

# USE OF BIO-MEDICAL WASTES IN FLEXIBLE PAVEMENTS

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**Abstract:** Bio-medical wastes are generated almost in every corner of world . Apart from famous hospitals of India like AIIMS, PGI Chandigarh, TATA institute Mumbia, Almost every village & town of India has its own health sub center. Every day almost on an average 20kg of biomedical waste is generated from a single hospital of India. The bio-medical waste generated from these hospitals & sub-center's is being disposed of as such either by incineration or by landfilling, but both these processes are not eco-friendly in nature. There is one of the safest mechanism to dispose of this bio-medical waste & that safest mechanism is use of such bio-medical wastes in road construction.

**Keywords:** Bio-medical waste, Hospitals, Flexible pavements, Environment pollution, Eco-friendly environment.

**I. Introduction:** In India, there are almost 11,296 government hospitals & many more private hospitals & sub health center's. In health care system, the rank of India in global health index 2021 is 66 with a score of 42.8. Among states of India, kerela emerges as the top ranking state in terms of overall health care system. Every day almost thousands of patients visit these hospitals for treatment of various diseases & everyday kg's of plastic bio-medical wastes are generated from such hospitals including syringes, Glucose bottles etc. These syringes & glucose bottles are disposed by incineration & by land filling. Both these processes are not eco-friendly in nature & they create various environmental hazards like soil pollution, air pollution that inturn causes many diseases. With the essence of diseases, people visit hospitals & again generation of bio-medical waste takes place. The process continues & the cycle repeats.

Its responsibility of an every individual to find some alternative ways to dispose off bio-medical wastes. As an individual we found some alternative ways to dispose off these biomedical wastes & the alternative way that we found was to use such bio-medical disposal wastes like syringes, glucose bottles in road construction. India as a developing country is in need to develop our road infrastructure more & more stable. Every year cores of rupees are spent for road development, but the outcome of our roads is not that much satisfactory? Our roads get degraded at fast rate, they develop more potholes, more spinouts & more accidents eventually takes place on such degraded roads then. The problem why these roads start degrading at such fast rate lies in the fact that bitumen, a binding material does not much stability. Bitumen, one of the important highway material is very highly unstable in terms of stability & flow value. The properties of bitumen are actually unstable that is the reason bitumen does not much that much capability to stay resist against traffic flow, against temperature. The properties of bitumen can be modified by several things, & plastic bio-medical wastes is one of them. By using mixture of plastic bio-medical wastes we can enhance the properties of bitumen, which in turn enhances our road development.

## II. METHODOLOGY

Materials used

Aggregates

Bitumen

Cement

Bio-medical waste (glucose bottles)

Aggregates, cement & waste glucose bottles were used for making various samples for marshal stability test. Three samples each of control mix (mix with bitumen, aggregates & cement only) and 6% bio-medical mix (mix with bitumen, aggregates, cement, & 6% waste glucose bottles by total weight of marshal sample that is 1200gm) were made. In 6% bio-medical mix, weight of aggregates was replaced by weight of waste glucose bottle.

### Tests Performed

#### Marshall Test

Marshall Stability Test is used for finding the Stability Of bituminous mixes. Marshall Stability Test implements the Principle that the Stability of the bituminous mix is its resistance to flow when loaded on lateral surfaces. In general, it may be defined as the capacity of load which the mixes can carry at 60°C. The measuring unit of Stability is kg. Flexibility of mixes can be determined by using Flow value. It is measured as deformation in 0.25 units from the application of load to the point when the load is maximum.

#### Procedure followed

- First selection of proportions of coarse aggregate and filler is done in order to meet the requirements as per IRC. The weight of mix should be kept as 1200g.
- The aggregates are heated to 170°C and bitumen is heated to 163°C respectively.

- c. Mix the materials and transfer the material to the compaction mould arranged on the compaction pedestal.
- d. 75 Blows are given on both sides of the sample specimen with a standard hammer (4.86 kg, 45cm- free fall).
- e) Keep the specimen in the mould for few minutes for cooling
- f) Remove the specimen by gently pushing it from the mould.
- g) The specimen is marked and cured at room temperature.
- h) A number of specimens are prepared by same method with 6% bio-medical waste content And control mix
- i) Test the samples both control mix & bio-medical mix by applying the load on the specimen at the rate of 5cm/min. Check the Stability and Flow Value of the samples.



Figure 1. Marshal stability test

### III. TEST RESULTS

Bitumen content 6%	CONTROL MIX	BIO-MEDICAL MIX
Specific gravity of bitumen	<b>1.0</b>	<b>1.0</b>
Density ( g/cc)	<b>2.36</b>	<b>2.29</b>
Specific gravity of aggregate blend	<b>2.57</b>	<b>2.39</b>
Volume of bitumen	<b>14.10</b>	<b>13.01</b>
Volume of aggregates	<b>82.90</b>	<b>85.11</b>
Voids in mineral aggregate	<b>18.4</b>	<b>15.02</b>
Voids filled with bitumen	<b>70.16</b>	<b>82.03</b>
Air voids	<b>5.4</b>	<b>3.39</b>
Stability ( kg)	<b>1300</b>	<b>1975</b>
Flow value ( mm)	<b>2.46</b>	<b>3.89</b>

### IV. OBSERVATIONS

Observations from marshal stability test for control mix & 6% bio-medical mix are as

#### 1. Stability

The maximum stability is exhibited by 6% biomedical waste mix i.e 1975 kg, the control mix attains least stability of 1300 kg .

