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TENTATIVE SPECIFICATION  
FOR  
20 mm THICK PREMIX CARPET  
USING CATIONIC BITUMEN  
EMULSION

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## TENTATIVE SPECIFICATION FOR 20 mm THICK PREMIX CARPET USING CATIONIC BITUMEN EMULSION

### 1. INTRODUCTION

1.1. Bitumen emulsion offers a new set of possibilities for the solution of problems faced in road paving works. Its usefulness in reducing the consumption of fuel, reduction in pollution while heating and spraying, wide adoptibility to all types of aggregates, lesser susceptibility to wet weather conditions, lower equipment investments and easier mobilisation in remote regions makes it a viable choice for road works. Recognising these benefits, the Bituminous Pavements Committee took up the drafting of this Specification.

1.2. The initial draft for this Specification was prepared by Shri M.B. Jayawant. The Bituminous Pavements Committee in their meeting held on the 29th September, 1977 modified the Specification. The modified Specification was circulated by the Indian Roads Congress to the Chief Engineers of States and the Director General Border Roads, to carry out trials and report on their performance for taking a decision on the Specification to be recommended. The Bituminous Pavements Committee (personnel given below) after considering all relevant information finalised this Specification at its meeting held at Madras on the 13th March, 1987.

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The Secretary, Indian Roads Congress (Ninan Koshi)

—*Ex-officio*  
—*Ex-officio*

1.3. The above draft document as approved by the Bituminous Pavements Committee in their meeting mentioned above was considered by the Specifications and Standards Committee in their meeting held on the 23rd April, 1987. Later on the draft document was approved by the Executive Committee and the Council in their meetings held on the 28th April, 1987 and 22nd May, 1987 respectively for being published as the finalised Specification of the Indian Roads Congress.

## 2. SCOPE

This is a tentative specification for 20 mm thick premix carpet and seal coat using cationic bitumen emulsion as binder.

Cationic bitumen emulsion, shall not normally be stored below zero degree Celsius. However, the construction shall be carried out only when the atmospheric temperature is above 10° C. The emulsion is usually brown in colour, but after setting, i.e., when the water breaks away from bitumen, the colour will be black. Rate of setting of the emulsion means the rapidity with which the water breaks away from the emulsion.

## 3. MATERIALS

### 3.1. Binder

The binder for premix carpet shall be cationic bitumen emulsion of MS Grade (Medium Setting) complying with IS: 8887-1978 and having a bitumen content of 60 per cent minimum weight.

For liquid seal coat, MS (Medium Setting) grade emulsion can be used, but it is preferable to use RS Grade (Rapid Setting) of cationic bitumen emulsion complying with IS: 8887-1978 and having a bitumen content of 60 per cent minimum by weight. However, for premix seal coat, SS Grade (Slow Setting) cationic bitumen emulsion should be used.

### 3.2. Coarse Aggregate

Coarse aggregate for the carpet shall be crushed rock, crushed gravel or shingle and shall consist of angular, clean, tough and durable fragments, free from disintegrated pieces and organic or deleterious matter and adherent coatings. Aggregate having stripping values higher than the permissible limit can also be considered for use, limited to the extent of the antistripping properties of such emulsions, as directed by the Engineer-in-

Charge. The aggregate should be free from surface coating such as clay, dust, ash etc., and should preferably be washed with water before use.

The coarse aggregate shall also satisfy the following physical properties :

<i>Test</i>	<i>Requirements</i>	<i>Test Method</i>
1. Los Angeles Abrasion Value or Aggregate Impact Value	Max. 40%	IS : 2386 (Part-IV)
2. Flakiness Index	Max. 30%	-do-
3. Stripping Value <sup>1</sup>	Max. 25%	IS : 2386 (Part-I)
4. Water Absorption <sup>2</sup>	Max. 1%	IS : 6242
5. Soundness :		
Loss with Sodium sulphate 5 cycles	Max. 12%	IS : 2386 (Part-III)
Loss with Magnesium sulphate 5 cycles	Max. 18%	-do-

*Notes :* 1. Stripping value need not be given too much importance unless otherwise directed by the Engineer-in-Charge, since cationic emulsion by nature has better adhesive properties than straight run bitumen.

