

## **Technical Note No: 13**

### **Sub: APRR Project: Flexible Pavements - Laying of BT- Importance of Prime Coat & Tack Coat- Execution Methodology-Reg.**

**Ref:** Inspection of works by PMC in 12 Districts.

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**1. Scope:** This Technical Note covers the specification and construction of bituminous prime coat for laying over granular surface and tack coat over primed granular surface, bituminous or cement concrete pavement.

#### **2. Prime Coat Over Granular Base.**

##### **2.1 Definition and Objective.**

**2.1.1** Priming is spraying of low viscosity liquid bituminous materials on the surface of non-bituminous granular base course. The objectives of priming a granular surface are as under.

- (i) To penetrate the existing base course surface so as to plug capillary voids in it.
- (ii) To coat and bond loose mineral particles on the surface of the base course.
- (iii) To seal surface pores and make the surface of the base course water-resistant.
- (iv) To provide adhesion between the base and the superimposed bituminous surface course in conjunction with a tack coat.

**2.1.2** Prime coat is not to be regarded as a substitute for tack coat.

#### **2.2 Materials**

##### **2.2.1 Primer**

The primer shall be cationic bitumen emulsion SS1 grade complying with IS:8887 or medium curing cut back bitumen conforming to IS:217. Cutback should not be prepared in the field. The use of medium curing cutback shall be restricted only for the sites at sub-zero temperatures or for emergency applications.

**2.2.2** The quantity of SS1 grade bitumen emulsion for various types of granular surfaces shall be as per Table 500.1A

**Table 500.1A Quantity of Bitumen Emulsion for Various Types of Granular Surface for Priming**

Type of Quantity per 10 sqm	Surface (kg)
WBM/WMM	7-10
Stabilized Base	9-12
Gravel Base/Crusher Run Macadam	12-15

**2.2.3 The type and quantity of cutback bitumen primer shall be as given in Table 500.1B.**

**Table 500.1B Type and Quantity of Cutback Bitumen Primer**

Type of Surface	Type of Cutback	Rate of Spray (kg/m <sup>2</sup> )
WMM/WBM	MC 30	0.6-0.9
Mechanical stabilized soil base, lime stabilized soil, soil cement and lime cement base	MC 70	0.9-1.2
Gravel Base, Crusher Run Macadam and Crushed Rock base	MC 250	1.2-1.5

### **2.3 Weather and seasonal limitations**

Primer shall not be applied to a wet surface or during a dust storm or when the weather is foggy, rainy or windy or when the temperature in the shade is less than 10-degree Celsius

## Prime Coat

- **Bitumen : Emulsion SS1 Grade or Medium Curing Cutback**
- It should penetrate about **10 mm** deep into base course.
- Bitumen Emulsion shall be applied on a **damp surface** but no free or standing water.
- Primed surface shall be allowed to cure for at least **24 hours**.

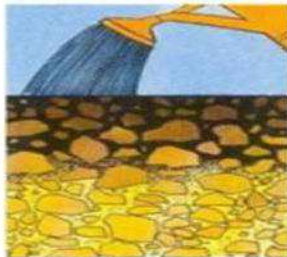
## Prime Coat

- **No heating or dilution of SS1 emulsion shall be permitted at site.**
- **Hand spraying shall not be allowed. Bitumen pressure sprayer shall be used.**

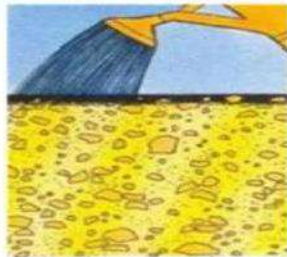
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The emulsion must penetrate the first few millimeters of the layer very quickly



Prime coat will not succeed if the emulsion is of a viscosity that does not correspond to the gravel or has too high a breaking speed.



