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To Determine Impact of Shape of Course Aggregate on DBM Mix

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Abstracts: Aggregates are the principal material in pavement construction. The shape of aggregate particle has significant influence on performance of the Bitumen pavement. The strength serviceability requirements of Bitumen mixes such as stability, flow, voids in mineral aggregate , voids filled with bitumen and air voids are highly depend on the physical properties of aggregate.

Key Words: coarse aggregate, aggregate shape, DBM ,VMA,VFB

I. Introduction

The shape of aggregate particle has a significant influence on the performance of the bituminous pavement. Particle shape can be described as cubical, flat, elongated and round. The presence of flaky aggregates is considered as undesirable in bituminous mixtures because of their tendency to break down during construction and subsequent traffic operations. The voids present in a compacted mix depend on the shape of aggregates. Highly flaky aggregates have more voids and reduce the workability. Hence it was felt that the study on the effect of the flaky aggregates on bituminous mixtures is relevant and essential.

Need of study: For the academic purpose studies and experiment has revealed that aggregate shape has effect on percentage voids ratio, percentage bitumen content and performance of the mix under applied load condition.

To evaluate the influence of shape of aggregate on Dense Bituminous Macadam the various individual properties of materials (Aggregates & Bitumen) are determined.

Objectives: To study the shape effect of aggregate particles & to examine their influence on the behaviour and performance characteristics of Dense Bituminous Macadam mix.

Scope Of Work: In order to this study, the performance behaviour of DBM mix with coarse aggregate of different shape experimental work need to be conducted is as bellow.

- Marshall Stability
- Marshall Flow
- Density
- %Voids in mix
- % Voids in mineral aggregate
- % Voids fill with bitumen

II. Material and Methodology

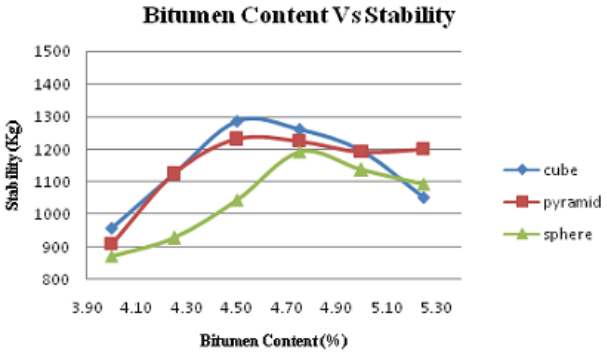
1. Selection of Materials
2. Test on aggregate & bitumen
3. Preparation of JMF (MoRTH-2004)
4. Marshall Mix Design (MS-2)
5. Experimental Work and Analysis

- Bitumen content vs Marshall Stability
- Bitumen content vs Marshall Flow
- Bitumen content vs Density
- Bitumen content vs VIM
- Bitumen content vs VMA
- Bitumen content vs VFB

6. Optimum Bitumen Content
7. Conclusion and Suggestion

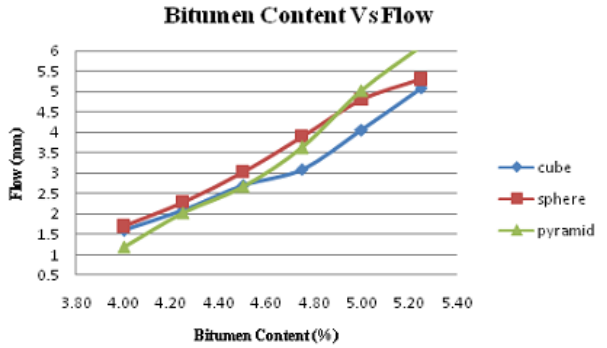
Experimental Work: The aggregates used in this study were 16-25 mm, 7-16 mm, 4-7 mm and 0-4. Bitumen of penetration grade 60/70 was used. The properties of the materials used are given in Table 1 and Table 2.

