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QUALITY IMPROVISED OF ASPHALT MIX USING NATURAL WASTE AND INDUSTRIAL WASTE MATERIALS

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Abstract - *Bituminous mix is a mixture of coarse aggregate, fine aggregate and filler. Hot Mix Asphalt (HMA) is a type of bituminous mix in which all particles are mixed and compacted at high degree of temperature. HMA is available in two forms namely dense graded and Stone Matrix Asphalt (SMA), formally is known as Bituminous Concrete (BC) and second one is known as gap graded. SMA needs additional fibers to minimize the drainage through the material. In this research, an effort has been made to enhance the stability of SMA using banana fiber along with binder content (BC). The mixture has been prepared as per the MORTH specification. The percentage of BC and fiber content is varied from 4 % to 7 % and from 0.1 % to 0.5 %. A number of tests have been performed on the marble dust to check its properties. As per the test analysis, Marble dust is found as an Optimum Binder Content (OBC) and has been used for the mixture with an average value determined as 5 %.*

Key Words: Bituminous Concrete, Stone Matrix Asphalt, Banana Fibre, Marshall Properties.

1. INTRODUCTION

The construction of the highway covers a large amount of investment. To invest less, construction engineering must have to design road in such a way so that one can achieve a reliable performance of the road along with the built in service. There are two factors that must be considered while using flexible pavement as well as the mix design.

These two factors are one of the key elements in the engineering-paving design and mixing design. This research deals with mixed design of bitumen.

1.1 EVOLUATION OF MIX DESIGN

According to Das et al. (2004) the bituminous paving was initially used on rural roads in the mid of 1990's to handle the fine particles extractions in terms of dust particles. Initially, hravey oil was utilized as dust calmative and the quantity of adding heavy oil has been determined by performing the past test. This process is whipped up like a mixed pancake form and underlying in a brown paper.

The primary formal mixed design technique was primarily Habbard Field mechanism that was designed on sand-asphalt mixture. Using this method, the mix with large amount of aggregates was not handled.

1.2 BITUMEN MIX SAMPLE

Bituminous concrete mainly comprises of a mixture of aggregates that are smaller than 25mm and the filler size is less than 0.075 mm. Adequate bitumen must be added to prevent the accumulated mixture from being effected efficiently and will have tolerable destructive as well as elastic features. The main aim of bituminous mix design is to find out the bitumen ratio, filler, coarse as well as fine aggregate so that a strong, stable and economical mixture can be developed.

2. BINDER SELECTION

Different binder type such as 60/70 or 80/100 penetration grade bitumen as well as other modified binders such as Polymer Modified Bitumen is a multitude of modified binders such as plastic Rubber Modification Bitumen; Natural Modified Bitumen is used by number of researchers to find better mixed bituminous material. A number of researchers also used the super pave performance grade connector such as PG along with Bituminous Concrete (BC) and Stone Matrix Asphalt with bituminous mixtures of 76-22 (SMA) [5].

2.1 SELECTION OF STABILIZING ADDITIVE

A number of stabilizing elements such as Cellulose fiber, mineral fiber and so on are added into the bituminous mix mostly with SMA so that the drain down of binder can be decreased. Natural fiber such as jute fiber, sisal fiber and coconut fiber has been also used by many researchers.

Attempts have been made to use naturally available fibers in this research work. It is called BANANA FIBER mixed in BC and SMA [6].

2.2 PAVEMENT

A highway pavement is an arrangement that includes a layer of treated material superimposed over the level of natural soil, the primary function of which is to process the applied transport load to the base. The main operation of the pavement is to provide a structure with high riding quality, sufficient slip resistance, good light reflection characteristics and low noise pollution surface. The ultimate goal is to ensure that the transmission pressure due to the wheel load is sufficiently minimized so that the road surface does not

exceed the basic load carrying capacity. For this purpose, there are mainly two kinds of pavements, called flexible pavements and rigid pavements.

2.3 RIGID PAVEMENT

Rigid pavements are flexible enough to transfer tire pressure loads to a wide area below. The general structure of a rigid pavement is shown in Figure 1.2. Rigid pavements are located on a rectangular bottom surface or a single layer of rich or stable material compared to a flexible pavement. Since there is only one layer between the concrete and the lower level, this layer can be called the base or sub-base.

2.4 ASPHALT CONCRETE

It is mainly used in construction sites like as to construct road, airport and vehicle parking etc. It mainly includes asphalt along with mineral aggregate which are mixed together and spread on the road surface and compacted. Following methods are used to mix asphalt and aggregates.

3. CONCLUSIONS

As per MORTH specification following are the properties of mix design that are:

i. Marshall Stability must be greater than 9 KN
ii. Flow Value lies between 2 mm to 4mm.
iii. VA Value lies between 3 % to 6%.
iv. VMA Value must be greater than 11 %.
v. OBC Value lies between 5 % to 6%.

The mixed sample prepared with marble dust as a filler material has satisfied all the above properties and we have used this as a filler agent. We can also used cement as a filler agent but it is costly therefore to optimize the construction cost MDPs has been used as a filler agent.

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