



## CODE OF PRACTICE FOR SURFACE DRESSING



## **Foreword**

This sixth edition of the Code of Practice has been produced by the RSTA Surface Dressing Technical Committee. It has been reviewed in the context of the European Standard for Surface Dressing BS EN 12271 published in September 2006 along with the national guidance document PD6689:2009.

This document has been peer reviewed by ADEPT Soils, Materials, Design and Specifications Committee.

The information contained herein is intended to represent industry best practice. No liability is accepted by RSTA or ADEPT for any damages caused to property or personal injury resulting from using the guidance contained within this document.

**RSTA** is the Road Surface Treatments Association [www.rsta-uk.org](http://www.rsta-uk.org)

**ADEPT** is the Association of Directors of Environment, Economy, Planning and Transport  
[www.adeptnet.org.UK](http://www.adeptnet.org.UK)

<b>CONTENTS</b>	<b>Page</b>
1.Preamble	4
General	4
Health & Safety & Environment	4
Training	5
Quality Assurance	6
Planning & Coordination	6
2. Defining The Site and It's Characteristics	6
3. Determining The Specification	6
4. Site Information	7
5. Planning The Execution of The Work	7
6. Spraybars	8
7.Joints	10
8.Traffic Management	11
9. Road Preparation	14
10.Binders	14
11. Chippings and Chipping Storage	15
12. Chipping Application	15
13. Rollers and Rolling	17
14. Sweepers and Sweeping	17
15. Plant	18
16. Method of Working	18
17. Aftercare	19
18. Surface Dressing Footways and Cycleways	20
19. Quality Assurance	21
20. Division of Responsibility Between the Highway Authority and The Contractor in Standard Contracts	22
21. End Product Specification Contracts	22
22. Type Approval Installation Trial (TAIT)	23
APPENDIX A - Checklists	24
APPENDIX B - Glossary	26
APPENDIX C - References	35
APPENDIX D - Depot Tray Test	38

## **1 PREAMBLE**

### **1.1 General**

To the highway engineer, surface dressing offers a quick, efficient and cost-effective way of maintaining skid-resistant and waterproofing road surfaces. To obtain the best results it is necessary to give careful consideration to a wide range of detail and to plan and design the work carefully. The speed of the surface dressing operation and the short duration of time during which motorists are inconvenienced is also an important issue.

The purposes of surface dressing are to waterproof the road surface, to arrest disintegration, to provide texture, and provide a skid-resistant surface. This latter quality can play a major part in accident reduction and was highlighted by the initiative of the Department of Transport in 1987 when the Minister introduced minimum mean summer SFC values for motorways and trunk roads. The importance of surface texture as provided by surface dressing has been highlighted by TRL report LR 286, which stresses that texture depth is important under both wet and dry conditions. Up to date guidance is available in the Design Manual for Roads & Bridges (DMRB): Volume 7 HD 28. The DMRB is available on line at [www.dft.gov.uk/ha/standards/dmr/](http://www.dft.gov.uk/ha/standards/dmr/).

A useful way of comparing the effectiveness of a dressing, or other maintenance work, is to express it in terms of a 'cost life index'. This is the cost per square metre of the work divided by the service life in years. It provides a measure of the "value for money" which the highway authority is achieving. A low 'cost life index' and "high value for money" is the result of high-quality work.

The purpose of this Code is to identify the important aspects of the process, and to refer to other documents relating to good surface dressing practice and so give practical guidance on achieving high quality.

### **1.2 Health, Safety and Environment**

All those involved in preparing and executing surface dressing operations have a legal duty of care for the health and safety both of the operatives carrying out the works, and those who come into contact with the operation whilst in progress and during aftercare.

The planning and organising for health, safety and environmental issues must commence as soon as a surface dressing programme is envisaged. The Construction Design and Management Regulations 2007 will apply to most surface dressing operations and therefore clients are urged to follow closely the advice in the relevant Approved Code of Practice as they have the responsibility under the new version of the Regulations for initiating the framework for safe working practices. This will enable the CDM Co-ordinator and Principal Contractor to plan and prepare the information and documentation necessary to ensure the specific hazards are identified on the various sites and the level of risk that is envisaged. This must take into account the nature of the site, the materials to be used, the traffic management requirements and any special health, safety and environment issues that have become evident during the pre-tender stage, (ensure the right information is provided to the right people at the right time).

The client should employ a competent contractor. It is recommended that the simplest way for a client to achieve this is to select at tender stage contractors accredited to National Highways Sector Scheme 13. This is the procedure of selection recommended in the Specification for Highway Works. Once the contractors have been selected, the pre-construction information contained in the tender document should be detailed enough for the prospective contractors to take account of the health, safety and environment issues in their tender submission.

On the appointment of the Principal Contractor to carry out the surface dressing operations, it will be his duty to prepare a detailed Health and Safety Plan for that particular contract or works from the Pre-construction information supplied by the Client, Designers and CDM-Coordinator. This must itemise the methods to be employed to overcome the specifically identified hazards and risk reduction measures that will be in force on this contract. They must also ensure adequate welfare is provided from the start of the contract.

Once the works commence the Principal Contractor has the control of health, safety and environment matters but liaison with the client, police and the general public on issues of congestion, diversions or closures must be ongoing throughout the contract.

The Principal Contractor has additional duties under other legislation to look after the health and safety not only of his own employees but of other persons who work alongside them and also of the passing public. Written specific risk assessments must be prepared which can be used to identify control measures for both physical and chemical hazards. The measures must form the Contractor's safe systems of work which enhance the safe behaviour of the workforce as well as protect the general public during the various stages of the works. These measures must be communicated to all involved in the project.

Account must also be taken of environmental factors with pollution from fumes, noise and dust being the main concern during the work phase. Disposal of waste and protection from spillage and contamination are other considerations when looking at the overall surface dressing activity.

### **1.3 Training**

The design of surface dressing and its execution is dependent on a wide range of factors and close attention to detail. Many engineers and technicians have been involved with surface dressing, but only a limited number of them have had any formal training in the design, specification and execution of the work. This lack of training often results in inappropriate selection of materials, unsatisfactory preparation, incorrect rates of spread and lack of traffic control and aftercare. All these can lead to premature failure and increased costs.

In recognition of this the National Highways Sector Scheme (NHSS) Sector 13 now defines the minimum qualifications required for all personnel involved in the design, supervision and installation of surface dressing. It is the Association's view that a competent qualified workforce makes a fundamental contribution to achieving high quality durable surface dressing. The RSTA runs regular training courses, details of which can be obtained from the RSTA website [www.rsta-uk.org/calendar.htm](http://www.rsta-uk.org/calendar.htm)

#### **1.4 Quality Assurance.**

The Road Surface Treatments Association continues its commitment to quality assurance and has been instrumental in producing the National Highways Sector Scheme (NHSS) for Surface Dressing, which is Number 13 in the series of Sector Scheme Documents.

The Sector Scheme Document, which was first published in 1998, is available on the UKAS website [www.ukas.com](http://www.ukas.com).

#### **1.5 Planning and Co-ordination**

Careful and detailed planning before work commences is an essential element of successful surface dressing. There should be close co-ordination between contractors and their clients at every stage, commencing with a pre-works meeting, the purpose of which is to ensure total understanding of the way that the programme will precede.

Contract prices will be provided by contractors based on an indication of the likely size of the client's programme. Significant reduction in the size of the indicated programme will increase the contractor's overhead costs per square metre of work undertaken and contracts should make provision for compensating contractors under these circumstances. It is in the interests of both contractors and clients that the programme of works flows smoothly from site to site without the need to travel many miles for the purpose of dressing small areas of road.

### **2 DEFINING THE SITE AND ITS CHARACTERISTICS**

Before any design, planning or dressing is undertaken, it is important to identify the lengths of road to be dressed and to draw up a schedule. A clearly understandable system such as a line, arrow and job number on the road surface is recommended.

### **3 DETERMINING THE SPECIFICATION**

3.1 The selection of the right type of dressing, size of chippings and rate of spread of binder is as important as the design of other engineering works. Each site must be considered in the light of its unique characteristics, including the nature of surface, geography, volume and speed of commercial and other traffic using the section of road.

Advice on the design of surface dressing is contained in the sixth edition of Road Note 39 "Design Guide for Road Surface Dressing" (2008) published by TRL Limited, Crowthorne House, Nine Mile Ride, Wokingham, Berkshire, RG40 3GA.

