



Foreword

This first edition of the Code of Practice has been produced by the RSTA Preservation Sub-Committee to capture and illustrate best industry practice for penetrative asphalt preservation techniques. In this context Asphalt preservation is a process whereby a proprietary penetrating liquid is spray applied onto the bituminous bound surface course of a road pavement thereby sealing the surface in order to extend its service life. The preservative must be approved under the HAPAS scheme as detailed in the Specification for Highway Works, Clause 950 (Surface Preservation Systems) and should be used as per Highways Agency Area Management Memo No. 124/10.

Although this document currently focuses specifically on Penetrative Preservation Techniques, the intention is to incorporate other types of preservation techniques within this Code as they enter the market.

The information contained herein is intended to represent industry best practice. No liability is accepted by RSTA 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

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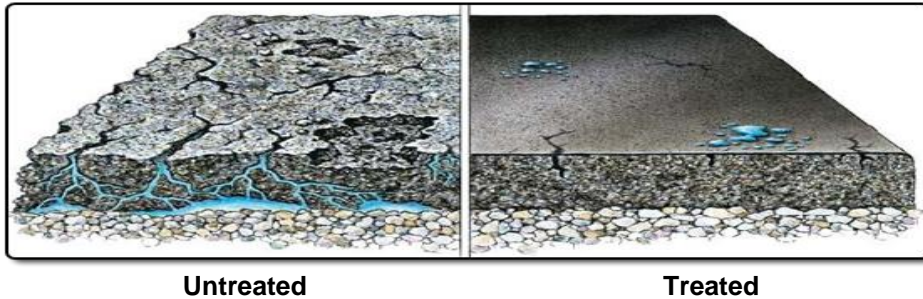
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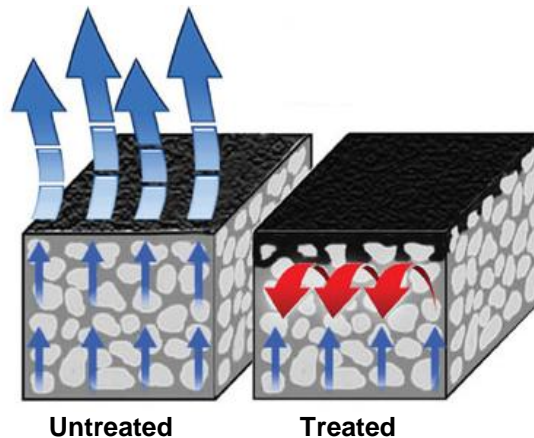
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1. PREAMBLE

The deterioration of a pavement which is structurally sound can be linked to oxidisation and evaporation of parts of the bituminous binder over time, its embrittlement and the subsequent ingress of moisture would accelerate that deterioration.



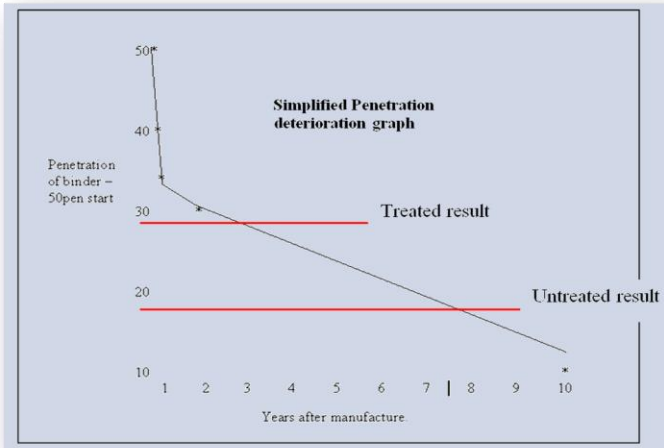
Penetrative Asphalt Preservation is the description given to a treatment which is designed to maintain the condition of the surface by preserving the intrinsic properties, as when treated, of the bituminous binder. It is a treatment which does not affect the texture of the surface and is designed to protect the binder properties by sealing in the bitumen's maltene fraction, thus preserving the life of the binder and slow down the rate of that deterioration.



The method is designed to create an impervious seal around the surface binder to prevent the ingress of moisture and any further oxidisation, and arrest aggregate loss.

1.1 General

For the highway engineer, Penetrative Asphalt Preservation offers an extremely quick and cost-effective method of prolonging the life of a pavement by maintaining the condition of the binder through sealing it against the ingress of moisture and also preventing further oxidisation of the binder. The nature of the treatment requires consideration to be given to several factors regarding the condition of the pavement and its structure, possibly including some technical evaluation of the properties of the surface course binder. Where used, this treatment is extremely rapid, requires minimal personnel and surfaces treated are re-opened to traffic soon after application.



• **Penetration Testing**

The treated section is exhibiting the softness of a three year old material.

This material was treated at approx. two years old therefore we see that the treating of this material has seriously retarded oxidisation.

