined categories and the type approval installation trial (TAIT) which demonstrates the producer's ability to design and install a product for a given road type. Essential guidance on the use of these performance specifications and the influence of their constituents is published and regularly updated in the following:

- TRL Road Note 39 (RN 39) [2];
- Manual of Contract Documents for Highway Works Volume 1 Series 900 Clause 922 and Clause 918, Volume 2 Clause NG 922 and Clause NG 918 [4];
- Road Surface Treatments Association Codes of Practice [5].

4.2 BS EN 12271 – Surface dressing

The main performance categories used in BS EN 12271 are:

a) visual assessment at the end of the guarantee period with different performance categories;

b) macrotexture;

c) tolerance on rates of spread of binders and chippings; and

d) accuracy of rates of spread of binders and chippings (a measure of evenness).

Other performance factors that can be specified are:

- polished stone value (PSV) of chippings; and
- aggregate abrasion value (AAV) of chippings.

4.3 BS EN 12273 – Slurry surfacing and microsurfacing

The main performance categories used in BS EN 12273 are:

a) visual assessment at the end of the guarantee period with different performance categories; and

b) macrotexture.

5 Requirements of BS EN 12271 and BS EN 12273

5.1 Constituent materials

5.1.1 Binders

Only constituent materials with established suitability can be used in surface dressing. Suitability may be established by means of conformity to a European Standard or a European Technical Approval, or based on a history of producing surface treatments conforming to the harmonized standard.

Unmodified binders should conform to a current European Standard for bituminous binders; the most commonly used is the European Standard for bituminous emulsions, BS EN 13808. The standard covering cut-back and fluxed binders is currently still under development within CEN, prEN 15322[1]. However, in the UK cut-back, binders have been replaced by bitumen emulsion and are no longer generally available.

Polymer modified binders are proprietary materials, for which the *Specification for Highway Works (SHW)*, Clauses 919 and 922 [4], require that the binders have certificates from the British Board of Agrément Highway Authorities' Product Approval Scheme (BBA/HAPAS)[2] (see also BS 434-2).

BS EN 13808 and prEN 15322 include a table of classes for Vialit pendulum cohesion of modified binders (for the test method, see BS EN 13588). Although two other bituminous binder standards (BS EN 12591 and BS EN 14023) do not include it, BS EN 12271 covers the mandated characteristic cohesion by cross-reference to the classes in BS EN 13808.

It is recommended that purchasers limit any requirements for binders to a minimum cohesion class. However, producers may require additional information to ensure that their designs are valid on a continuing basis. The requirements in the SHW Series NG 700 (see NG Sample Appendix 7/3 and 7/7 binder data sheets) [4] include the recording of rheological data and ageing information. Their data may be passed to the purchaser for information to further demonstrate adequacy of binder performance over the short, medium and particularly the long term.

Guidance on the selection of appropriate binders is given in:

a) the TRL Design Guide RN 39 [2] for surface dressing;

b) the RSTA Design Guide for slurry surfacing and microsurfacing [5]; and

c) the Design Manual for Roads and Bridges Volume 7 HD 37 (DMRB, **7.5.2**) [6] for surface dressing and slurry surfacing and microsurfacing.

The classes of cohesion given in the European binder standards have traditional names in the UK, and these are given in Table 1.

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1) In preparation. To be published by CEN as EN 15322 and in the UK as BS EN 15322.

2) For further information on BBA/HAPAS contact BBA at www.bbacerts.co.uk.

Table 1 **Traditional binder class names**

Traditional UK name	Minimum peak cohesion J/cm^2	Binder class
Unmodified	0.7	3 [A)]
Intermediate grade	1.0	4
Premium grade	1.2	5
Super-premium grade	1.4	6

[A)] For conventional binders where 0.7 is not consistently achieved, 0.5 over a minimum temperature range of 15 °C has been found to provide satisfactory performance.

It is possible to specify other characteristics of binders chosen from the relevant European standards. In the case of slurry surfacing and microsurfacing, the characteristics are declared by the producer.

5.1.2 Aggregates

5.1.2.1 General

Advice on the polished stone value (PSV) and aggregate abrasion value (AAV) to be used on a site-by-site basis can be found in HD 36 (DMRB, **7.5.1**) [6]. The PSV is required to ensure the durability of skidding resistance.

