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RESEARCH ARTICLE

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EFFECT OF VARIOUS FILLERS ON BITUMINOUS CONCRETE

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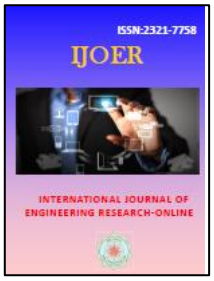

ABSTRACT

Construction of highway involves huge outlay of investment. A precise engineering design may save considerable investment; as well as reliable performance of the in-service highway can be achieved. Two things are of major considerations in this regard – pavement design and the mix design. Our project emphasizes on the mix design considerations. A good design of bituminous mix is expected to result in a mix which is adequately strong, durable and resistive to fatigue and permanent deformation and at the same time environment friendly and economical. A mix designer tries to achieve these requirements through a number of tests on the mix with varied proportions of material combinations and finalizes the best one. This often involves a balance between mutually conflicting parameters. Bitumen mix design is a delicate balancing act among the proportions of various aggregate sizes and bitumen content. For a given aggregate gradation, the optimum bitumen content is estimated by satisfying a number of mix design parameters.

Fillers play an important role in engineering properties of bituminous paving mixes. Conventionally stone dust, cement and lime are used as fillers. An attempt has been made in this investigation to assess the influence of non-conventional and cheap fillers such as brick dust and fly ash in bitumen paving mixes. It has been observed as a result of this project that bituminous mixes with these non-conventional fillers result in satisfactory Marshall Properties though requiring a bit higher bitumen content, thus substantiating the need for its use. The fillers used in this investigation are likely to partly solve the solid waste disposal of the environment.

1. INTRODUCTION

TYPES OF PAVEMENTS: Generally pavements are divided into two types that is

Flexible pavements

Rigid pavements

1.1 Flexible pavements: Flexible pavements are constructing from the bitumen or tarmac where stress is transmit to the sub grade through the lateral allotment of the applied load with depth. This type of pavements is generally construct in layers more than rigid pavement.

1.2Rigid pavements: Rigid pavements are those which contain adequate beam strength to be able to overpass over the over the localized sub grade. Load is transmitted from first to last beam action of slab in rigid pavements. They reduces the stress concentration and distributes the reduced stresses uniformly to the area under the slab.

1.3 Bitumen: Bitumen is a binder material which is produced by the limited distillation of crude oil. It is the key matter used in the flexible pavement. Bitumen has excellent adhesive behavior provided the conditions are favorable. However in presence

of water the adhesion does create some problems. Most of the aggregate used in road structure possess a weak off-putting charge on the surface. The bitumen aggregate bond is because of a weak dispersion force. Water is highly polar and hence it gets strongly close to the aggregate displacing the bituminous coating.

2. SCOPE AND OBJECTIVES OF THE PROJECT

IRC grading 2 with stone aggregate from 19 mm to 600 micron and fly ash/ brick dust constitute the aggregate grading.

Bitumen 60/70 is used as standard grade for paving road in India for case of normal paving mixes.

Bitumen content has been varied depending on the type of filler till change in the trend of Marshall Properties is observed.

Marshall Properties of the resulting mixes are compared with the smallest amount requirements suggested by

IRC.PORPOSED MODELLING

The entire proposed modeling and architecture of the current research paper should be presented in this section. This section gives the original contribution of the authors. This section should be written in Times New Roman font with size 10. Accepted manuscripts should be written by following this template. Once the manuscript is accepted authors should transfer the copyright form to the journal editorial office. Authors should write their manuscripts without any mistakes especially spelling and grammar.

