Curing and Spray Sealing for Road Stabilisation

1 Introduction

There are many factors that affect the ability of a pavement to meet its desired performance. Of particular note for road stabilisation there is the need to:

- ensure that bonding between pavement layers and the wearing surface is sufficient, and
- create an environment that promotes the continued development of strength within the stabilised layer over time.

This guideline provides information on typical construction practices for the curing and spray sealing of insitu stabilised pavements.

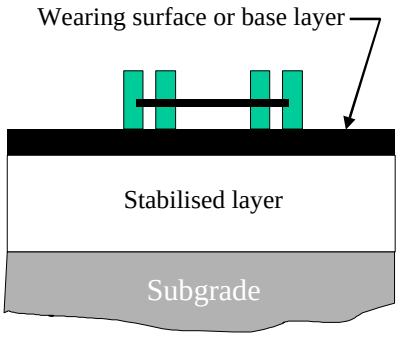

Figure 1 *A view of a typical cross-section through a stabilised pavement.*

2 Curing

Curing assists in the initial development of strength and reduces shrinkage of the stabilised pavement material. By reducing the likelihood of significant moisture loss from the pavement during the initial stages of the pavement life, curing aids in the continuation of the hydration process for cementitious and lime binders. Generally the curing period is specified as being between 3 and 7 days.

Curing may be carried out by the following methods:

- Keeping the surface moist by light water application from a water cart.
- Application of a prime or primerseal.
- Application of a curing compound.
- Placement of the next layer with minimum delay.

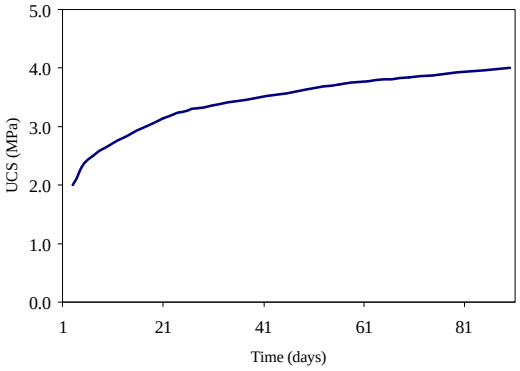

Figure 2 *As a binder cures the stabilised layer develops strength over time.*

The curing period depends on the following factors:

- Soil temperature - colder temperatures (typically below 10°C) increases the curing duration.
- Binder type, such as GP Cement has a short curing period.

As a general rule a slow setting binder has a slower curing period than for example GP cement. Engineers should always refer to the binder supplier in regard to their recommendations regarding the curing period.

During curing the pavement may be trafficked by both construction and commercial vehicles. To prevent undue damage to the surface during this period it is beneficial to limit the road speed limit to 60 km/hr. Trafficking during the curing period propagates the

development of micro fine cracks that, without affecting the life of the stabilised layer because of good mechanical interlock, reducing the incidence of future shrinkage cracking.

Figure 3 *Fine micro-cracks develop on the surface in a stabilised layer, but pose no detrimental problems.*

If curing is not carried out then the surface may become dry and shrinkage cracks are likely to appear. In some instances where the surface is powdery, this may prevent a seal from binding to the top of the stabilised pavement leading to premature debonding of the seal.

Light rain is generally not detrimental during the curing period. However, as the rain intensity increases water will be absorbed to the upper layers and may slow or prevent hydration of the cementitious material under commercial or heavy traffic, and the surface may rut.

Where a stabilised pavement has been damaged by heavy rain or rutting under traffic, the following options may be considered:

A. Trim pavement by grading with the trimmed material to be used for other useful purpose. Note that some assessment should be made on the affect of final pavement depth by the pavement engineer.

   And in extreme cases

B. Re-stabilise the existing material after investigation by excavation to determine the depth of the affected portion. Add a percentage of nominated binder content in accordance with the specification and compact to the specified requirements.

C. For slow setting binders it may be sufficient for the stabilised pavement to be remixed to a specified depth and compacted as specified. In some cases it may be sufficient to add another binder, such as lime.

Figure 4 *A stabilised pavement with a cementitious binder undergoing moist curing and open to heavy traffic.*

If the pavement engineer cannot establish the depth to re-stabilise it is suggested that the following guide be used:

- For stabilised pavements up to 200 mm in thickness the depth to re-stabilise is the specified depth.
- For stabilised pavements greater than 200 mm the thickness is 0.5 times the specified depth and not less than 150 mm.

3 Spray Sealing

3.1 General

Spray sealing stabilised pavements is based on local knowledge and the availability of local materials used for sealing. The recommendations made for spray sealing are strictly guidelines and advice should be sought.

The key aspect of sealing over stabilised pavements is to ensure good bonding to the pavement.