It is possible to specify other characteristics of aggregates chosen from the relevant European standards. In the case of slurry surfacing and microsurfacing, the characteristics are declared by the producer.

5.1.2.2 Aggregates for surface dressing

Aggregates used in surface dressing should conform to BS EN 13043. Recommendations for the grading of surface dressing chippings are given in PD 6682-2:2009, Table 4. In order to ensure the absence of any potentially damaging oversize, the guidance in PD 6682-2:2009, Table 4, footnote [A)], should be followed.

BS EN 13043 also recommends that, for surface dressing, the fines content should be f_1 (i.e. not more than 1% passing through the 0.063 mm sieve). Some producers might consider this level of fines (filler) to be too high for chippings from some sources and for some uses. Where this is the case a producer may require a fines category of $f_{0.5}$. It is recommended that producers should demonstrate that chippings have adequate durability for the intended use, following the guidance in PD 6682-2:2009.

5.1.2.3 Aggregates for slurry surfacing and microsurfacing

Aggregates are selected based on the design requirements for the product.

5.2 Recommended performance criteria

5.2.1 General

The performance categories recommended in this Published Document have been chosen from those given in BS EN 12271:2006, Table 2, and

BS EN 12273:2008, Table 1. These recommendations are related to the HAUC road types which are specified in the HAUC's specification for highway reinstatements and in RN 39 [2], and shown in Table 2 together with the design classifications from RN 39. The HAUC road types have been used because highway authorities are required to have a record of these values for all of their roads. For design purposes traffic counts conforming to HD 24 (DMRB, **7.2.1**) [6] should be used as the HAUC categories are broad and tend to indicate a larger chipping size in the case of surface dressing than would be optimum for the site. Local adjustments to traffic levels might be needed to take into account the use of heavier private vehicles than has historically been the case.

NOTE Examples of specifications set out using this Published Document are shown in Annex A.

Table 2 **Traffic categories**

Commercial vehicles per lane per day	**Footway**	**0 to 20**	**21 to 100**	**101 to 250**	**251 to 500**	**501 to 250**	**1 251 to 2 000**	**2 001 to 2 500**	**2 501 to 3 250**	**Over 3 250**
HAUC road type	FW	4	4 [A)]	3 [A)]	3	2	1	1	S	S
RN 39 Design Category	FW	H	G	F	E	D	C	B	B	A

[A)] Strictly, the division between HAUC type 4 and HAUC type 3 is at 125 cv/l/d assuming the normal calculation of 20 years life and 2% annual increase in traffic, but 100 cv/l/d may be used given the usual uncertainty in the knowledge of traffic flows.

5.3 Surface dressing

5.3.1 General

The producer is responsible for the design of the surface dressing and should typically use the guidance in Road Note 39 [2] to select the type of surface dressing. However, where an experienced purchaser wishes to secure specific performance criteria, the type of surface dressing may be specified, because each type is considered in BS EN 12271 to be a different product. The less experienced purchaser should consider selecting a producer accredited to National Highways Sector Scheme 13A [7] and seek a performance guarantee (the performance guarantee required by Clause 922 of the *Specification for Highway Works* [4] is 2 years).

If the producer proposes, or purchaser specifies, a product that is not a preferred type for the particular site conditions as detailed in Road Note 39 [2], an explanation should be provided. A double surface dressing, for example, may be specified by the purchaser because it is a more durable product than a single surface dressing and has a greater initial cost; therefore, it might not necessarily be selected by a producer to satisfy the performance requirements in a contract with a short guarantee period.

The type of surface dressing influences tyre/noise generation. Where quieter surface dressings are required the purchaser can specify a maximum macrotexture, which encourages design proposals that

incorporate smaller chippings or multiple-layered surface dressings. For further information see the RSDA Code of Practice [8] based on research at the University of Ulster, and the Design Manual for Roads and Bridges Volume 7 HD 37 [6].

5.3.2 Tolerances on rate of application of binder and chippings

Tolerances on the rate of spread of binder and chippings should be in accordance with the recommendations in Table 3.

