

Asphalt Tack Coating

pavement work tips – No 51

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INTRODUCTION

Tack coating is the light application of a bituminous material to promote adhesion between an existing surface and a new asphalt layer.

Obvious effects of poor bond between asphalt layers and underlying pavements are seen as premature failures such as delamination and slippage. Less obvious effects of poor bonding between layers are reduced structural performance and reduced long term serviceability. Recent research suggests that the effectiveness of this bond plays an even greater part in pavement performance than that commonly accepted in the past.

A further specialty role of asphalt tack coating is in paving of ultra-thin asphalt surfacings where a heavy application of tack coat is used for both bonding of the surface layer and as an aid to waterproofing the underlying surface.

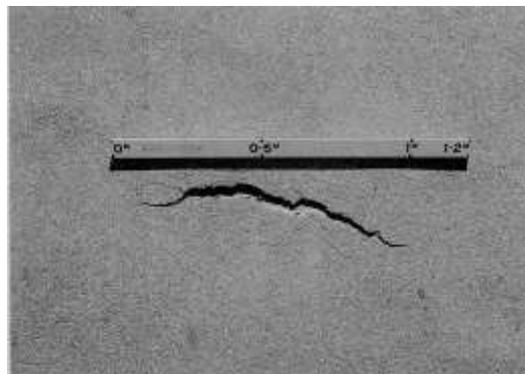


Figure 1 Slippage failure

TACK COAT BINDER TYPES

Bitumen emulsions are preferred as tack coat binders. Cutback bitumens or bitumen emulsions containing cutter oils should not be used as the oils can remain trapped in the binder and cause softening of the asphalt.

Generally, either cationic or anionic bitumen emulsions complying with AS1160 can be used. The type of bitumen emulsion should suit the conditions of use, e.g. climate, required emulsion break time, available spray equipment, etc.

Rapid setting cationic emulsions provide the most versatile binder for use in cooler regions where damp conditions may be encountered.

In warmer or drier conditions, slower setting cationic emulsions and anionic emulsions may combine satisfactory performance with greater ease of handling and stability in storage and dilution.

Emulsions may be diluted with clean, potable water before application to improve spraying properties. Contaminants that can cause premature breaking of the emulsion must be avoided. Where emulsion is diluted, the water must be added gradually to the total quantity of the emulsion. Addition of emulsion to water will cause the emulsion to break. An alternative to field dilution of emulsions is the manufacture of tack coating emulsions with a lower (e.g. 30%) binder content.

Further guidelines for storage and handling of bituminous emulsions are provided in Work Tip No. 2.

In some specialty bituminous emulsions, the use of harder base bitumens can reduce tackiness and pick-up under the tyres of delivery trucks, thus reducing the incidence of tracking of emulsions onto other surfaces or loss of tack coat within the wheelpath area.

Tack coating materials used in conjunction with the placing of ultra-thin asphalt surfacings usually employ a high bitumen content, polymer modified emulsion specifically developed for that purpose. These emulsions require special handling due to their high binder and polymer contents.

TACK COAT APPLICATION RATES

Residual binder application rates are specified in some specifications. Where no minimum is specified, a minimum rate of 0.15 L/m² residual bitumen binder (at 15°C) is recommended.

Actual rates of spraying of binder must take into account the water content of bitumen emulsions. For example, an ASS/170-60 diluted 50:50 with water will require a total spray rate of 0.5 L/m² to achieve a residual binder application rate of 0.15L/m², i.e. 0.5 L/m² × 0.6 binder content of the emulsion × 0.5 dilution factor = 0.15 L/m² residual binder.

Key Summary

This issue of "pavement work tips" provides a guide to asphalt tack coating, including rationale for its use and guidelines to good practice.



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Increased tack coat binder application rates may be required on aged, porous or very textured surfaces, particularly milled surfaces or sprayed seals that have received little or no traffic. If uncertain, a suitable application rate may be determined by visual assessment of trials of different spray rates on measured areas of the existing surface.

