

TOP DOWN CRACKING IN MELBOURNE PAVEMENTS (MAINTENANCE OF THICK ASPHALT PAVEMENTS)

PURPOSE

Whilst the performance of thick asphalt pavements has been widely reported overseas, only limited investigation has been undertaken in Victoria to determine how thick asphalt pavements constructed in Melbourne since the 1970s are performing and the types of distress they are exhibiting. This Technical Note provides guidance for pavement maintenance based on the outcomes of R&D Project No 951 Top Down Cracking in Melbourne Pavements.

The guidance provided comes from local research which generally supports overseas experiences.

The aim of this project was to:

- Develop an understanding of top-down cracking and the design and maintenance of predominantly asphalt pavements of indeterminate pavement life (known as ‘long-life’ or ‘perpetual’ pavements); and
- Identify opportunities to improve the cost-effectiveness of VicRoads maintenance program.

WHAT HAS OVERSEAS RESEARCH SHOWN?

‘Long-life’ pavements are generally understood to be pavements that are designed and constructed such that they do not require structural rehabilitation within their projected lives. This can be attractive to an asset manager and motorist alike, as the need for maintenance and associated user delays are reduced.

Overseas research has shown:

- If an asphalt pavement is thick enough the pavement will have a very long life provided the surface cracking that develops during its life is treated; and
- The surface cracking appears to be the result of environmental deterioration (oxidation) of the binder and surface stresses on the pavement.

These types of pavements are known as “long-life” or “perpetual” pavements.

Merrill (2005) suggests that pavements with less than 0.25mm deflection and with 300mm or more of bituminous material could be considered to be ‘long-life,’ provided they are not experiencing other forms of deterioration affecting service.

WHAT HAS LOCAL RESEARCH SHOWN?

R&D Project No 951 Top Down Cracking in Melbourne Pavements and work by Paul (1998) suggested that local asphalt pavements were performing very well. Sites that were selected for this project generally exhibited behaviour expected of long-life pavements, that is an asphalt depth exceeding 210mm and cracking limited to the to 40 to 60mm from the top of the pavement.

R&D Project No 951 also included an:

- Estimation of the horizontal tensile strain at the base of the asphalt layers; and
- Consideration of aspects of pavement performance during service such as roughness, rutting, cracking, strength (deflection), stiffness (curvature) and whether there had been structural intervention (by resurfacing or patching).

The investigation has shown that 3 out of 4 of the sites investigated generally exhibited behaviour expected of ‘long-life’ pavements. (See Figure 1).

The project basically demonstrated cracking generally was limited to 40 to 60mm from the top of the pavement provided:

- Asphalt thicknesses typically exceed 210mm
- The pavement is a very strong, with stiff asphalt components, and there had been no structural intervention during the service life.

DESIGN AND MAINTENANCE

Overseas Practices

A review of overseas trends in relation to materials and maintenance practices relating to ‘long-life’ pavements identified:

- A project investigating the technical and economic feasibility of ‘long-life’ surfacings which indicated that a material based on asphalt with epoxy binder placed on high-traffic facilities will be cost-effective over a period of about 30 years;
- The use of SMA is increasing, and diversifying, with trials underway in the USA of applications in intermediate courses; and

- A major consideration of designing and planning rehabilitation works is minimisation of delays to motorists.

Guidelines: Changes to Pavement Maintenance Patching Requirements.

Pavement maintenance practices for these types of pavement should include the following considerations:

- An investigation of the pavement cracking prior to any removal and replacement program. Undertake coring to confirm the asphalt depth (if not known from records) and depth of cracking;
- If the pavement depths are greater than 210mm then this R&D project has found in 3 out of the 4 sites, cracks are in the surface, rather than deep seated cracks (to the subgrade), coring will confirm this;
- Patching of cracked pavements involving the removal and replacement of large depths of asphalt pavement material, is not necessary;
- Consider crack sealing, as the first option, to ensure the surface is water tight and delay the propagation of the crack; and
- If and when patching is required depths can be limited to 40-60mm, without being detrimental to the performance of the asphalt pavement.

CONTACT OFFICER

Bill Tsoumbanos	9881 8909
E-mail	bill.tsoumbanos@roads.vic.gov.au
Klaus Kiesel	9881 8926
E-mail	klaus.kiesel@roads.vic.gov.au

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Merrill, D 2005, Guidance on the Development, Assessment and Maintenance of Long-Life Pavements, TRL Report No.639, Crowthorne, UK.

Paul, R 19thARRB Conference, Sydney 1998, Developments in the Design and Construction of Deep Strength Asphalt Pavements in Victoria over the past 25 years.



Figure 1 Example of extent of cracking and condition of underlying asphalt.



Figure 2 Surface appearance of the sites inspected.

Note: no vertical displacement across the crack.

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