5.3.3 Evenness of rate of spread of binder and chippings

Evenness of rate of spread of binder and chippings, as coefficient of variation, should be in accordance with the recommendations in Table 3. Category 3 is not recommended for accuracy of rate of spread of chippings as there are currently no chipping spreaders capable of achieving this accuracy reliably. Testing should be conducted in accordance with BS EN 12272-1.

Table 3 **Surface dressing – tolerance and accuracy of rate of spread of binder and chippings**

Performance	Road type				
	FW	**4**	**3**	**2**	**1 and S**
Rate of spread of binder – tolerance	1 (± 15%)	1 (± 15%)	2 (± 10%)	2 (± 10%)	3 (± 5%)
Accuracy of spread of binder	NR	1 (± 15%)	1 (± 15%)	2 (± 10%)	2 [A)] (± 10%)
Rate of spread of chippings – tolerance	1 (± 15%)	1 (± 15%)	2 (± 10%)	2 (± 10%)	3 (± 5%)
Accuracy of spread of chippings	NR	1 (± 15%)	1 (± 15%)	2 (± 10%)	2 (± 10%)

[A)] Where the existing surface is very even on dual carriageways or motorways there is a case for recommending that Category 3 is used for accuracy of spread of binders. However, only a limited number of spray-bars are capable of this accuracy.

NOTE The first number is the category from BS EN 12271:2006, Table 2. The second number in parenthesis is the maximum permitted value.

5.3.4 Defects determined by visual inspection

Defects determined by visual inspection should be categorized in accordance with Table 4. Defects should be assessed at the end of the guarantee period. Testing should be conducted in accordance with the BS EN 12272-2.

Table 4 **Surface dressing – categories for defects determined by visual assessment**

Defects	Road type				
	FW	4	3	2	1 and S
*P*1 – fatting up, tracking and bleeding	0	1 (⩽ 2.5%)	2 (⩽ 1.0%)	2 (⩽ 1.0%)	3 (⩽ 0.5%)
*P*2 – scabbing and tearing	0	1 (⩽ 1.0%)	2 (⩽ 0.5%)	2 (⩽ 0.5%)	3 (⩽ 0.2%)
*P*3 – fretting	1 (⩽ 10%)	1 (⩽ 10%)	2 (⩽ 6%)	3 (⩽ 3%)	3 (⩽ 3%)
*P*4 – streaking	1 (⩽ 90 m)	1 (⩽ 90 m)	2 (⩽ 30 m)	3 (⩽ 10 m)	3 (⩽ 10 m)

NOTE The first number is the category from BS EN 12271:2006, Table 2. The second number in parenthesis is the maximum permitted value.

5.3.5 Macrotexture

Advice on the level of macrotexture required for different sites is specified in SHW Volume 2 Series NG 922 [4] (see also Table 5). Requirements for higher speed roads are generally higher than those for lower speed roads. Similarly, high traffic levels require a higher texture at 1 year than lightly trafficked roads as more embedment occurs under heavier traffic after the 1 year measurement point.

Table 5 **Surface dressing – recommended minimum macrotexture levels at the end of the guarantee period**

Traffic cv/lane/day	Single or racked-in surface dressings		Double and multiple surface dressings
	Speed limit 50 mph or higher	Speed limit less than 50 mph	All
> 3 250	1.5	1.5	1.2
2 000–3 250	1.5	1.5	1.0
250–2 000	1.5	1.5	1.0
50–250	1.2	1.2	0.8
< 50	1.0	0.8	0.8

NOTE These macrotexture requirements are not all directly transferable to categories specified in BS EN 12271 but are those that are included in long standing specifications in the UK.

Excessive levels of macrotexture should not be used as this increases costs and noise disproportionately. Although the standard method of measuring macrotexture is the patch test in BS EN 13036-1, alternative methods may be used (to speed up testing) provided that they have been calibrated against the patch test.

NOTE In SHW, Clause 922 [4], texture decay between 12 and 24 months is used to judge durability.

5.3.6 Design

Producers should use the guidance in Road Note 39 [2] to design the surface dressing. Where a producer uses another design methodology this should be clearly identified in the design proposal.

