

Performance Evolution of Modified Bituminous Concrete Mix Using Waste Plastic

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ABSTRACT

Generally a bituminous mixture is a mixture of coarse aggregate, fine aggregate, filler and binder. A Hot Mix Asphalt is a bituminous mixture where all constituents are mixed, placed and compacted at high temperature. HMA can be Dense Graded mixes (DGM) known as Bituminous Concrete (BC). Bituminous mix is generally used as a surface course and wearing course in flexible pavements since it is necessary that the wearing course must provide a smooth riding surface that is dense and at the same time take up wear and tear due to traffic. The development of transportation plays an important role in the development of nation. With flexible pavements being widely used in India, steps must be taken to increase the life of the bituminous pavements. Flexible pavements are often plagued with problems of cracking and rutting due to repeated traffic loads. Hence one needs to address these problems in order to improve the performance of flexible pavements.

KEYWORDS: bituminous, mixture, Graded, Concrete, Asphalt, flexible

INTRODUCTION

Roadways are considered one of the most important elements of infrastructure and they play an essential role in our daily lives. Pavement is most important component of highway section. Therefore the overall functioning of highway system is greatly relying on performance of its pavement. In India, bituminous pavement is commonly used for highways. Due to increasing traffic intensity, distress such as rutting and cracking of pavements are very common in Indian roads. Under varying seasonal temperature flexible pavement tend to become soft in summer and brittle in winter. In India almost 90 percent road network is occupied by bituminous pavement only which are constructed and maintained by using naturally available road aggregates and bitumen, a petroleum product, which being mixed at high temperatures to produce hot mix asphalt. Investigations revealed that properties of bitumen can be improved with the incorporation of modifiers. In this study, bitumen of grade VG30 is selected and improved its properties by the addition of modifiers.

Marshall Stability value of modified bitumen is also improved when compared to the selected raw bitumen. Construction of highway involves huge outlay of investment. A precise engineering design may save considerable investment as well a reliable performance of the in service highway can be achieved. Two things are of major consideration in flexible pavement engineering – pavement design and the mix design. Mix design for the different layers of the pavement can have a major impact on the performance, cost and sustainability of the bituminous surfaces.

A good design of bituminous mix is expected to result in a mix which is adequately

- strong
- durable
- resistive to fatigue and permanent deformation
- environment friendly
- economical

