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**TENTATIVE SPECIFICATION
FOR
SINGLE COAT SURFACE
DRESSING USING CATIONIC
BITUMEN EMULSION**

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TENTATIVE SPECIFICATION FOR SINGLE COAT SURFACE DRESSING 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 Indian Roads Congress has already brought out Standards on two types of surfacing using cationic emulsion, viz, IRC : 96-1987 on two coat surface dressing and IRC : 97-1987 on 2-cm premix carpet. This standard on single coat surface dressing is the third in the series.

1.2. Single coat surface dressing using cationic emulsion can be used as surfacing for low volume roads, as a renewal coat or as a temporary surfacing. For each case it will be preferable to examine the appropriateness of emulsion as binder prior to its choice.

1.3. The Specification of single coat surface dressing using Cationic Bitumen Emulsion was drafted by Shri P. Bhaskaran, Member-Secretary of the Bituminous Pavements Committee. This was discussed by the Bituminous Pavements Committee (personnel given below) in their meeting held at Trivandrum on the 5th December, 1987 and it was decided that the Specification would be finalised by S/Shri M. B. Jayawant, R. S. Shukla and Lt. Col. R. Bhargava.

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1.4. The document finalised by them was discussed by the Highways Specifications & Standards Committee in their meeting held at New Delhi on the 25th April, 1988. The Committee approved the draft subject to certain modifications and authorised the Member-Secretary of the Committee to modify the draft in light of the comments of the members. Later on the draft was approved by the Executive Committee and the Council in their meetings held on the 26th April, 1988 and the 7th May, 1988 respectively for being published as the finalised Specification of the Indian Roads Congress.

2. SCOPE

This Tentative Specification describes the method of construction of single coat surface dressing using cationic bitumen emulsion either over a granular base or for renewing an existing black-topped surface. The work consists of single application of the emulsion on a previously prepared base by spraying and thereafter covering it by stone chippings. Because of the low viscosity of the emulsion, the Specification differs from that using ordinary bitumen.

3. MATERIALS

3.1. Binder

The binder shall be of cationic type bitumen emulsion

of RS grade (Rapid Setting) complying with IS : 8837-1978 and having bitumen content of 60 per cent minimum by weight.

3.2. Aggregate

3.2.1. **General requirements:** The cover aggregate shall consist of crushed stone, crushed slag, crushed gravel (shingle) and shall have clean, strong durable and fairly cubical fragments free from deleterious matter, dust, ash or other adherent coatings. Uncrushed rounded gravel shall not be used.

Wet aggregate can be used for surface dressing with cationic bitumen emulsion and hence when the aggregates are dusty, they should be cleaned by dipping or washing or by sprinkling water copiously.

Aggregates should preferably be hydrophobic in nature and of low porosity. However, aggregates having a stripping value higher than the permissible limit can be considered for use to the extent the antistripping properties of such emulsions can counteract the stripping after approval of the Engineer-in-charge. Because of their very nature, cationic emulsions have better adhesive properties with wet aggregates as well as aggregates having stripping tendencies.

3.2.2. **Physical requirements:** The aggregates shall satisfy the physical requirements set out in Table 1.

TABLE 1. PHYSICAL REQUIREMENTS OF AGGREGATES

Test	Requirement	Test method
1. Los Angeles Abrasion Value or, Aggregate Impact Value	Max. 40% Max. 30%	IS : 2386 (Pt. IV) —do—
2. Flakiness Index ¹	Max. 25%	IS : 2386 (Pt. I)
3. Stripping Value	Max. 25%	IS : 6241
4. Water Absorption ²	Max. 1%	IS : 2386 (Pt. II)
5. Soundness		
Loss with sodium sulphate, 5 cycles	Max. 12%	IS : 2386 (Pt. V)
Loss with magnesium sulphate, 5 cycles	Max. 18%	—do—

- Notes:**
1. Stripping value need not be given too much importance when cationic emulsion is used. See also para 3.2.1.
 2. Water absorption upto 2 per cent might be permitted in exceptional cases.

3.2.3. **Size of aggregate :** The size of aggregate to be used will depend on whether the treatment is for the first or for the subsequent/ renewal coat and should be as per the size specified in Table 2.

