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An Investigational Study of SMA Mixes with Fly Ash as Filler and Sisal Fibre as Stabilizer

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ABSTRACT

It was discovered that 0.3% was the Optimum Fibre Content (OFC) for both BC and SMA mixtures using the Marshall Procedure. Similar results showed that the BC and SMA OBCs were 5% and 5.2%, respectively. The performance of the BC and SMA mixes created at OBC and OFC is then assessed using various performance tests, including the Drain down test, the Static Indirect Tensile Strength Test, and the Static Creep Test. Conclusion: In both BC and SMA mixes, sisal fibre addition improves mix attributes such Marshall Stability, Drain down characteristics, and indirect tensile strength. It has been found that SMA has better indirect tensile strength and creep properties than BC.

KEYWORDS: *Sisal Fibre, Marshall Properties, Static Indirect Tensile Strength, Static Creep*

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INTRODUCTION

This was one of the limitations of this procedure. Francis Hveem, a project engineer of California Department of Highways, developed the Hveem stabilometer. Hveem did not have any prior experience on judging the *just right* mix from its colour, and therefore decided to measure various mix parameters to find out the optimum quantity of bitumen. Hveem used the surface area calculation concept (which already existed at that time for cement concrete mix design), to estimate the quantity of bitumen required. Moisture susceptibility and sand equivalenttests were added to the Hveem test in 1946 and 1954 respectively. Bruce Marshall developed the Marshall testing machine just before the World War-II. It was adopted in the US Army Corpes of Engineers in 1930's and subsequently modified in 1940's and 50's.

LITERATURE SURVEY

Brown and Manglorkar (1993) has done a comparative study on SMA and DGM by using2 type aggregate (granite and local siliceous gravel) and also used cellulose and mineral fibre in SMA and did different test like Marshall test, Drain down test , Indirect tensile strength test, resilient modulus. They found that in SMA mixture the high amount of coarse aggregate forms a skeleton type structure providing a better stone-on-stone contact between coarse aggregate particle , which offer high resistance to rutting**.**SMA has shown good resistance to plastic deformation under heavy traffic loads with high tire pressure , also show good low temperature properties. Further, SMA has a rough texture which provides good friction properties after surface film of the binder is removed by the traffic.

Brown (1994) studied on SMA using different type of filler, stabilizer and concluded that Drain down in SMA is effected by type of filler, type of stabilizer , amount of stabilizer(higher the amount of stabilizer lower the drain down).Optimum binder content of SMA mixes is greaterthan DGM.

Bradely et al. (2004) studied Utilization of waste fibres in stone matrix asphalt mixtures. They used carpet fibre and polyester fibres and waste tires to improve the strength and stability of mixture compared to cellulose fibre. They found waste tire and carpet fibre are effective in preventing excessive drain down of SMA mixture also found that tensile strength ratio of mixes more than 100% , it means fibre don't weaken the mixture when expose to moisture. Addition of tire and carpet fibre increases toughness of SMA. They found no difference in permanent deformation in SMA mix containing waste fibres as compared to SMA mix containing cellulose or mineral fibre.

Kamaraj et al. (2004) carried laboratory study using natural rubber powder with 80/100 bitumen in SMA by wet process as well as dense graded bituminous mix with cellulose fibre and stone dust and lime stone as filler and found its suitability as SMA mix through various tests.

METHODOLOGY

Table 1 Adopted aggregate Gradation for SMA (MORTH)

Sieve size (mm)	Percentage passing
16	100
13.2	94
9.5	62
4.75	34
2.36	24
1.18	21
0.6	18
0.3	16
0.15	12
0.075	10

Coarse Aggregates
Coarse aggregates consisted of stone chips collected from a local source, up to 4.75 mm IS sieve size. Its specific gravity was found as **2.75**. Standard tests were conducted to determine their physical properties as summarized in Table

Fine Aggregates
Fine aggregates, consisting of stone crusher dusts were collected from a local crusher with fractions passing 4.75 mm and retained on 0.075 mm IS sieve. Its specific gravity was found as **2.6.**

Flow Value
It is observed that with increase binder content flow value increases. For BC flow value should be within 2 to 4 mm. Variation of flow value with different binder content of BC with different filler is shown in f

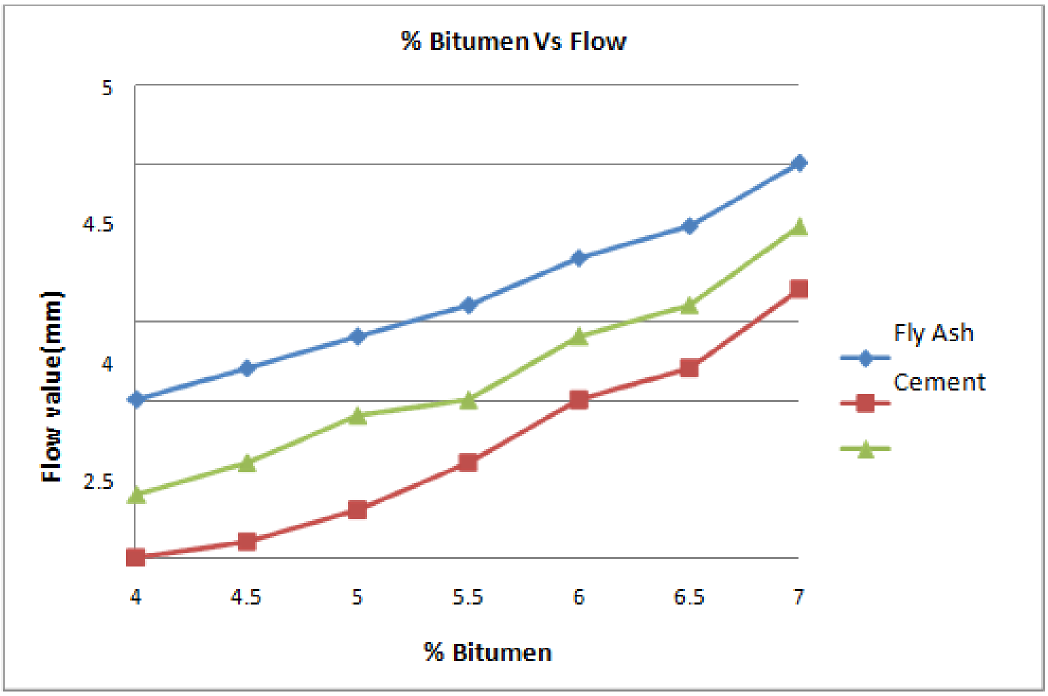

Fig 1. Variation of Flow Value of BC with different binder content.

CONCLUSION

1. By addition of 0.3%fibre to SMA Stability value increases significantly and further addition to it, stability decreases.
2. By addition of 0.3%fibre to SMA flow value decreases and further addition of fibre flow value increases.
3. Main advantage of using fibre is that air void in mix decreases.
4. Drain down of binder decreases.

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