

TO: Chief Engineer  
Director of Construction & Maintenance  
Directors – Planning and Major Projects  
Engineering Branch Section Heads  
Regional Managers of Professional Services/Engineering  
Regional Managers, Operations  
Regional Geotechnical & Materials Engineers  
Regional Project Managers - Paving

SUBJECT: USE AND APPLICATION OF EMULSIFIED PRIMERS  
B. C. MINISTRY OF TRANSPORTATION AND HIGHWAYS

BENEFITS:

The proper understanding and use of all emulsified primers will greatly improve the waterproofing characteristics and adhesion properties of prime and tack coat operations using the available emulsified primers.

POLICY:

All tack coat and priming operations carried out between May 1<sup>st</sup> and September 30<sup>th</sup> must utilize emulsified primers according to Ministry of Environment Order In Council 0721 dated June 26<sup>th</sup>, 1997. (See Technical Circular T-2-99)

EMULSIFIED PRIMER CLASSIFICATIONS:

Asphalt Emulsion: The most commonly used product that falls under this category is SS-1 which is manufactured by most asphalt suppliers. Asphalt Emulsions contain asphalt cement, water and an emulsifying agent. SS-1 is classified as a slow setting emulsion.

Penetrating Asphaltic Emulsion: There are currently two emulsified primers that meet the classification as *Penetrating Emulsified Primer*, EP-94 from M<sup>c</sup>Tar Petroleum, EP2000 from M<sup>c</sup>Asphalt (formally Koch Materials) and EAP2 from Pounder. Products that fall under this category contain, asphalt cement, water, emulsifying agent and up to 5% oil distillate. The addition of the distillate helps with the penetration process. Both EP-94 and EP2000 are classified as *Slow Setting Emulsified Primers*

Tall Oil Pitch Emulsion “RESTAK”: This product is a by-product of the pulp and paper industry and comes from the soap skimmings generated by the Kraft pulping of resinous softwoods. When the raw Tall Oil is blended with water to form an emulsion the Product brand named “Restak” is produced.

## HANDLING, STORAGE AND APPLICATION PROCEDURES

Application procedures and techniques for each of the products currently on the Ministry's Recognized Products List are as detailed below.

### General

All emulsions are water based and therefore should not be allowed to freeze. If the products become frozen the asphalt or base product and water separate and can not be rebleded rendering the product un-usable. When separation occurs the materials cannot be recombined.

If these products are to be stored in the contractor's storage tanks care should be taken to avoid contamination by water, oils or other liquids.

When pumping into tanks or the distributor, intake lines should be at the bottom of the tanks to avoid foaming. If the tank has to be loaded from the top a full-length drop hose should be used to reach the bottom of the tank.

When working with Asphalt Emulsions prevent unnecessary circulation that can cause a increase in emulsion viscosity or actual emulsion breakdown.

Emulsions should not be applied if the ambient temperature is below 10°C. Please note, EPS Seal Coat projects permit the use of High Float Emulsions at a temperature of 6°C.

All aspects of the distributor should be clean and in good working order to aid in the application of emulsions. Cleaning nozzles after spraying is very important. Lines and pumps that become clogged can be heated carefully to re-liquefy the residue that is causing the clogging.

### Construction Hints

**Watering** To aid penetration it is a good practice to apply water the gravel surface 2 – 12 hours before priming depending on atmospheric conditions. The surface at the time of priming should be damp but not saturated.

**Application** When applying emulsions, as a prime on gravel, diluting the product supplied, at a ratio of 1:1, (the water used to dilute the emulsion should not be hard nor cold, ideally the water should be the same temperature as the emulsion) will give somewhat deeper penetration. **Water must be added to the emulsion not emulsion to the water.** The addition of a small amount of Surfactant, or the same emulsifier used for the preparation of the emulsion, could be added to the water to obtain additional stability of the emulsion. On a very dense grade it may be advisable to make two

applications so as to avoid run-off and puddling of the product. This second application should be done immediately after the first.

**Compaction** If the base material is loose after priming, compaction, generally using pneumatic tired rollers, should be used to consolidate the loosened material.

**Application of Sand Cover** The application of a fine sand coat, at an application rate of 2-3 kg/m<sup>2</sup>, can be applied after spraying to help with the set-up process and to aid in the avoidance of tracking. After application of the sand this material can be rolled with a pneumatic tired roller to help with imbedment and setting-up of the emulsion.