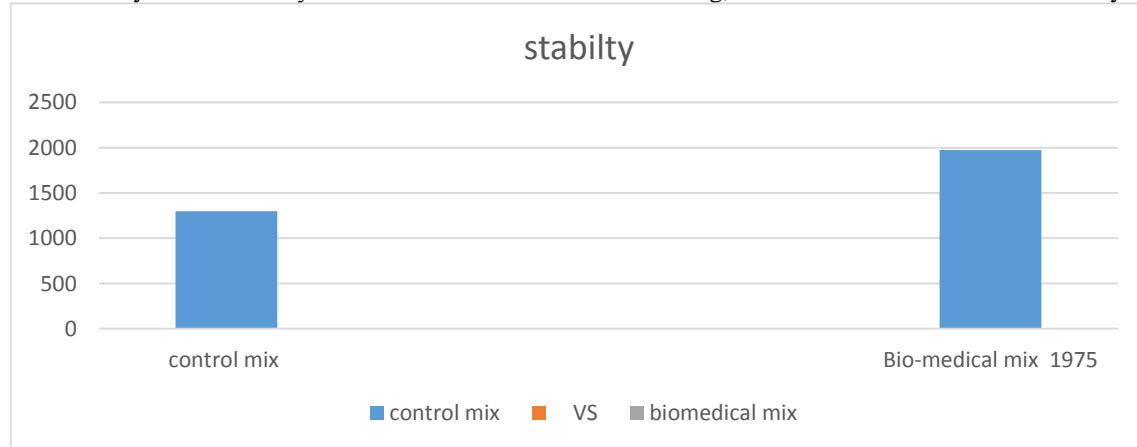


Chart1 Comparison between stability results of control mix & bio-medical waste

## 2. Flow value

The maximum flow value is attained by bio-medical mix when as compared with control mix. The bio-medical mix 6% attains flow value of 3.89mm & control mix of 2.46mm.

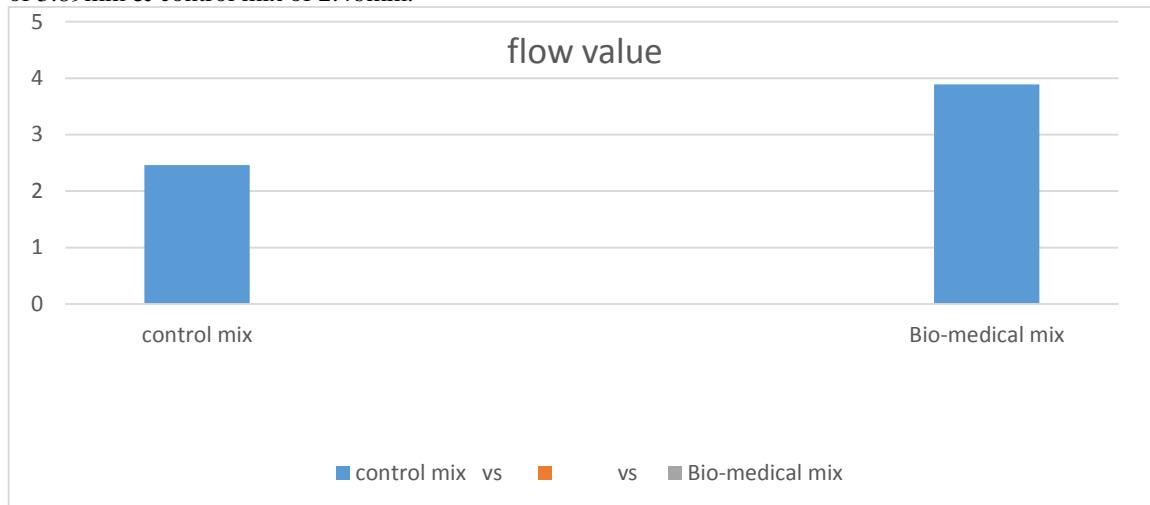


Chart 2 Comparison between flow value of control mix & 6% Bio-medical mix

## V. CONCLUSION

1. Bio-medical mix exhibits more stability as compared to control mix, that indicates the fact that biomedical wastes improves the properties of bitumen, and use of biomedical wastes in road construction is a welcoming step.
2. Use of Bio-medical wastes in road construction proves to be one of the safest mechanism to dispose off bio-medical waste plastic.
3. Use of bio-medical wastes in road construction does not create any kind of environmental hazard.
4. Using bio-medical wastes in road construction prevents spread of transmissible diseases like aids & all.
5. Also by using waste plastic, roads constructed in such areas can prove to be economical.

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