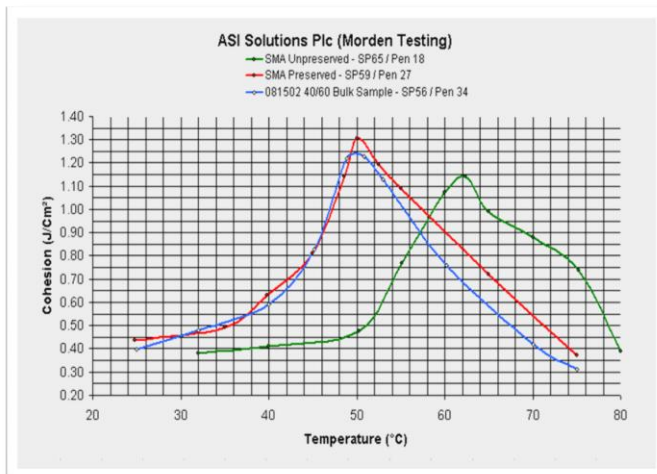
Five years after treatment, the material is exhibiting qualities that would indicate that it has only aged by one year.

Independent UKAS accredited laboratory studies have carried out a series of tests on roads which have treated areas and untreated areas and recovered bitumen from those areas have shown that sealing the road surface significantly delays the sign of ageing.

The skid resistance values of the surface to be treated must be above investigatory levels required for safety of traffic. The Preservation treatment may initially introduce a marginal drop in SRV but these will return to pre-treatment levels soon after application.

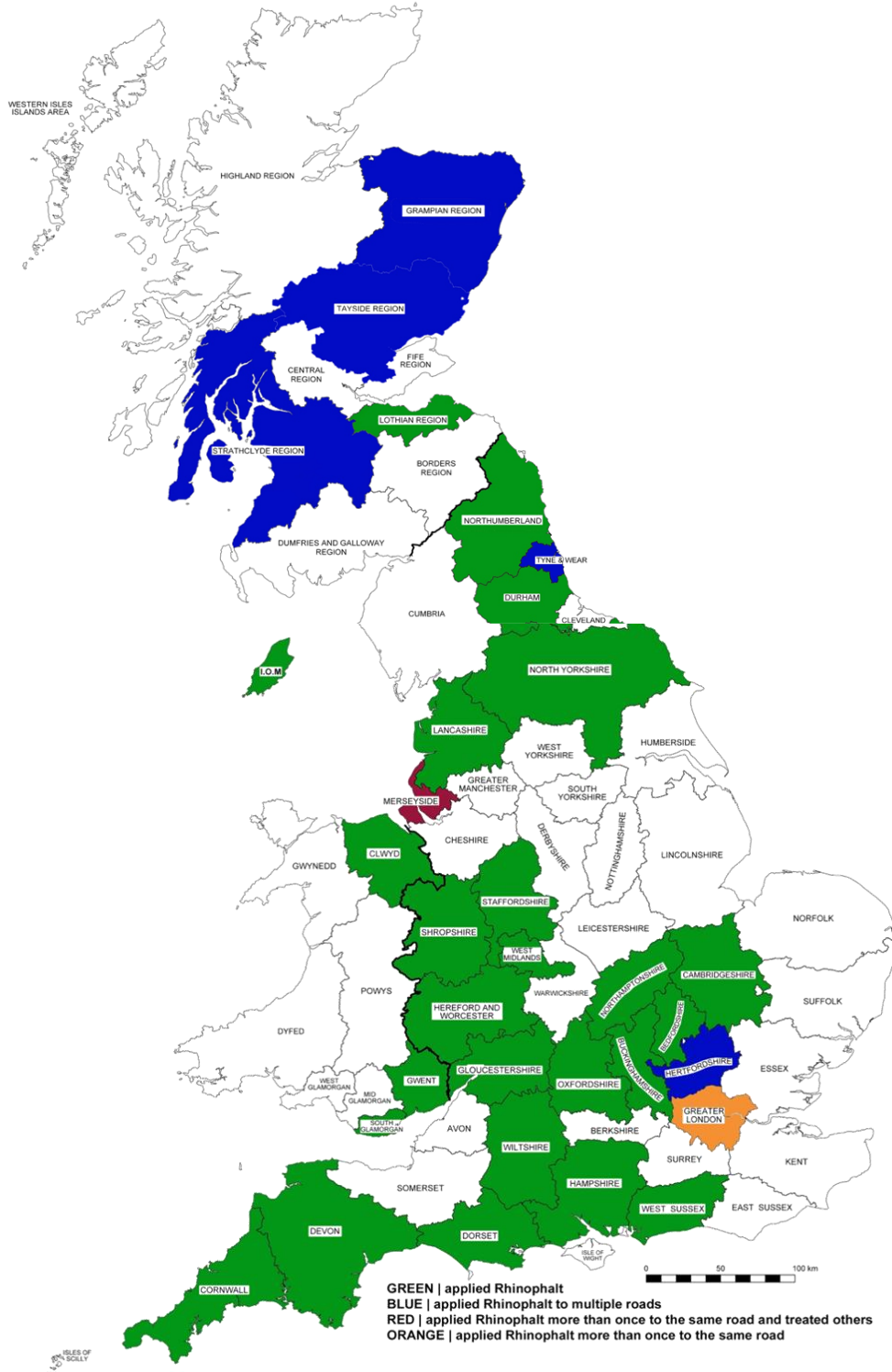
The commercial effectiveness of using Asphalt Preservation can be readily identified through looking at a Whole Life Cost Model and comparing the "programme" of conventional interventions and repairs that would be expected against a programme which uses Asphalt Preservation to extend the life of the pavement.