3.2 The design considerations of surface dressing are particularly important in order that the dressing applied to the road surface is right for the circumstances in which it has to operate and the job it has to do.

This is equally the case if the design is done by the Client or Contractor.

3.3 In recent years, there has been a movement towards "End Performance Specifications". End Performance Specifications transfer the responsibility for the design of the dressing to the selected contractor who is also responsible for the execution of the dressing and generally guarantees the dressing for a specified period of time.

3.4 Advice on "End Performance" and "Recipe" specifications can be found in Clauses 922 and 919 respectively of the Manual of Contract Documents for Highway Works, Volume 1 Specification for Highway Works, available online at [www.dft.gov.uk/ha/standards/mchw/vol1/](http://www.dft.gov.uk/ha/standards/mchw/vol1/) .

#### **4 SITE INFORMATION**

It is important that the person in charge of surface dressing operations on site fully understands the type and extent of the work required. One way of achieving this is the preparation of a schedule and map indicating the sections of road to be dressed, the length and average width of each section, the area to be dressed, the type of binder, rate of spread of binder, size of chipping and location of chipping storage area – The Information / Programme Sheet.

#### **5 PLANNING THE EXECUTION OF THE WORK**

In addition to compiling the site information, the person supervising the dressing may need to decide which width of spray bar and type of chipping machine to use and where joints are to be located. Most modern equipment can operate in standard lane widths and, where possible, the equipment selected should be compatible so that the spraying width and chipping width at each pass are the same (see Section 6 – Spray bars, Section 7 – Joints, and Section 12 – Chipping Applications).

Unless they are made with proper care, joints can become weak points on any dressing. For that reason, the number of joints made should be kept to a minimum.

5.1 On narrow roads, it is better to spray the whole width in one pass, after making appropriate arrangements for temporary diversions. Where wider roads are being dressed, there are also advantages to be gained by introducing traffic diversions while the work is in progress. This causes minimum inconvenience to road users and separates traffic from the surface dressing operations.

Note: For road widths of less than 6.0 metres, due consideration should be given to road closures.

5.2 Temporary diversions should not be introduced casually and will involve consultations between contractors and the highway authority. Refer to RSDA / CSS Code of Practice for Signing at Surface Dressing Sites. CSS is now re-named The Association of Directors of Environment, Economy, Planning and Transport (ADEPT).

5.3 Poor planning can result in low daily output, increased costs and public criticism. The Information / Programme sheet mentioned in paragraph 4 also enables supervisory staff to give proper consideration to the order in which various sections are dressed, the number of lorries required to haul chippings from storage sites and when and where additional binder deliveries are required. Wherever possible, operations that result in a break in the spraying operation can be planned to coincide in order to minimise "down time". Such operations include moving from one site to another, transferring binder from one tank to another and heating the binder.

## 6 SPRAYBARS

Most modern tankers are fitted with adjustable spraybars enabling the distance across the spraybar to be varied, whilst in motion, to cater for any changes in road width. This enables the spraybar to be operated from 0.1m up to its maximum width.

Adjustable spraybars come in two types:

- 1) Expandable: These can be expanded to the particular width required. Typical machines available in the UK have maximum widths of 4.0m – 4.3m.
- 2) Extendable: These can be extended by bolting on extra sections.

Fixed width spraybars are available in several sizes, from 2.25m to 2.75m. These are often mounted on smaller tankers and are ideal for narrow roads, particularly housing estates, where manoeuvrability is essential. The spraying width is also variable from 0.9m upwards.

In order to achieve the desired rate of spray of binder, two systems of control are used:

- 1) The driver uses a pre-calibrated chart to select the correct forward speed and drives to that speed as indicated on a special low-speed speedometer.
- 2) The spraybar is equipped with automatic ground speed control with the operator pre-setting the required rate of spread and, the controller then electronically controls the forward speed of the machine.

As it is essential that the correct amount of selected binder is applied onto the road surface, it is also necessary to check that the spraybar is working correctly. Member companies of the Road Surface Treatments Association are required to have all their spraybars tested by a UKAS - accredited testing house at the beginning of each season. Contractors will also undertake additional tests to BS 1707 to calibrate their spraybars for use with various binders.

BS 1707 requires spraybars to be tested in depots that are suitably equipped, where binder is sprayed for a given duration over test trays divided into sections, each of which is 50 mm wide. A satisfactory spraybar will deliver the same amount of binder into each section (plus or minus 15% of the average) and a spraybar that does not achieve this standard requires either adjustment or replacement of jets.

### 6.1 Checking Output

Although a successful test result will show that any particular bar is capable of operating within the limits specified in the British Standard, checks should be made at the start of each day and during the day as appropriate, for example if there has been a long break in the continuity of the work, to ensure that the jets are continuing to operate satisfactorily.

Spraybars are fitted with either swirling or slot jets. The output from any jet is affected by both the temperature of the binder and the spraybar pressure and pump output. The rate of spread of binder on the road surface is additionally affected by the speed at which the spray tanker moves.

Some machines are fitted with equipment that automatically adjusts the output from the spraybar to compensate for variations in the forward speed of the spraybar. Filters are fitted in the pipework feeding binder from the tanker to the spraybar to prevent any solid material reaching the spraybar where it could cause the total or partial blockage of a jet. It is essential that these filters are checked at the start of each day as well as during the work, particularly if a drop in pressure is observed during spraying.

For bars fitted with swirling jets, a site test indicating whether or not all the jets are operating correctly can be carried out as follows:

All the jets, with the exception of the two that are at the extreme ends of the bar, should be closed and the bar opened momentarily. The tanker should then be moved forward about a metre and the process repeated, closing the end jets and opening the penultimate jets at each end of the bar. This process should continue to be repeated progressively along the bar until all the jets have been operated. This should produce a pattern as indicated in Diagram 1 and the photograph in appendix D.

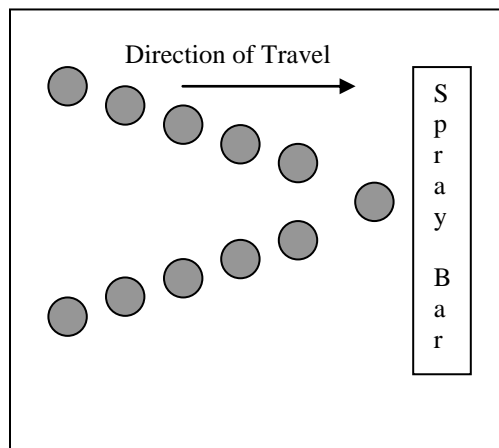


Diagram 1

Where all the jets are working properly each of the patches of binder on the road surface will be circular and of similar appearance. Where a jet is partially blocked, the shape of the spray from that jet will be irregular. It should be removed, cleaned and retested. This test may not be appropriate for bars fitted with slot jets but where it is possible, the spray pattern from a blocked or misaligned jet is noticeably different from jets operating correctly.

On-site testing of transverse distribution can be carried out using carpet tiles or similar material. In this test, tiles forming a continuous strip, the full width of the spray bar and taped together, are laid in the path of the spraybar. For a spraybar operating correctly across its full width, the difference in the weight of each tile before and after spraying with binder should be similar. Once it has been established that a spraybar is operating correctly in a transverse direction, longitudinal distribution is normally controlled by the vehicle's forward speed or pump output.

The rate of spread of binder over any section of road can also be calculated by comparing the area of the section dressed with the amount of binder used as determined by a calibrated volume capacity gauge or by dipping the tanker with a calibrated dipstick on level ground before and after the section has been dressed. Spot checks on the rate of distribution at any point can be checked using the carpet tile test. In this test, carpet tiles

or other suitable material, measuring not less than 200 mm square, are pre-weighed. The weight is then marked on the back of the tile. Tiles can be placed in any position on the road ahead of the tanker and subsequently sprayed. They are then re-weighed and the rate of spread of binder is calculated as follows:

$$\frac{\text{Increase in weight of tiles (g) x Number of tiles required to cover 1.0m}^2}{\text{Density of binder (g per mm) x 1000}}$$

To be reliable, this type of carpet tile test must be taken with great care and accuracy. It should not be forgotten that for emulsion binders, weight loss takes place immediately the binder film hits the road surface, as the water evaporates. For this reason, it is recommended that both the carpet tile and a sealable plastic bag are weighed together before the test and compared with the weight of the tile, bag and sample, which should be placed in the bag as quickly as possible after the test and sealed.

