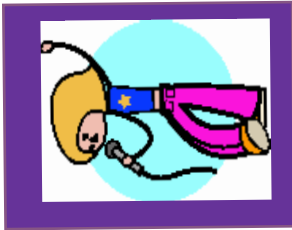


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Tack Coats: How and what to apply!



The Asphalt RAP

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Colorado Asphalt Pavement Association



The proper application of tack coat material is a key component of a quality asphalt paving project. Tack coat promotes bonding between layers, facilitating achievement of maximum strength of the pavement structure. It prevents delamination and it ensures long-term performance and lasting ride quality to the highway user.*¹

This technical bulletin will examine the necessary procedures for ensuring proper tack coat material application. The important questions to be answered are:

- 1 Is the application rate correct?
- 2 Did the correct or specified materials get placed?
- 3 Was the surface prepared to accept the application of the tack materials so it would be in the most effective condition?
- 4 Are proper application techniques being used?
- 5 Did the tack set before the layers was placed?



Uniform tack-coat application

1 Application Rate:

The application rate will vary depending on the surface to which it is being placed and the existing pavement condition. The application rate is generally measured in gallons per square yard (g/sy) of surface to be covered. A new asphalt surface may require a shot rate of 0.08 to 0.1 g/sy. This would be a tack layer placed between lifts if the surface was not immediately covered after the lower layer construction was completed. For an oxidized surface the application rate

WHAT IS A TACK COAT MATERIAL

Most tack coats are produced from a binder base stock which is emulsified to allow for spray application. The materials from the supplier are emulsified with maximum of 35% water for rapid setting and 43% for slow setting materials.

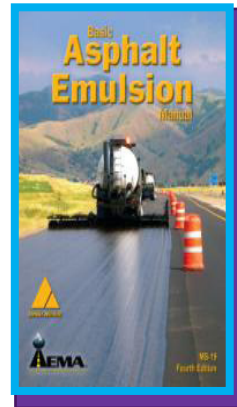
Tack Coats: How and What to apply!

may be increased to 0.09 to 0.12 g/sy. A milled asphalt surface 0.08 to 0.12 g/sy, an overlay of PCCP 0.08 to 0.1 g/sy. Longitudinal joints should have sufficient tack coverage to adhere the overlying layer while not permitting run-off due to excessive emulsion coverage. The application of the tack materials in excess of the recommended rates can be more detrimental than applying the materials at a lesser rate than recommended. In these instances the tack coat can act as a lubricant, creating a slippage plane. Additionally, using too much material can cause it to be drawn into an overlay, negatively affecting mix properties and even creating potential for bleeding in thin overlays.

2 Materials:

While user specifications generally indicate what type of tack should be used, occasionally the incorrect grade or type of materials are placed. Specifications may require an SS-1H type material when a different grade may be more appropriate. **Rapid Setting emulsion**, which include polymer modified emulsions, used for tack coats are RS1, RS2, CRS1, CRS2, CRS- 2P, CRS-2R. The letters "P or R" in the rapid-setting grade emulsions denotes polymer-modified emulsion. Rapid-setting emulsions, already containing a maximum of 35 percent water. Slow-setting grades of emulsion used for tack coats are SS1, SS1h, CSS1, and CSS1h. The original slow-setting emulsion, already containing a maximum of 43 percent water, is always diluted by adding up to an equal amount of water. In general, the dilution rate is less when it is cool or damp.

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The Asphalt Institute
publication, MS - 19

The tack coat materials may be either Cationic or Anionic. The letter "C" in the emulsion type denotes cationic (positively charged) emulsified asphalt particles. The absence of the "C" denotes anionic (negatively charged) emulsified asphalt particles. For example, SS1 is anionic and CSS1 is cationic. The type of emulsifying agent used in the asphaltic emulsion determines if the emulsion will be cationic or anionic. The perception is cationic emulsions tend to break chemically whereas anionic emulsions tend to break evaporatively. However this is primarily only a chipseal concern and not necessarily a tack concern. The relative break of a tack may be more governed by the chemical loading of the emulsion and weather conditions than anything else. Anionic emulsions carry a negative charge whereas cationic ones carry a positive charge and by theory are best used with aggregates carrying an opposite charge.

Any of the emulsions or paving asphalt mentioned above that conforms to the Standard Specifications can be used for a tack coat. However, local experience and engineering judgment may dictate which type of material is ultimately used. For consideration, the following information and experience is offered for each material type.