The purpose of this Code of Practice is to define the best means of achieving a successful project using an Asphalt Preservation treatment. It will assist in site selection and operationally how best to deliver the process.



Vialit Cohesion Testing Results

- The untreated material (green line on graph) is showing results compatible to a 7 year old binder recovered from open material
- By comparing the Rhinophalt treated sample (red line on graph) results against results obtained from other samples recently examined, the plot is very similar to that of a bulk sample taken from a delivery vehicle supplying 40-60 penetration grade surfacing course (blue Line).



Areas of the UK where Penetrative Asphalt Preservation has been used to date

Experience to date has shown that approximately 3.4 million m² of Penetrative Asphalt Preservation has been applied on the highlighted areas of the UK both on local authority roads as well as the trunk road network.

1.2 Health, Safety and Environment

All personnel involved in planning, preparing, execution and application of Asphalt Preservation 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 or will be affected by the works whilst in progress. This same duty of care is equally as applicable to any aftercare operations.

The planning and organising for health, safety and environmental issues must be considered as soon as an Asphalt Preservation programme is envisaged.

Asphalt Preservation operations will be undertaken under the framework provided in the Construction Design and Management Regulations 2007 (CDM). Clients are urged to follow the advice in the relevant Approved Code of Practice as they have the responsibility under the new version of the Regulations for initiating safe working practices.

The CDM Co-ordinator and Principal Contractor will plan and prepare the information and documentation necessary to ensure the specific hazards are identified on individual sites and the level of risk that is envisaged. This must take into account the nature of the site, the materials being used, the traffic management requirements and any special health, safety and environment issues that have become evident during the tender stage.

The client should employ a competent and approved 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 as 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 Asphalt Preservation 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. Disposal of waste and protection from spillage and contamination are other considerations when looking at the overall preservation activity.

1.3 Training

The execution of Asphalt Preservation is dependent on several factors and it is recognised that only a limited number of engineers have had any formal training in the specification and execution of the work. This lack of training can result in unsatisfactory preparation, incorrect rates of spread and

lack of traffic control and aftercare could lead to increased costs.

In recognition of this the intention is to incorporate Preservation treatments within National Highways Sector Scheme 13 (NHSS 13) which defines the minimum qualifications required for all personnel involved in the design, supervision and installation of Surface Treatments.

It is the Association's view that a competent qualified workforce makes a fundamental contribution to achieving high quality application. The RSTA runs regular training courses, details of which can be obtained from www.rsta-uk.org/calendar.

1.4 Quality Assurance

The Road Surface Treatments Association continues its commitment to quality assurance and has been instrumental in producing and managing Sector Scheme 13 for Road Surface Treatments.

The Association's Chief Executive, from whom further details are available, currently chairs the Sector Scheme Technical Advisory Committee.

Product used for Asphalt Preservation must be manufactured under BS EN ISO 9001.

The quality assurance of Asphalt Preservation is a UKAS accredited system operated by the British Board of Agrément under the Highway Authorities Product Approval Scheme (HAPAS). It comes in two parts, a system for the manufacturers of the products and one for the installers of the system; these may or may not be the same organisation. Installers must use HAPAS approved products. A Contractor approval element should be linked to the need for Contractors to operate under the guidance issued by the material manufacturer.

A key part of the system is in the use of trained and competent staff. A good working relationship between the client's supervisors who are knowledgeable about the process being installed, and the Contractors' staff and operatives is very helpful to a good installation.

1.5 Planning and Co-ordination

Careful and detailed planning before work commences is an essential element of successful Asphalt Preservation. There needs to 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 proceed.

Planning will also assist in the correct budgeting for the projects. Where possible accurate measurement of the area to be treated should be made and agreed by the client and the contractor. This measurement together with other factors such as time of day/night for delivery, type of traffic management etc. will ultimately govern the charges made for the service and avoid additional costs being incurred by both parties.

2. SITE SUITABILITY – THE DECISION PROCESS

In deciding whether Asphalt Preservation is appropriate for a particular project, it is necessary for the end-user to understand what needs to be achieved by the application and the limitations of the product.

The Client may consider the adoption of a preservation strategy starting at the construction stage and designed to maximise all of the benefits available in using the process.

Alternatively, short time life extension may be desired particularly where funding may be restricted and where traditional plane out and in-lay, or resurface interventions may not be the affordable option. In this case a single application of preservative may be considered as a means of extending

the service life of the surfacing course for at least 3 years or so, until such time as funding may be available for an alternate intervention.

Preservative treatments have been used successfully over the years in both circumstances, however; there is an investigatory process which must be undergone before deciding on the appropriate option.

In order to assist in deciding on the suitability of a project for preservative treatment, a Decision Tree Flow Chart has been formulated and is included as Appendix E. In all cases it will be necessary for a technical representative from the material supplier to inspect the proposed site. In many instances it may be necessary for some laboratory and/or on-site pre-testing of the existing material to be carried out. The steps towards making the decision as presented in the Decision Tree are outlined below.