The carpet tile test is an important method of ensuring that spraybars are working correctly at the actual time of spraying and not relying on the pre-season tray test.

Further information is available on testing methods and is given in BSI and CEN documentation to which reference should be made e.g. BSEN 12272-1.

## 6.2 Other Considerations

The operating height of both spraybars fitted with swirling jets or slotted jets is important if the correct binder distribution is to be achieved. This is particularly the case with slotted jets. The operating height of any particular spraybar should be indicated on the chart carried in the driver's cab. A typical operating height is about 450 mm. It is good practice to check the height of the bar regularly and to make adjustments if necessary. With slotted jets, it is also important to ensure that the jets are fitted and locked at the right angle. This is normally achieved when the jets are correctly fitted into the bar but a visual check will quickly indicate if any particular jet is out of alignment.

## 6.3 The Calibration of New Spraybars

Because a spraybar is new, it does not necessarily follow that the transverse distribution will be satisfactory. Whether it is fitted with swirling jets or with slotted jets, it should be tested and proved satisfactory both before and during the season.

## 7 JOINTS

Joints, both longitudinal and transverse, are potential points of weakness (see also Section 5). Longitudinal joints should not therefore be located where they will coincide with the wheel tracks of vehicles. Consequently, the best position for a joint is on the centre line of a road or on the line separating adjacent traffic lanes.

For good transverse joints, the binder should be at the correct temperature and well circulated through the spraybar prior to spraying. If this is not the case, the binder film will be uneven and streaky for the first few metres. **A good operator using properly maintained equipment is able to form a perfect transverse joint.** If an acceptable joint cannot be formed roofing felt or similar masking material can be applied to the end of the previously dressed section. This will enable the spraybar to be opened half a metre or so before the required position of the transverse joint.

Longitudinal joints between adjacent binder applications or 'breeds' can be formed in two ways, namely by butting or overlapping. As explained earlier, all sections of the road need to receive binder from several jets to provide the required thickness of binder, but there are positions at the ends of the bar where the road surface would normally be receiving binder from only one to two jets. To overcome this deficiency, spraybar manufacturers fix a baffle or deflector plate at each end of the bar.

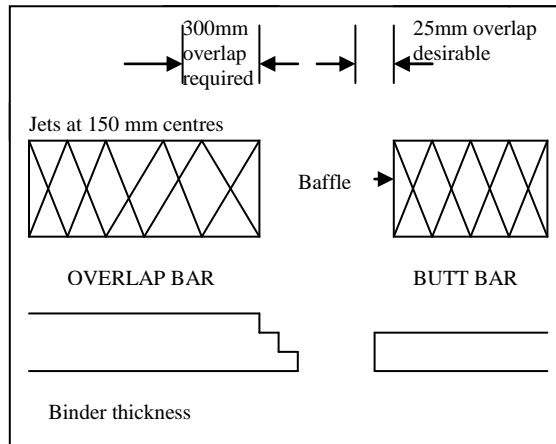


Diagram 2

This ensures that binder from the jets at the ends of the bar is deflected inwards and a full application of binder thus occurs across the full width of the bar between the baffles. The joint made between adjacent "breeds", where the full width of the bar has been used, may therefore be butted together.

In practice, this is not easy because it demands great accuracy on the part of the tanker driver, particularly where there are bends in the road. A further difficulty arises because, when chippings are applied to the binder film, some bounce and fall outside the sprayed width. These must be swept back onto the sprayed width before the adjoining breed is sprayed. In this way, a 'wet edge' is produced and the joint is in fact slightly overlapped.

Where a joint is formed using only part of a bar width, for example, where the total road width is only one and a quarter bar widths, a butt joint is not possible. In these circumstances it is necessary to overlap the previous breed by the width indicated on the driver's chart for that spraybar. This will however result in some excess binder that may result in some 'blacking up'.

## 8 TRAFFIC MANAGEMENT

In undertaking surface dressing the needs of road users must be considered at all stages. The safety of surface dressing operatives and the public, whether on foot or in motor vehicles, is paramount. Recommendations on the signing and traffic management during surface dressing operations are contained in a Code of Practice produced jointly by the Road Surface Dressing Association, now part of RSTA, and CSS now re-named The Association of Directors of Environment, Economy, Planning and Transport (ADEPT). This document has recently been reviewed and the revisions published in January 2008. The Code is now a reference document of chapter 8 of the Traffic Signs Manual (D3.29). Whilst the Code gives general advice, it must always be remembered that the needs of

any site should be considered as unique and each surface dressing crew should contain properly trained personnel. For specific sites, a proper risk assessment should be undertaken by an appropriately trained person and acted upon before surface dressing equipment and operatives are dispatched to the site. At some sites, this will require discussion between the contractor and representatives of the highway authority at the pre-contract stage. Where this is the case, the agreement reached between the parties should be passed on to the person controlling site operations and included in the information detailed in Section 4 of the Code. National Highway Sector Scheme 13 details these requirements.

8.1 The correct selection of traffic management system to be adopted is important. The public should not be unduly inconvenienced by detours or long delays, or the reputation of surface dressing as an efficient and economic process is put at risk. When considering traffic management arrangements, the following factors need to be taken into account:

(a) Traffic flow data

This will include such factors as high peak-hour flows, high percentage of HGV's etc.

(b) Road layout and junctions

This will identify the type of road under consideration e.g. whether it is a 7.3 metre wide single carriageway principal road with no major junctions, or a narrow country lane.

(c) Type of control

The information from (a) and (b) above will give the input necessary to decide the general type of traffic control required, e.g. restricted hours of working, maximum working lengths, availability of alternative routes, level of advance publicity needed, etc. Narrow country lanes, for instance, may need to be temporarily closed or a warning of delays may need to be given. Layouts 1, 2 or 3 in the Code of Practice for Signing at Surface Dressing Sites give guidance.

(d) Specification

Both the specification for the work and the job sheet for the site should state any exceptional requirements for dealing with traffic.

(e) Traffic regulation orders

Legal processes, such as allowing the closure of a road or imposing mandatory speed limits, need to be arranged by the highway authority well in advance of the works.

(f) Publicity

Road users do not like being delayed and will take alternative routes if they are given adequate information. As surface dressing works are normally of a short duration and dependent upon favourable weather forecasts, it is difficult to predict accurately when traffic flow at any particular site is likely to be affected. Nevertheless, principal roads carry many thousands of vehicles per day. It is essential therefore that every possible method should be utilised to inform the road user that a site is to be affected. Press releases to local papers, district and parish councils, local radio etc can all help. The most effective methods are

- 1) The display of information boards at each site saying, for example, that surface dressing is to be carried out and when.
- 2) The distribution of letters to all dwellings and premises and also attached to all vehicles (loosely under windscreen wipers) detailing what works are to take place and when.

In addition, emergency services, bus operators and any other organisation likely to be affected by work at a particular site should be notified in advance.

(g) Traffic control and signing

For the safety of drivers, pedestrians and operatives, traffic passing over newly surface dressed roads, or alongside dressing that is in progress, must be properly controlled. Such control includes adequate advance warning of the works, regular reminders throughout the site of the risk of loose chippings and the proper management of vehicles by the use of traffic lanes. Some instructions such as "stop" and "give way", are indicated both by carriageway markings and by mounted signs. When these carriageway markings are covered by surface dressing, it is important to replace them as soon as possible or to provide some temporary signs during the period between the covering of the markings and their permanent replacement. This is particularly important at junctions with high-speed roads.

The careful control of traffic and the maintenance of speeds of 20 mph or less over newly-completed dressings is necessary in order to give the binder time to 'set' or break' as appropriate and to give the dressing time to settle down to a close matt mosaic. Traffic should not be allowed to pass over new stabilised dressings at uncontrolled speeds until such time as the dressing has been thoroughly swept, preferably with a full-width sweeper. (see Section 15.) The larger the size of aggregate used for the dressing, the greater degree of aftercare and sweeping necessary to ensure success and safety.

Where one-way traffic is operated using stop and go signs, the operators of these signs should be appropriately trained, be in radio communication with one another, and one of the operators should be nominated as being in overall control of the traffic flow arrangements. On roads where it is not possible to provide the desirable safety zone between surface dressing plant/operatives and moving traffic, the speed of traffic past the works should be restricted to a maximum of 10 m.p.h. Due consideration should be given to the use of convoy vehicles for this speed restriction. Traffic passing over new surface dressings which have not been thoroughly swept to ensure the removal of surplus chippings should be subject to a recommended speed of not more than 20 m.p.h.