TABLE 2. SIZE REQUIREMENT OF AGGREGATE

Type of Construction	Nominal Size	Specification
1. For surfacing granular base i.e. first coat	13.20 mm	100 per cent passing through 19 mm sieve and retained on 9.5 mm sieve.
2. For subsequent or renewal coat	11.2 mm	100 per cent passing through 13.2 mm sieve and retained on 6.7 mm sieve.

3.3. Quantities of Materials

The approximate rate of application of cationic bitumen emulsion and aggregates per 10 m² area are given in Table 3.

TABLE 3. APPROXIMATE RATE OF APPLICATION OF BITUMINOUS MATERIALS AND AGGREGATE PER 10 m² AREA

No.	Nominal Size (mm)	Aggregate Size	Quantity (cum)	Emulsion Quantity (kg)
1.	For surfacing granular base	13.2 mm	0.14-0.15	25-30
2.	For subsequent or renewal coat	11.2 mm	0.09-0.11	12-14

4. CONSTRUCTION

4.1. Weather and Seasonal Limitations

Cationic bitumen emulsion should not be normally stored below zero degree Celsius. However, surface dressing with cationic bitumen emulsion should be carried out only when the atmospheric temperature is above 10°C. The work can be carried out when the base is damp. All standing water in the depressions, however, should be removed.

4.2. Equipment

All equipment necessary for the proper execution of work shall be at the site of work and in good condition.

4.3. Preparation of Base

The existing base on which the surface dressing is to be laid should be prepared, shaped and corrected to an uniform grade and camber as specified. Any depressions and potholes should be properly made up and well compacted sufficiently in advance. All defective parts should be rectified. The surface should be cleaned to remove all loose particles, dust and other deleterious matter before applying the emulsion. It is preferable to slightly dampen the surface before applying the emulsion.

If the base, to be covered by the surface dressing, is an old bituminous surfacing, it should be swept clean and made free from sand, dust, and other loose or deleterious matter by means of wire and coir brushes, small picks, brooms, etc.

On primed surface no bituminous material shall be applied until the prime coat has thoroughly cured (IRC: 16-1965). The edges of the surface to be treated shall be defined by rope lines stretched in position.

4.4. Preparation of Binder

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

4.5. Application of Binder

The cationic bitumen emulsion should be sprayed uniformly on the prepared base by mechanical sprayers. In exceptional cases spraying cans may be resorted to as directed by the Engineer-in-charge. An emulsion tank of 30 litre capacity pressurised by compressed air from a hand pump and with a 12 mm flexible pipe with a spray nozzle is simple and efficient arrangement for spraying. While using pouring cans, the holes should be of 6 mm diameter spaced 30 mm apart to prevent clogging. Table 3 gives approximate rate of application of binder per 10 m² area of surfacing.

4.6. Application of Aggregate

Immediately after spraying of the cationic emulsion, aggregate of the size and in quantities indicated in Table 3 should be spread uniformly, preferably by mechanical means or otherwise manually so as to cover the surface completely. The surface should be broomed to ensure uniform spreading. Any oversize aggregate, if seen, should be removed.

4.7. Rolling

Immediately after the application of the cover material the surface should be rolled with a 6 to 8 tonnes road roller, preferably of tandem or pneumatic type. The roller should begin at the edges and proceed towards the centre, parallel to the centre line except in the superelevated portions where it should proceed from the inner edge to the outer. While rolling, aggregate should be added or removed so as to ensure a uniform covered surface. Each pass of the roller should uniformly overlap not less than one-third of the track in the preceding pass. Rolling should continue for just enough time so as to embed the aggregate in the binder and present a uniform closed surface. Excessive rolling should be avoided since it may result in the crushing of the aggregates. Normally, 6 to 8 passes with 6-8 tonnes smooth wheel roller are adequate.

4.8. Finishing

The finished surface should be uniform and free of roller marks, and should conform to the specified lines, grade and cross section. Finish rolling on the next day helps to give a firm surface.

4.9. Opening to Traffic

Though the road may be opened to traffic, four hours after completing rolling, it is preferable to allow the traffic after 24 hours.

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