2.1 Surface Binder Composition

Asphalt Preservatives will work on bituminous bound surfaces only. If the surface is cementitious or any other type of surface not bound by bitumen, then Asphalt Preservation is not relevant.

2.2 Site Location

Location of the site must be considered at this stage as under some circumstances preservation will not be possible. Principal exclusions due to practical and/or Health and Safety reasons are:

2.2.1 Any site that is not external, or any part of the site that is not external and open to the atmosphere i.e. tunnels, underground platforms, inside buildings etc. due to ventilation issues.

2.2.2 Small roundabouts where access issues and correct application rates will be a problem.

2.2.3 Severe Gradients where safety of operation and application issues will preclude the process.

2.3 Skid Resistance

In the first instance, it is important that current skid resistance data is available. It is usually the case with the high speed road network that recent data is available. Readings should be above investigatory level as there is usually a slight fall in skid resistance for a short time after application (the recovery timing is dependent upon traffic volumes). In all tested cases the skid resistance levels will always return to their original values. Should the skid resistance levels of a proposed treatment site be slightly below, or very close to intervention level, it may be possible to retexture the surface. Various methods of retexturing are available both mechanical and by utilising water pressure systems. However, should this option not be considered viable, then preservation should be discounted as a treatment option.

2.4 Visual Condition Index

The Visual Condition Index (VCI) is a method which may be used for determining the suitability of the pavement for preservative treatment. This involves a visual inspection of the surface in order to determine the state of deterioration present using a scale of 1 to 100 where 100 is as new condition. High definition video surveys with close up video capture of the material matrix and surfacing condition can be used to assist in the determination of the VCI of the surface. Due to the mapping capabilities of the process this can be very useful in comparing the condition at a later time with that taken originally. Where the surface course is in the first few years of its life the rating is usually very good and there would be little hesitation in recommending the process. In this condition all of the benefits of the process are available to the end-user and the recommendation would be for a preservation strategy involving multiple repeat applications over a longer period of time.

It is worth noting however, that if there are major signs of early life failure, then it is possible that there are material or workmanship problems and more extensive testing will have to be carried out to determine the extent of the problem before proceeding with preservation treatment. Depending upon the outcome of the tests, in some cases, it may still be possible to proceed and gain some extension to the surfacing life before further intervention is required. In this case a modified performance guarantee would be provided by the material supplier.

On an older surface one would expect that the VCI would be lower than that for a new pavement. In such cases, the extent of the defects should be recorded and remedial action taken to correct these defects before proceeding (such as sealing cracks, filling opening joints, repairing potholes, patching, structural issues etc). At this stage, a positive decision could be taken on preservation treatment especially if the requirement from the process is to simply delay the cost of resurfacing for the next few years. In such cases, it is recommended that at the end of this period the next intervention would be to resurface.

2.5 Binder Condition

One of the main benefits of the preservation process is to retard the deterioration of the binder within the surfacing course. If the binder condition is already poor, the process can only hold it in this condition at best. If the condition of the bitumen is suspect then binder recovery tests may be carried out to determine the state of its deterioration before taking any further decision. As a guide, where penetration values of the bitumen are lower than 15 dmm, then the long term benefits of a preservation strategy would be in doubt.

However, if the pressing need is only to prolong the life of the surface before a more major intervention, then, subject to other factors satisfying the decision process, it could be possible to proceed with an Asphalt Preservation treatment.

3. SITE INFORMATION

The person in charge of Asphalt Preservation operations on site is to be made fully aware of the extent of the work required including the need to ensure the pre-agreed control sites are not treated. Control sites are not applicable in all cases but where designated these are to enable post application monitoring and tests to be carried out to check the ongoing performance of the Asphalt Preservation treatment.

One means of achieving this is for a detailed map to be created which will be agreed by the contractor and the client utilising readily recognised markers as the guides to the areas. These markers could be marker posts, numbered lamp posts etc.

It is the responsibility of the person in charge to ensure all operatives are aware of the appropriate boundaries.

4. OPERATIONAL PLANNING AND TRAFFIC MANAGEMENT

The main considerations when planning the execution of an Asphalt Preservation project are detailed below. In all cases, it is important not to overlap consecutive runs by more than 50mm if possible. More than this will waste material and may adversely influence skid resistance recovery.

4.1 Width of Spraying Passes

To a large extent, the type of sprayer being used will drive the decision process as regards the spraying plan for a particular site. The traffic management plan for a given site and the type of closures provided will also be taken into account.

4.1.1 Motorways

Most frequently, though not exclusively, this work will be carried out during night shifts when traffic flows are light, which permits single lane traffic running. Under this type of closure on a 3 lane motorway it is possible to spray the hard shoulder, lane 1 and half of lane 2 with traffic running in lane 3 or the reverse. This option will be reduced by one lane in the case of a two lane motorway with hard shoulder.

Due to the need for a substantial safe working zone and the overlap required into adjacent lanes, this is practically the only solution on this type of carriageway.

With sprayers equipped with extending spray bars and grit delivery systems it is relatively straight forward to determine the application widths. With sprayers equipped with fixed gritting widths, more care has to be taken when deciding the application widths, to ensure optimum overlap of runs.

