

## MICRO SURFACING

Cost Effective Solution for Pavement Preservation and Renewal



### MARKOLINES TRAFFIC CONTROLS PRIVATE LIMITED

6th Floor, Wing A, Shree Nand Dham, Sector 11, CBD Belapur,  
Navi Mumbai – 400 614, M.S. INDIA. Phone: +91 22 6266 1111  
Email: [info@markolines.com](mailto:info@markolines.com) , Web : [www.markolines.com](http://www.markolines.com)

## **BRIEF NOTE & METHODOLOGY**

- 1. Company Introduction**
- 2. Micro Surfacing**
- 3. Micro Surfacing Methodology**
  - 3.1. Specifications
  - 3.2. Materials
  - 3.3. Design and proportioning of Micro Surfacing Mix
  - 3.4. Plant, Machinery & Equipment's
  - 3.5. Quality Control Laboratory (Field)
  - 3.6. Construction
- 4. Rut Filling Methodology/Profile Correction**

## 1. About us

We introduce ourselves as one of the preferred companies in the business of 'Highway Operations & Maintenance' and have ventured in Pavement Preservation Solutions which is an extended field of Maintenance and our portfolio of preservation systems includes Micro surfacing, Slurry sealing, Fog Sealing, Mill & Fill.

We are one of the pioneers in Highway Operations & Maintenance operating pan India and have successfully completed 850 lane kms of Micro Surfacing. The said milestone could only be achieved in such a short span due to our emphasis of "Quality comes first" for which we have set up a state of art laboratory. We have also partnered with Possehl Germany who specialize in pavement maintenance and have more than 60 years of experience, Bergkamp Inc, and Ingevity both from USA, who are world leaders in pavement preservation technologies. Bergkamp is also a renowned manufacturer of Micro Surfacing Pavers worldwide since more than 30 years.

Recently we have completed Micro surfacing works on Ahmedabad Airport Runway. This is the first project in India for Micro surfacing on the main Runway (Excluding Touch Down Zone)

Our Clientele for Micro surfacing includes leading developers like Peak Infra (Brookfield India), Cube Highways (I Square Capital), Reliance Infra, Tata Reality & Infrastructure Ltd - Atlantia, Airport Authority of India (Ahmedabad Runway MS through M/s Kunal Const), Essel Infra, Ramky Infrastructure, Navi Mumbai Municipal Corporation, Engineers India Limited and PWD of Uttarakhand/Maharashtra.

We are one of the pioneers in Highway Operations & Maintenance pan India and have successfully completed 30 lac square meters of Micro Surfacing i.e. 857 lane kms. approx. and have ongoing works of 10 Lacs sqm. The said milestone could only be achieved in such a short span due to our emphasis of "Quality comes first" for which we have set up a state of art laboratory. We have partnered with Bergkamp Inc from USA, who are world leaders in pavement preservation technologies. Bergkamp is also a renowned manufacturer of Micro Surfacing Pavers worldwide since more than 30 years.

## 2. Micro Surfacing

Micro Surfacing is an eco-friendly surface treatment used to restore and preserve the surface characteristics of the road. It is of two types (i) 4 mm to 6 mm thick (Type II) (ii) 6 mm to 8 mm thick (Type III). It is a mix of polymer modified asphalt emulsion, graded aggregate, cement, water and additives. This mixture is applied in a semi-liquid condition with specialized paving equipment. Upon application the mixture so designed changes chemically and sets quickly to give a uniform coat of cold mix dense material that allows resuming the traffic within two hours.

It is to be applied over an existing pavement surface which is structurally sound, but the surface is showing signs of premature ageing, aggregate loss, high degree of polishing, oxidation / hungry surface etc.

### Why Micro Surfacing?

- A proven solution for resurfacing as a wearing course
- Cost effective as compared to Hot Mix treatment
- Smooth surface without disturbing existing profile
- Longer life:
  - Arrest's pavement deterioration due to oxidation on account of polymer emulsion
  - Retards progressive failures
  - Reduces need for routine maintenance.
- Less down time:
  - Can be open for traffic in two hours.
  - No damage to existing road furniture
  - No disturbance to drainage
- Quick application:
  - Mixing and laying is done in one process.
  - Higher output

### 3. Microsurfacing Methodology

#### Scope & Objectives:

The Design, Testing, Construction and Quality Control Procedures for the application of Micro surfacing Type III.

The objective is to have a standard approach of construction in order to meet the specification and quality set. Therefore, this method statement shall outlay the contractor sequence of work to ensure that the work is carried out with due consideration of having and doing “first time right”.