The design of surface dressing is site-specific and the purchaser should ensure that the producer has access to at least the following information:

- commercial vehicle per lane per day or, where not available, the HAUC road type for each site;
- the required minimum PSV for the chippings;
- any significant variations in traffic that might not be apparent from a single site visit, e.g. market day in rural areas or seasonal timber logging;
- "cold spots" revealed by winter maintenance or seasonal flooding.

The producer should visit each site. The procurement process should be planned to give sufficient time for the input to the design to be collected (road hardness is a fundamental input for design conforming to RN 39 [2] and can only be tested when the road temperature is above 15 °C).

The producer should supply the purchaser with a fully documented design proposal for each site and a method statement demonstrating conformity to the relevant TAIT (see Clause **7**). The method statement should also detail the producer's proposals for traffic management and dealing with emergencies or weather-related problems. If any site is deemed to be unsuitable for surface dressing, the purchaser should be informed at this stage.

5.3.7 Binder-aggregate adhesivity

It is recommended that the binder-aggregate adhesivity test and its associated variations (see BS EN 12272-3) are not used in the UK as a requirement, although individual producers may use it as part of their factory production control (FPC) to test the suitability of a new combination of binder and chippings.

5.4 Slurry surfacing and microsurfacing

5.4.1 Slurry surfacing and microsurfacing design

It is usual for the producer to determine the slurry surfacing and microsurfacing design, but where a client has particular concerns about skidding performance/noise generation due to site geometry, e.g. bends, junctions or gradients and location (e.g. urban or rural), the purchaser might impose limitations on the slurry surfacing and microsurfacing used in order to ensure anti-skidding performance or to limit noise generation. Specifying the macrotexture can assist in achieving this.

Advice on the level of macrotexture required for different sites is given in SHW volume 2 NG 918 [4]. However, the SHW recommends that the use of slurry surfacing and microsurfacing is limited to roads carrying fewer than 250 cv/lane/day with a speed limit of 60 mph or less and that on more heavily trafficked or higher speed roads the slurry surfacing and microsurfacing should be defined as a thin surfacing covered by SHW Clause NG 942 [4] which requires a BBA/HAPAS certificate. In recognition that the guidance in the SHW is only mandatory on trunk roads and that other clients might accept a relevant TAIT as adequate demonstration of the slurry surfacing and

microsurfacing performance under the heavier traffic levels, guidance on macrotexture based on Table NG 9/32 of SHW Clause NG 942 [4] is reproduced in Table 6 below. The selected level is dependent upon both traffic and speed restrictions.

Table 6 **Slurry surfacing and microsurfacing – recommended minimum macrotexture levels**

Road type	**Level**	**Minimum macrotexture depth** (mm)	
		Untrafficked	**After two years trafficking**
1	3	1.5	1.0
2	2	1.2	0.8
4/3 [A)]	1	1.0	0.7
FW [B)]	0	No requirement [C)]	No requirement [C)]

[A)] This can include cycleways.

[B)] This can include cycle paths.

[C)] The purchaser may wish to specify minimum macrotexture where there is a particular safety issue.

Excessive levels of macrotexture should not be used as this increases costs and noise disproportionately.

Although the standard method of measuring macrotexture is the patch test in BS EN 13036-1, alternative methods may be used (to speed up testing) provided that they have been calibrated against the patch test.

5.4.2 Design method

Producers should use an appropriate design methodology, which should be clearly identified in the design proposal. It is recommended that producers use the RSTA Design Guide as the basis for their design [5].

The design of slurry surfacing and microsurfacing is generally site-category specific and the purchaser should ensure that the producer has access to at least the following information:

- the HAUC road type category for each site;
- the required minimum PSV for the coarse aggregate;
- confirmation that there is no minimum PSV requirement where the site is a footpath or cycleway;
- any significant variations in traffic that might not be apparent from a single site visit, e.g. market day in rural areas or seasonal timber logging.

The producer should visit each site. The procurement process should be planned to give sufficient time for the input to the design to be collected and the design carried out well ahead of the required start date on site.

The producer should supply the purchaser with a fully documented design proposal for each site and a method statement demonstrating conformity to the relevant TAIT. The method statement should also detail the producer's proposals for traffic management and dealing with emergencies or weather-related problems. If any site is deemed to be unsuitable for slurry surfacing and microsurfacing, the purchaser should be informed at this stage.