4.1.2 Dual Carriageways

For dual carriageways with hard strips to each carriageway it is possible to spray each lane under lane closure providing a satisfactory safe working area can be achieved.

Under these circumstances, care should be taken to overlap the centre line by the minimum amount required to satisfy safety requirements. As above, careful planning of the width of the first run needs to be made in order to achieve optimum coverage when using a sprayer with fixed width grit delivery apparatus.

Where a safe working zone cannot be achieved, road closures may be the only safe practical solution.

4.1.3 Single Carriageway Roads

In most cases in this category it will only be possible to safely execute the work under a road closure. When a closure is in force the lane width spraying plan is less important.

4.2 Materials Handling

Consideration must be given to the delivery, storage and transfer of materials with regard to a particular site.

On a large scale project, e.g. multiple shifts on a motorway; it would be preferable to secure a compound within easy reach of the site where all materials can be safely handled and refilling of preservative and grit can be carried out as required. Equipment can also be kept and serviced here when not in use. On smaller projects best practise is to re-supply preservative from mobile tanker if the scale of the project dictates. Alternatively one or more supply vehicles loaded with IBC's and bags of grit may be used. Refilling should be planned in a safe area off site if possible.

4.3 Traffic Management

In most cases for works on motorways and dual carriageways the Traffic Management on site will be carried out by the Client or by specialist sub-contractor. The schemes will need to take into account the considerations outlined in 4(a) above and comply with Chapter 8 of the Traffic Signs Manual, Traffic Safety Measures and Signs for Road Works and Temporary Situations Part1 and 2 and with all local rules that may apply.

When planning the project sufficient time will need to be allowed for any traffic orders that may be required to come into effect.

5. SITE PREPARATION

It is always necessary to carry out a degree of site preparation. The amount involved will depend on the condition and nature of the surfacing course in question. On certain sites it will be necessary to carry out some of this work in advance of the project start and the remainder during the application phase. It should be noted that elements of this work can be done in either phase for various reasons and this will be discussed in the relevant section following.

5.1 Surfacing Repairs

On some sites, especially those with more recently laid material, there will be no surface defects; on older sites this work can form a substantial item in its own right. This work will normally be identified by the Client and Contractor at time of site inspection.

Because of the time taken to effect repairs to the surface course, it is almost always the case that these works would be planned and executed prior to the application phase of the project. Infrequently, where for instance there are very few repairs on a particular project, and where programme time permits, then it may be possible to execute the surfacing repairs in advance of the spraying works during the application phase.

Remedials may be carried out by any approved method using bituminous-bound materials and when these are completed satisfactorily, preservative can be applied immediately if necessary.

5.2 Joint and Crack Repairs

Although minor cracking along joints and in general on the surfacing course will be sealed by the preservative, it will be necessary to repair more major instances by approved joint sealing methodology, or in severe cases by reconstruction. This work will normally be identified by the relevant parties at the time of site inspection and selection.

The remedial may be carried out prior to or during the application phase.

One technique that is frequently used on preservation projects is to place a narrow over-band of skid resistant hot-poured bituminous sealing compound onto the defect starting 20 minutes after commencement of spraying. Extra skid-resistance is supplied by simultaneously applying a measure of the same grit that is being used with the preservative onto the hot sealing compound. The adhesion qualities of the preservative provide an excellent bond resulting in a durable repair. This repair is particularly effective on extensive longitudinal joint defects.

5.3 Sweeping

It is necessary to clean all surfaces prior to application usually by road suction sweeper. This operation would normally be carried out by dry sweeping the surface prior to spraying during the application phase of the works.

In extreme cases of contamination, particularly on SMA or porous type materials it may be necessary to clean debris from the interstices of the surfacing course by approved pressure washing machinery. Due to the nature of this process, the wetting of the aggregate would preclude spraying of preservative on the same shift and it is necessary to carry out this operation prior to the application phase.

5.4 Masking of Road Markings and Studs

All road studs, Halifax / Stimsonite type or otherwise must be masked with suitable masking tape or other approved method prior to spraying at the start of the application phase.

Where road markings are not being replaced they should also be masked using similar means. In most cases the time constraints in masking the amount of lines involved in the area being sprayed will necessitate the over-spraying or re-screeding of road markings.

6. EQUIPMENT

6.1 Preservative Delivery

Asphalt preservation delivery vehicles are fitted with an adequate pumping system and either fixed or adjustable spray bars enabling the distance across the spray bar to be varied to cater for any changes in road width. This enables the spray bar to be operated from 0.1m up to its maximum width. It should be noted that to facilitate the best use of extendable spray bars, the method of gritting should allow for application width to be also variable in relation to the spray width.

Adjustable spray bars are available in two types:

6.1.1 Expandable: These can be expanded to the particular width required. Typical machines have maximum widths of 4.0m – 4.3m.

6.1.2 Extendable: These can be extended by bolting on extra sections.

Fixed width spray bars are available in several sizes. These are often mounted on smaller vehicles and are ideal for narrow roads, particularly housing estates, where manoeuvrability is essential.

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

6.1.3 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.

6.1.4 The spray bar 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.

Note: for the highest levels of accuracy, automatic speed control is required.

