Descriptions of Road Surface Treatments

**Surface Dressing**

Surface Dressing is a long established proven highway maintenance technique. In simple terms it involves the even spray application of an emulsion bituminous binder through a purpose built spray tanker onto the existing road surface followed immediately by the even application of aggregate chippings to ‘dress’ the binder. Surface dressing offers many advantages;

- Seals the road surface against ingress of water which is known to be one of the major causes of asphalt pavement deterioration.
- Arrests the deterioration of the road surface and underlying road pavement structure.
- Restores the necessary level of skid resistance to the road surface with the resultant benefits of reduction in skid related traffic accidents.
- Timely intervention will enable worn out road surfaces to last longer thereby increasing the time to when structural maintenance is required.
- Can help to reduce spray caused by vehicles travelling on wet road surfaces.
- Maximises the cost effectiveness of limited highway maintenance funds.

**When to Surface Dress**

- Surface Dressing is seasonal and must be done between April and late August ideally.
- Before the road surface deteriorates to the stage at which expensive major patching and/or reconstruction is required. Site selection is very important.
- Before surface skidding levels fall below the nationally accepted intervention level for the class of road in question.

**Cost effectiveness**

- Low initial cost - in the region of £1.50 m² for routine single dressings to £2.50 m² for specialist multi-layer dressings for high speed roads.
- Low cost/life index. When done properly, at the right time, surface dressing is a very cost effective treatment.
- The product can be likened to painting one's house. It needs doing before deterioration occurs and means that expensive preparation or replacement is not required.

**Which roads can be Surface Dressed?**

- All classes of road, from single track, unclassified roads and footpaths to national high speed motorways can and have been successfully treated.

**Some important considerations**

- Surface Dressing can be specified in accordance with The Specification for Highway Works Clauses 919 (Recipe) and 922 (End Performance). DLO’s tend to work to clause 919 whereas contractors generally work to Clause 922 and take full design responsibility and provide a performance guarantee.
- The dressing required must be designed for the conditions of the road surface on which it is to be laid and the traffic expected on it. The latest version of Road Note 39 (7th Edition 2016) provides guidance on all aspects of design. The RSTA
run regular training courses on surface dressing covering tuition on design. For course details visit www.rsta-uk.org/calendar.

- The work should be carried out by a fully experienced contractor who can demonstrate that he has a record of quality work. All RSTA surface dressing member companies are accredited to BSEN ISO 9001 Standard for Quality Management Systems and have achieved registration to National Highway Sector Scheme 13 for The Supply and Application of Surface Treatments onto Road Surfaces. Clients are urged to specify such quality accreditation requirements in their Contract Documents.
- Surface dressing emulsion binder technology has developed enormously over the last 30 years. It is important to specify the binder quality required to give the optimum end product performance. Failures will be minimised by proper binder selection.
- Good "aftercare" is essential. This, together with the correct design and binder specification, will minimise any loose chipping problem.
- The Code of Practice for Surface Dressing is available from RSTA and covers every aspect of the process and should be regarded as representing industry best practice. There is also a joint ADEPT/RSTA Code of Practice on Traffic Management and Signage relating to Surface Dressing works at www.rsta-uk.org/publications.htm.

Environmental considerations
- Surface dressing minimises the use of scarce national aggregate resources – most of the aggregate used is in direct contact with the vehicle tyre, not buried below the road surface.
- Accident levels will be reduced by restoring adequate skid resistance.
- By careful design ‘quiet’ surface dressings can be installed to reduce road noise generated by traffic.
- The rapid speed of the process means that disruption to road uses, local businesses and emergency services is minimised. A well trained and experienced crew can install up to 40,000 m2 per day during the summer months.
- Compared to re-laying hotmix asphalt, surface dressing provides a very low carbon footprint solution typically at least 4 times less embodied carbon compared to asphalt.

Life expectancy
- Proper attention to design and execution has provided surface dressing lifetimes well in excess of 10-15 years, even on very heavily trafficked sites.

