




ROADING NEW ZEALAND

BUILDING AND MAINTAINING NEW ZEALAND'S LAND TRANSPORT INFRASTRUCTURE

ROADING NEW ZEALAND

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FIRST COAT SEALING ON A STABILISED BASECOURSE

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1. Introduction

The intention of this technical note is to give additional guidance to the practitioner that is tasked to determine the amount of bitumen and diluents required for a seal design on all types of stabilised basecourse pavement surfaces. This technical note is also intended to provide recommendations on industry "best practice" in addition to the guidance given in "Chipsealing in New Zealand" [1].

Sealing a basecourse treated with cement or lime requires different measures to those of sealing a foamed bitumen basecourse. Therefore these are dealt with separately below.

2. First Coat Sealing On Foamed Bitumen Stabilised Pavement Layers

A foamed bitumen stabilised (FBS) basecourse is constructed by mixing 2.5 to 3.5% bitumen (usually 80/100 penetration grade), and 1 to 2% cement with basecourse aggregate usually by means of an in-situ process. For more information on this process refer to the Roading New Zealand Technical Note 001 "Foamed Bitumen Treated Materials" [2].

Foamed bitumen stabilisation is often undertaken on lower quality or aged materials where the fines content may be considerably higher than a premium unbound aggregate. This makes FBS treated basecourse relatively impermeable and the finished pavement surface often becomes slightly bituminous and "fatty". The treatment process also coats the fine particles effectively immobilising them so that they cannot be transported or "pumped" in the event of saturation, meaning that FBS treated pavements tend to be more water resistant. Consequently, the main purpose of the seal is to provide a good wearing course and texture for purposes of skid resistance rather than waterproofing the basecourse.

Prior to the application of any surface treatments the pavement should be maintained in a well broomed condition with a slightly damp surface to ensure that no loose fines are present that could impair adhesion. Common causes of flushing in the wheel-paths on FBS pavements are due to sealing the pavement when it is too damp, failure to remove excess fines from the surface, or allowing insufficient time for the pavement to cure, resulting in embedment of the sealing chip into the basecourse surface. Where a FBS surface with a good mosaic finish is presented a very good bond is achieved and delamination of seal coat(s) is very rare. Post construction investigations of FBS basecourses have confirmed that the seal coat bond is very difficult to separate from a well prepared pavement surface.

As for any pavement surface, whether it be unbound, modified or stabilised, it can be beneficial to use traffic through the site to provide rubber-tyre finishing to assist in the removal of any excess fines from the surface prior to applying the wearing course. Good practice is to use an angular (sharp) chip running course to “cut” the fines from the surface to reveal the stone mosaic beneath and ensure the removal of caked fines from the surface. However, traffic needs to be managed to avoid wheel tracking on the ‘green’ basecourse with plenty of lateral movement and control of vehicle speeds. Regular supplementary drag-brooming will also assist in achieving a stone mosaic surface. Even with these preparation methods, a typical NZTA B / 2 stone mosaic surface may not be achieved for FBS basecourse in many instances due to the finer grading curve.

It is recommended that sufficient time is provided for the FBS layer to cure prior to placement of the first coat seal, otherwise the sealing chip can ‘punch’ into the top of the layer. Generally 48 hours is more than adequate to present a robust surface. However, curing time can be affected by the ambient air temperature, presence of active filler and FBS material properties.

Where busy intersections or turning traffic are operating on fresh FBS basecourse it is prudent to protect the curing surface with some running course to avoid ‘scuffing’.

When compared to unbound granular pavements, FBS treated pavements inherently produce a more impermeable surface which reduces their absorption ability. This can affect the penetration of binder / diluents into the surface. Therefore, the seal design and binder recipe need to reflect this condition to avoid later problems such as flushing.

The following points should be noted when chipseal or asphalt surfacings are applied to FBS basecourse materials.

- It is important to ensure that the degree of saturation of the upper portion of the layer is below 70% prior to surfacing. This can be difficult to measure with a nuclear density gauge (NDM) due to the presence of bitumen being 'read' as water by the gauge due to their similar specific gravity. Therefore the raw NDM moisture results will be high and need to be adjusted by using analytical data gathered from previously treated FBS sites, or by carrying out on-site moisture tests using the microwave method. It is also important to ensure that the surface is not too dry prior to surfacing.

- Kerosene (diluent) content of the first coat seal binder should be reduced by two parts per hundred. This will stop the softening of the top 10mm of the FBS layer and prevent chip embedment, while still allowing sufficient kerosene to promote adhesion of the binder to the stone.

- The binder application rate of the first coat seal should be reduced by 10 to 15 % in the wheel tracks. However, care is needed to ensure that there is sufficient binder for the seal coat to maintain its integrity.

- The main objective of the seal is to protect the basecourse from wear and ravelling as, unlike an unbound granular basecourse, FBS fines are immobilised against movement / pumping. On this basis maximising bitumen content for waterproofing is not the critical factor. The designer's main objective needs to be to avoid excess binder that could cause flushing or flooding of overlying asphalt (if utilised).

- Where emulsion is used for the first coat seal, the residual binder application rate should be reduced by 10 to 15%. For emulsion first coat seals, a key concern is to ensure the seal adheres well to the surface, especially if more than 1% cement has been used with the FBS pavement treatment. Bitumen emulsion can be prone to breaking more rapidly when it comes into contact with cement.

3. First coat sealing on Cement or Lime Stabilised pavement layers

A lime or cement stabilised basecourse layer is constructed by mixing lime and / or cement into the top layer of the pavement. The cement and / or lime make the surface very reactive to bitumen emulsion and dusty when dry, so attention to detail regarding the binder recipe and the seal design is required.

Due to the reduced amount of penetration of the binder into the stabilised basecourse the residual binder application rate may be reduced by 5 to 10%.

Kerosene can be used to help the binder cut through the surface in the event of it being dusty to promote adherence to the stone mosaic surface. However, excess kerosene can lead to soft flushing binder on the surface in hot summer conditions. The use of a sharp angular chip as a running course will reduce surface fines and especially caking. For best results, the surface should be well broomed, clean and slightly damp.

Common causes of flushing in the wheel paths on lime and / or cement stabilised pavements are sealing the pavement when it is too damp, chip embedment into the

pavement surface, which is caused by inadequate curing time and excess fines on the surface. Before any sealing takes place it is imperative that a stone mosaic surface is achieved where materials and grading permit. Where a finer grading does not permit a stone mosaic, any surface fines and / or slurry cake must be removed to expose what aggregate is present.

Reference

[1] Chipsealing in New Zealand, Transit New Zealand, Road Controlling Authorities and Roading New Zealand, 2005
[2] Roading New Zealand Technical Note 001 – Foamed Bitumen Treated Materials, Roading New Zealand, 2007

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