As it is essential that the correct amount of preservative is applied onto the road surface across the width of the spray bar, it is also necessary to check that all of the nozzles are working correctly.

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.

For asphalt preservation materials the spray bar is normally fitted with slot jets. The output from any jet is affected by both the temperature of the preservative and the spray bar pressure. The rate of spread of preservative on the road surface is additionally affected by the speed at which the applicator vehicle moves. Additionally, any restriction in an individual jet will impair its ability to deliver the correct amount of liquid to the required pattern.

Some machines are fitted with equipment that automatically adjusts the output from the spray bar to compensate for variations in the forward speed of the spray bar.

Filters are fitted in the pipe work feeding preservative from the tank to the spray bar to prevent any solid material reaching the spray bar 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. Where a jet is partially blocked, the shape of the spray from that jet will be irregular. It should be removed, cleaned and retested.

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 spray bar. For a spray bar 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 spray bar is operating correctly in a transverse direction, longitudinal distribution is normally controlled by the vehicle's forward speed.

The rate of spread of preservative over any section of road can also be calculated by comparing the area of the section treated with the amount of preservative used as determined by dipping the tank on level ground before and after the section has been treated. 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:

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

To be reliable, this type of carpet tile test must be taken with great care and accuracy. It should not be forgotten that weight losses take place immediately the preservative is sprayed onto the road surface. For this reason, it is recommended that the test should take place immediately.

The operating height of the spray bar is also important if the correct distribution rate is to be achieved. The operating height of any particular spray bar should be indicated on the chart carried in the driver's cab. It is good practice to check the height of the bar regularly and to make adjustments if necessary. With slotted jets, it is 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.

6.2 Grit Delivery

Abrasive grit graded between 0.8 and 1.2 mm is used with asphalt preservatives as a means of supplying initial skid resistance and providing an abrasive medium together with the action of vehicle movements to remove deposits of the preservative from the aggregate thus restoring the skid resistance to the surface of the pavement.

Consideration needs to be given to the amount of onboard storage of the grit. As similar amounts by weight of both materials are applied simultaneously, ideally the storage capacities for both components will be the same. Having a smaller capacity for grit than for preservative will mean more frequent stops to refill the grit and more down-time as a consequence.

Gritting apparatus is available in 3 types and in all cases is mounted to the asphalt preservative delivery vehicle and arranged so that the grit is applied to the surface immediately following the application of preservative.

6.2.1 Gravity Fed Systems

In this arrangement, grit falls by gravity through an adjustable gate which can be adjusted manually through a range normally varying between 0.2 and 0.5 grams per square metre according to speed. Unlike the preservative delivery, this operation is not controlled by onboard computer and so needs to be set to match the speed at which the vehicle is driven for a given rate of preservative application. In more sophisticated vehicles with extending spray bars, the grit delivery can also be extended to cover the area being sprayed. In systems without extending grit boxes, the maximum width of delivery of preservative is governed by the maximum gritting width.

6.2.2 Air Driven Systems

It is possible to blow the grit onto the surface using an arrangement whereby the grit is fed by gravity into the path of a stream of air provided by a large blower. The grit is forced down individual tubes and deflected by a disperser which scatters the grit evenly onto the surface of the pavement. One advantage of this system is that a very even distribution of the grit is provided without the less desirable pattern effect that can be generated by other systems. This method also allows for the quick addition/removal of delivery tubes making it easy to adapt the applicator to differing spray widths.

6.2.3 Rotary/Reciprocating Systems

On smaller application vehicles this method of applying the grit has been used to good effect. The grit is gravity fed onto either a rotating delivery disk/disks or into a reciprocating arm which in both cases throws the grit out onto the pavement. Disadvantages of this system are that it can be difficult to balance the volume of grit together with the width of application. The grit is usually dispersed in regular patterns onto the surface which leads to an uneven collection of the grit in the freshly applied preservative.

In all cases the correct amount of grit applied to the pavement is important in achieving the desired levels of skid resistance on the surfacing course. The rate of delivery should be calibrated using the methods described above for the preservative using trays instead of carpet tiles to capture the grit. This calibration will normally follow that for the preservative when the forward speed for correct application of preservative is known. The calibration will be carried out at this speed and adjustments made until the correct rate is achieved.

6.3 Ancillary Equipment

In order to carry out the preservation process, various other items of equipment will need to be used to service the operation. These are variously described below.

6.3.1 Preservative Delivery Vehicle

Preservative may be delivered by tanker or by IBC according to the requirements of the contractor. In all cases great care must be taken to avoid spills during the refilling operation. Where IBC's are used the applicator truck may be filled from the containers loaded on a flatbed truck with all discharge valves located facing outwards on both sides of the vehicle.

6.3.2 Grit Delivery Vehicle

Depending on the scale of the project this vehicle may be used solely for re-supply of grit or a combination of preservative-filled IBC's and grit. This vehicle will be supplied with a means of safely lifting the grit bags above the grit container on the application vehicle in order to discharge the grit into its container. Care should be taken at all times when carrying out this procedure with all due regard to the relevant safety rules for such an operation.