#### 3.1. Specifications /Approvals

- a) MoRTH Letter F.No.RW/NH-33044/68/2016/S&R(R) dated 28th September 2016
- b) IRC:SP:100-2014 – Use of Cold Mix Technology in Construction of Road and Maintenance of Road.
- c) Clause 514 of MoRTH Specifications – V Edition
- d) IRC : SP :81:2008 – Tentative guidelines for Microsurfacing.

#### 3.2. Materials : (As per Clause 514.3 of MoRTH)

##### 3.2.1. Binder

The Bitumen shall be a modified Bitumen Emulsion confirming to requirements specified in Table mentioned below. The modifier shall be polymer/rubber, preferably synthetic or natural rubber latex.

**Requirement of Modified Bitumen Emulsion for Micro-surfacing  
(Table 500-32 of MoRTH Spec.)**

Test Name	Specifications	Test Method
Residue on 600 micron IS Sieve (% by mass), Maximum	0.05	IS:8887
Viscosity by Say Bolt Furol Viscometer, at 25o C , in second	20 – 100	IS:8887
Coagulation of emulsion at low temperature	NIL	IS:8887
Storage Stability after 24h (168 h), % maximum	2	IS:8887
Particle charge, +ve/-ve	[+ve]	IS:8887
<b>Test on Residue:</b>		
Residue by evaporation, % minimum	60	IS:8887
Penetration at 25oC/100g/5s	40 – 100	IS:1203
Ductility at 27oC, cm, minimum	50	IS:1208

Softening Point, in oC, minimum	57	IS:1205
Elastic Recovery*, %, minimum	50	IS:15462
Solubility in tri-chloroethylene, %, minimum	97	IS:1216

*\* In Case, elastic recovery is tested for Torsional Elastic Recovery as per Appendix-8 of IRC:SP:81-2008, the minimum value shall be 20 %.*

### 3.2.2. Aggregates

The mineral aggregates shall be crushed stone dust, clean, sharp, hard, durable and uncoated dry particles and shall be free from soft pieces and organic and other deleterious substances. The aggregate shall satisfy the requirements and target grading shall confirm mentioned below.

**Properties of Aggregates  
(Table 500-26 of MoRTH Spec.)**

Properties	Test Method	Specification
Sand Equivalent Value	IS:2720 (Part 37)	Min 50 %
Water absorption*	IS:2386 (Part 3)	Max 2 %
Soundness with- Sodium sulphate Magnesium sulphate	IS:2386 (Part 5)	Max 12 % Max 18 %

*\* In case water absorption exceeds 2% but is less than 4%, same may be permitted subject to conformity of soundness test and wet stripping test.*

**Aggregate Grading  
(Table 500-27 of MoRTH Spec.)**

Sieve Size (mm)	%age by Mass Passing
	Type III (6-8mm)
9.5	100
6.3	90-100
4.75	70-90
2.36	45-70
1.18	28-50
0.600	19-34
0.300	12-25
0.150	7-18
0.075	5-15

### 3.2.3. Filler

Mineral filler shall be Ordinary Portland Cement. The quantity of filler shall be in the range of 0.5 to 2 % by weight of dry aggregate.

### 3.2.4. Water

Water shall be potable, free from harmful salt and contaminants. The pH of the water shall be in the range of 6 to 7.

### 3.2.5. Additives

- a) Chemical additives may be used to accelerate or retard the break-set time of the slurry or to improve the resulting surface finish. The quantity of additive, if used, shall be decided by mix design and to be adjusted as per the site/climate conditions. The specifications for additive shall be supplied by the supplier of the emulsion. The additive and emulsion shall be compatible with each other.
- b) For Microsurfacing with glass fibers special grade, AR glass fibers shall be added to the mix at the rate of 0.2% to 0.3% by weight of aggregate by special dispensing unit.

## 3.3. Design and proportioning of Micro Surfacing Mix

The compatibility of aggregate, emulsion, filler and additive (if needed) shall be verified by mix design for a selected type and grading of aggregate as specified in Tables.

The mix design report shall clearly show the proportions of aggregate, filler, water and residual bitumen content based on the dry weight of the aggregates, additive usage (if any). The design criteria for Micro Surfacing Mixture is specified in Table 500-33 mentioned below.

