Asphaltic Plug Joint Overlay

Introduction

The overlaying of existing Asphaltic Plug Joints (APJ’s) with suitable high modulus materials is a cost effective and quick means of maintaining and increasing the life of the installed Asphaltic Plug Joint.

It is common knowledge that conventional APJ’s are prone to rutting, deformation under loading and loss of skid resistance. The Permatrack H system incorporates a high modulus running surface, which demonstrates excellent resistance to both rutting and deformation and retains skid resistance properties akin to the existing carriageway surface.

Diagram

The main concern with overlaying the Permatrack system over an existing asphaltic plug joint is the restriction of movement that a high modulus system would impart onto the APJ.

The reason for this conclusion is that the movement principals for the two systems are different.

Asphaltic Plug Joints
The asphaltic plug joint being a mixture of graded aggregate and an elastic bituminous compound means that the movement accommodation for the system is provided by the full cross section of the material over the joint.

Permatrack System
The system provides the running surface from the high modulus inner material with the movement accommodation being provided by the elastic bituminous material surround.

The concern is that the interface between the two systems restricts the movement of the asphaltic plug joint underneath.
System Behaviour

The behaviour for the compatibility of the two systems can be determined through a theoretical approach using suitable engineering principals and the historical information available on the in-situ performance of the system.

Theoretical Approach

The first aspect for determining the movement performance of the system is the restriction that is placed on the APJ.

If we look at the behaviour of a volume of elastic material then we can determine how much of an effect an applied ‘static’ system would have.

If the depth of the material is equal to the width of the joint then the movement accommodation will be reduced by 50%. The non-elastic interface applies a restrictive force upon the elastic material (APJ in this case) and reduces the movement accommodation. The depth of the material dictates how much of an effect this will have until the depth is greater than width.

Cross Section of Joint

![Cross Section of Joint Diagram]

To put this in relative terms an asphaltic plug joint with a specified movement of +/-20mm overlaid with a non-elastic material would have potential unrestricted movement of +/-10mm. This is assuming that the width and depth are equal. So therefore a joint of 500mm wide by 50mm deep would have 5% of the material un-affected by an overlaid non-elastic material.

Cross Section of Joint

![Cross Section of Joint Diagram]

The material under restriction will still maintain elastic behaviour. However, there will be a graduated increase in the inherent force upwards through the affected volume to the interface. This may cause problems with shear failure at the interface between the asphaltic plug joint and a non-elastic overlay.

However, in order to prevent this mode of failure the Permatrack system for APJ overlays incorporates an elastic compound (Permatrack PSB) with a movement accommodation of 300% @ 0ºC which will allow the underlying system to perform upto design movements of +/-10mm (The current Permatrack system movement limit).
**Historical Information**
Permatrack asphaltic plug joint overlays have been laid over the past six years in locations such as; Coventry Ring Road, Birmingham Expressway and the M6 (Midlands) with great success with regard to prolonging the life of overstressed APJ’s without the need to undertake a complete replacement.

**Conclusion**

The Permatrack asphaltic plug joint overlay has a registered movement capability of +/- 10mm. The underlying asphaltic plug joint has a typical movement capability of +/- 20mm. With this in mind the underlying APJ is when first installed functioning well within its movement capabilities.

The interface between the two systems, as previously stated is a highly elastic compound providing the overlay system (Permatrack) its base movement capabilities and allowing the underlying system to function.

Alistair Puddick
*Technical Development Manager*
IKO Plc

20.10.06