International Journal of Enhanced Research in Science, Technology & Engineering
ISSN: 2319-7463, Vol. 8 Issue 5, May -2019, Impact Factor: 4.059

Bituminous Concrete Mix Roads under the Uses of Dissipation Poly (Methylene)

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ABSTRACT

Bituminous Concrete (BC) is a composite material mostly used in construction projects like road surfacing, airports, parking lots etc. It consists of asphalt or bitumen (used as a binder) and mineral aggregate which are mixed together & laid down in layers then compacted. Now a days, the steady increment in high traffic intensity in terms of commercial vehicles, and the significant variation in daily and seasonal temperature put us in a demanding situation to think of some alternatives for the improvisation of the pavement characteristics and quality by applying some necessary modifications which shall satisfy both the strength as well as economical aspects. Bitumen and polymer modified binder and observed a significant improvement in case of rutting resistance, indirect tensile strength and resilient modulus of the bituminous concrete mix with polymer modified bitumen. They also concluded that Polymer modified bitumen results a high elastic recovery (79%).

HOW TO CITE THIS ARTICLE

Naveen, Pardeep, "Synthesis, Bituminous Concrete Mix Roads under the Uses of Dissipation Poly (Methylene)", International Journal of Enhanced Research in Science, Technology & Engineering, ISSN: 2319-7463, Vol. 8 Issue 5, May -2019.

INTRODUCTION

The main constituents of bituminous concrete (BC) are aggregate and bitumen. Generally, There are two types of pavements based on design considerations i.e. flexible pavement and rigid pavement. Difference between flexible and rigid pavements is based on the manner in which the loads are distributed to the sub grade.

i. Flexible Pavement:

It can be defined as the one consisting of a mixture of bituminous material and aggregates placed on a bed of compacted granular material then it is called "flexible" since the total pavement structure can bend or deflect due to traffic loads.

ii. Rigid Pavement:

If the surface course of a pavement is PCC then it is called "rigid" since the total pavement structure can't bend or deflect due to traffic loads . Such pavements are much stiffer than the flexible pavements due to the high modulus of elasticity of the Plain Cement Concrete material.
Mix Design

Objectives of mix design

The bituminous mix design aims to estimate the proportions of bitumen, filler material, fine aggregates, coarse aggregates & polythene to produce a mix which should have:

- Sufficient workability so that there is no segregation under load .
- Sufficient strength to resist shear deformation.
- Sufficient durability.
- Sufficient flexibility to avoid premature cracking due to repeated bending by traffic.

Types of mix

- Hot mix asphalt concrete
- Warm mix asphalt concrete
- Cold mix asphalt concrete
- Cut-back asphalt concrete
- Mastic asphalt concrete or sheet asphalt

RAW MATERIALS

Basic materials

The materials used are as follows.

i. Aggregates

ii. Bituminous Binder

iii. Mineral Filler

iv. Polythene

Aggregate

Aggregates should have minimum plasticity. The presence of clay fines in bituminous mix can result in problems like swelling and adhesion of bitumen to the rock which may cause stripping problems. Clay lumps and friable particles should be limited to utmost 1%.

Bitumen

Grade of bitumen used in the pavements should be selected on the basis of climatic conditions and their performance in past.

Use of extra waste poly (methylene) in bituminous concrete

a) Waste plastic acts as a stabilizing additive in Stone Mastic Asphalt when the mixtures were subjected to performance tests including Marshall Stability, tensile strength, compressive strength tests and Tri-axial tests. There results indicated that flexible pavement with high performance and durability can be obtained with 10% shredded plastic.

b) Waste plastic utilization in asphalting road by using both wet and dry method.

Mineral Filler

Mineral filler consists of, very fine, inert mineral matter that is added to the hot mix asphalt, to increase the density and enhance strength of the mixture. These fillers should pass through 75µm IS Sieve. The fillers may be cement or fly ash.

Mixing Procedure

The mixing of ingredients was done as per the following procedure (STP 204-8).

1) Required quantities of materials were taken in an iron pan.

2) This was kept in an oven at temperature 160^0C for 2 hours. This is because the aggregate and bitumen are to be mixed in heated state so preheating is required.
3) The bitumen was also heated up to its melting point prior to the mixing.

4) The required amount of shredded polythene was weighed and kept in a separate container.

5) The aggregates in the pan were heated on a controlled gas stove for a few minutes maintaining the above temperature.

6) The polythene was added to the aggregate and was mixed for 2 minutes.

7) Now bitumen (60 gm), i.e. 5% was added to this mix and the whole mix was stirred uniformly and homogenously. This was continued for 15-20 minutes till they were properly mixed which was evident from the uniform colour throughout the mix.

8) Then the mix was transferred to a casting mould.

9) This mix was then compacted by the Marshall Hammer. The specification of this hammer, the height of release etc.

ANALYSIS

Finding Optimum Polythene Content

The value of polythene content at which the sample has maximum Marshall Stability Value and minimum Marshall Flow Value is called as Optimum Polythene Content.

CONCLUSION

It is found from the study that increase of Marshall stability value with polyethylene content up to 4% and after that it decreases. It was found that the marshall flow value decreases upon addition of polythene i.e the resistance to deformations under heavy wheel loads increases and Also the values of the parameters like VMA, VA, VFB are within the required specifications.

Considering of these factors we can assure that we can took a more durable and stable mix for the pavements by polymer modifications. This small investigation shows not only utilizes beneficially, the waste non-degradable plastics but also provides us an improved pavement with better strength and longer life period.

Pavements of modified Polymer would be a boon for India's hot and extremely humid climate, where temperatures frequently rises past 50°C and torrential rains create havoc, leaving most of the roads with heavy distresses. Life of the pavements is also affects adversely. The improved properties for pavement constructions is also showed by polymer modified bitumen. This also can reduce the amount of plastics waste which otherwise are considered to be a threat to the hygiene of the environment.

Plastics-waste is coated over aggregate in this modification process. This ensures better bonding between aggregate and bitumen and increases the surface area of contact at the interface. The polymer coating also reduces the void spaces present in the mix. This prevents the moisture absorption and oxidation of bitumen by entrapped air.

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