5.4.3 Defects determined by visual inspection

Defects determined by visual inspection should be categorized in accordance with Table 7. Defects should be assessed at 11–13 months (approximately the usual guarantee period). Testing should be conducted in accordance with BS EN 12274-8.

Table 7 **Slurry surfacing and microsurfacing – categories for defects determined by visual assessment**

Defects	Road type				
	FW	**4** [A)]	**3**	**2**	**1 and 0**
*P*1 – bleeding, fatting up and tracking	0	1 (⩽ 8%)	2 (⩽ 2%)	3 (⩽ 0.5%)	4 (⩽ 0.2%)
*P*2 – delamination, loss of aggregate, wearing, lane joint gaps, rutting or slippage	0	1 (⩽ 8%)	2 (⩽ 2%)	3 (⩽ 0.5%)	4 (⩽ 0.2%)
*P*3 – corrugation, bumps and ridges	1 (⩽ 10%)	1 (⩽ 8%)	2 (⩽ 2%)	3 (⩽ 0.5%)	4 (⩽ 0.2%)
*P*4 – groups of small and repetitive defects in not more than (n) rectangles	2 [⩽ 5% in (6)]	2 [⩽ 5% in (6)]	2 [⩽ 5% in (6)]	3 [⩽ 1% in (2)]	4 [⩽ 0.2% in (1)]
L – longitudinal grooves (score marks)	0	1 (< 20 m)	2 (< 10 m)	3 (< 5 m)	4 (< 1 m)

[A)] This can include cycleways and cycle paths.

NOTE The first number is the category from BS EN 12273:2008, Table 1. The second number in parenthesis is the maximum permitted value.

5.5 Characterizing noise generation for surface treatments

Noise generation is characterized by macrotexture. If the site configuration permits then BS EN ISO 11819-1 may be used to provide noise generation data. Experience in the use of this standard for noise assessment suggests that the specified physical requirements for the site can make it difficult to implement on many sites where surface dressing and microsurfacing are used. Test methods are being developed to measure noise generation but these have not yet been completed in the standardization process. In the interim, guidance is provided in Road Note 39 [2]. It is essential that there is no conflict with any minimum level of macrotexture that is required for safety or durability.

NOTE Research into the design of surface dressings, which have relatively low noise generation characteristics, is reported in RN 39 [2] and the RSDA Code of Practice, Guidance on Quieter Surface Dressings [7].

6 Factory production control

6.1 General

BS EN 12271:2006, Annex A, and BS EN 12273:2008, Annex A, specify an FPC system which is one of the routes to CE marking.

The FPC systems have some specific requirements, mainly to ensure that the design procedure is documented, that the relevant controls

and tests are carried out at the required minimum frequency and that adequate records are kept.

All UK producers accredited to National Highway Sector Scheme 13 [8] have a quality assurance system which meets the requirements of the BS EN 12271 and BS EN 12273 FPC systems. The Sector Scheme is a requirement of the Specification for Highway Works [4] and has the advantage that it requires producers to demonstrate the competence of their workforce.

The list of producers accredited to the National Highway Sector Scheme is available on www.scheduleofsuppliers.com.

6.2 Process control

BS EN 12271 and BS EN 12273 set out the requirements for process control, the actions to be controlled and tables of minimum frequencies of control testing and assessment. These should be adhered to and set out in the producer's FPC system.

One group of control tests affects durability. The frequency of this testing can be linked to road type. For the purposes of FPC in the UK five road types are used (see Table 2). The recommended frequency of the relevant tests for inclusion in the FPC should be established by the recommended link by category to HAUC road type as illustrated in Table 8 and Table 9.