Where road junctions are surface dressed, which result in the obliteration of "stop" and "give way" markings on the carriageway, the appropriate warning signs should be provided (Sign 7012 - the Traffic Signs Regulations and General Directions 2002).

Some highway authorities use mandatory speed limits to control traffic speeds when surface dressing main roads. If the road in question is a trunk road the consent of the Regional Director's Office of the Highways Agency is required. In other cases, local highway authorities have powers under Section 14 of the Road Traffic Regulation Act 1984. Where local authorities wish to use these powers they should first be discussed with the Chief Constable who will have the task of enforcing any orders that are made. Highway authorities may then "give notice" of a temporary speed limit on a list of roads,

usually main roads or roads where traffic speeds are unusually high. The usual procedure is for the council to give their engineer authority, at the appropriate time, to apply the orders that have been approved. Once the order has been applied it may remain in force for a maximum of fourteen days, which is normally far longer than is necessary for surface dressing operations. The speed limit selected is usually 20 mph.

Although the use of mandatory speed limits may be helpful in exceptional circumstances experience suggests that controlling traffic speeds by reducing lane widths and the creation of convoys is likely to prove more effective.

Not only is it important that signs are placed in accordance with the principles outlined in Chapter 8 of the Traffic Signs Manual, it is also important that a safe system of work is operated, to ensure the safety of the operators when placing signs.

(h) Signs

Unless the Highways Agency has given approval in writing to the use of a sign not included in the Traffic Sign Regulations and General Directions and subsequent amendments, only signs approved by Statutory Instrument should be used. Where such signs are used, they should be provided in addition to rather than instead of approved signs. Should a member of the travelling public make a claim against the contractor and/or the highway authority, the use of the correct signs located in the correct positions is likely to be taken into account by the courts.

## **9 ROAD PREPARATION**

Advice on this subject is contained in the RSTA Guidance Note on Preparing Roads for Surface Dressing. The Guidance Note deals with patching and the preparation of the road in the months before surface dressing is carried out as well as works to be carried out immediately before dressing operations commence

## **10 BINDERS**

This subject is covered by the RSTA Advice Note on Surface Dressing Binders. The note covers the function, properties and availability of the different types and grades of surface dressing binders.

The physical testing of binders is described, as is the selection of binders to meet particular site requirements.

The Highway Authorities Products Approval Scheme (BBA HAPAS) can facilitate the approval of modified binders for surface dressing and other surface dressing applications.

Further advice on binders may be found in the current edition of Road Note 39 published by the Transport Research Laboratory, which deals in detail with the selection of binders for particular circumstances of traffic, geometry, geography and road conditions. It enables the calculation of recommended rates of spread of binders for roads of specified traffic category and road hardness.

## 11 CHIPPINGS AND CHIPPING STORAGE

Advice on this subject is contained in the RSTA Guidance Note on Surface Dressing Aggregates. The Guidance Note deals with the mechanical properties of suitable aggregates, including resistance to polishing and crushing, the affinity of surface dressing aggregates with binders and the selection, storage and handling of aggregates.

## 12 CHIPPING APPLICATION

There are two principal types of machine used for the application of chippings:

- a) Self-propelled, forward-moving; and
- b) Attachments fitted to lorries that are operated either in forward/reverse mode or reverse mode only.

The self-propelled forward-moving chipping spreader has several advantages over the alternative lorry-attached spreader.

The disadvantages associated with lorry-mounted chippers are:

- a) The operator usually has to reverse to apply the chippings, requiring a high level of driving skill to avoid over- or under-application of chippings.
- b) The width of chipping is unlikely to match the width of spray, requiring use of chippers in echelon or multiple passes.
- c) The point of discharge is considerably higher than self-propelled machined and quality control is compromised.
- d) It is more difficult to achieve an accurate rate of spread of chippings, leading to wastage.
- e) There is a greater potential for accidents when spreaders are operated in reverse mode. To avoid accidents, skilled driving and rigid discipline in the operation of a communication system between the vehicle driver and the operator of the chipping spreader is required. The general principle should be that the lorry driver should stop either when signalled to do so or if he has not got a clear view of the operator of the chipping spreader.

Note: for the highest levels of accuracy demanded by Clause 922 (see Section 21), self-propelled chipping machines will be required.

Lorry attached spreaders may be suitable on Clause 922 works for the application of secondary chippings on double and raked-in dressings. It is imperative that these lorry attached spreaders are operated by experienced and skilled drivers / operatives.

Before work commences at the beginning of the season, it is important to ensure that the lorries delivering to these machines have the appropriate mounting bracket fitted correctly.

All chipping spreaders, including the self-propelled variety, have provision for adjusting the rate at which chippings are delivered. The equipment should be calibrated in the depot, prior to use, for the various sizes and types of chipping that are going to be used during the season. Failure to adjust the machine on site during the work can result in insufficient or excess chippings being delivered to the road surface. Excess of chippings will have to be swept up. These cannot usually be used again for surface dressing without recycling because they may have become too dusty. This represents a waste of resource and will add to the cost of the dressing. At the same time, it will reduce the quality of the work because the surplus chippings tend to displace the chippings that are embedded in the binder film.

Most machines either have an attachment to one of the driving wheels of the lorry or an independent wheel running on the road surface that relates the rate of delivery of chippings to the speed of the vehicle. In the case of machines that are operated by an independent wheel, it is important that this wheel does not become coated in a thick layer of binder and chippings, as this will increase the effective diameter of the wheel and thereby affect the rate of spread. On most chipping spreaders the width of chipping application can be increased from a few centimetres to the full width of the machine. A lever mounted at either end of the chipping spreader achieves this. The ability to adjust the width of spread is principally utilised when 'quartering'. The flow of chippings should be carefully watched as any contamination caused, for example, by pieces of stone, timber, clods of earth or other material can cause blockage. This problem is very much reduced when the chippings have been drawn from a properly constructed chipping storage area.

As there is normally a delay between the emptying of one vehicle, the removal of that vehicle from the working area and its replacement by another fully loaded vehicle, it is important that the spraying operation stops while this changeover takes place. If this is not done, long lengths of binder will be applied ahead of the chipping operation. The binder will cool quickly and there will be no initial bond between the chippings and the binder. Ideally, the distance between the spray tanker and the chipping spreader should be kept to a minimum consistent with safety. This is generally about 10 or 15 metres.

When large tipping lorries are used to deliver chippings, operators must take account of the increased height of such vehicles and the danger of the raised body fouling overhead lines and trees. The use of banksmen to look for these hazards is required.

Operators of both self-propelled forward moving machines and attachments fitted to lorries may be exposed to high levels of dust. It is important that chippings are checked to ensure that they comply with BS EN 13043 (PD 6682 – 2 Table 4), thereby ensuring that dust levels are as low as possible. (This also improves the bond between binder and chippings.)

It is important that the risk to health is assessed and the necessary control measures adopted. The Health and Safety Executive Guidance Note EH 40, "Occupational Exposure Limits", lists the approved occupational exposure standards for dust and fumes.

Chipping rates of spread and distribution need to be checked on a regular basis. These tests are described in BS EN 12272-1 "Surface Dressing – Test Methods – Part 1: Rate of Spread and Accuracy of Spread of Binders and Chippings".

### **13 ROLLERS AND ROLLING**

It must always be remembered when selecting rollers for surface dressing that there is no compaction involved. All that is required is for the chippings to be pressed into the binder film and that they should be lying on their longest dimension in order to be stable.

The rollers used for surface dressing include traditional steel-wheeled rollers, pneumatic tyred rollers and tandem vibrating rollers with rubber-clad drums. However, the best type of roller for a newly laid surface dressing is the passage of slow-moving vehicle tyres, but this should not be adopted as the sole method.

Heavy steel-wheeled rollers can cause crushing of aggregate, thereby reducing the size and accelerating the loss of texture. For this reason, they are not normally recommended. However, the use of steel-wheeled rollers weighing about 5 tonnes, can result in a minimal amount of crushing and much successful work is carried out using this type of roller. A disadvantage is the slow speed at which they travel between sites. The steel drums of the rollers may also bridge high spots on the road and thus fail to press some of the chippings into the binder film.

