DIFFERENCES BETWEEN CONVENTIONAL, HSS, SAM AND SAMI TREATMENTS

1. INTRODUCTION

There are essentially four different types of single/single coat sprayed seals and the philosophy of their design and expected performance varies. This Technical Note broadly describes these types of sprayed seals.

2. TYPES OF SPRAYED SEAL

The different types of single/single coat sprayed seal treatments are:

- A sprayed seal with conventional binder;
- A High Stress Seal (HSS) which uses slightly modified binder;
- A Strain Alleviating Membrane (SAM) seal which uses a higher modified binder;
- A Strain Alleviating Membrane Interlayer (SAMI) that acts as an interlayer beneath an asphalt surface and uses highly modified binder.

3. CONVENTIONAL AND HIGH STRESS SEALS

3.1 Function

The function of a conventional sprayed seal and HSS are to:

- Waterproof a structurally sound pavement;
- Hold aggregate in place so that the aggregate can form the wearing surface; and
- Provide sufficient surface texture to reduce the potential for aquaplaning and ensure that vehicle tyres will not contact the binder and damage the seal.

These types of sprayed seal are very similar in appearance and use, except that the HSS is usually placed in locations where vehicles apply a higher stress to the seal, e.g. high speed locations, tight curves and braking areas.The use of a lightly modified binder (polymer or crumb rubber) and additional binder in the HSS will provide improved performance compared to a conventional seal.

In a HSS the aggregate particles are generally orientated so that the Average Least Dimension (ALD) of the particles is essentially vertical.

3.2 Design

The design of HSS is undertaken using standard Austroads design procedures. In these procedures an allowance of 10% additional binder, compared to a conventional seal, is used to increase seal robustness.

4. SAM SEALS

4.1 Function

The function of a SAM seal is to delay reflective cracking and to waterproof a cracked pavement by using:

- An appropriately modified binder for the conditions; and
- A very thick membrane of binder.

Modified binders are stiffer and do not permit the aggregate to re-orientate in the same way as a conventional seal. To accommodate this lack of re-orientation, additional binder is needed to hold the aggregate. The aggregate is spread approximately 10% heavier than normal so the aggregate mosaic is self-supporting.

In practice, there is a compromise made when SAM seals are applied. This compromise is between:

- Using a very low amount of binder, but sufficient to prevent stripping, which results in the seal essentially looking and behaving like a conventional seal. In this case the cracking will often return quickly as the resistance is only provided by the type of binder used rather than the quantity of binder used; and
- Using a large quantity of binder, which minimises the reflection of cracking, but runs the risk that the surfacing will soon flush and have inadequate surface texture. This may result in the need to grit the surface during summer or treat the pavement in a relatively short time.

4.2 Choice of Aggregate Size

Because the resistance to reflection cracking of a sprayed surfacing is directly related to the quantity of binder used, (i.e. the membrane thickness) it is advisable to use a 14 mm aggregate where ever practical. Sometimes, for reasons such as noise or the size of the aggregate used in the existing surfacing, it is necessary to use a 10 mm aggregate. In such

cases, a relative reduction in the life of the SAM seal can be expected. A 7 mm seal is not considered suitable for use as a SAM seal due to the small volume of binder used and its greatly reduced ability to resist reflective cracking.

4.3 Choice of Binder

The choice of binder used in a SAM seal is dependent upon a number of factors. These factors include:

- The type of cracking, i.e. whether the cracking is environmental in nature or flexural in the form of crocodile cracking; and
- The risk involved in the treatment. Highly modified binders will reduce the rate of return of flexural cracking however there is an increased risk of aggregate stripping occurring.

General experience suggests that:

- Environmental cracking is better resisted by the use of lightly modified binders; and
- Flexural cracking is better resisted by medium to highly modified binders or in extreme cases by SAM seals containing geotextile or fibre glass.

4.4 Design

The design of a SAM seal basically follows the same method used for a conventional seal except that the base binder application rate is increased using polymer factors. The polymer factors are used to create a thick binder membrane and accommodate the lack of re-orientation of the aggregates.

The design BAR for a SAM = Conventional Base × BAR Polymer Factor + Allowances.

Where BAR = Binder application rate.

The "polymer factor" used is dependent upon the:

- Seal design method;
- Type of polymer modified binder;
- Traffic using the pavement.

5. SAMI TREATMENTS

5.1 Function

The function of a SAMI treatment is to resist the reflection cracking through an overlying asphalt surfacing and to provide a membrane to waterproof the pavement by:

- Using an appropriately modified binder for the conditions (weather, etc.);
- A very thick membrane of binder (generally 1.8 to 2.2 litres/m^2).
- holding sufficient aggregate in place so that construction vehicles can travel over the surface to place the asphalt layer.

5.2 Choice of Binder

In a SAMI the binder used is normally highly modified. The choices of the binder depends upon the conditions and the type of works. Highly modified binders that do not contain cutting oils are difficult to spray especially when carrying out handwork. Consideration should be given to using very lightly modified binders in the areas of handwork so that the binder can be hand sprayed effectively and safely.

SAMI binders generally do not contain cutting oils because the cutter may soften the asphalt wearing surface. Aggregate adhesion is generally not an issue with SAMI treatments as they are designed to be covered by asphalt soon after construction.

5.3 Design

A SAMI generally uses a 10 mm aggregate and a design binder application rate of 1.8 to 2.2 litres/m^2. The rate of binder applications chosen depends largely on cracking intensity and traffic volumes.

A SAMI is used for water proofing and stress alleviation in two main applications:

- over previously sealed surfaces; and
- in new works as an interlayer in the construction of the pavement surface.

In the case of new works it is most important that a prime coat is applied to the new granular surface pavement prior to the placement of the SAMI treatment. This is to ensure that the SAMI bonds sufficiently to the pavement to allow for the placement of an asphalt surfacing over the top. If insufficient bond is achieved it is likely that the SAMI will debond from the surface under the action of asphalt pavers and other construction equipment.

A SAMI may contain geotextile or fibreglass reinforcement where particularly strong crack resistance is required.

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