Sprayed Sealing - Extreme Hot Weather

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pavement work tips

Key Summary

This issue of "pavement work tips" provides a guide to sprayed sealing work during extreme hot weather events.

INTRODUCTION

Sprayed bituminous seals have an increased risk of flushing or bleeding during extreme hot weather events. Bleeding is an outcome of fresh and lively bitumen rising to the surface and exceeding the height of the sealing aggregate. Apart from reduced surface texture, severe bleeding can also lead to pick up on the tyres of vehicles.

Newly constructed seals are particularly vulnerable to the effects of extreme hot weather. This work tip refers to minimising the risk of bleeding when carrying out sprayed sealing work in such conditions, especially when subject to slow moving or stationary heavy traffic, or unusually heavy loads.

Figure 1. Bleeding sprayed seal

BACKGROUND

General issues related to causes and treatment of flushed and bleeding surfaces are described in Work Tips No.7, 44 and 48 (see references below). Principal causes of flushing and bleeding in sprayed seals are referred to in Work Tip No.7 as including:

- An excessive application of binder for the particular service conditions,
- Embedment of aggregate into underlying pavement,
- Softening and bleeding of binder in hot weather due to the amount of cutter oil in the binder,
- Overturning of aggregate by heavy turning traffic.
- High pavement temperatures (often associated with unexpectedly high traffic volumes and/or heavy vehicle numbers.

Guidelines for design of sprayed seals are contained in Austroads Reports AP-T68/06, AP-T236/13 and AP-T260/14.

Sites of high severity of traffic and/or high pavement temperatures generally require the use of Polymer Modified Binders (PMB). Specific guidelines for selection of binder type based on site severity and pavement temperature regime are included in Austroads Report AP-T235/13 and Pavement Work Tip No. 6.

The construction guidelines contained in this work tip more particularly apply to seals constructed with hot bitumen and cutback bitumen binders and designed for low moderate pavement temperature regimes but subject to short term extremes of hot weather . Typically this refers to the increased risk arising from ambient temperatures rising above 40°C on any day or above 35°C on three or more consecutive days. Under these conditions, pavement temperatures can be up to 15°C to 30°C higher than the ambient temperature; rising as high as 60°C to 70°C.

A further consideration is where the overnight temperature does not fall below 25°C following an extreme hot temperature day.

At high temperatures, the aggregate in the seal can quickly reorientate, forcing binder to the surface resulting in a bleeding seal (Figure 1). In more extreme cases, or if not controlled, this can lead to pick-up on vehicle tyres (Figure 2).

Overspreading of aggregate can also reduce the void space that can rapidly fill with binder in hot weather with a consequent increased risk of bleeding.

Construction of seals with bitumen emulsion binders in high temperature conditions require special consideration that are not covered in this work tip, although general issues relating to post construction treatment apply equally to all binder types.

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CONSTRUCTION PRACTICES DURING EXTREME HOT WEATHER

Programming

When programming work during periods where extreme hot weather is occurring or predicted, contingency plans, such as moving operations to a lower risk site (e.g. lower traffic) or implementation of traffic control measures described below, should be developed.

Management of Traffic During Construction

During sprayed sealing operations, traffic is normally slowed, stopped and temporarily held on new work or adjoining existing surfacings. As well as the risk to new work, other recently placed surfacings (generally within the first year) that are carrying medium to heavy traffic are at risk of bleeding during periods of extreme hot weather.

The onset of bleeding is particularly related to the number of heavy vehicles and length of time the traffic is stationary. Risks of bleeding are also increased on uphill grades and tight curves, when using small sized (7 mm) aggregates, or where the proportion of equivalent heavy vehicles (EHV) exceeds about 20%.

Where a decision is made to proceed with sprayed sealing operations during a period of extreme hot weather, the following steps should be considered for managing traffic:

- Delaying the spreading of aggregate until the bitumen cools a little, requiring longer traffic delay times;
- Where possible, keep the traffic off the newly constructed seal during the hottest part of the day;
- If the road has been opened to traffic and bleeding occurs, cool the seal down by spraying water over the surface and reopen to traffic while ensuring that reduced speed limits are still in place;
- Where possible, store waiting traffic on an unsealed shoulder, or
- Where traffic is stored on an existing seal, reposition the traffic storage area to an alternate location after each stoppage, or keep stoppage times as short as possible.

Further, where traffic is channeled into a slow moving single lane for both directions of traffic, there is an increased risk of bleeding, particularly where traffic is diverted on to sealed shoulders or overtaking lanes where binder application rates are commonly higher due to the lower design traffic volumes.

Impact of Heavy Over-Dimensional Vehicles using the Network

Heavy over-dimensional vehicles, particularly those with axle loads in excess of the normal legal limit but using the network under authorised permit, may accelerate the incidence of bleeding and surface damage resulting from pick up by tyres on days of very high temperature or periods of prolonged hot weather.

Maintenance personnel should be made aware of this risk and the need to alert the relevant authority of such incidences so that action may be taken to control further damage to the surfacing.

REFERENCES

Austroads/AAPA 2014, Pavement Work Tip No. 6*: Polymer Modified Binders.*

Austroads/AAPA 2010, Pavement Work Tip No. 7: *Treatment of Flushed or Bleeding Surfaces.*

Austroads/AAPA 2004, Pavement Work Tip No. 44: *High Pressure Water Retexturing.*

Austroads/AAPA 2010, Pavement Work Tip No. 48: *Treatment of Flushed Seals using Chemical Solvents.*

Austroads 2006, *Update of the Austroads Sprayed Seal Design Method,* AP-T68/06.

Austroads 2013, *Guide to the Selection and use of Polymer Modified Binders and Multigrade Bitumens,* AP-T235/13.

Austroads 2013, *Update of Double/Double Seal Design for Austroads Spray Seal Design Method*, AP-T236/13.

Austroads 2014, *Towards Incorporating Heavy Vehicles into the Austroads Sprayed Seal Design Method*, AP-T260/14.

Figure 2. Bleeding and surface pick up

*For more information on any of the construction practices discussed in "**pavement work tips**", please contact either your local Austroads representative or AAPA:*
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A complete list of "pavement work tips" issues is available on AAPA's website: www.aapa.asn.au

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This edition was prepared by members of the Austroads Bituminous Surfacings Workings Group.