**Mix Design Criteria for Micro Surfacing Mix  
(Table 500-33 of MoRTH Spec.)**

Requirements	Specifications	Method of Test as given in IRC:SP:81
Mix time, minimum	120 s	Appendix-1
Consistency, maximum	3 cm	Appendix-3
Wet Cohesion, within 30 min, minimum.	12 kg cm	Appendix-4
Wet Cohesion, within 60 min, Minimum	20 kg cm	Appendix-4
Wet stripping, pass %, minimum	90	Appendix-5
Wet track abrasion loss (one hour soak), maximum	538 g/m <sup>2</sup>	Appendix-6

### 3.4. Plant, Machinery & Equipment's

Description	Quantity
Self-propelled Micro Surfacing Machine	01 No
Tipper / Trucks	02 No
Water Tankers	01 No
Tractor Air Compressor	01 No
Screening Plant	01 No
Gensets for Lighting / Plant	01 No
Front End Loader	01 No

Above will vary as per requirement of site.

### 3.5. Quality Control Laboratory (Field)

A Field Laboratory / QC Lab will be situated in Base Camp for quality control and routine testing as per frequency mentioned in Section 900 of MoRTH Spec./IRC:SP-81/IRC:SP-100.

### 3.6. Construction

#### 3.6.1. Weather and Seasonal Limitations

Laying of Micro Surfacing shall not be undertaken, if either the pavement temperature or air temperature is below 10°C. However, during a dry spell, Micro Surfacing may be laid in rainy season also, even if the surface is wet but there is no stagnant water on the pavement. (Ref : Clause 512.5.1 of MoRTH Spec)

#### 3.6.2. Surface Preparation

The underlying surface on which the Micro Surfacing is to be applied shall be cleaned of all loose material, mud spots, vegetation and extraneous matter and shall be prepared and shaped to the needed profile. It is essential to pre-treat cracks on the pavement surface with an appropriate crack sealing material prior to application of slurry seal, if it is used for preventive/ renewal treatment. The surface should be swept clean by removing caked earth and other foreign matter with wire brushes, sweeping with mechanical brooms and finally dusting with air jet or high pressure water jet or other means approved by the Engineer. (Ref: Clause 512.5.2 of MoRTH Spec)

#### 3.6.3. Application of Tack Coat

Tack coat is not required normally for flexible pavements, unless surface is extremely hungry and dry. In case it is needed, Clause 503 shall apply. (Ref: Clause 512.5.3 of MoRTH Spec)

Concrete Pavement, Tack coat of polymer modified microsurfacing emulsion at the



rate of 3.00 Kg/Sqm. shall be applied after thorough cleaning of surface by pressure distributor.

#### **3.6.4. Micro Surfacing Paver/Machine**

The machine shall be specially designed and manufactured to lay Micro surfacing. It shall be self propelled equipment, truck mounted, consisting of following sub-assemblies used to manufacture and simultaneously spread these mixes on the surface:

- a) Aggregate bin
- b) Filler bin
- c) Water and Emulsion Tanks
- d) Additive Tanks
- e) Aggregates and filler conveyors to supply the mixer box
- f) Pump or compressed air system to supply the emulsion/water
- g) Mixer Box
- h) Spreader box to place the mixed slurry on the job (Ref: Clause 512.5.4 of MoRTH Spec)

#### **3.6.5. Calibration of Machine**

Micro Surfacing laying machine shall be calibrated for flow of all the constituents as per the job mix in presence of Engineer. No machine shall be allowed to work on the project until the calibration has been completed and accepted by the engineer.

2 kg samples of Micro Surfacing mix will be taken and verified for proportioning and mix consistency. The verification for application rate shall also be carried out in presence of the Engineer. The procedure for calibration and verification is as given in Appendix 7 of IRC: SP: 81-2008. (Ref: Clause 512.5.5 of MoRTH Spec)

#### **3.6.6. Application of Micro Surfacing**

It can be applied in Single/Double (Multiple layers) as per procedure below:

##### **a) Single layer Micro Surfacing Type II/III.**

A **calibrated Micro Surfacing machine**, as per requirements of job mix, shall be used to spread the material. The surface shall be pre-wetted by fogging ahead of the spreader box (if required under hot weather conditions). The rate of application shall be adjusted during the day to suit temperature, surface texture and humidity. The mixture shall be agitated and mixed uniformly in the spreader box by means of twin shafted paddles or spiral augurs fixed in spreader box.

A front seal shall be provided to ensure no loss of the mixture at the road contact point. The rear seal shall act as final strike off and shall be adjustable.

