
STUDY OF WASTE MATERIALS IN CONSTRUCTION OF FLEXIBLE PAVEMENT

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ABSTRACT:

Bituminous blends are most commonly use everywhere throughout the world in flexible pavement construction. It comprises of bitumen or asphalt (use as a binder) and mineral aggregate which are mix together, set down in layers and after that compacted. Under typical conditions, traditional bituminous pavement if designed and executed properly perform acceptably yet the execution of bituminous blends is exceptionally poor under different situations. Today's asphaltic concrete pavement are required to perform better as they are encountering expanded volume of traffic, increased loads and increase variations in day by day or regular temperature over what has been experienced in the past. Moreover, the execution of bituminous pavement is observed to be extremely poor in dampness initiated circumstances. Thinking about this as a lot of work has been done on the utilization of added substances in bituminous blends and in addition on the bituminous mixer. Research has demonstrated that the expansion of polymers to black-top folios expands the interfacial cohesiveness of the security between the total and the fastener which can improve numerous properties of the black-top asphalts to help meet these expanded requests. Notwithstanding, the added substance that will be utilized for alteration of blend or fastener should fulfill both the quality prerequisites and in addition efficient viewpoints. Plastics and fly ash remains are wherever in the present way of life and are developing quickly all through especially in a creating nation like India and world.

KEYWORDS: Plastic Waste, Modified Bitumen, Bitumen, Fly ash, Aggregates, Plastic Roads.

INTRODUCTION:

Considerable research has been carried out to determine the suitability of plastic waste modifier in the construction of bituminous blend. Recycled polyethylene and fly ash are may be useful in bituminous pavements resulting in reduced permanent deformation in the form of rutting and reduced low-temperature cracking of pavement surfacing[5]. Plastic is a very versatile material. Due to the industrial revolution, and its extensive scale production plastic seemed to be a less expensive and effective raw material. Today, every imperative area of the economy beginning from agriculture to packaging, automobile, electronics, electrical, building development, communication sectors has been virtually revolutionized by the applications of plastics. Plastic is a non-biodegradable material and researchers found that the material can stay on earth for 4500 years without debasement. Several studies have proven the health hazard caused by improper disposal of plastic waste. The health hazard includes reproductive causes in human and animal, genital variations etc. Looking forward the situation of present life style an entire prohibition on the utilization of plastic can't be put, although the waste plastic taking the face of the devil for the present and future era. We cannot ban use of plastic but we can reuse the plastic waste[2-6]. An alternate use for the waste plastics is also the needed. Plastic waste when mixed with hot bitumen, plastics melt to form an oily coat over the aggregate and the mixture is laid on the road surface like a normal tar road. In the construction of flexible pavements, bitumen expect the role of binding the aggregate together by covering over the aggregate[3]. This paper demonstrates a nearby execution of properties of bituminous cement blends containing plastic/polymer (PP) and fly ash debris with the ordinary bituminous solid blend (use with 60/70 grade of bitumen), utilizing the dry process

[5]. The dry procedure includes the coordinate joining of waste plastic which is mixed with the total before including bitumen, to set up a plastic altered bituminous solid blend. The wet procedure includes the synchronous mixing of bitumen and waste plastic. Different added substances like polymers and filaments have been used with the end goal of enhancing the high and low-temperature attributes of bitumen pieces, and in addition to enhancing their toughness and durability [1]. Use of plastics in flexible pavement then its increase the marshal stability of road by approx three times as comparison to normal flexible pavement road. Plastic road is also economical than normal road [3].

OBJECTIVE OF STUDY:

1. To evaluate the stability value, flow value, % air voids, % VMA and % VFB of DBM mixes with addition of fly ash by Marshall Method of mix.
2. To evaluate the stability value, flow value, % air voids, % VMA and % VFB of DBM mixes with addition of combination of fly ash and waste plastic by Marshall Method of mix design.
3. To compare the Marshall properties of bituminous mix with fly ash and bituminous mix with combination of fly ash and plastic waste.
4. To use the fly ash by incorporating it in bituminous mix.
5. To use the plastic wastes by incorporating them in bituminous mix.