Some specifications allow the tack coat to be omitted where asphalt is to be spread over clean, freshly laid asphalt. Generally, this should only be allowed where successive asphalt layers are placed on the same or following day and have not been subjected to trafficking.

PREPARATION

Unbound and lightly bound granular bases

Unbound and lightly bound (stabilised or modified) granular base materials require a prime or primerseal prior to asphalt surfacing. Cutback bitumen primerseals require a curing period, generally a minimum of three months of warm weather, before surfacing with asphalt. No minimum curing period is required for primerseals constructed with bitumen emulsions that contain little or no cutter oil.

A tack coat cannot be used as a substitute for priming or primersealing. Bitumen emulsion tack coats provide very little penetration of the granular base and, being both tacky and poorly bonded to the underlying surface, provide a high risk of pick-up on the tyres of delivery trucks and paving equipment.

Cured primed and primersealed surfaces should be tack coated immediately prior to placing asphalt.

Existing bituminous surfaces and concrete pavements

Existing surfaces must be clean and dry prior to tack coating. Particular care is required in removing dust from freshly milled surfaces. Figure 2 shows excessive pick up of tack coat applied to a poorly cleaned, milled surface.



Figure 2 Pick-up of tack coat on dusty milled surface

Very dense and hard surfaces may require milling to achieve an additional mechanical key in areas of high surface shear. For example, Figure 3 shows slippage of asphalt placed on a smooth concrete surface on a heavily trafficked freeway exit ramp.



Figure 3 Asphalt slippage failure on concrete pavement

APPLICATION PROCEDURES

Application procedures must ensure a uniform distribution of binder across the entire width of the area to be paved. For large areas, the emulsion should be applied through a pressurised spray bar and purpose built tack coat spray system or calibrated sprayer. A hand sprayer or lance may be used for small areas.

Heating of tack coat emulsions to a maximum of 60°C, prior to spraying, can improve the flow through the spray nozzles and help with the breaking of the emulsion. Heating is generally not necessary with diluted emulsions or application through pressure sprayers.

The emulsion tack coat must be allowed to break and be dry to the touch before applying asphalt. 'Break' is achieved when the water separates and leaves only the bitumen, and is generally distinguished by a change in colour from brown to black. Breaking time will depend mainly on the prevailing weather and existing surface conditions.

Breaking of the emulsion reduces the risk of pick-up of fresh tack coat binder onto the tyres of delivery vehicles and paving equipment. Pick-up must be avoided as it reduces the effectiveness of bond between old and new surfaces, particularly in critical wheelpath areas, as well as creating a nuisance by tracking on to nearby surfaces. Where pick-up is an issue, a light mist of water sprayed on the tyres of delivery vehicles may assist in reducing pick-up. Care should also be taken to ensure that tyres of delivery vehicles remain clean and uncontaminated by pick-up of material from unpaved shoulders, etc.

A special application of tack coating is the use of an asphalt paver with integrated emulsion application. This is particularly applicable to ultra-thin asphalt paving applications where a high binder application rate of modified bituminous emulsion is required. When applied in this manner, there is no contact of vehicle tyres with the tack coat and the asphalt may be applied directly to the unbroken emulsion. The heat of the asphalt causes rapid breaking and vaporisation of the water in the bituminous emulsion.

REFERENCES

Pavement work tips No 2: Storage & handling of bituminous emulsions.

AS 1160: Bituminous emulsions for construction and maintenance of pavements.

For more information on any of the construction practices discussed in "pavement work tips", please contact either your local Austroads Pavement Task Force rep. or AAPA: tel (03) 9853 3595; fax (03) 9853 3484; e-mail: info@aapa.asn.au. A complete list of "pavement work tips" issues is available on AAPA's website: www.aapa.asn.au Issues may be downloaded using Adobe Acrobat Reader. Copies may also be obtained from AAPA. Material may be freely reproduced providing the source is acknowledged. This edition was prepared by members of the Asphalt Research Working Group.