Figure 19 Prime Coat (Courtesy: <http://PMGSY.nic.in> and Hincol.com)

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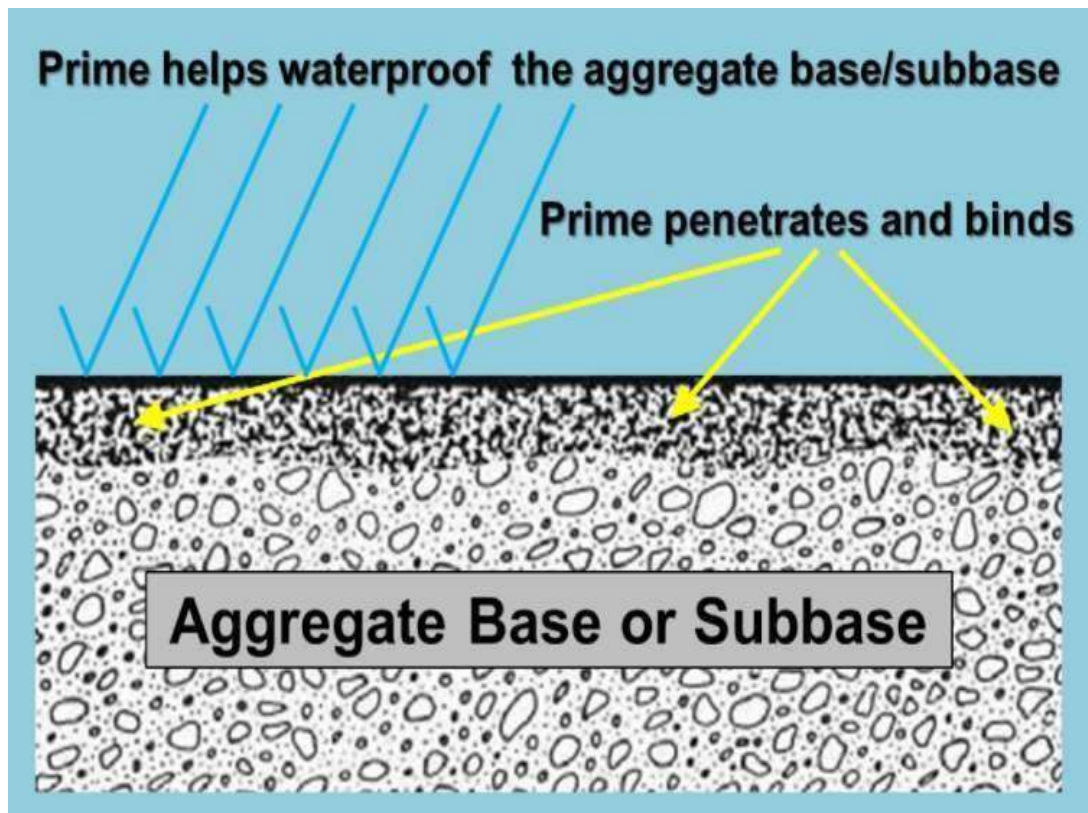
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Surface immediately after laying prime coat



#### 2.4 Functioning of Prime Coat





### **3 Tack Coat**

#### **3.1 Scope**

Tack Coat is a very light application of low viscosity liquid bituminous material to an existing bituminous, cement concrete or primed granular surface to ensure a bond between the surface being paved and the overlying course. The tack coat material is not expected to penetrate into pavement and for this reason; the application should be very light to provide adequate bond between two layers.

- 3.2** The use of cutback bitumen RC-70(in cold climate) as per IS:217 shall be restricted only for sites where atmospheric temperature at the time of application reaches below Zero-degree Celsius or for emergency applications. The salient features of Tack coat are explained as below.

## **Tack Coat**

- **Binder : Cationic Bitumen Emulsion : RS1 Grade**
- **Shall be applied by a self -propelled or towed bitumen pressure sprayer**
- **Hand spraying shall not be permitted**
- **No traffic should be allowed other than required construction equipment**

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### 3.3 Application of Tack Coat

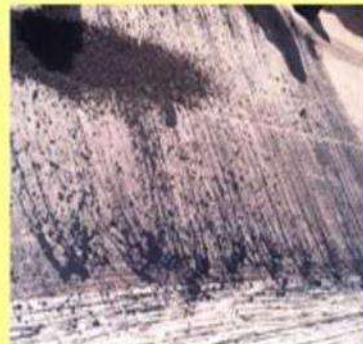
The binder shall be sprayed on the base at the rate specified in Table 500.2

**Table 500.2 Rate of Application of Tack Coat**

	Type of Surface Emulsion	Rate of Spray of Binder
		(kg/m <sup>2</sup> )
i)	Normal bituminous surfaces	0.20 to 0.25
ii)	Dry and hungry bituminous surfaces	0.25 to 0.30
iii)	Granular surfaces treated with primer	0.25 to 0.30
iv)	Cement Concrete Pavement	0.30 to 0.35

Note: Binder used for Tack Coat shall be Rapid setting Bitumen Emulsion Grade RS-1 or suitable low viscosity paving bitumen of VG 10 grade.