6.3.3 Hand Spraying Equipment

This is important for accurate placement of preservative in difficult areas or where small remedials may need to be carried out. It is normal to fit a hand lance with hose to the application vehicle to

facilitate this need. It is also possible to use a pressurised hand sprayer or motorised sprayer independent of the application vehicle if so desired.

6.3.4 Masking Materials

In most cases where preservative is being applied it will be necessary to mask off road studs, gully grates and occasionally road markings. Various proprietary materials including masking tapes and/or pre-formed templates as necessary can be used. Care should be taken to remove all masking after initial curing of the preservative.

7. MATERIALS

These specific cold applied Preservation Systems comprise a blend of petroleum based bitumen, diluents, plasticisers fortified with natural based bitumen, and with an application of a specific fine graded grit.

To facilitate the approval of a solvent based modified binder for Surface Preservation applications the Highway Authorities Products Approval Scheme (H.A.P.A.S.) has been introduced. The H.A.P.A.S. system will allow the testing and approval of a solvent based modified binder and grit for Surface Preservation applications.

Where solvent based binders are being used, although cold applied, precautions must be taken to minimise the risk of any potential explosion, or fire, arising from the use of such low aromatic volatile oils, having a relatively low flash point. These oils are mixed with blended base bitumen's, reducing the viscosity so that it is fluid at ambient temperatures for application.

8. METHOD OF WORKING

After all checks and the calibration of the equipment are complete and the appropriate site preparation has been carried out (see section 5 of this Code); the Asphalt Preservation work will be carried out to the following method:

Before the "site" start and with an operative giving assistance, accelerate the delivery vehicle up to working speed. This speed will be determined by the specification of the delivery vehicle and the on-board computer capability linking application rates to vehicle speed.

As the spray machine enters the work area, switch on the pump and grit applicator. The assistant operative shall confirm the machine is applying the preservative correctly.

Spray uniformly across the area giving a full application of preservative, the assistant operative shall check for gaps or thin areas and note these as they may require a further application.

If the site width is such that more than one run is needed then the vehicle can work back towards the exit of the site but needs to avoid running over treated areas. The adjustable spray bar or selective spray nozzles need to be set before entering the site.

While the preservative is allowed to cure it is recommended all the equipment can be cleaned in preparation for leaving site.

Once the agreed drying time is completed the follow up actions of lining and longitudinal joint filling (where required) can be started. This work can be commenced before the time agreed as required for full curing of the preservation material. Similarly any masking materials are to be removed before the site is re-opened.

Where instructed by the Client, tests for skid resistance value (SRV) may be conducted on the finished repair before the area is opened to traffic. These tests shall be conducted in accordance with TRRL Road Note 27 and Texture Depth to BS 598-105: 1990.

9. POST APPLICATION AND AFTERCARE

The nature of Asphalt Preservation treatments means that once properly cured there is little adverse effect on the surface characteristics. After a period of time the action of traffic and grit will abrade the surface, restoring SRV's to original levels.

Other activities which may need attention post application but before opening would be;

9.1 Any areas which should have been sprayed by the applicator, but missed, should be completed by means of hand spray equipment.

9.2 All masking material should be removed as soon as possible after spraying (usually with 30 minutes) and before the road is opened to traffic. Once lifted, the masking material should be removed from the site for appropriate disposal.

It is recommended that there is an annual visual inspection carried out on the site by both the client and the contractor (or the material manufacturer).

As a further check it may be considered that tests be carried out on the properties of the binder at 1 or 2 yearly intervals in order to ascertain how effective the treatment has been and also gain an indication whether a further treatment may be beneficial.

10. DIVISION OF RESPONSIBILITY BETWEEN THE CLIENT AND THE APPLICATION CONTRACTOR

Arrangements between the Client and application contractor will vary depending on the scope of the project and as determined during preliminary discussions between the two parties. Examples of divisions of responsibilities are listed below:

10.1 A contract in which the contractor is entirely responsible for the booking of highway occupancy, supply of all the necessary traffic management, labour, plant, supervision, materials and subsequent road marking operations. This may also cover supplementary operations such as road repair and jointing.

10.2 As in 10a above but excluding road space booking and the provision of traffic management, supplementary operations and road marking operations.

10.3 Supply of labour, plant and materials only.

10.4 Any combination of the options in 10a above as decided in preliminary discussions.

There will always be an element of responsibility on the Client to provide information on the condition of the surface from available records as discussed in section 2 and 3 of this COP.

The influences of weather will affect the process. It is standard practise between the two parties to arrange for the studying of the latest weather forecast at an agreed time prior to the project start time and to jointly agree as to any postponement that may be necessary as a result of such a forecast.

REFERENCES

MANUAL OF CONTRACT DOCUMENTS FOR HIGHWAY WORKS
VOLUME 1: SPECIFICATION FOR HIGHWAY WORKS SERIES 900
Road Pavements – Bituminous Bound Materials

HIGHWAYS AGENCY AREA MANAGEMENT MEMO No. 124/10
The Use of Pavement Preservation Materials Issue Date 15th April 2010

BS EN 1426:2000
Needle Penetration Test

SHW Clause 950 August 2008
Surface Preservation Systems

SHW Clause 957 August 2008
Vialit Pendulum Cohesion Test

CONSTRUCTION DESIGN AND MANAGEMENT REGULATIONS 2007 (CDM)

TRAFFIC SIGNS MANUAL CHAPTER 8
Traffic Safety Measures and Signs for Road Works and Temporary Situations Part1 and 2

TRRL ROAD NOTE 27/69
Determination of SRV

BS 598-105: 1990
Methods of test for the determination of texture depth

APPENDIX A

GLOSSARY

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).