Summary
- Surface dressing is an established, proven process. It is an extremely cost-effective surface maintenance treatment when properly designed, specified and executed.
- Developments in surface dressing materials, techniques and equipment and improved operator training mean the risk of failure has been significantly reduced.
- Surface Dressing helps over stretched highway budgets stretch even further.
High Friction Surfacing

High Friction Surfacing (HFS) has a long history of proven use in saving lives by imparting the highest level of skid resistance onto a road surface. High Friction Surfacing is available as hot or cold applied systems. The cold applied technique involves the even application of a tough polymeric liquid binder onto the road surface followed by the application of calcined bauxite aggregate. The hot applied systems involve the application of a hot pre-mixed material consisting of binder and calcined bauxite.

The concept was first investigated in the USA during the 1950's using epoxy resin binders and was first known as "Anti-skid Surfacing". In the UK, the first evaluation trials were conducted in 1967 for the Greater London Council. The study over a period of 12 months demonstrated a 50% reduction in accidents and casualties on roads treated with High Friction Surfacing.

The use of High Friction Surfacing was fairly limited in the 1970’s due to its relative high cost and limited highway budgets. Applications grew steadily in the 1980’s when Highway Engineers could balance the cost of High Friction Surfacing against a broader savings strategy. Effectively, budgets were allocated for Accident Investigation and Prevention, demonstrating returns on the investment in High Friction Surfacing at Accident Black Spots compared with the savings in casualty reduction.

The growth of High Friction Surfacing accelerated in the late 1980’s and early 1990’s, largely in parallel with the Traffic Calming Act and the development of alternative resin processes to the original epoxy resin systems.

When to Use High Friction Surfacing

- On sites where there is high risk of accidents resulting from collisions between vehicles or between vehicles and pedestrians e.g. on approaches to pelican crossings, roundabouts, junctions and crossings.

Cost effectiveness

- Tragic loss of life or serious injury has an immeasurable cost to the accident victims, their families and friends.
- Financially, there are major cost consequences for emergency services, local and national governments. It is estimated that one fatality on a non-motorway road costs £1.4M and on a motorway £1.7M.

Which roads can be treated with High Friction Surfacing?

- All classes of road, from single track, unclassified roads to high speed urban routes, trunk roads and motorways can and have been successfully treated.
- High Friction Surfacings can be specified in accordance with The Specification for Highway Works Clause 924.

Some important benefits and features

- Designed to enhance the skid resistance of trafficked surfaces.
- A high strength veneer surfacing, typically 3-5mm thick.
- Durable able to withstand high braking and shearing forces.
- Should only be applied onto sound substrates that have been well prepared and are in fair to good condition.
- Accredited for substrates with a texture depth up to 2mm.
- All HFS systems have HAPAS certification (Highway Authorities Product Approval Scheme).
• All HFS installers are approved under the HAPAS scheme.
• HAPAS "Type 1" High Friction Surfacing is the highest classification attained ("Type 3" lowest classification).
• The Design Manual for Roads and Bridges deals with the design standards for Highways. The relevant standards for High Friction Surfacing in these documents are:
  o HD37/99: High Friction Surfacing
  o HD28/04: Skid Resistance

**Environmental considerations**
• Accident levels will be reduced by imparting the highest attainable skid resistance.
• The rapid speed of the process means that disruption to road uses, local businesses and emergency services is minimised.

**Life expectancy**
• Careful attention to material selection and installation has provided service lifetimes of typically 8 – 12 years. The BBA published a report of the service life of HFS systems in 2016.

**Summary**
• High Friction Surfacing is an established, proven process for saving lives by imparting the highest level of skid resistance onto any road surface.
• It is a cost effective solution when compared to the value prevention by avoiding collision related fatalities.
• Installed by specialist companies and organisations.
• Requires well trained operatives and specialist plant.
• Suitable for all vehicular traffic.
• Adaptable to cycleways or pedestrian surfaces.
• Commonly referred to as "Anti-skid" Surfacing.

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**Slurry-Micro Surfacing**

**What is Slurry-Micro Surfacing?**

These materials are cold-applied, thin bituminous surface courses incorporating bitumen emulsion and fine graded aggregate with fillers.

**What are they used for?**

These materials can be used to restore the surface condition on roads, footways, cycleways, car parks, playgrounds, central reservations, traffic islands, amenity areas.
Is there a difference between Slurry and Micro Surfacing?

Slurry Surfacing is normally a single coat application laid mechanically or manually up to a dried film thickness of 6mm.

