TREATING PAVEMENTS SUBJECT TO COMPLEX PRIOR TREATMENTS

INTRODUCTION

Since the late 1980s, the range of specialist 'surfacing treatments' has greatly expanded—open graded asphalt was joined by ultra-thin asphalt, stone-mastic asphalt and cold asphalt—with and without geofabric reinforcing seals. Pavement lives were, and are still extended by adopting these "special" or "complex" treatments in appropriate situations—usually a combination of surfacing treatments. Many of these pavements and surfacings now require re-treatment.

In 2002/03 VicRoads undertook a research project (Esnouf and Favaloro 2004) to investigate the issues associated with and the appropriate re-treatment options for such "complex" surfacings. The questions being posed are: which complex surfacing types require special precautions in their re-treatment, and what are these?

This Note reports on the outcomes of the research and provides discussion on the issues pertinent to the treatment of these surfaces.

BITUMINOUS SURFACING TREATMENTS

The 'complex' surfacing types considered in the research were:

- Geotextile Reinforced Seals (GRS) and Ultra Thin Asphalt (UTA) combination;
- GRS with/without asphalt;
- Open Graded Asphalt (OGA);
- Emulsion (Cold) Asphalt;
- Multiple (many individual treatments of) spray seals over time;
- High Performance Friction Surfacings

ISSUES

Ultra Thin Asphalt

This material is often open in its grading (similar to OGA) and its failure mechanism is frequently associated with ravelling, either due to brittle, oxidized binder or the shearing stress associated with turning or braking traffic (Figure 1).

Figure 1 Ravelling of UTA

The particular issues associated with re-treatment of this material are:

a) If removal is proposed:

- The UTA surfacing may have been placed on a GRS which was designed to waterproof the underlying pavement. Removal of the UTA may damage the GRS.
- The thickness of UTA may not be uniform for many reasons, including its use to regulate rutted pavement. This can make removal extremely difficult.
- The existing surfacing may be covering/hiding a badly distressed pavement.

b) If "covering" is proposed:

- Any resurfacing treatment placed on a distressed UTA may result in an interlayer of weak and permeable material. The accumulation of water in this layer is likely to increase the risk of the new surface delaminating and make further resurfacing difficult unless the entire layer is removed. Avoiding the sealing of the edges of the UTA may assist in allowing water to escape in the short term however the build up of detritus material along the edges will cause clogging.
- Application of a spray seal surfacing will need to consider drain down of the sprayed seal binder and the possible existing variable surface texture. There is a likelihood that poor performance of the seal will result in stripping (Figure 2) from binder drain down or flushing due to less binder drain down than anticipated.
- Placement of spray seals over the UTA will increase tyre/surface road noise.

Figure 2 – Stripping of a spray seal applied to UTA.

In some cases ravelling of the UTA has resulted due to high stresses imposed by braking, turning and accelerating traffic. These areas are often best retreated with dense graded asphalt or stone mastic asphalt.

Geotextile Reinforced Seal

The geotextile or the type of binder used in the GRS does not require special consideration when being retreated and it is unlikely to effect the performance of any subsequent treatments. The particular issues associated with re-treatment are:

- When resurfacing new or young seals there is an increased risk of flushing.
- If patching is required care needs to be taken with the operation of the milling machine as it may cause delamination or removal of the GRS. The front edge of the milling machine needs to be operated in a downwards motion.
- If a layer above the GRS requires removal; e.g. a partially delaminated / ravelled UTA, extreme care must be taken if only the surfacing layer (and not the geotextile) is to be removed. Geotextile fabrics are readily torn during milling operations.
- GRS are very flexible and if overlaying with stiff asphalt the GRS may be covering/hiding significant distress and flexibility in the original pavement which could rapidly reflect through the stiff asphalt surface.

Open Graded Asphalt

By itself, Open Graded Asphalt (OGA) is a 'non-complex' treatment; however to prevent further ravelling a small number of sites have been sprayed sealed, and in one case another layer of OGA applied over the existing OGA as a trial.

The particular issues associated with re-treatment are:

- For sites treated with a sprayed seal, binder drain down as described above.
- When a new layer of OGA is placed over an existing OGA surface, treatment to prevent an excessive "step" being created at the edge.
- Confirmation that the existing base is waterproof and free from distress and that the existing layer of OGA is thoroughly dry, i.e. moisture is not contained within its structure.

In general the practice of removal of OGA surfacing prior to re-treatment is warranted.

Emulsion (Cold) Asphalt

These surfacings currently tend to be used for roughness regulation and for covering flushed seals and are more likely to be located in rural areas. Many of these types of treatment are sprayed sealed to ensure waterproofing and to prevent ravelling of this more porous type asphalt. Note, due to the more open structure of cold asphalt, care is required to allow for this factor when determining bitumen application rates when spray sealing over these surfacings. Entrapment of water as discussed earlier must also be considered.

Multiple Seals

The two scenarios that most likely led to these 'complex' mats comprising multiple sprayed seals of 50 mm or greater surfacing thickness are:

- Flushing of lower down seals requiring further (seal) treatment within a short time; the resulting 'surface' being a relatively non-stable matrix of aggregate and bitumen;
- The application of sprayed seals over many years resulting in the build up of very thick layer of sealing aggregates and binder. This often occurs on very old pavements, perhaps with some level of distress.

The particular issues associated with re-treatment are:

- The instability of the multiple layer increases the potential for flushing and rutting;
- The multiple layers tend to increase texture differences across the pavement making it more difficult to reseal;
- The patching and crack sealing type repairs carried out between reseals affect longitudinal texture and surface stability making it more difficult to reseal.

These issues can often be address by minimizing resealing frequency, use of small size seals to improve transverse and longitudinal texture, modifying repair techniques and the use of water blasting to remove excessive binder.

High Performance Friction Surfacings

The major problem with re-treatment of sites using High Performance Friction Surfacings (HPFS) is the condition of the substrate. The particular issues associated with re-treatment of a delaminated area are:

- The substrate may be incapable of resisting the differential expansion between itself and the HPFS. It may not be able to resist this stress because the asphalt surface is too new and soft, too old and brittle or there may be a weakness in the system such as a sprayed seal.
- The substrate may have an oily or dirty surface or special techniques may be needed to bond the HPFS to the surface, e.g. concrete.

- The substrate may contain water, which may adversely affect or destroy the bonding of the HPFS to the substrate. Examples are HPFS placed on poorly compacted asphalts or open graded type asphalts where water is still able to flow.

CONCLUSIONS

The re-treatment of existing pavements that currently have "special" or complex surfacings requires careful consideration.

The new treatment may be designed for its intended purpose subject to the usual precautions and/or pre-treatments some of which are described above, necessitated by the existing surfacing characteristics.

REFERENCES

Esnouf, J. and Favaloro, J. (2004). Treating Roads Subject to Complex prior Treatments, Project No. 2002/855, March 2004. VicRoad's GeoPave Final Research and Development Project Report, Burwood East.

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