Table 8 **Surface dressing – frequencies of test for binder and chipping application**

Performance	Road type				
	FW	**4**	**3**	**2**	**1 and S**
Rate of spread of binder – tolerance	F1 (Reconciliation per job site)	F1 (Reconciliation per job site)	F2 (Every 100 000 m^2 or change of binder type or source)	F3 (Every 25 000 m^2 or change of binder type or source)	F3 (Every 10 000 m^2 or change of binder type or source)
Accuracy of spread of binder	F0 (As set out in the quality plan) [8]	F0 (As set out in the quality plan) [8]	F1 (Every 100 000 m^2 or change of binder type or source)	F1 (Every 100 000 m^2 or change of binder type or source)	F1 (Every 100 000 m^2 or change of binder type or source)
Rate of spread of chippings – tolerance	F1 (Reconciliation per job site)	F1 (Reconciliation per job site)	F2 (Every 100 000 m^2 or change of binder type or source)	F3 (Every 25 000 m^2 or change of binder type or source)	F3 (Every 25 000 m^2 or change of binder type or source)
Accuracy of spread of chippings	F0 (As set out in the quality plan) [8]	F0 (As set out in the quality plan) [8]	F1 (Every 100 000 m^2 or change of binder type or source)	F1 (Every 100 000 m^2 or change of binder type or source)	F1 (Every 100 000 m^2 or change of binder type or source)

NOTE 1 The tests for accuracy of spread automatically provide the measure of tolerance.

NOTE 2 Where a producer changes from one road type to another, necessitating a change of test frequency, the area surfaced should be checked since the last appropriate test (on any road type) and if it is in excess of the value given for the new road type then a test should be conducted in the early stages of the work on the new road type. The frequency does not have to be separated by road type. If, for instance, a producer is moving frequently between road types 3 and 4, most of the tests should be carried out on the more heavily trafficked roads.

The visual assessment of defects in slurry surfacing and microsurfacing should be carried out at regular intervals and on completion of the works to ensure conformity with Table 7 and to BS EN 12274-8.

Table 9 **Slurry surfacing and microsurfacing – frequencies of testing – all road types**

Control/test	Purpose	Minimum frequency
Control of storage areas	Check storage areas conform to the quality plan	For every site
Check the cleanness of the tanks	Avoid contamination	Daily before production or on change of constituents
Check constituent quantities	To complete production	For every site
Weather	Suitable for application and service	Before production
Preparation	Ensure the substrate is clean	Daily before work starts
Machine settings	Check that all settings conform to the quality plan	Daily before work starts
Residual binder content	Check the binder content conforms to the design as specified in BS EN 12274-2	1 test per 1 000 t
Check spread rate	Check that the thickness conforms to the design	Daily
Perceptible properties	Check that materials conform to normal appearance	–

NOTE These minimum frequencies are taken from BS EN 12273 and it might be more appropriate to consider higher frequencies. Further detail is contained in the Quality Plan as shown in Sector Scheme 13A and Sector Scheme 13B documents, as appropriate for the product [8].

6.3 Monitoring and measurement of the product

The producer is required to establish procedures for monitoring and measuring production tolerances to ensure that the product conforms to the requirements specified for the surface treatments. Conformity of visual assessment and macrotexture should be measured at the end of the guarantee period and could comprise the results from inspections by the producer or the purchaser. The relevant test methods for visual assessment (in BS EN 12272-2, surface dressing, and BS EN 12274-8, slurry surfacing and microsurfacing) recommend that the assessment is carried out from a moving vehicle (not by the driver) in the first instance and only in case of doubt should a more precise measurement method be used. A similar assessment procedure or a traffic speed machine method can be used for macrotexture (this is typically conducted by the purchaser and not necessarily at the immediate end of the guarantee period).

7 Type approval installation trial (TAIT)

TAITs are the means by which a producer demonstrates the ability to design and install a group or family of surface treatments meeting the required performance characteristics. TAITs can also be used as the basis for CE marking if required by regulation. An example of a family of TAITs suitable for surface dressing for the conditions prevailing in the UK is set out in Table 10.

Table 10 **Surface dressing – example of family of TAITs**

Road type	Binder class [A]	Type of surface dressing	
FW	3 or higher	T1	T2
1	3 or 4 [B]	T1	T2
2	4	T1	T2
3	4	T1	T2
4	5 or 6	T1[C]	T2

[A] BS EN 13808:2005.

[B] Road Note 39 [2] recommends Class 4 binder for many of these roads.

[C] It would be unusual for a single surface dressing to be used at this traffic level.

T1 = Single surface dressing
T2 = Racked-in or double surface dressing

NOTE This is the recommended minimum family of TAITs. However, a producer is free to carry out and record as many TAITs as required to suit specific circumstances.

A family of TAITs suitable for slurry surfacing may be determined from a combination of the road types, slurry surfacing and microsurfacing types and binder types in Table 11.