Pneumatic-tyred rollers (PTRs), being multi-wheeled, avoid this problem.

For main road works, particularly where the racked-in process is being used, the use of heavy vibrating tandem rollers with rubber-clad drums has proved extremely successful. The vibration, which should be in the low amplitude/high frequency mode, helps to press the larger chippings into the binder film and assists in distributing them evenly. Some of these machines also have a good road speed between sites.

Where racked-in dressings are being applied, it may be desirable in some instances to roll the first layer comprising of the larger size chippings to ensure that they are lying on their longest side and properly pressed into the binder film before the application of the racking material.

In most circumstances, both primary and secondary chippings can be rolled together once the secondary chippings have been laid.

### **14 SWEEPERS AND SWEEPING**

Mechanical sweepers are used to clean the road before surface dressing is carried out. They are also used as a means of collecting surplus chippings, after the dressing has been completed and subjected to traffic travelling at controlled speeds. Machines used for the latter purpose usually have a full width brush that feeds the loose chippings towards the suction nozzle and are fitted with suitable dust suppression equipment.

Whilst it is desirable to remove loose chippings as soon as possible in accordance with guidelines in the RSDA/CSS Code of Practice for Signing at Surface Dressing sites, care should be taken not to disturb the new dressing.

## 15 PLANT

Unreliable or inappropriate equipment can seriously affect the quality of work carried out. It can also lead to breakdowns and reductions in output. These may result in increased costs that will quickly overtake any initial savings.

## 16 METHOD OF WORKING

Having made a decision on the width of spraybar to be used and where the joints between adjacent spray widths are to be, it is necessary to decide the length of road to spray before returning to complete the road or lane width. This decision will be closely related to the type of road and the volume of traffic carried. If 'quartering' is necessary, the surface dressing 'train' may need to return to the starting point and proceed to work in the same direction until the section is completed.

On single carriageway trunk and principal roads, surface dressing falls into the category of "mobile works". Under this type of working, traffic will be controlled by the use of stop and go signs as described in Section 8. The length subjected to this operation should be kept as short as possible consistent with safety requirements. Experience suggests that the safest method of operation is to dress one half of the road for the total length of the section. After initial rolling traffic should be stopped in both directions to allow all plant and equipment to turn and position itself to surface dress the second half of the road in the opposite direction of travel adopted for dressing the first pass.

The decision on the direction of travel to be adopted will depend upon such factors as the speed of traffic and the visibility available. The direction of operation selected should form part of the risk assessment for each particular section of road.

On minor roads, a decision will be required at the initial planning stage as to whether or not the road is to be sprayed in one pass. The direction of working under these circumstances is probably not important, the only consideration being the direction in which lorries will approach the site from the chipping storage area. Where the whole width is not to be sprayed in one pass and one way traffic operation past the surface dressing is contemplated, it is essential to ensure that the width of road available to passing traffic is not less than the desirable minimum of 3.25 metres or the absolute minimum of 3 metres set out in paragraph 2.5.1.6 of chapter 8 of the Traffic Signs Manual. Where these widths are not available, Chapter 8 should be consulted with regard to the legal requirements for a road closure, whereby in the interests of safety, it may be preferable to divert traffic away from the road, subject to a risk assessment and length of the diversion that would be necessary. Where for this purpose a road is to be temporarily closed to allow surface dressing operations to be carried out safely, proper contingency arrangements must be made to allow for the passage of emergency vehicles.

Additional advice is given in the RSDA/CSS (ADEPT) Code of Practice for Signing at Surface Dressing Sites.

This covers single carriageway roads:

- a) Over 7.3m wide
- b) 6.0m – 7.3m wide
- c) Under 6.0m
- d) After completion of dressing, prior to final sweeping and relining.

## 17 AFTERCARE

A good surface dressing, using all the right materials, equipment and procedure, is easily spoilt or totally ruined by lack of aftercare. Once a surface dressing has settled down and stabilised it can cope with traffic stresses. Dressings carried out with polymer-modified high-viscosity binders can cope with high-stress situations such as sharp bends, junctions and roundabouts however, there is one factor which all dressings have in common, whatever their constituent materials; they all have EARLY-STAGE VULNERABILITY.

Before dealing specifically with the protection of dressings and with aftercare and sweeping, it is worth noting a few elements of good housekeeping, which contribute to the creation of a successful dressing.

- 1 It is almost inevitable that some dressings will be damaged by wheel spin or heavy braking. Any areas so damaged should be repaired as soon as possible in order to give the repair the best chance of blending with the rest of the dressing.
- 2 All masking material should be removed as soon as possible after rolling and before the road is opened to uncontrolled traffic. Once lifted, the masking material should be removed from the site for disposal.
- 3 Any accidental spillage of binder onto parts of the carriageway which are not being dressed or onto the kerb face, should be dealt with immediately. The longer they are left the more difficult it is to remove them. As much of the binder as possible should be scraped from the surface of the road or kerb. On road surfaces, the remaining film may be covered with dust. Where kerbs have been sprayed, binder may be removed with the use of solvent and a stiff brush. In some cases, where pre-cast concrete kerbs are affected, it may be possible to cover the cleaned surface with cement.

When 'bleeding' occurs on a new dressing, early treatment by over chipping with an aggregate complying with BS EN 13403 Gc85/20 (this is an aggregate which complies with PD 6682-2 Col 5) should be undertaken. The possible need for such treatment should be anticipated and contingency arrangements identified. When "treatment" is required this should be concentrated in the wheel tracks. It should be noted that sand is not a suitable material to use and in some circumstances it can aggravate the problem. Treatment should be kept to a minimum, consistent with minimising the problem, since it can have an adverse effect on the long-term performance of the dressing.

Traffic control is also a vital element of aftercare. On main road sites and points of particular stress, it is essential that personnel should stay to control traffic until such time as the dressing has settled down to form a close mosaic and surplus chippings have been removed (see also Section 8).

In urban areas, the surface dressing process is made unpopular by large quantities of loose chippings being left on footways. Proper attention to sweeping is therefore vital for both carriageways and the adjacent footways.

## 18 SURFACE DRESSING FOOTWAYS & CYCLEWAYS

The surface dressing of footways and cycleways offers the engineer the same benefits as dressing roads, but there are several different aspects that must be taken into account. General advice is now included in Road Note 39 (Sixth Edition), Appendix A1.

The footway or cycleway should be dressed to the specification detailed by the engineer. To achieve a successful finish, the same criteria should be adopted as for conventional surface dressing of roads.

The binder must be applied at the correct rate of spread and at the correct temperature. If possible, the plant should be purpose-built to carry out the work. Small self-propelled sprayer units with narrow spray bars are available, some of which combine the spraying and the chipping application unit. Separate small self-propelled chipping spreaders are also available as an option to hand-chip spreading.

The principles set out in this document with regard to health and safety, early use and aftercare of roads, are equally applicable to footways and cycleways.

### 18.1 Specification

It is essential when undertaking footway and cycleway surface dressing that the users of the site are considered at all stages.

The main points to be considered both on urban and rural sites are:

- a) Plant and equipment should be suitable for use in the particular surroundings without causing damage.
- b) All ironwork should be properly masked.
- c) Binder should not be allowed to come into contact with gates, walls or surfaces other than those to be dressed.
- d) A full application of chippings should be made to cover all the sprayed area but excessive application should be avoided.
- e) All loose chippings should be swept off as soon as a close mosaic has been established.
- f) Advance warning of the work should be given to local residents.

Embedment of chippings does not occur as rapidly on footways or cycleways due to the lack of traffic present. An increased rate of spread of binder is therefore essential to ensure a successful dressing, particularly when considering the early life stability.

Rolling is usually carried out with a rubber-coated, steel-wheeled roller not exceeding 1.5 tonnes, although steel-wheeled rollers may also be used.

**Binder:**

Generally polymer modified emulsions are used because of their relatively low spraying temperatures and their early break and strength. On sites that are more heavily stressed (e.g. predominance of higher use vehicular accesses) or in high rainfall or high attitude locations, it is recommended that a Premium Polymer Emulsion be used.

Some binder manufacturers produce specially formulated polymer modified Bitumen Emulsions for footway and cycleway applications.

Guidance for rates of spread of binder is given in Road Note 39 (Sixth Edition), or direct from binder manufacturers for special products.