2. Water absorption upto 2 per cent may be permitted in exceptional cases.

### 3.3. Fine Aggregate

Fine aggregate for seal coat shall be crushed stone chips or coarse sand, clean, uncoated, and free from clay, dust and other deleterious matter.

## 4. QUANTITIES OF MATERIALS REQUIRED

### 4.1. Aggregate

#### 4.1.1. For premix carpet

(a) *Coarse aggregate* : 13.2 mm size, passing I.S. 19 mm sieve and retained on I.S. 9.5 mm sieve

*Per 10 m<sup>2</sup> area*

0.18 cu.m.

(b) *Coarse aggregate* : 9.5 mm size, passing I.S. 13.2 mm sieve and retained on I.S. 6.7 mm sieve

9.09 cu.m.

4.1.2. For seal coat

- |  |                                  |
|--|----------------------------------|
| (a) <i>Liquid seal coat</i> : Crushed fine aggregate 6.7 mm size, passing I.S. 9.5 mm sieve and retained on I.S. 2.36 mm sieve | <i>Per 10 m<sup>2</sup> area</i> |
|  | 0.06 cu.m.                       |
| (b) <i>Premixed seal coat</i> : Coarse sand or stone grit passing 2.36 mm sieve and retained on 180 $\mu$ m sieve              | 0.06 cu.m.                       |

4.2. Binder

4.2.1. For tack coat

*Per 10 m<sup>2</sup> area*

- |                                    |               |
|------------------------------------|---------------|
| (a) On water bound macadam surface | 6.5 to 7.5 kg |
| (b) On existing black top surface  | 4.5 to 5.5 kg |

4.2.2. For premix carpet 20 to 23 kg

- |                          |          |
|--------------------------|----------|
| 4.2.3. For seal coat     |          |
| (a) For liquid seal coat | 12-14 kg |
| (b) For premix seal coat | 10-12 kg |

5. CONSTRUCTION

5.1. Preparation of Base

The existing base or surface shall be cleaned thoroughly to remove all dust and other deleterious matter before the carpet is laid. The surface shall be cleaned by wire brushes, broom etc. and finally dusted with sacks or washed with water if available easily.

5.2. Preparation of Binder

Before opening, the cationic emulsion drums should be rolled at slow speed, to and fro, for a distance of about 10 metres, 5 to 6 times to mix the contents properly.

5.3. Tack Coat

The tack coat of emulsion can be applied on wet road

surface. Tack coat should be applied not earlier than 10 minutes before spreading the premix. The spraying-cans should have holes 6 mm diameter spaced at 30 mm. Compressed air sprayer will give faster and more uniform coverage and the same shall be preferred.

On water bound macadam surface, water should be sprayed to make the surface damp before applying the tack coat.

#### 5.4. Preparation of Premix

Premixing of cationic emulsion and aggregate shall be done in a suitable mixer such as cold mixing plant as per IS : 5435 (revised) or concrete mixer or by shovels in exceptional cases. However, for large works, continuous mixing operation can be done either in batch or continuous type mixer units suitable for emulsion mixes.

5.4.1. Premixing in concrete mixer : When using concrete mixer for preparing the premix, 0.135 cu.m. (i.e. 0.09 m<sup>3</sup> of 13.2 mm and 0.045 m<sup>3</sup> of 9.5 mm size) of aggregates per batch may be used as this quantity will cover 5 sq.m. of road surface with 20 mm average thickness.

The aggregate required for one batch should be kept ready near the mixer. The aggregate should be free from dust and dirt, if any, by washing with water in advance.

The coarse aggregate of 13.2 mm size should be first charged into the mixer followed by 5 to 6.5 kg of cationic emulsion. Then 9.5 mm size aggregate added followed by 5 to 6.5 kg of cationic emulsion.

After the materials are mixed uniformly, the same should be unloaded and immediately transported to the laying site in wheel barrows. Too much mixing should be avoided as it may result in decoating and aggregate.