Table 11 **Slurry surfacing and microsurfacing – example of family of TAITs**

Product	Road type				
	Footway	4 cycleways and cycle paths	3	2	1
Slurry surfacing and microsurfacing design	Defined by maximum aggregate size and binder class (see Table 1).				

NOTE This is the recommended minimum family of TAITs. However, a producer is free to carry out and record as many TAITs as required to suit specific circumstances.

Although the full range of traffic levels has been given here, the Specification for Highway Works Vol 2 NG 918 [4] requires that slurry surfacing and microsurfacing installed on roads carrying more than 250 cv/l/d should be treated as a thin surfacing and should have a BBA/HAPAS certificate.

Although a TAIT has unlimited time validity, it is only valid for as long as all records are available for inspection by purchasers and the product or process has not changed significantly. It is recommended that TAITs are renewed from time to time as purchasers are unlikely to be convinced by a TAIT that only exists on paper.

NOTE Where a producer operates over a large area of the UK it might be convenient to have more than one TAIT in each category so that it is easier to demonstrate capability to a potential purchaser.

Annex A (informative) Examples of specification – surface dressing

Figure A.1 gives examples of surface dressing specifications using BS EN 12271 and the recommendations given in this Published Document.

The four scenarios that have been used are:

1) a major motorway with 4 000 commercial vehicles per day at 70 mph (type S);
2) a rural single carriageway with 400 commercial vehicles per day at 60 mph (type 3);
3) a rural very minor road with very little traffic at 60 mph [type 4 (rural)];
4) an urban, residential cul-de-sac at 30 mph [type 4 (urban)].

Figure A.1 **Surface dressing – example specifications**

Requirements	**Road type (category)**			
	S	**3**	**4 (rural)**	**4 (urban)**
Type of surface dressing	Double	Not single	Any	Any
Minimum binder cohesion	5	4	3	4 [A)]
Rate of spread of binder tolerance	3	2	1	1
Binder coefficient of variation *cv*	2	1	1	1
Rate of spread of chippings tolerance	3	2	1	1
Chipping coefficient of variation	2	1	1	1
*P*1 fatting, etc.	3	2	1	1
*P*2 scabbing, etc.	3	2	1	1
*P*3 fretting, etc.	3	2	1	1
*P*4 streaking, etc.	3	2	1	1
Skidding resistance	0	0	0	0
Noise generation	0	0	0	0
Binder ageing	Reported	Reported	NR [B)]	NR [B)]
PSV	65	60	55	50
Macrotexture	4	3	2	1

[A)] Category 4 required to cope with powered steering use; a double surface dressing could also be needed.

[B)] NR = no requirement.

Annex B (informative) Examples of specification – slurry surfacing and microsurfacing

Figure B.1 gives some examples of slurry surfacing and microsurfacing specifications using BS EN 12273 and the recommendations given in this Published Document.

The four scenarios that have been used are:

1) a rural single carriageway with 400 commercial vehicles per day at 60 mph (type 3);
2) a rural, very minor road with very little traffic at 60 mph (type 4) (rural);
3) an urban, residential cul-de-sac at 30 mph (type 4) (urban);
4) a footway/cycleway.

Figure B.1 **Slurry surfacing and microsurfacing – example specifications**

Requirements	Road type (category)			
	3	4 (rural)	4 (urban cul de sac)	Footway
Minimum binder cohesion [B]	NR [A]	NR [A]	4	NR
Category *P*1 – bleeding, fatting up and tracking	2	1	1	0
Category *P*2 – delamination, loss of aggregate, wearing, lane joint gaps, rutting or slippage	2	1	1	0
Category *P*3 – corrugation, bumps and ridges	2	1	1	1
Category *P*4 – groups of small and repetitive defects in not more than (n) rectangles	2	2	2	2
Category L – longitudinal grooves (score-marks)	2	1	1	0
Skidding resistance	0	0	0	0
Noise generation	0	0	0	0
PSV	65	60	55	NR
Macrotexture	5	3	2	0

[A] NR = no requirement.

[B] Binder cohesion should not normally be specified by the purchaser as it is part of the design process, but there might be occasions when the purchaser requires a tougher material.

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