**Chippings:**

The polished stone value of chippings for footway surface dressing is not as critical as it is for work on roads. Consequently the engineer has an opportunity to use materials where colour, shape and availability of local chippings are of greater importance. The chippings should nevertheless comply with the requirements of the engineer and normally be of 3mm – 5mm size.

**19 QUALITY ASSURANCE**

Membership of the Road Surface Treatments Association is available to contractors who have third party quality assurance for the type of surface dressing work they undertake. The unanimous decision of the Association to adopt this principle is an indication of its commitment to quality in all its undertakings. The setting up and maintenance of a quality assurance system represents a substantial financial commitment to member companies. Those costs will inevitably have been reflected in the unit prices tendered for surface dressing. Surface dressing contractors who are not members of the Association and have not invested in quality assurance may therefore be in a position to offer lower contract rates, but it follows that their work may well be of a lower quality than that carried out by RSTA contractors.

Quality controlled RSTA member companies need much reduced supervision by highway authority representatives and should decrease the call for tests and checks on machinery and workmanship which form part of a quality assurance system.

The Association do not see the requirement for quality control as a restriction to competition but rather a method of ensuring fair competition between contractors giving maximum value for money, that should be implicit in all work undertaken for public bodies.

The National Highway Sector Scheme for Surface Dressing was revised in May 2011 and republished as number 13 in the series of Sector Schemes for Quality Management in Highway Construction and Maintenance.

This document, which is available on the United Kingdom Accreditation Service (UKAS) website [www.ukas.com](http://www.ukas.com), is actively supported by RSTA Members most of whom have or are gaining accreditation against the scheme as their Quality Assurance registration is reviewed and updated.

## **20 DIVISION OF RESPONSIBILITY BETWEEN THE HIGHWAY AUTHORITY AND THE CONTRACTOR IN STANDARD CONTRACTS**

Contracts between highway authorities and contractors using the Specification for Highway Works Clause 919 (Recipe Specifications), take many forms but they are mostly based on full contracts in which the contractor is entirely responsible for the supply of all the necessary labour, plant, supervision and materials.

In these contracts, there are still activities that the highway authority may undertake, such as design and specification of the surface dressing, traffic management, etc, unless the contract specifically makes provision for the contractor to undertake them and to be paid for them.

## **21 END-PRODUCT SPECIFICATION CONTRACTS**

In this type of contract, using the Specification for Highway Works Clause 922 (End Performance Specification), the choice of binder, chipping source, chipping size and all other matters, with the possible exception of traffic control on motorways, are the responsibility of the contractor. In making his choice of materials and rates of spread, he will take account of the highway authority's requirements relating to skid resistance and texture depth. He will need to ensure that these will achieve and retain their stated value for a given period. Where these contracts are entered into, the method of measuring skid resistance and texture depth should be clearly stated in the contract document. The method of measuring any other performance criteria should also be clearly stated.

These type of end-product specification contracts allows surface dressing contractors to assume total responsibility for the quality of the work undertaken and to apply their experience to the greatest benefit. If contractors are to be responsible for the design as well as the execution of surface dressings, it will be necessary for the highway authority to provide them with the information required to execute that task. The interval of time between the advertising of a contract and its determination do not allow contractors to carry out road hardness tests and to count traffic at all the sites listed in the surface dressing programme. It would in any case be a great waste of resource to have many contractors carrying out the same measurements. It is for this reason that the industry looks to highway authorities to provide the following basic information , as detailed in Road Note 39, on all sections of road which are to be the subject of an end-performance specification:

- 1 Details of the type of existing surface.
- 2 Road hardness measurements.
- 3 Total traffic volume and any developments that are likely to significantly change the volume of traffic carried by any section of road to be dressed as the result of forthcoming developments.
- 4 Medium and heavy vehicle traffic volume.

**Note: Medium and heavy vehicles are defined in Road Note 39 as vehicles of unladen weight greater than 1.5 tonnes (Mg).**

- 5 Maximum altitude for each section, if greater than 200 metres above sea level.
- 6 Details of any section which have a gradient of greater than 10 per cent or where the radius of curvature of the road is less than 100 metres.

**Note:** Under this type of contract it should not normally be necessary for the client to require mandatory testing during the execution of the work.

## **22 TYPE APPROVAL INSTALLATION TRIAL (TAIT)**

The Contractor may have carried out a Type Approval Installation Trial (TAIT) in accordance with BS EN 12271 as required by Clause 922 of the Specification for Highway Works (MCHW1) on the type of surface dressing that is proposed to be used at approximately the traffic levels and site difficulty of the site in question.

Normally, the trial will have been carried out on the following sites:

- Within one traffic category (above or below) of the actual site; and
- Within one investigatory level (IL) of the actual site, as described in HD 36/99 (DMRB 7.5.1).

The TAIT demonstrates the product performance and durability (macrotexture and visual assessment demonstrated after one year) and the capability of the Contractor. The TAIT Certificate will be the basis for the contractor to claim CE marking and provide the Client with some assurance that the product will be of high quality.

CE Marking is not currently mandatory in the United Kingdom, but will become a requirement when the E.U. Construction Products Regulations become law, which will require mandatory CE Marking in the U.K. from 30<sup>th</sup> June 2013.

## **APPENDIX A**

### **Pre-Contract Checklist. (Template.)**

- 1 Has the contractor all relevant site information i.e. location of schools, bus route, market days, events etc?
- 2 What type of traffic control is to be operated and is there enough labour to carry out the works in a safe and proper manner?
- 3 Have all labour received the appropriate training? C.S.C.S. / C.P.C.S. cards.etc.
- 4 Has the correct and adequate plant been allocated as required under the contract?
- 5 Are the chippings specified under the contract available when required?
- 6 Is the binder specified under the contract available.
- 7 If required, are there arrangements in place for additional binder to be supplied?
- 8 Does the tanker to be used carry a current spraybar test certificate to BS 1707?
- 9 Is there a chart in the tanker that will enable the correct rate of spread relative to the speed of the vehicle to be achieved?
- 10 Has the tanker a calibrated dipstick on board or calibrated volume capacity gauge and, do you know the minimum volume of binder that must be in the tank before any heating is applied?

### **Site Checklist**

- 1 Has the road been swept?
- 2 Is the pre-patching complete and satisfactory?
- 3 Is the road clear of parked vehicles or any other obstructions?
- 4 Are the correct signs in place?
- 5 Has all necessary masking of cat eyes and street furniture been carried out?
- 6 Are the operatives all present and correct and wearing the relevant Personal Protection Equipment?
- 7 Is all the plant present and in safe working order?
- 8 Is there enough aggregate available, in good condition, at the correct storage area?
- 9 Is the required rate of spread of chippings known?
- 10 Is there enough binder available at the correct temperature?

## RSTA Code of Practice for Surface Dressing 2011

- 11 Has the tanker driver been informed of the rate of spread required?
- 12 Is the spraybar at the correct height?
- 13 Are the weather conditions appropriate to commence work i.e. high humidity levels, air temperatures?
- 14 Is the planned method of operation safe, both to the operatives and the public?
- 15 What type of traffic control is to be implemented and does everybody understand the method of operation?
- 16 Are joints to be butted or overlapped?
- 17 Have you planned the work with the minimum number of longitudinal joints in the correct place relative to the wheel tracks?
- 18 Has any appropriate aftercare been arranged i.e. trafficking under restricted conditions and sweeping?

### **Post Contract Checklist.**

- 1 Have arrangements been made for post-contract inspections and any required further sweeping?
- 2 Are signs being maintained in a satisfactory condition and placement and removed when required?
- 3 Is the required contract information being collected and documented?
- 4 Have arrangements been made for line replacement?
- 5 Are re-inspection arrangements clear and agreed?

## **APPENDIX B**

### **GLOSSARY**

#### **ADEPT**

Association of Directors of Environment, Economy, Planning and Transport, previously known as the County Surveyors Society (CSS).

#### **ADHESION**

The property by means of which a binder sticks to the surface of a solid body, e.g. the road or chippings.

#### **AGGREGATES**

Aggregate from mineral sources which has been subjected to nothing more than mechanical processing and which has a particular grading.

#### **AGGREGATES STORAGE AREA**

A suitable hard standing for storing graded aggregate.

#### **BAFFLE**

A deflecting device fitted at the end of a spraybar to produce a concentration of binder on the road surface.

#### **BAR**

An abbreviation for spraybar (see Spraybar)

#### **BINDER**

A liquid, comprised of bitumen, either in its natural condition or modified in some way (see Modified Binder).