RESULTS AND DISCUSSION:

From this study the following results are obtained which is shown from the Tables.

Table 1 Following results were obtained from the tests conducted on aggregates

Sr. No.	Property	BIS Test methods	Results	MORT&H specification
1.	Aggregate impact value %	IS:2386 Part IV	15.10%	27% Max
2.	Combined flakiness & elongation Index	IS:2386 Part I	19 %	30% Max
3.	Specific gravity 1. C.A 2. F.A	IS:2386 Part II IS:1202-1978	2.57 2.55	Nil Nil
4.	Water Absorption %	IS:2386 Part III	0.9%	2% Max

Table 2 Following results were obtained from the tests conducted on bitumen

Sr. No.	Property	Specification of IS:73	Test Result
1.	Specific Gravity	0.99 (min)	1.025
2.	Penetration	60-70 (0.1 mm)	75
3.	Softening Point	45-55 °C	40
4.	Ductility	75 cm (min)	68.3

Table 3 Marshall Properties of various Bituminous Mix

Sr. No.	Type of Mix	Flow Value	Va (%)	VMA (%)	VFB (%)	Marshall Stability value (kg)
1.	Plain bituminous mix.	13	4.4	7.75	70.3	372.84
2.	Bitumen + Fly ash mix.	11.2	2.43	8.28	69.80	462.25
3.	Bitumen + Fly ash + Plastic Waste mix.	14	3.0	9.48	68.3	533.10

Utilization of plastic waste in the construction of flexible pavement is gaining importance because of the several reasons. The polymer modified bitumen indicate better properties for road construction & plastics waste, generally thought to be a contamination danger, can find its utilization in this process and this can help solving the problem of pollution because most of the Polymer Modified Bitumen is used due to its better performance. But in the case of higher percentage of polymer bitumen blend, the blend is a more polymer dispersion in bitumen, which get separated on cooling. This may affect the properties and nature of the mix and furthermore the street laid utilizing such mix.

In the changed procedure (dry process) plastics-squander is covered over total. This has better authoritative of bitumen with the plastic-squander covered total because of expanded holding and expanded territory of contact amongst polymer and bitumen. The polymer covering additionally lessens the voids. This keeps the dampness ingestion and oxidation of bitumen by ensnared air. This has brought about lessened rutting, raveling, and there is not pothole development. The street can withstand overwhelming activity and show better solidness.

CONCLUSIONS & FUTURE SCOPE:

From the above tests conducted the following conclusions were drawn out:-

1. Marshall Test conducted on plain Bituminous mix have stability value 372.84 kg, correspondingly the value of flow is 13, Percent Air voids is 4.4%, VMA is 7.75% & VFB 70.3%.
2. Marshall Test conducted on Bituminous mix with 2% fly ash have maximum stability value of 462.25 kg, correspondingly the values of flow is 11.2, Percent Air voids is 2.43%, VMA is 8.28% & VFB is 69.80%
3. Also Marshall Test conducted on the bituminous mix with combination 3% fly ash and 2% plastic waste have higher value of stability 533.10kg correspondingly the values of flow is 14, percentage air voids is 3.0%, VMA is 9.48% & VFB is 68.3%.
4. Marshall Test conducted on the bituminous mix with the combination of 2% plastic & 3% fly ash have the value of stability, flow, percentage air voids, VMA & VFB are within the limits of specification given by MORT&H.
5. These results are based on laboratory performance.

FUTURE SCOPE:

1. This study deals with strength calculation of plain bituminous road which can be further extended for the strength calculation of bituminous road by using plastic waste materials such as LDPE(low-density polyethylene), HDPE(high-density polyethylene), PVC(polyvinyl chloride) etc.
2. We can also use Plastic waste with Mastic asphalt which is oldest construction product and oldest

waterproofing membrane system. By the mix of plastic waste we can enhance its quality and improve the strength and stability.

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