## WRONG PRACTICE OF TACK COAT



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### 3.4 Curing of Tack Coat

The tack coat of emulsion shall be left to cure until all the volatiles have evaporated before any subsequent construction is started. No plant or vehicle other than essentially required for construction shall be allowed on the tack coat.

## 4 Quality Control

### 4.1 Tests on Prime coat and Tack Coat

#### 4.1.1 Tests Prior to Construction

The quality control tests to be carried out prior to construction shall be as given in Table 1800.18. These tests shall be carried out on the bitumen binders (Emulsion/Cutback) brought on the site by the contractor for use in the work. Where paving bitumen is used for the tack coat, the tests on bitumen shall be as specified in Table 1800.20.

**Table 1800.18 Quality Control Tests Prior to Construction**

Type of Test		Frequency
1)	Viscosity (using Saybolt Furol Viscometer) (IS:8887)	One test for each lot
2)	Residue on 600 micron sieve (IS:8887)	-do-
3)	Storage Stability Test (IS:8887)	-do-
4)	Flash Point Test, where bituminous cutback is to be used (IS:217)	-do-
5)	Viscosity Test (IS:217), where bituminous cutback is to be used	-do-

#### 4.1.2 Tests during Construction

The quality control tests to be conducted during construction shall be as given in Table 1800.19

**Table 1800.19 Quality Control Tests during Construction**

Type of Test		Frequency
1)	Temperature of Binder, when emulsion/cutback is to be used	Regularly
2)	Rate of Spread of Binder	At least two tests per day.
3)	Curing of Primer/Tack surface	Before any subsequent treatment.

The quality control tests to be carried out prior to construction shall be as given in Table 1800.20.

**Table 1800.20 Quality Control Tests Prior to Construction**

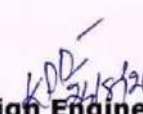
Type of Test		Frequency
1)	Quality of Binder (Paving Bitumen as per IS:73)	
	a) Absolute Viscosity and Penetration Test	One test per lot
	b) R&B Softening Point Test	-do-
	c) Ductility Test	-do-
2)	Quality of Binder (Modified Bitumen) (IS:15462 and IRC:SP:53*)	
	a) Penetration Test	-do-
	b) R&B Softening Point Test	-do-

	c) Elastic Recovery Test	-do-
	d) Separation Test	-do-
3)	Aggregate Impact Value Test (IS:2386 Part 4)	One test on representative sample per km length from each source identified by the Contractor
4)	Flakiness Index Test (IS:2386 Part 1)	Two tests per source
5)	Bituminous Stripping of Aggregate Test (IS:6241)	One test per source
6)	Water Absorption (IS:2386 Part 3)	-do-
7)	Soundness Test, if water absorption of aggregate exceeds 2 percent (IS:2386 Part 5)	-do-



## **Method of Test for Measurement of Spread of Binder for Prime Coat and Tack Coat**

Aluminum or other light metal tray of 200 mm x 200 mm size and 20 mm depth are to be used. A set of three plates is essential for one test. All the plates are to be weighed and numbered. These are placed at intervals of 10 m along the road in path between wheels of bitumen distributor. After the distributor crosses a length of 50 m, trays are to be removed and wrapped in weighed polyethylene bags so that these can be handled, stocked safely for further weighing in laboratory. The trays shall be weighed to first place of decimal. Similarly, transverse distribution of liquid bituminous material can be checked by placing three numbers of plates at interval of 50 cm in the path of binder spraying equipment.

  
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### **References:**

- 1) IRC:16-2008: Standard Specifications and Code of practice for Prime and Tack Coat  
(second revision)
- 2) MoRD-2014.