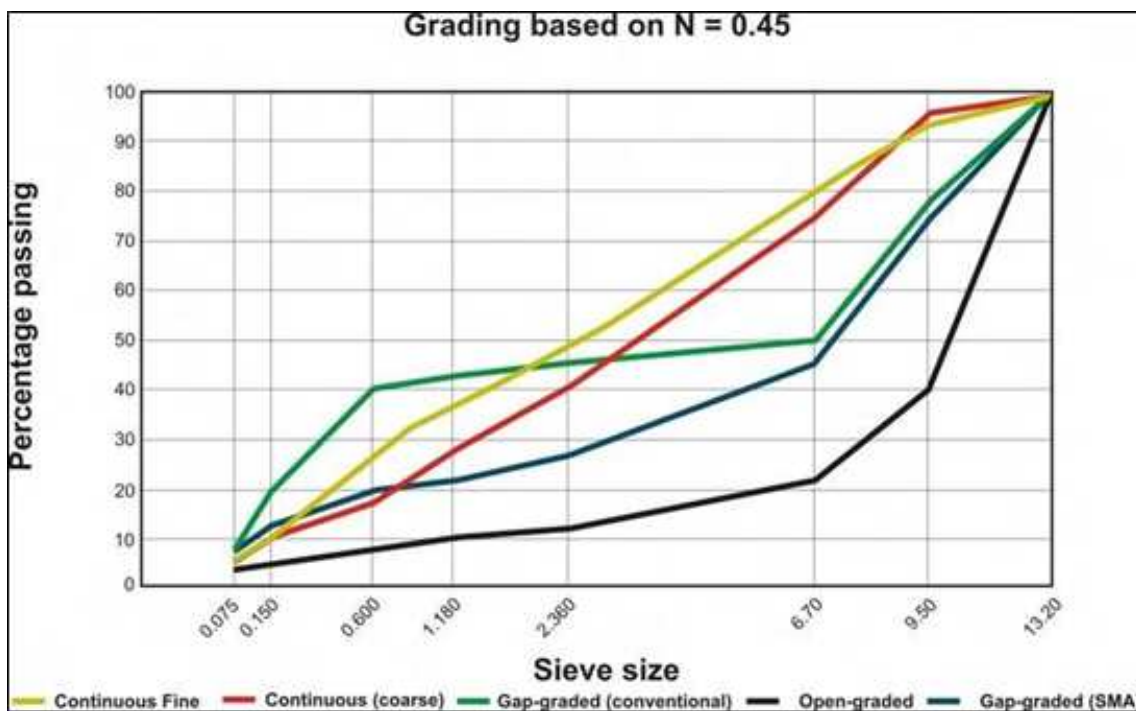
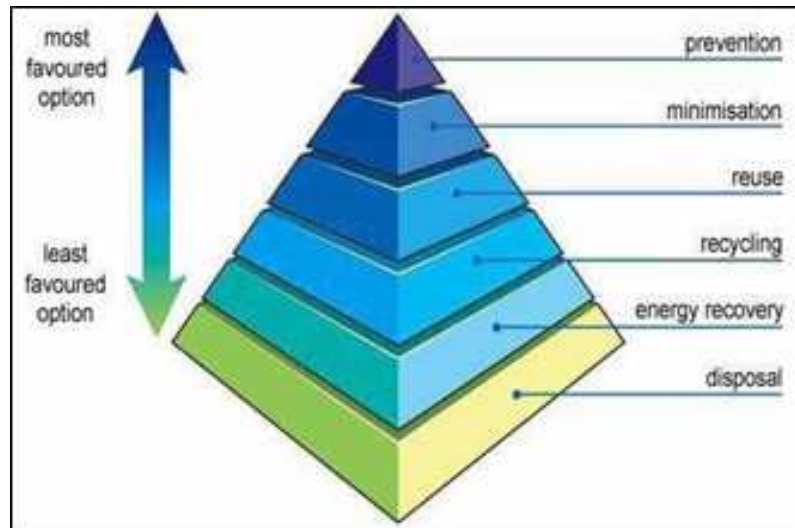
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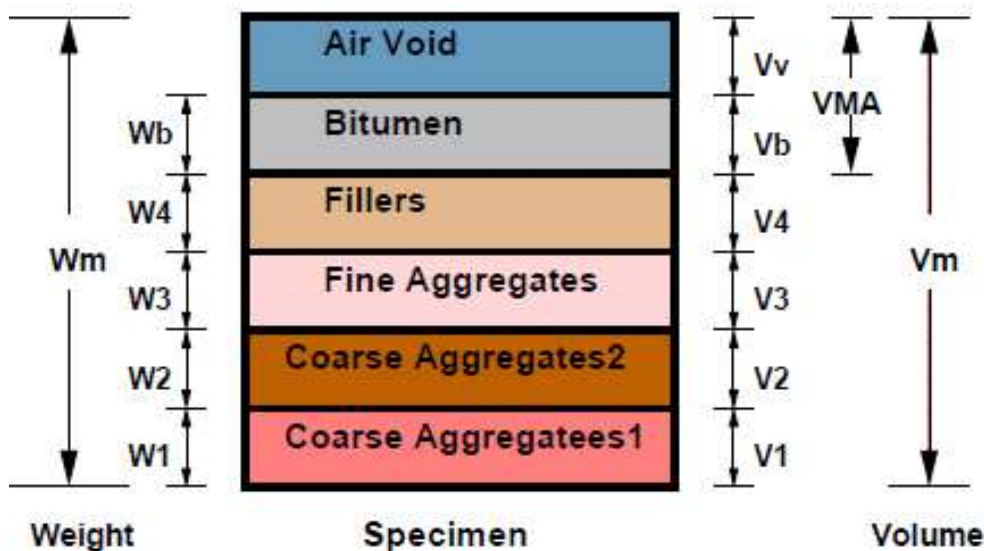


A mix designer tries to achieve these requirements through a number of tests on the mix with varied proportions and finalizes with the best one.



