

Treatment of Cracks in Flexible Pavements

pavement work tips — no. 8

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INTRODUCTION

Pavement cracking may occur as the result of a wide variety of causes, but regardless of the cause, the outcome is a path for the entry of moisture. Unless treated, this will result in the accelerated deterioration of the pavement. Treatment will stop or slow down the rate of deterioration and improve the effectiveness of subsequent surfacing treatments.

This Work Tip provides advice on the treatment of cracks in flexible pavements surfaced with asphalt, sprayed seals or slurry surfacing. Treatment can be applied:

- directly to individual cracks
- as a complete surfacing of the affected area
- as a combination of the two.

The severity and extent of the cracks, as well as the underlying causes, will influence choice and effectiveness of the treatment.

TREATING INDIVIDUAL CRACKS

General

Filling of individual cracks is often regarded as being tedious and time consuming. However, when done correctly, it often provides the most effective treatment in terms of waterproofing and extending the life of the pavement.

Crack Filling

This involves cleaning the cracks and filling with an appropriate crack sealant, and is suitable for all cracks from about 2 - 10mm wide.

Overbanding

This involves cleaning the surface around the cracks and applying a “band-aid” of sealant over the top of the crack. A band of material about 50 to 100mm wide, 2 to 3mm thick, is applied over the crack using a special applicator. Suitable for cracks from about 5-15mm wide.

If it is intended to overlay the area with dense graded asphalt, overbanding may also be applied in the form of a proprietary, pre-formed strip of binder, highly modified and/or reinforced, about 250 to 300mm wide. A tack coat is sprayed and the strip placed centrally over the crack and rolled, just prior to placing the asphalt. Suitable for cracks from about 5-15 mm width.

Overbanding would be used in preference to filling cracks if crack movement is relatively large and/or cracks to be treated are deep or difficult to clean out.

Routing and Filling

This involves routing the crack and filling with a thick “plug” of joint sealant material. Width to depth ratio should be about 1:2 to minimise tension at the interface at the walls of the crack, and optimise its performance. This is most suitable for use with cracks that are reasonably straight e.g. joints in aged asphalt, or concrete pavements.

Suitable for medium to large cracks. Maximum recommended routing width is about 15mm.

This method may be used to treat cracks in the existing surface or with a dense graded asphalt overlay the routing and filling can be applied in the new asphalt directly over the cracks. It is essential that the location of cracks can be accurately marked prior to placing the overlay. This has been found to be a most cost effective treatment when asphaltting over cracked concrete pavements.

CRACK AND JOINT SEALANTS

General

The material must be able to fill and/or seal the cracks to prevent water entering the pavement at the surface. A typical problem is the thermal contraction and expansion of the pavements with seasonal and/or diurnal temperature variations. This movement can exceed the resilience of normal bitumen when used as a crack sealant, allowing the cracks to reopen. Polymer modified bitumen is often used to address this problem because it has improved cohesive (internal) strength, and is usually more elastic, at normal road surface temperatures.

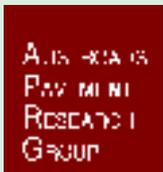
The practitioner must assess whether the enhanced properties are required, and if modified sealant provides an economic solution.

The following, generally in order of performance and cost, provides a brief description of the materials commonly used:

- Bitumen emulsion can be poured into the cracks, or sprayed or spread onto the surface

Key Summary

This issue of 'pavement work tips' provides advice on treating cracks in flexible pavements to stop or slow down deterioration and improve future surfacing treatments



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with a broom or squeegee, and covered with grit or clean sand. Generally most suitable for small cracks, less than 2mm, with little movement.

- Bitumen emulsion modified with natural rubber, or polymers, provides improved performance over standard emulsions. Suitable for small to medium cracks, 2 - 5mm, with little movement.
- Hot poured modified bitumen, usually with a high polymer content, is generally used as a sealant in overbanding, and routing and filling treatments. These treatments are suitable for medium to large cracks, about 5 - 15mm with larger movement.

PROCEDURES FOR CRACK FILLING

- Cracks must be cleaned out, generally to a depth of about twice the width. Any greater depth may affect the ability of the sealant to remain bonded to the sides if the crack width increases due to any movement in the pavement.
- Compressed air is the most common method of cleaning out cracks, but this may be supplemented by wire brushes etc.
- The cracks should be filled level, or just below the surface, to prevent pick-up and minimise potential bleeding in subsequent reseals.
- If possible, treat cracks when, environmentally, they are at their widest, such as at the end of a long dry spell.
- When applying grit or sand, take care not to fill the full depth of the crack as this will reduce the effectiveness and life of the sealant.
- Bonding of the sealant to the sides of the crack may be a problem when using hot pour sealant. When this occurs, the crack may need to be dried out using a blower, or a primer applied to the sides.

TREATING THE ENTIRE SURFACE

General

It is generally more cost effective to treat the entire surface by applying a sprayed seal if cracking

is extensive and treating cracks individually would be labour intensive and time consuming.

Sprayed Seals

These may be either single or two coat seals, with normal binder. Suitable for untreated small cracks, less than 2mm, with very small movement, or over all sizes of treated cracks.

Stress Alleviating Membrane (SAM)

These are sprayed seals using a polymer modified binder to provide a thicker and more elastic film of binder, thereby giving improved waterproofing properties. Suitable for small to medium cracks, about 2-5mm.

Strain Alleviating Membrane Interlayer (SAMI)

These are similar to SAM's, but generally with a more highly modified binder at higher rates of application, used over a cracked pavement prior to placing an asphalt overlay. Suitable for small to medium cracks, about 2-5mm.

Reinforced Seals

These are sprayed seals reinforced with glass fibres, or geotextile fabric, to provide an extremely strong and waterproof membrane.

In areas where the cracking or loading is extreme, the performance may be further improved by using a two coat seal, with modified binder.

Suitable for medium to large cracks, about 5-15mm, but has been successfully used in treating larger cracks.

Choice of Polymer Modified Binder (PMB)

The widths of the cracks and amount/cause of any movement influence the choice of a suitable polymer modified binder. The movement is usually defined in terms of being due to environmental causes or traffic (load) induced. If movement exceeds about 0.5 to 1mm, it is doubtful that a PMB alone will provide a long term solution and it should be used in conjunction with a geotextile. APRG Report No 19 provides guidance as to the selection of a suitable grade of PMB to use.

SAFETY ASPECTS

Where cracks are evident as crocodile crazing/cracking, and the pattern is closely spaced, overbanding may cause problems due to water ponding, which may cause loss of skid resistance and a rough ride.

For more information on any of the construction practices discussed in "pavement work tips", please contact either your local AUSTROADS Pavement Research Group representative or AAPA — tel (03) 9853 3595; fax (03) 9853 3484; e-mail: info@aapa.asn.au

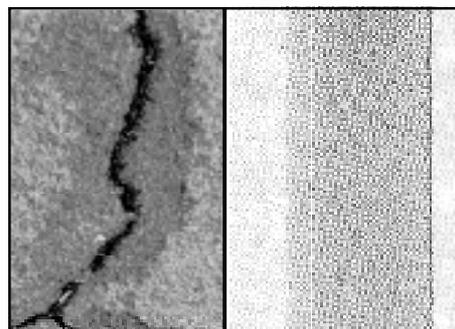
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Crack filling with insulated hand lance



Overbanding before (left) and after (right)



Filling and sanding cracks after routing