3. RESULTS AND DISCUSSIONS

Table No .1 Average Marshall Properties of samples with fly ash

Bitumen %	5	5.5	6	6.5
Marshall				
Properties				
Stability (kN)	18.64	22.07	23.53	21.39
Flow value (mm)	1.95	2.4	2.8	3.5
Unit wt (g/cc)	2.08	2.09	2.1	2.07
% air void	8.17	6.69	4.18	4.5
VMA (%)	18.27	17.88	16.41	17.6

Table No 2: Average Marshall Properties of samples with Brick dust as filler

Bitumen	5	5.5	6	6.5
Marshall Properties				
Stability (KN)	15.69	16.67	18.35	19.42
Flow value (mm)	1.8	2.4	3.2	3.73
Unit wt (g/cc)	2.245	2.27	2.27	2.29
% air voids	9.13	7.6	6.2	5
VMA(%)	19.1	18.35	19.35	19.8

Table number 6.2.3 Average Marshall Properties of samples with Glass powder as filler

Bitumen % Marshall Properties	5	5.5	6	6.5
Stability (kN)	16.43	18.24	20.47	19.36
Flow value (mm)	1.85	2.18	2.36	2.84
Unit wt (g/cc)	2.9	3.2	3.4	3.1
% air void	8.9	8.37	7.9	7.4
VMA (%)	19.15	18.54	19.46	19.7

Table number 4 Average Marshall Properties of samples with cement as filler

Bitumen	5	5.5	6	6.5
Marshall				
Properties				
Stability (kN)	17.9	19.42	22.5	21.3
Flow value (mm)	1.87	1.93	2.9	3.3
Unit wt (g/cc)	2.07	2.09	2.1	2.09
% air void	8.06	6.72	4.67	4.93
VMA (%)	18.33	17.97	16.78	17.49

Table number 5 Average Marshall Properties of samples with Lime as filler

Bitumen %	5	5.5	6	6.5
Marshall				
Properties				
Stability (kN)	15.96	16.43	17.6	16.69
Flow value (mm)	2.2	2.5	2.9	2.6
Unit wt (g/cc)	2.7	2.1	3.1	2.9
% air void	8.74	7.51	5.62	4.2
VMA (%)	19.2	18.7	17.21	17.86

4. CONCLUSION

1. Bituminous mixes contain glass powder, fly ash, cement, lime and element dust as fillers are found to have Marshall property almost nearly same as those of conventional fillers such as cement and glass powder.
2. Bituminous mixes contain glass powder as filler displayed maximum stability at 6% content of bitumen having an increasing trend up to 6% and then progressively decreasing, the unit weight/ bulk concreteness also displayed a similar trend with flow value being satisfactory at 6% content of bitumen.
3. Bituminous mixes contain as fly ash filler displayed maximum stability at 6% content of bitumen having an increasing trend up to 6% and then slowly decreasing, the unit weight/ bulk density also displayed a analogous trend with flow value being satisfactory at 6% content of bitumen.
4. Bituminous mixes containing cement as filler displayed utmost stability at 6% content of bitumen having an rising trend up to 6% and then gradually decreasing, the unit weight/ bulk density also displayed a similar trend with flow worth being satisfactory at 6% satisfied of bitumen.
5. Bituminous mixes contain lime as filler displayed maximum stability at 6% content of bitumen having an increasing trend up to 6% and then gradually lessening, the unit weight/ bulk density also display a similar trend with flow value being acceptable at 6% content of bitumen.
6. Bituminous mixes contain brick dust as filler showed greatest stability at 7% content of bitumen displaying an ascending trend up till 7% and then declining, the flow value showed an growing trend and similar was the trend shown by unit weight/bulk density, the percentage of air voids obtained were seen to be falling with increase in bitumen content thus from here we can see that at 7% bitumen content we are obtain satisfactory results.
7. These mixes were seen to display upper air voids than required for typical mixes.
8. Higher bitumen content is essential in order to satisfy the propose criteria and to get usual trends.
9. From the above argument it is evident that with further tests glass powder, fly ash and brick dust generated as waste materials can be utilized in effect in the making of bitumen concrete mixes for tarmac purposes.
10. Further modification in design mixes can result in exploitation of glass powder, fly ash and brick dust as fillers in bituminous pavement thus partly solving the disposal of industrial and construction wastes respectively.

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