Marshal Stability: The variation of stability with increase in Binder content is shown below. It is observed that stability increases to certain point, further increase in bitumen content the stability decreases in all case.



Marshall Flow

The variation of flow value with increase in binder content is shown below It is observed that flow value increases with increase in proportion of binder content.



Percentage Air Voids: The variation of Va with increase in binder content is shown below. It is observed that Va decreases with increase in proportion of binder content.

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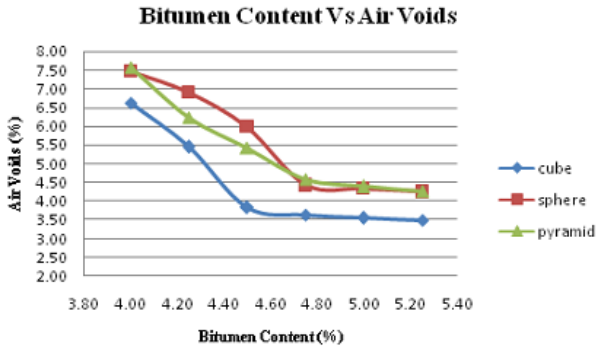
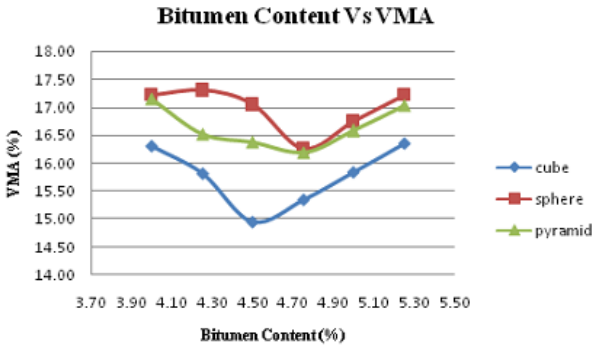


Voids in Mineral Aggregate :

The variation of VMA with increase in binder content is shown below It is observed that VMA decreases with increase in proportion of binder content to the certain point then after it is increase with increase in proportion of bitumen content.



Conclusion:

To achieve economy considering minimum % bitumen content with maximum stability, bulk density and optimum flow (3mm to 6mm) the most suitable shape of aggregate appears to be cubical through our experimental study.

Acknowledgement

This is the place to admit that while there appears only one author on the cover, this work is a product of the interaction and support from many people. I am thankful to all of them specially my parents & friends for their help and support during my entire work.

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xv. ***OVERSEAS ROAD NOTE 31***

Sr no.	Test	Test method	unit	Test results (mm)			
				16-25	7-16	4-7	0-4
1	Aggregate Impact value	IS:2386	%	-	-	-	-
2	Water Absorption	IS:2386	%	0.445	0.698	0.972	1.760
3	Specific gravity	IS:2386	-	2.869	2.846	2.822	2.675
4	FI & EI	IS:2386	%	21.07			

Table 1 Physical Properties Of Aggregate

1	Penetration	IS:1203	Mm	63
2	Ductility	IS:1208	Cm	82.33
3	Specific Gravity	IS:2386	-	1.020
4	Softening Point	IS:1203	^{0}C	50.5
5	Flash Point	IS:1209	^{0}C	239

Table 2 Properties of 60/70 Grade Bitumen

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Sr. No.	Test Properties	Bitumen content By wt. Of mix (%)			Optimum Bitumen Content By wt. Of mix (%)		
		cube	pyramid	sphere	cube	pyramid	Sphere
1	Max. Bulk density (gm/cc)	4.56	4.77	4.78	4.51%	4.66%	4.71%
2	4.5% VIM	4.39	4.81	4.73			
3	70% VFB	4.37	4.81	4.73			
4	Max. Marshall Stability	4.55	4.57	4.65			
5	3mm Flow	4.70	4.49	4.60			

Table 3 Optimum Bitumen Content