

CIRCULAR (DRAFT)

File No.RW/NH-34049/12/2022-S&R (P&B) SMA
Government of India
Ministry of Road Transport & Highways
(S&R (P&B/New Technology) Zone)
Transport Bhawan, 1, Parliament Street, New Delhi-110001

Dated: 22nd December, 2022

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To

1. The Chief Secretaries of all the State Governments/ UTs.
2. The Principal Secretaries/ Secretaries of all States/ UTs Public Works Department/ Road Construction Department/ Highways Department (dealing with National Highways and other centrally sponsored schemes).
3. The Chairperson, National Highways Authority of India, G-5 & 6, Sector-10, Dwarka, New Delhi-110 075.
4. The Managing Director, NHIDCL, PTI Building, New Delhi-110001.
5. The Director General (Border Roads), Seema Sadak Bhawan, Ring Road, New Delhi-110 010.
6. All Engineers-in-Chief and Chief Engineers of Public Works Department of States/ UTs/ Road Construction Department/ Highways Departments (dealing with National Highways and other centrally sponsored schemes).
7. All CE-ROs, ROs and ELOs of the Ministry.

Subject: - Use of Stone Matrix Asphalt (SMA) Mix in Wearing Course of Flexible Pavement - Reg.

Madam/Sir,

Over the years India has seen a tremendous rise not only in the traffic volume, but heavy loading as well. Vehicles carrying heavy loads, have specially designed tyres, which are inflated to high pressure, causing high stress on pavement. Under these conditions, conventional dense grades mixes are not rut resistant.

2. **STONE MATRIX ASPHALT - SMA**, a gap graded mix, is highly rut resistant, tough, stable, skid resistant, with high quantity of coarse aggregates, relies on stone-on-stone contact, to provide strength & rich in binder, to provide durability. SMA has almost double bitumen film thickness than that of conventional Bituminous Concrete (BC) mix which makes it more resistant to top-down cracking, less susceptible to ageing and oxidation and resistance to moisture damage. Further, the stiffer modified binder as well as strong coarse aggregate skeleton with stone-on-stone contact gives resistance against plastic shear deformation i.e. rutting and shoving at high axle load in tandem with high ambient temperature. Thus, SMA is long-life durable wearing course mix and it generally requires renewal in 7-10 years. A few benefits of SMA are given below:

- High resistance against rutting
- Can be used at places with very high temperatures, highly stressed intersections and heavy traffic
- It has been the most successful wearing course under heavy axle loads

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- Stone matrix asphalt is a suitable surfacing for pavements with fairly high deflections and requiring resistance to deformation such as signalised intersections or where traffic volumes are high
- High flexibility provides resistance against cracking which happens during cold temperatures
- Good wearing resistance
- Good adhesion between aggregates and bitumen
- Less bleeding
- Reduced traffic noise
- better wet-weather skid resistance due to less spray of water
- improved frictional resistance (improving frictional resistance, reducing splash and spray (i.e., improve visibility))
- The rough surface texture provides more space for standing water within the SMA rather than the surface, thus reducing hydroplaning, splash and spray, as well as night time glare during wet conditions, and enhancing the visibility of pavement markings

3. Guidelines/Specifications are published by Indian Roads Congress related to SMA. These are given below:

- IRC: 37-2018 "Guidelines for Design of Flexible Pavements"
- IRC: SP: 79-2008 "Specifications for Stone Matrix Asphalt" along with its amendment No. 1/IRC: SP: 79/November, 2018 (Effective from the 31st January, 2019)
- MoRT&H Specification for Roads & Bridge Works

Further, Clause 9.1 of Guidelines for Design of Flexible Pavements IRC: 37-2018 mentions that "For high traffic volume roads with a design traffic of more than 50 million standard axles (msa), (a) Stone Matrix Asphalt (SMA), (b) Gap Graded Mix with Rubberized Bitumen (GGRB) and (c) Bituminous Concrete (BC) with modified binders, are recommended for surfacing course for durable, ageing resistant and crack resistance surface courses. For the Stone Matrix Asphalt (SMA) mix, use of modified binders is preferred as it is expected that mixes with modified binders will result in longer service life and will be more resistant to ageing".

4. In view of the aforementioned benefits of SMA and to avoid the frequent periodic maintenance overlay requirements of flexible pavement, following has been decided:

- i. SMA shall be used for wearing course mix in following one or more situations of the National Highway Project
 - Maximum ambient temperature is more than or equal to 40°C;
 - Design Traffic is more than 50msa;
 - NH sections for port/mines etc. bound traffic subjected to heavy axle loads;
 - High speed NH corridor;
 - Perpetual Pavement;
 - Highly stressed intersections; high-stress pavement areas (e.g., intersections, bus stops, and toll booths)
 - Steep gradient/sharp curves;

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- Urban Pavements;
 - Overlay on Concrete Pavement;
 - Snowy and Cold Regions
 - NH sections for which capacity augmentation is not envisaged in near future
- ii. Augmented quality control in production & construction of SMA is desirable. Therefore, taken into consideration of Contractor's capability, SMA can be insisted only if cost of project is more than 500 crore or cost of bituminous wearing course is more than 50 crore.
- iii. Only Modified Bitumen shall be used for SMA.
- iv. No Pneumatic Roller (PTR) shall be used for compaction of SMA mix.
- v. Dry mixing time shall be sufficient enough generally requires 10-15 sec more than that of the conventional mix to have homogeneous mixing of the palletized cellulose fiber whether wax coated or bitumen coated.
- vi. Minimum hydrated Lime content (with minimum purity of 80.0% free CaO) shall be 4.0% and the remaining required filler % might be inert filler stone dust i.e. baghouse fines.
- vii. % passing from 4.75 mm Sieve shall be 26-30%.
5. This issues with the approval of Competent Authority.

Yours sincerely,

(Bidur Kant Jha)
Director

(New Technology for Highway Development)
For Director General (Road Development) & Special Secretary

Copy to:

1. All CEs in the Ministry of Road Transport & Highways
2. All ROs of the Ministry of Road Transport & Highways
3. The Secretary General, Indian Roads Congress
4. Technical circular file of S&R (P&B) Section
5. NIC-for uploading on Ministry's website under "What's new"

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