#### **BINDER DISTRIBUTOR**

A tanker fitted with a spraybar through which the binder is applied to the road surface.

#### **BLEEDING**

The exudation of bituminous binder from a road surface.

#### **BOND**

The adhesion between the binder and either the road surface or the applied chippings.

## **BITUMEN EMULSION**

See Emulsions.

## **BITUMEN – MODIFIED**

Bituminous binder whose rheological properties have been modified during manufacture by the use of one or more chemical agents. In this context, "chemical agent" includes natural rubber and synthetic polymers but not sulphur and certain organo-metallic compounds, oxygen or oxidation "catalysts" such as ferric chloride, phosphoric acid and phosphorus pentoxide. Fibres and inorganic powders ("fillers") are not considered to be bitumen modifiers. In Surface Dressing modified bitumens are employed in the form of emulsions.

## **BITUMEN – PENETRATION GRADE**

A bitumen which complies with the requirements set out in BS EN 12591 : 1991.

## **BITUMEN – ROAD**

Virtually in-volatile, adhesive and waterproofing material derived from crude petroleum, or present in natural asphalt, which is completely or nearly completely soluble in toluene, and very viscous or nearly solid at ambient temperatures.

## **BLACKING UP**

The discolouration of a dressing caused by the binder migrating to the surface under traffic loading.

## **BREAK (EMULSION)**

The coagulation of the dispersed bituminous phase of an emulsion when in contact with mineral aggregate.

## **BREAKING**

The separation of binder from the aqueous phase in such a way that the binder forms a continuous medium with substantially similar properties to those of the binder before emulsification.

## **BREEDS**

The width as sprayed by the bar, irrespective of the maximum spray width of which the bar is capable.

## **BSI**

British Standards Institution

## **BUTT JOINT**

A type of joint where the spray between adjacent “breeds” does not overlap significantly.

## **BOXED-IN**

The creation of an even start and finish of adjacent breeds.

## **CARPET TILE TEST**

A test used as a means of checking the amount of binder applied to a road surface. Sections of carpet tile of known area, normally about 200 mm square which have been pre-weighed, are placed on the road in front of the spraybar. Once the bar has passed over the tile, the tile is re-weighed. The quantity of binder delivered to the road surface is calculated and compared with the rate of spread specified for that section of road.

## **CDM**

The Construction (Design and Management) Regulations 2007 which place duties on clients, designers and contractors in relation to management arrangements and practical measures for construction projects.

## **CE MARKING**

The CE marking (also known as CE mark) is a mandatory conformance mark on many products placed on the single market in the European Economic Area (EEA). The CE marking certifies that a product has met EU consumer safety, health or environmental requirements.

## **C E N**

The European Committee for Standardization or Comité Européen de Normalisation (CEN), is a non-profit organisation whose mission is to foster the European economy in global trading, the welfare of European citizens and the environment by providing an efficient infrastructure to interested parties for the development, maintenance and distribution of coherent sets of standards and specifications.

## **CHIPPINGS**

Coarse, crushed aggregate practically free of fines with a narrow grading range.

## **CHIPPING SPREADER**

A machine used to apply chippings to the road surface as part of a surface dressing.

## **CHIPPING STORAGE AREA**

A suitable hardstanding for storing chippings

**CLOSED-TEXTURED**

A description of the density of a macadam.

**CONES**

An abbreviation for traffic cones.

**COSHH**

Control of Substances Hazardous to Health.

**COSHH ASSESSMENT**

An assessment relating to the hazards to health represented by the use of materials or equipment.

**COST LIFE INDEX**

The cost (in this case of a surface dressing) expressed as the cost per square metre per annum of service life.

**CURTAINS**

The canvas or other material surrounding a spraybar to minimise the gap between the bar and the road surface.

**DELAYED-SET**

Freshly-mixed macadams to which volatile oils have been added to enhance the workability and compactability of the macadam after cooling.

**DENSE**

See Close-Textured.

**DEPOT TRAY TEST**

Method of test for uniformity of transverse distribution of binder.  
See Appendix D.

**DISTRIBUTOR**

An abbreviation for binder distributor.

**DRESSING**

A surface treatment consisting of the successive laying of at least one layer of binder and at least one layer of chippings.

**DUSTING**

The application of 3 mm to dust crushed rock onto a road surface to counteract bleeding.

**DUMPS**

A politically incorrect term for chipping storage areas.

**ECHELON WORK**

The running of two binder distributors or chipping spreaders, one behind the other, in such a way as to produce an application of binder or chippings over a width equivalent to their combined widths.

**EMULSION – ROAD**

A liquid product in which a substantial amount of bitumen is suspended in a finely-divided condition in an aqueous medium by means of one or more suitable emulsifying agents.

**FATTING-UP**

The result of almost total embedment of chippings in the binder.

**FLUSHING-UP**

See Fattening-Up.

**FUMING**

The vapours given off by some binders when first sprayed on the road surface.

**HUNGRY**

The description of a road surface which has become deficient in binder to the extent that when new binder is applied to it, some will soak into the surface.

**JET**

An orifice through which binder passes from the tanker spraybar to the road surface.

**JOINTS**

The point at which binder or chippings from adjacent breeds meet or overlap.

**LANDING**

A chipping storage area

**LEAN**

See Hungry

## **MASK**

An adhesive tape or other similar material used to cover cat's eyes, road ironwork, etc, in such a way that, after removal, they are free from binder or chippings.

## **MODIFIED BINDER**

A binder in which the original properties of the base binder have been altered by the addition of "modifiers". The most common of these are polymers. The resulting binders are often referred to as being "polymer-modified".

## **NAMAS**

National Measurement Accreditation Services.

## **OPEN TEXTURED**

A road surface consisting of aggregate of various sizes and proportions which, after compaction, contains a high proportion of air voids.

## **POLISHED STONE VALUE (PSV)**

A relative measure of the extent to which different types of aggregate in the surface course will polish under traffic.

## **POLYMER**

A substance formed, either naturally or artificially, from chemically simpler substances called monomers, which are joined together by chemical (covalent) bonds to produce very large molecules.

## **PRE-PATCHING**

The remedial measures carried out to make good defective areas of surfacing in advance of surface dressing.

## **PTR**

An abbreviation for pneumatic-tyred roller

## **QUALITY ASSURANCE**

Quality assurance, or QA for short, is the systematic monitoring and evaluation of the various aspects of a Surface Dressing operation to maximize the probability that minimum standards of quality are being attained by the production process.

Registration to BSEN ISO 9001 given to a contractor by a certification body indicates minimum standards are being attained.

## **QUARTERING**

A term used to describe the method of laying adjacent breeds of surface dressing. These are usually considerably less than the full width of the spray bar. They are laid to make up the difference between full (or approximately full) bar widths and the total (sometimes variable) width of a road.

## **RACKED-IN**

The term used to describe the successive laying of one layer of binder and two layers of chippings, the second layer being of a smaller size.

## **SECTOR SCHEME**

National Highway Sector Schemes are bespoke management schemes within an ISO9001:2000 framework. Each scheme is managed by a separate technical advisory committee made up of representatives from across the sector, regulated by UKAS.

## **SET**

A description of the state of a binder which has cooled to road temperature or, in the case of an emulsion, has 'broken'.

## **SKIDDING RESISTANCE**

The frictional forces between tyre and road, which are available to oppose skidding.

## **SLAG**

A manufactured aggregate from steel production or from the ore-refining industries.

## **SLOTTED JET**

A jet nozzle fitted to a spraybar and formed in such a way that binder passing through it onto the road surface is in the shape of a fan.

## **SPRAYER**

An abbreviation for binder distributor.

## **SPRAYBAR**

The bar, carrying jets, that is fitted to the tanker and through which the binder is applied to the surface.

## **SPREADER**

An abbreviation for chipping spreader.

**STABILISED**

A term used to describe a dressing where the binder has completely 'broken' and where the aggregate applied to the surface has settled into a close mosaic.

**STRIPPING (BINDER)**

The displacement of binder from the surface of aggregate, usually by the action of water.

**STRIPPING (CHIPPING)**

The loss of chippings from a completed dressing.

**SWEATING**

The early stages of bleeding

**SWIRL JET**

A jet nozzle formed in such a way that binder passing through it swirls and forms a curtain in the shape of a cone.

**TANDEM ROLLER**

A roller with two drums.