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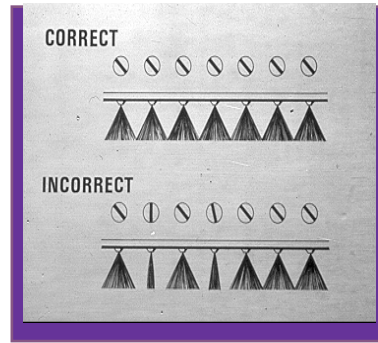
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Slow-setting emulsion is most commonly used, however, they take longer to break than rapid-setting emulsions. For this reason, they are not recommended for use as a diluted tack coat in cold weather, at night, or when there is a short construction window.

3 **Suface Preperation:**

Tack coat material should be placed on clean, dry pavement. Where cold and/or damp weather conditions exist, an adjustment to the type of material used may be necessary. Emulsified tack coat materials may be applied to cool and/or damp pavement, however, the length of time needed for the set to occur may increase. Guidance on the types of tack coat materials can be found in the Asphalt Institute's publication number **MS-19, A Basic Asphalt Emulsion Manual**. The pavement surface receiving tack coat material should be free of any substance that might inhibit bonding. The tack coat operation is never a substitute for cleaning a pavement prior to overlay. A dirty or overly dusty surface will inhibit the ability of the tack coat to bond, resulting in a potential slippage plane between the existing surface and the asphalt overlay. Slippage cracking, or tearing, and delamination are distresses typically seen when cleanliness is lacking.



Spray Patterns from a typical spray bar

4 **Application Techniques/ Tracking:**

The pick-up of the emulsified asphalt material by vehicle tires, can occur as a result of the tack coat operation. An undesirable consequence of tracking is the depositing of tack materials on adjacent pavement and at intersections, etc. Though aesthetically not pleasing, the effect on adjacent pavement is typically minimal, and wears off in a short time period. Intersections, on the other hand, can receive deposits of material significant enough to distort the pavement surface and hinder a driver's ability to navigate. As such, steps should be taken to eliminate the occurrence of tracking. If tracking of the tack is a problem an owner or contractor may consider Trackless tack. Trackless tack is an advanced asphalt emulsion tack specially formulated to dry extremely fast into a hard and driveable coating—often in less than 10 minutes. Recent national studies indicate that trackless tack, when compared to traditional tack coats, can help contractors achieve better density with less compactive effort and improves the bonding and shear strength between two asphalt pavements.

Cleaning prior to the placement of the Tack Coat materials



"Slow-setting emulsions are not recommended for use as a diluted tack coat in cold weather, at night, or when there is a short construction window."

5 Was the tack set before placement? Allowing the emulsified asphalt tack coat material to set prior to placing the asphalt overlay will enhance opportunity for bonding to occur. Whenever practicable, equipment should stay off the tack coat until the set has occurred. During the break, dispersed droplets of asphalt cement in the emulsified asphalt begin to coalesce. This starts when the emulsified asphalt comes in contact with the pavement surface, and is complete after all moisture has evaporated. A change in the color of the emulsified asphalt tack coat material, from brown to black, is a visual indicator of when the emulsion has broken. The ability of the tack coat to bond is best once the material has set.

Conclusions: Uniformity is a major consideration in the proper application of tack coat material. A good tack coat application will exhibit a uniform layer of tack coat material adequately covering the existing pavement.

To ensure a uniform application of tack coat material, equipment must be capable of delivering the material at the required temperature and pressure. Dilution may facilitate uniform application by assisting the flow of material, however, a delay in the set time will result. Modification to equipment or operational methods such as reducing spray bar nozzle size or increasing pressure will help ensure uniform application. The spray bar and angle of the nozzles must be verified for proper height and alignment.

Tack coat application should be made on clean, dry pavements at a rate reflecting the condition of the pavement being overlaid. Allowing the emulsified asphalt tack coat material to set prior to placing the asphalt overlay will enhance opportunity for bond to occur.

To mitigate tracking, the emulsified asphalt tack coat material must set prior to access by haul vehicles.

This issue of "The Asphalt RAP" was compiled from information provided by ^{*1}-Flexible Pavements of Ohio. Technical Bulletin: 2001; Marshall Shackelford, Suncor Energy, USA, Denver CO; Doug Martin, COBITCO, Inc, Denver, CO; A Basic Asphalt Emulsion Manual, Series No. 19, Third Edition, Asphalt Institute; Construction Leaflet No. 23, Asphalt Institute; Construction of Hot Mix Asphalt Pavements, Manual Series No. 22, Second Edition, Asphalt Institute; HOT-MIX ASPHALT PAVING HANDBOOK 2000, US Army Corps of Engineers, Federal Aviation Administration publication AC 150/5370-14A, Appendix 1 (James A. Scherocman, Consultant); Principles of Construction of Quality Hot-Mix Asphalt Pavements, US Department of Transportation, FHWA, August 1982; Pavement Maintenance With Asphalt, Asphalt Institute.



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