Micro-surfacing incorporates a polymer modified bitumen emulsion and is often a two-coat application and can be laid mechanically or manually to a maximum dried film thickness of 15mm. These materials are usually referred to as Micro-Asphalts.

What are the benefits?

- Rapid curing characteristics – Able to receive traffic within twenty minutes.
- High daily output means less traffic disruption.
- Restores surface texture and improves skid resistance.
- Impervious membrane prevents ingress of water into the pavement structure.
- Seals and preserves existing surfaces.
- Suitable for overlay on wide range of existing surfaces.
- Micro-surfacing has the ability to reshape and re-profile existing surfaces.
- Able to provide smooth or textured finish.
- Can be available in a limited range of coloured finishes.

When to Use Slurry-Micro Surfacing

- Before the footway or carriageway surface deteriorates to the stage at which expensive major patching and/or reconstruction is required.
- Before surface skidding levels fall below the nationally accepted intervention level for the class of road in question.
- When the road surface profile needs minor restoration.

Cost effectiveness

- Typically in the region of £2.50 m² for Slurry surfacing and £4.50 m² for Micro-Surfacing plus extra if the work involves surface course regulating and ironworks.

Where can Slurry-Micro Surfacing be used?

- Slurry surfacing is ideal for any type of surfacing receiving mainly pedestrian traffic e.g. footways and cycleways.
- Micro-Asphalts are ideal for use on urban roads and roads carrying up to 250 commercial vehicles per lane per day.
Some important considerations

- Slurry-Micro Surfacings can be specified in accordance with The Specification for Highway Works Clause 918.
- The Slurry-Micro surfacing must be designed by the contractor to meet the requirements of the road surface on which it is to be laid.
- The work should be carried out by a fully experienced contractor who can demonstrate that he has a record of quality work and has a CE mark for the product.
- All Slurry-Micro Contractors who are members of RSTA have achieved registration to National Highway Sector Scheme 13. Clients are urged to specify such quality accreditation requirements in their Contract Documents.
- Good "aftercare" is essential. This, together with the correct material design will minimise the risk of early life failure.

Environmental considerations

- The rapid speed of the process means that disruption to road uses, local businesses and emergency services is minimised.

Life expectancy

- Careful attention to material design and installation can provide a typical service life of 10 years for micro-surfacings laid on heavily trafficked sites. Footway slurry surfacings are known to last beyond 15 years.

Summary

- Slurry-Micro Surfacing is an established, proven process.
- It is an extremely cost-effective surface maintenance treatment when carefully designed, specified and executed.
- Developments in materials, techniques and equipment and improved operator training mean there is a very low risk of early life failure.

Re-texturing

Retexturing is described in the Design Manual for Roads and Bridges (DMRB) as the mechanical reworking of an existing surface to improve its frictional characteristics and hence its skid resistance.

Apart from improving road safety and addressing the issues that the government’s casualty reduction targets introduce, the re-use of existing road surfacing materials will considerably reduce the attendant energy consumption in quarrying, processing, laying new road surfacing materials and waste removal. By extending the life of existing surfaces and by making best use of what you’ve got, the conservation of substantial quantities of irreplaceable high quality aggregate is ensured. Retexturing also results in a significant reduction in carbon emissions. Even several repeat treatments would not generate the same carbon footprint as one layer of hot mix asphalt.
When to Re-texture

- Before surface skidding levels fall below the nationally accepted intervention level for the class of road in question.

Cost effectiveness

- Low cost/life index. If roads are treated at the right time, Retexturing is a very cost effective treatment.
- Non-trafficked areas and surface markings are avoided, further minimising works costs.

Which roads can be Retextured?

- All classes of road can be treated.

Some important considerations

- Restores the necessary level of skid resistance to the road surface with the resultant benefits of reduction in skid related traffic accidents.
- Roads can be treated even in wet conditions.
- Timely intervention will enable road surfaces to last longer thereby increasing the time to when structural maintenance is required.
- Maximises the cost effectiveness of limited highway maintenance funds.
- Rapid treatment thereby minimising disruption to the road user, local businesses and emergency services.
- Only treats the surface aggregate.
- A consistent skid resistant finish is achieved.