**TANKER**

An abbreviation for binder distributor.

**TEXTURE DEPTH**

A term used to denote the measure of projection of aggregates in a wearing surface.

**THERMOPLASTIC**

The property of material by which their viscosity changes in relation to temperature change.

**TRAIN**

A term used to describe all the vehicles required for the surface dressing operation, assembled in the order in which they play their part in that operation.

**TRAY TEST**

A test previously used, where a shallow metal tray, usually between 200 and 300 mm square and about 10 mm deep, was placed on the road surface ahead of the binder or chipping spreader. The tray collected binder or chippings, as appropriate, for the purpose of calculating the rate of spread.

This test has now been superseded by the carpet tile test for checking the spread rate of binder and the volumetric box for checking the spread rate of chippings.

**UKAS**

United Kingdom Accreditation Service.

**WET EDGE**

The edge of a width of sprayed binder to which chippings have not been applied and that is incorporated in the joint-forming process.

**“WET TAR”**

The wording used on warning signs to describe any freshly applied binder. Although it very rarely describes the binder accurately it is, nevertheless, the mandatory sign under “The Traffic Signs Regulations and General Directions of 1981”.

## APPENDIX C

### References

**Design Manual for Roads and Bridges.** The Stationery Office, London.

*HD 24/06 Traffic assessment* (DMRB 7.2.1).

*HD 28/04 Skidding resistance* (DMRB 7.3.1).

*HD 36/06 Surfacing material for new and maintenance construction* (DMRB 7.5.1).

*HD 37/99 Bituminous surfacing materials and techniques* (DMRB 7.5.2).

Note: available at <http://www.dft.gov.uk/ha/standards/dmr/>

**Manual of Contract Documents for Highway Works.** The Stationery Office, London  
*Volume 1: Specification for Highway Works* (MCHW 1)

Note: available at [www.dft.gov.uk/ha/standards/mchw/vol1/](http://www.dft.gov.uk/ha/standards/mchw/vol1/)

*Volume 2: Notes for Guidance on the Specification for Highway Works* (MCHW 2)

Note: available at [www.dft.gov.uk/ha/standards/mchw/vol2/](http://www.dft.gov.uk/ha/standards/mchw/vol2/)

BRITISH STANDARDS INSTITUTION (2005)

**Bitumen and bituminous binders. Framework for specifying cationic bituminous emulsions**

*BS EN 13808:2005.* British Standards Institution, London.

BRITISH STANDARDS INSTITUTION (1989). **Test aggregates: Part 105, Methods for determination of particle shape, Section 105.1, Flakiness Index.** *BS 812-105.1: 1989.* British Standards Institution, London.

BRITISH STANDARD INSTITUTION (1997). Tests for geometrical properties of aggregates Part 3. Determination of particle shape – Flakiness index  
*BS EN 933-3:1997.* British Standards Institution, London

BRITISH STANDARDS INSTITUTION (2009). **Bitumen and bituminous binders – Specification for paving grade bitumen.** *BS EN12591:2009.* British Standards Institution, London.

BRITISH STANDARDS INSTITUTION (1989b\*). **Specification for hot binder distributors for road surface dressing.** *BS 1707: 1989.* British Standards Institution, London.

BRITISH STANDARDS INSTITUTION (2007\*). **Bituminous Mixture** *BS EN 13108 Parts 1-4: 2007.* British Standards Institution, London.

BRITISH STANDARDS INSTITUTION (2010). **Road and airfield characteristics – Test methods: Part 1, Measurement of pavement surface macrotexture depth using a volumetric patch technique.** *BS EN 13036-1:2010.* British Standards Institution, London.

BRITISH STANDARDS INSTITUTION (2002b\*). **Sampling and examination of bituminous mixtures for roads and other paved areas: Part 112, Method for the use of road surface hardness probe.** *BS EN 13036: 2002.* British Standards Institution, London.

BRITISH STANDARDS INSTITUTION (2002). **Surface dressing – Test methods – Part 1: Rate of spread and accuracy of spread of binders and chippings.** *BS EN 12272-1.* British Standards Institution, London.

BRITISH STANDARDS INSTITUTION (2006). **Surface dressing – Requirements** *BS EN 12271:2006* British Standards Institution, London.

BRITISH STANDARDS INSTITUTION (2003) **Surface dressing – Test methods – Part 2: Visual assessment: Evaluation of homogeneity.** *BS EN 12272-2: 2003.* British Standards Institution, London.

BRITISH STANDARDS INSTITUTION (2002) **Aggregates for bituminous mixtures and surface dressings for roads, airfields and other trafficked areas.** *BS EN 13043:2002.* British Standards Institution, London.

BRITISH STANDARDS INSTITUTION (2009) **UK national guidance for the use of BS EN 13043 “Aggregates for bituminous mixtures and surface dressings for roads, airfields and other trafficked areas” PD6682 – 2: 2009.** British Standards Institution, London.

BRITISH STANDARDS INSTITUTION (2004). **Bitumen and bituminous binders – Determination of cohesion of bituminous binders with pendulum test.** *BS EN 13588:2004.* British Standards Institution, London.

BRITISH STANDARDS INSTITUTION (2005). **Bitumen and bituminous binders – Framework for specifying cationic bitumen emulsions.** *BS EN 13808:2005.* British Standards Institution, London.

BRITISH STANDARDS INSTITUTION (2002). **Bitumen and bituminous binders – Determination of efflux time of bitumen emulsion by the efflux viscometer.** *BS EN 12846: 2002.* British Standards Institution, London.

CARSWELL, J (1994). **The testing and performance of surface dressing binders for heavily trafficked roads.** *Department of Transport TRL Project Report PR 12.* Transport Research Laboratory, Crowthorne.

CSS, HEALTH & SAFETY EXECUTIVE and HIGHWAYS AGENCY (2002). **Guidance for safer temporary traffic management.** TRL Limited, Crowthorne.

RSDA/CSS **Code of Practice for Signing at Surface Dressing Sites** (2008) Road Surface Treatments Association, [www.rsta-uk.org/publications.htm](http://www.rsta-uk.org/publications.htm) .

DEPARTMENT OF TRANSPORT (2009). **Traffic signs manual, Chapter 8: Traffic safety measures for roadworks.** The Stationery Office, London.

DEPARTMENT OF TRANSPORT (2002). **Safety at street works and road works – A Code of Practice**. The Stationery Office, Norwich.

\* Current at time of publication; latest version to be used

HESLOP, M W, M J ELBORN and G R POOLEY (1982). **Recent Developments in surface dressing**. *The Highway Engineer*, pp 6-19, July 1982. Institution of Highways and Transportation, London.

HOUSE OF COMMONS (1974). **Health and Safety at Work, etc., Act 1974**. Her Majesty's Stationery Office, London.

HOUSE OF COMMONS (2002). **Control of Substances Hazardous to Health (COSHH) Regulations 2002** The Stationery Office, London.

HOUSE OF COMMONS (1991). **New Roads and Street Works Act 1991**. The Stationery Office, London.

HOUSE OF COMMONS (1994). **Construction (Design & Management) Regulations 2007**. The Stationery Office, London.

L J MILTON, M H BURTWELL and J C NICHOLLS (2001). **Review of protection provided by surface dressings and thin surfacings to structural pavements**. *TRL Report 496*. TRL Limited, Crowthorne.

NELSON, J R, and R HARDMAN (1980). **A guide to road surface dressing practice**. *Department of Transport TRRL Supplementary Report 627*. Transport and Road Research Laboratory, Crowthorne.

NICHOLLS, J C, and J CARSWELL (1997). **Trials of high-friction systems for highways**. *TRL Report TRL 125*. Transport Research Laboratory, Crowthorne.

NICHOLLS, J C, and D P FRANKLAND (1997). **The long-term performance of a surface dressing trial on A413, Amersham**. *TRL Report 261*. Transport Research Laboratory, Crowthorne.

ROAD SURFACE TREATMENTS ASSOCIATION (2011). **Code of Practice for Surface Dressing; Parts 1-9**. Road Surface Treatments Association  
[www.rsta-uk.org/publications.htm](http://www.rsta-uk.org/publications.htm) .

Dr JOHN READ & DAVID WHITEOAK (2003) **The Shell Bitumen Handbook – 5<sup>th</sup> Edition**. Shell Bitumen UK, Chertsey.

**APPENDIX D**

**DEPOT TRAY TEST**