DISTRIBUTOR VEHICLE

A tanker or similar vehicle fitted with a spraybar through which the preservative is applied to the road surface.

BITUMEN

A hydrocarbon obtained by distillation of crude oil used in this context as a binding agent for road surfacing materials

BITUMEN – MODIFIED

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”.

CARPET TILE TEST

A test used as a means of checking the amount of preservative 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 preservative delivered to the road surface is calculated and compared with the rate of spread specified.

CLOSE-TEXTURED/GRADED

A description of the grading of an asphaltic concrete type material.

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.

CURING TIME

The length of time taken before the preservative treated surface can be accessed.

DISTRIBUTOR

An abbreviation for binder distributor.

GRIT

Aggregate used to provide initial skid resistance to the road surface and to abrade the preservative from the surface together with the action of traffic.

GRIT APPLICATOR/SPREADER

The device by which a measured amount of grit is applied onto the road surface.

JET

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

LONGITUDINAL JOINT

The interface formed between adjacent surfacing layers when laid.

MASKING

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 uncontaminated with preservative

MODIFIED BINDER

A binder in which the original properties of the base binder have been altered by the addition of "modifiers".

OPEN TEXTURED

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

OVERLAP

The amount by which each pass of the spray bar overlaps a previous pass.

PASS

A longitudinal run by the application vehicle spraying preservative at a chosen width.

POLISHED STONE VALUE (PSV)

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

PENETRATION VALUE

A measurement of the hardness of bitumen

PRE-PATCHING

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

QA

An abbreviation for Quality Assurance.

QUALITY ASSURANCE

A registration given to a contractor or to a product, under a scheme administered by the Department of Trade and Industry, through its agencies.

SECTOR SCHEME

A Quality Assurance Scheme document used in highways construction and maintenance.

SKID RESISTANCE VALUE (SRV)

The measured value of resistance of the road surface to skidding

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 that is fitted to the tanker and through which the binder is applied to the surface via jets.

SPRAYING PLAN

The decision taken on the widths and number of passes of preservative that will be applied to the carriageway in order to achieve the optimum coverage with due regard to safety and economy.

STORAGE AREA

The area designated for safe storage (on or off site) of materials to be used in the preservation process

STRIPPING (BINDER)

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

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.

TRAY TEST

A test where a shallow metal tray, usually between 200 and 300 mm square and about 10 mm deep, is placed on the road surface to calibrate the level of grit being applied.

VISUAL CONDITION INDEX (VCI)

A means of evaluating the condition of a pavement by visual inspection.

APPENDIX B

CHECKLISTS

Pre-Application Checklist

The following points should be considered prior to the commencement of the project:

- 1 All operatives have received the appropriate training.
- 2 Traffic control is correctly and safely organised.
- 3 All relevant site information is available e.g. start/end points, refilling location, site specific information.
- 4 Required rate of spread of preservative and grit is known.
- 5 Pre-sweeping operation organised.
- 6 All necessary masking materials are available.
- 7 Correct and adequate plant has been allocated as required for the project.
- 8 If required, are there arrangements in place for additional preservative/grit to be supplied?
- 9 Have the preservative and grit delivery systems been checked and calibrated?
- 10 If applicable, is there a chart in the application vehicle that will enable the correct rate of spread relative to the speed of the vehicle to be achieved?

On Site Pre-Start Checklist

- 1 Traffic management is correctly in place.
- 2 Operatives are wearing the relevant Personal Protection Equipment.
- 3 All operatives are aware of the planned method of traffic management.
- 4 All operatives are aware of the planned method of operation
- 5 Driver is aware of spraying plan.
- 6 Driver informed of the rates of spread required.
- 7 The surface is clean and dry.
- 8 Pre-patching/jointing if relevant is complete and satisfactory.
- 9 Road is clear of parked vehicles or any other obstructions.
- 10 All necessary masking of road studs and street furniture has been carried out.
- 11 All plant/tools on site and in safe working order.
- 12 Sufficient preservative and grit available at the storage area.
- 13 Spraybar at correct height.
- 14 Current weather conditions appropriate.

On-Site Post Application Checklist

- 1 Preservative has been correctly applied to all agreed areas.
- 2 The preservative has cured sufficiently for opening to traffic.
- 3 All road markings have been reinstated.
- 4 All masking has been removed.
- 5 All plant and equipment and materials are off site or in safe pre-determined locations.
- 6 Any agreed advisory signing is in place.
- 7 All data recorded as necessary.

Post Application Checklist

- 1 Site inspected for compliance after opening to traffic.
- 2 All data recorded filed for future reference.
- 3 Date of annual inspection logged.

APPENDIX C

ASPHALT PRESERVATION DECISION TREE