National guidance on Retexturing is contained within The Design Manual for Roads and Bridges, Vol. 7 Pavement Design & Maintenance, Surfacing & Surfacing Materials
  - HD37/99, Retexturing (Bituminous)
  - HD32/16, Retexturing (Concrete)
- The work should be carried out by an experienced contractor who can demonstrate that he has a record of completing quality work.
- There are various different types of retexturing processes but they are not the same so it is important to select the correct technique for the job in hand.
- The suitability and effectiveness of a particular retexturing process depends largely on the type and condition of the existing road surface.
- The durability of the treatment is also a function of aggregate quality and again the condition of the existing surface.
- Treatments on sound surfaces can;
  - Increase both skidding resistance and texture depth.
  - Increase skidding resistance but reduce texture depth.
  - Increase texture depth with little effect on skidding resistance.

Environmental considerations

- Effectively 100% in-situ recycling, environmentally friendly.
- Uses no additional materials – no aggregates or binders are used.
- Accident levels will be reduced by restoring adequate skid resistance.
- The rapid speed of the process means that disruption to road uses, local businesses and emergency services is minimised.
- Compared to re-laying hotmix asphalt, retexturing provides a very low carbon footprint solution.
- Generates minimal if any waste.

**Summary**
- Retexturing is an established, proven process. It is an extremely cost-effective environmentally friendly surface maintenance treatment when properly designed, specified and executed.

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**Asphalt Reinforcement using Geosynthetics & Steel Meshes**

Geocomposites are increasingly being used as a means of extending the life of existing or old road surfaces across Europe. The system can be used in conjunction with a surface dressing technique for short to medium term benefits, in the reconstruction of existing roads following the milling/planning process to remove the top surface or in new construction where the benefits can be designed in to the project.

Many advantages include:

- Reduction in reflective cracking and aids stress relief in the surface.
- Provides an effective seal to prevent the penetration of water and oxygen to the lower levels of the pavement construction.
- Strengthens the road and resists rutting.
- Extends the life cycle of the road surface and reduces maintenance costs.
- Improves the bond between adjacent layers or between old and new surfaces.
- Increases chemical resistance to road salt and other damaging products.

**When to use the technique**

Geosynthetics and Steel Meshes can be employed at the initial design stage of a road leading to improved life cycle costing and extended design life for the construction.

The technique can be applied as a maintenance or repair method in conjunction with surface dressing or after planning has taken place to remove the surface course.
Cost effectiveness

The initial cost is low when measured against the long term benefits.

A typical cost of £8 per m$^2$ for the supply and installation of the product should extend the life of the road by at least a factor of 2.

Other considerations

Installation must be carried out by an experienced contractor registered to National Highway Sector Scheme 13 whose methods are approved by the manufacturer of the Geosynthetic or Steel Mesh being proposed.

Road planing/milling must be carried out to the required standard before the approved installer can proceed.

The surface to receive the treatment must be clean and free from dirt, dust or vegetation and thoroughly swept to ensure no loose material remains.

All ironwork must be protected with an approved spray or tape.

Any cracks exceeding 4mm wide or pot holes should be filled with a suitable asphalt or bitumen material.

A regulating course may be required if the surface is of poor quality.

A bond coat must be used and applied via a calibrated sprayer or otherwise as agreed.

The calibrated sprayer must be in good working order and should be certified showing that it has been tested within the last twelve months and conform to BS1707 Hot Applied Binder Distributors for Road Surface Dressing.

The rate and accuracy of the distribution of the bond coat should be checked at the commencement of work by means of a carpet tile test in accordance with BSEN 12272-1:2002.

Laying the geosynthetic or steel mesh must be done with a purpose made applicator to ensure the material is laid under tension to help adhere the membrane into the bond coat. There must be no creases or wrinkles.

The selected geosynthetic must comply with BSEN 15381.

Lapping must comply with meet the manufacturers and installers guidelines.

All operatives must be well trained and competent in the laying of the product and possess an NVQ Level 2.

Environmental considerations

The extended service life of the pavement will reduce the carbon footprint of a scheme. The technique is quick and does not delay any other associated trades.
The products are able to be recycled at the appropriate time and where appropriate the resultant planning may be reused.

**Summary**

Across Europe this technology is widely accepted.

Investment at the front of a scheme can bring about real cost benefits and environmental bonuses over the life cycle of the road in question.