5.4.2. Premixing by shovels : Cationic emulsion and aggregate can also be mixed manually, by shovels when mechanical mixer is not available or when the work is too small. About 0.06 cu.m of the aggregate can be conveniently mixed in one heap at a time. It is preferable to make the aggregate damp before mixing as it reduces the effort required for mixing and also helps better coating of the aggregate. The 13.2 mm size aggregate and emulsion are mixed first and then the 9.5 mm size aggregate

and the remaining quantity of emulsion are added and mixed. Too much mixing should be avoided as it will result in 'decoating'.

### 5.5. Spreading of Mix

The premix cationic emulsion and aggregate should be spread within 10 minutes of applying the tack coat. The mix remains easily workable for about 20 minutes after mixing and hence all levelling, etc., should be completed within this time, for easy workability.

The mix should be spread uniformly to the desired thickness making due allowance for extra quantity required to fill up depressions. The camber should be checked by means of camber boards and inequalities evened out. Too much use of blades or rakes should be avoided.

### 5.6. Rolling

Rolling should start at least half an hour after laying the premix and in no case should the rolling be delayed beyond four hours after laying. Smooth wheeled tandem roller of 8 to 10 tonne is preferable though three-wheeled roller of equivalent capacity can also be used. While rolling, wheels of roller should be cleaned and kept moist.

Rolling shall commence at the edges and progress towards the centre longitudinally except in case of superelevated sections where rolling shall be done from the inner edge towards the outer edge of the curve.

After one pass of roller over the whole area, depressions or uncovered spots should be corrected by adding premix material. Rolling should be continued until the entire surface has been rolled to compaction and all the roller marks eliminated. With each pass of the roller, preceding track shall be overlapped uniformly by at least 1/3 width. The roller wheels shall be kept damp to prevent the premix from adhering to the wheels and being picked up. Rollers shall not be used on newly laid material as there is a risk that the surface will be deformed thereby. At joints, the edges along the transverse of the carpet laid and compacted earlier shall be cut to their full depth so as to expose a fresh surface which shall be painted with a thin coat of binder before the new mix is placed against it.



### 5.7. Seal Coat

A seal coat, liquid or premix type, shall be applied 4 to 6 hours after laying the premix carpet.

**5.7.1. Liquid seal coat :** The aggregate for liquid seal coat shall be of uniform quality crushed stone comprising clean, hard, durable and uncoated chips free from dust, soft, flaky or elongated particles and organic or any other deleterious matter. Quantities of the material required are given in paras 4.1.2. and 4.2.3.

Mechanical spraying should be carried out as far as possible. Only in exceptional cases spraying from a spraying-can be resorted to as directed by the Engineer-in-Charge. Spraying should be done uniformly to cover the area completely with emulsion without leaving any blank spots.

Immediately after spraying the emulsion, clean and washed grit for the seal coat shall be spread uniformly preferably by means of a mechanical gritter, otherwise manually so as to cover the surface completely. Rolling with 6 to 8 tonne roller should start soon after spreading the chips. The rolling operation shall be as indicated in para 5.6. as far as practicable.

**5.7.2. Premix seal coat :** The fine aggregate shall be coarse sand or fine grit, comprising clean, hard, durable and uncoated particles free from dust, soft, flaky, elongated, organic or any other deleterious materials. The quantities of aggregate and binder to be used shall be as given in paras 4.1.2. and 4.2.3. Grit or sand used for premix seal coat should be made thoroughly wet with water before mixing with emulsion of slow setting grade. The mixing, spreading and rolling etc., shall be carried out as explained in paras 5.4, 5.5. and 5.6. Rolling shall be continued till the premix material completely seals the voids in the premix carpet and smooth uniform surface is obtained.

### 5.8. Opening to Traffic

Traffic should not be allowed over the premix surface with or without seal coat for 6 to 8 hours after rolling. In case of single lane roads, traffic may be allowed at slow speed not exceeding 10 km per hour. If any premix gets picked up by tyres, the spot should be filled up by new mix. It is preferable to open the road to traffic after 24 hours.