**Inversion of Prime** Inversion is the process whereby a small windrow, with just enough aggregate to cover the surface being sprayed, is left on the outer edges of the work area. After application of the primer this surplus material is graded, in one pass, onto the primed surface and rolled into place. This should be done as soon as the primer has been placed to allow the product to penetrate in both an upward and downward direction.

**Traffic Control** Traffic should be kept off the treated surface until the product has penetrated and the surface is no longer tacky. There should be no pickup of the treated materials on shoes or tires.

### Asphalt Emulsion (SS-1)

Care has to be taken to ensure that the weather conditions are suitable for the application of SS-1. This product should not be applied prior to probable rain and not during rainfall. High humidity will slow the set-up time. SS-1 has a tendency to re-emulsify if it is rained on prior to being completely set-up, which may take a few days in cooler temperatures.

The heating of SS-1 will assist in the spraying and setting up of the product. The temperature can be safely taken as high as 85°C so long as the heat is applied evenly and the material is gently agitated or circulated for a short period of time. This heating could be done in the distributor.

### Penetrating Asphaltic Emulsion:

These products are treated very similarly to SS-1 however they are a little more stable, due to the addition of up to 5% distillate, and tend not to re-emulsify as easily as SS-1.

Dilution prior to use as a prime is recommended at a ratio of 1:1, again add the water to the emulsion.

The application of a sand seal after spraying is very advantageous and will assist in the setup time.

## Tall Oil Pitch Emulsion “Restak”

Storage and handling of “Restak” requires more attention than the other products.

It is very important to keep the “Restak” moving while in storage, so circulating tanks are a must. After a period of approximately 3-4 weeks the fatty acids separate from the rest of the product and form globules on the surface. This does not effect the product's ability to perform but these fatty acids create problems in spray bars and tend to plug filters. Only as much material as can be sprayed in a short time should be brought to the project site. If, after a period of time, the product starts to solidify in storage the addition of more “Restak” will re liquefy the hardening material.

“Restak” is delivered as an emulsion having about 50% water but for road application must be further diluted by combining with at least another 50% for use tack coat. As a primer it does not need to be cut. Prior to spraying the product can and should be heated to between 70°C and 85°C. This heating should be done slowly and carefully so as not to cause any separation of the product.

As a tack coat this product is very useful in that paving can commence as soon as the spray has been applied. An application rate of approximately 0.2l/m<sup>2</sup> is a good target rate. A good bond is not obtained for 24-48 hours but after that time a very good bond develops.

As a primer the product requires inversion or blinding with sand, which should be done as soon as the spray is complete as it becomes extremely sticky. The normal application rate ranges from 1.5 – 2 l/m<sup>2</sup>. As with the other products if the grade is tight it is helpful to dampen the surface before application.

After application the nozzles of the distributor should be cleaned in either gas or diesel. At no time should the distributor be allowed to sit overnight with less than half a load in it. The best practice is to fill or empty the distributor at the end of each day.

## REQUISITIONS FOR EMULSION

When completing a requisition of primer there are four possible scenarios.

- Emulsified Prime:- This request, on a Requisition, opens the bid process to all approved primer products.
- Asphaltic Emulsion:- This request, on a Requisition, allows the Supplies of Penetrating Asphalt Emulsions and SS-1 to bid.
- SS-1:- This request limits the product supplied to SS-1.
- Penetrating Asphaltic Emulsion:- This request on a Requisition restricts the bidding to M<sup>c</sup>Tar (EP-94) M<sup>c</sup>Asphalt (EP2000) and Pounder (EAP2) at this time

- Tall Oil Pitch Emulsion “Restak”:- This request limits the bidding, at this time, to B.C. Chemicals.

CONTACT:

Michael E Symons  
Pavement Research & Standards Technician  
Engineering Branch, Geotechnical & Materials Engineering Section  
(250) 387-7717



Merv Clark, P. Eng.  
Chief Engineer

- c.c. A.D.M. Highways Operations
- c.c. A.D.M. Planning and Major Projects
- c.c. All Regional Directors
- c.c. All District Highways Managers
- c.c. Purchasing Commission, Attn.: Ralph White, Purchasing Agent