The principles forming the spray sealing process may be summarised as follows:

- pavement preparation
- prevailing weather conditions
- road locality
- type of aggregate
- type of seal applied

The following type of seals (or combinations) are used in Australia:

- Prime
- Primerseal
- Single coat seal
- Two coat seal
- SAM or SAMI seal
- Geotextile

3.2 Prime / Primerseal

On lightly trafficked roads or where the roads are constructed free of traffic a primer should be used to penetrate the surface to a depth of about 5 to 10 mm. Where a prime is not practical, a primerseal should be applied. Emulsion primerseals are also available, but not recommended, especially for roads carrying moderate to heavy traffic as they can take a considerable time, especially in cold weather to set up. For both cases a final seal should be applied. Their timing should be as follows:

- Primes should be allowed to cure for 24 to 48 hours, depending on prevailing weather conditions (i.e. cold weather will require the greater curing time) before final seal.
- For a primerseal the final seal should follow a minimum of 12 months later.
- The pavement engineer should also seek local road authority guidelines.

Consideration should be given to turning movements and/or truck usage which may require “nursing” of the primerseal for the first 12 to 48 hours depending on weather. Areas subjected to turning forces may benefit from the placement of a racked-in layer of small aggregates to strengthen the seal. Nursing of a primerseal can be achieved by reducing allowable traffic speeds. This may require the need for traffic escorts (particularly with fresh emulsion seals) for the immediate 2 to 4 hours after application (weather and bitumen set up dependant).

In preparing the surface for sealing the pavement should have a dense tight surface and be free of loose material. A light application of water and a thorough brooming is usually undertaken prior to sealing. Brooming should not be excessive as this will dislodge the stones.

The durability of a primerseal and later seals will be severely reduced if the construction of the stabilised layer produces a soft surface crust. This surface crust acts as a bond breaker between the unsealed surface and the sealing treatment. Also, slurrying of the surface is to be avoided.

If a soft surface is formed it can be removed by grading and heavy brooming of the areas affected. Although this activity will improve the performance of the Primerseal a poor riding surface may result unless topped with a thin layer of asphalt.

Where the stabilised base is a finely graded material the lack of stone can produce a soft surface the aggregate for the primerseal will tend to punch into the base resulting in bleeding of the seal.

By rolling in a 5 or 7 mm crushed aggregate into the surface of the stabilised base to armour coat it and this will reduce the likelihood of stone penetrating from the primerseal.

Figure 5 *View of stabilised pavement with 7 mm crushed aggregate on surface.*

Priming or primersealing over-wet stabilised pavements in cool to cold conditions should be avoided. In cases where this is unavoidable, priming followed by a seal is the recommended method. The engineer should also refer to the manufacturers temperature guidelines for the minimum application temperatures of various prime or primerseal binders.

3.3 Sealing

The application of a flexible seal treatment 12 months or more after primersealing is becoming increasingly common. These treatments can take the form of rubber seals (modified bitumen), geotextile seals or fibre seals, and where there is a perceived risk of future block cracking of the pavement.

To improve future performance engineers and supervisors should maintain procedures for their local usage. Information that should be recorded is:

- weather,
- traffic at the time of spraying,
- Primerseal details,
- application rates,
- product type, etc.,

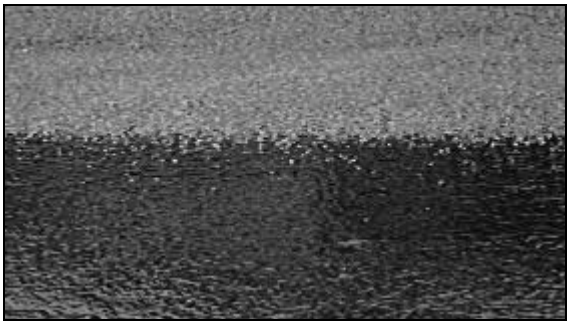

Figure 6 *View of stabilised pavement with seal and 7 mm crushed aggregate as a wearing surface.*

Consideration should also be given to the trialing of adhesion agents to determine whether benefits are viable.

Further information on spray sealing may also be found in the Section 4.9.4.4 of the Austroad's *Guide to Stabilisation in Roadworks*.

Further reading

Sharp, K et al *The performance of insitu stabilised marginal sandstone pavements* APRG Report No. 22

Roads & Traffic Authority *Sprayed Sealing Guide* Edition 2, Roseberry, February 1997.

Austroads *Guide to Stabilisation in Roadworks* Sydney, 1998

For further information on bitumen products for spray sealing, contact:

Shell Bitumen
Nigel Preston Phone: 03 9666 5463 or
Email: Nigel.J.Preston@Shell.com.au

Mobil Bituminous Products
Sam Maccarrone Phone: 03 9289 3145 or
Email: sam_maccarrone@email.mobil.com

For further information, please contact Secretary, AustStab, PO Box 797, Artarmon NSW 2064 or Email: vorobief@auststab.com.au
Other National AustStab Guidelines are available from AustStab members or visit our web site.
Internet: http:\\www.auststab.com.au