Representative continuous-graded, open-graded and gap-graded mixes of 13.2 mm maximum aggregate size

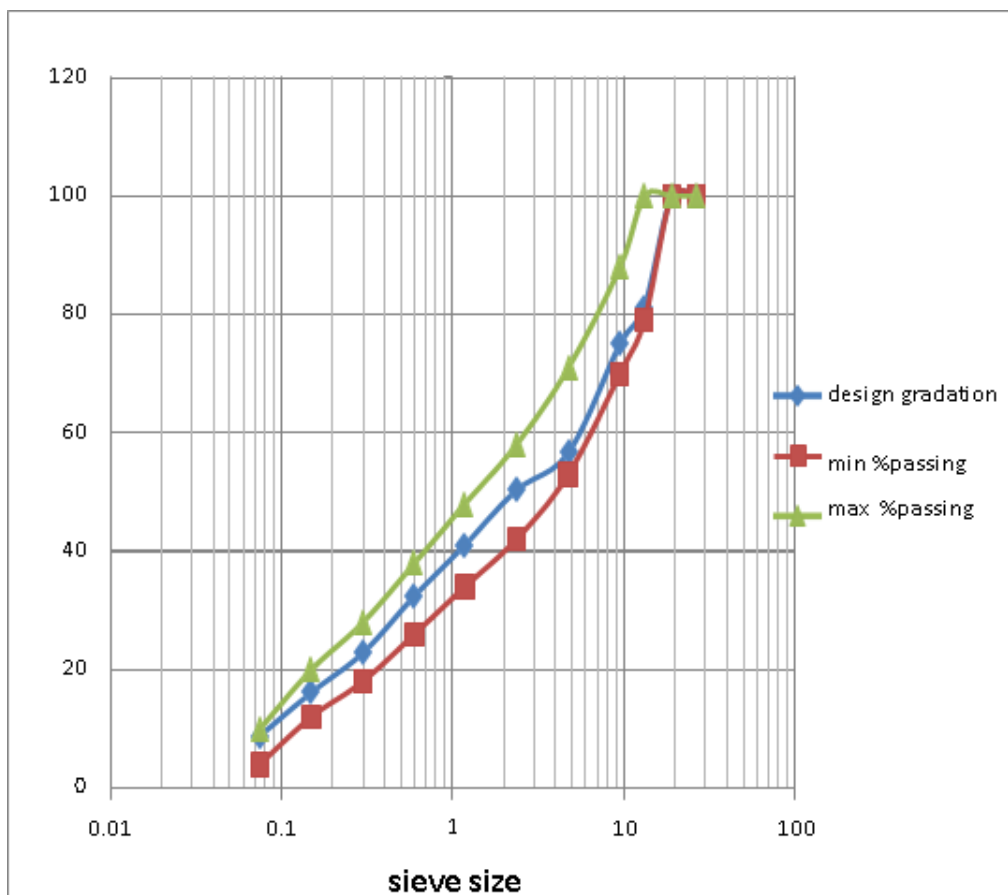
MIX DESIGN FOR BITUMINOUS CONCRETE



RESULTS

Test results of the ingredient aggregates

Property	Results	Specifications
Aggregate Impact Value, %	19	Maximum 27
Abrasion value%	27	Maximum 35
Flakiness and Elongation Indices, %, (Combined)	29	Maximum 30
Water Absorption, %	1.5	Maximum 2
Specific Gravity	2.665	



Design gradation of aggregates

CONCLUSION

Based on the results and discussion of experimental investigation carried out on Bituminous concrete mix following conclusion are drawn.

1. From the results and discussions on the BC mix it can be concluded that stability of the mix can be improved by the addition of different waste material in OBC by weight of bitumen and also the flow criteria as given by the MORTH can be satisfied also .
2. The optimum binder content for BC grade 2 is 6%
3. The Marshall Stability value of the mix is increased by the addition of all the different waste material in OBC used in this experimental work. However increase in stability value is different for different material and for different percentages.
4. The Marshall stability value of BC grade 2 is increased by 10.67% by the addition of 10 %

waste plastic in OBC, also the flow criteria as specified by the MORTH is satisfied by the addition of 10% waste plastic in OBC.

5. Addition of waste plastic by 10% in OBC has the highest Marshall Stability value.

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