The spreader box and rear strike off shall be so designed and operated that a uniform consistency is achieved to produce free flow of material to the rear strike off. A secondary strike off shall have the same adjustment as the spreader box. The spreader box shall have the suitable means provided to side shift the box to compensate for variation in pavement geometry.

Sufficient amount of material shall be carried in all parts of spreader box at all times so that a complete coverage is obtained. Overloading of the spreader box shall be avoided. No lumping, balling and unmixed aggregates shall be permitted. No streak, caused by oversized aggregates shall be left on the finished surface. Longitudinal joints shall correspond with the edges of existing traffic lanes.

Other patterns of longitudinal joints may be permitted, if pattern will not adversely affect the quality of finished surface. In case streak is formed, it shall be corrected immediately by fresh material and with use of squeegee. Longitudinal joints, common to two traffic lanes shall be butt joints with overlap not exceeding an average of 60-100 mm. The mixture shall be uniform and homogeneous after spreading on existing surfaces and shall not show separation of the emulsion and aggregates after setting. *(Ref: Clause 512.5.6 of MoRTH Spec)*

#### **b) Double Layer of Microsurfacing Type II / III.**

The procedure for application of the 1st coat is as above. After application of 1st coat the 2nd coat of Type II / III shall be applied.

#### **3.6.7. Quality Control and Surface Finish**

The surface finish of construction shall conform to the requirements of Clause 902. For control of the quality of materials and work carried out, relevant provision of Section 900 shall apply. *(Ref: Clause 514.5.9 of MoRTH Spec)*

#### **3.6.8. Control of Traffic**

Micro-surfacing mix requires. about 2 hours to set. Traffic may be opened only after 2 hours restricting the speed to 20 km/h till 12 hours thereafter.

#### **3.6.9. Arrangement of Traffic**

Traffic control devices shall be in accordance with agency requirements and if necessary, conform to the requirements of the local authorities. Prior approvals from concerned departments shall be obtained before starting work in densely populated areas.

#### 4. Rut Filling Methodology /Profile Correction

Before the final surface course of Micro surfacing is placed, preliminary microsurfacing may be required to fill the wheel path depressions in the existing surface, which is done by special rut filling box. Ruts measuring 12.5 mm or greater in depth shall be filled independently with a rut filling spreader box. For irregular or shallow rutting of less than 12.5 mm in depth, a full width scratch coat pass may be used. Ruts that are in excess of 40mm in depth may require multiple placements with the rut filling spreader box to restore the cross-section. All rut filling level up material should cure under traffic for at least a twenty four hour period before additional material is placed on top.



**Mumbai – Nashik Road –Before Microsurfacing (NH-3-Old)**



**Mumbai – Nashik Road –After Microsurfacing (NH-3-Old)**

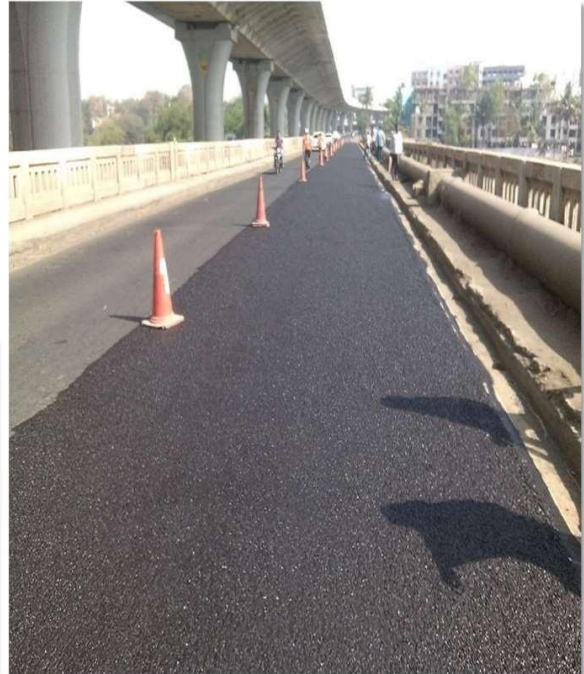


L&T Six Lane Highway Project, Nashik (NH-3)

Before



After



L&T Six Lane Highway Project, Nashik (NH-3)



**Trichy to Dindigul Section of NH-45(from Km 333+000 to Km 421+600)**



**Mahua-Jaipur Section of NH-21 (Earlier NH-11 in the State of Rajasthan)**



**Meerut-Muzaffarnagar Section on NH -58 (from km 52.250 to km 131.000)**



## Meerut-Muzaffarnagar Section on NH -58 ( From km 52.250 to km 131.000 )

