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# SUSTAINABLE ROAD AND BUILDING CONSTRUCTION USING WASTE PLASTIC

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## ABSTRACT

*Modern world around us consists of many toxic substances, plastic being most hazardous amongst them. Due to its qualities of being cheap, durable, moldable, strong, bad conductor of heat and electricity, etc. it finds its use in almost all walks of life. Different environmental issues and pollution problems arise due to its end-life.*

*India, a tropical country, due sun's heat, rains, etc. the roads keeps on degrading under the normal conditions also, which results into shortening of the life of roads. The soil stabilization is techniques which not only solve the problem of waste plastic disposal, but also increases the shear strength and resilience of the roads by adding this waste plastic in their making. In this paper an attempt to increase the life span of roads and solve the disposal problem of waste plastic both has been dealt in one step only. Also with the help of bottle brick technology the waste plastic is recycled into cheap and durable construction material.*

***Keywords:*** *Environment, Plastic, Roads, Soil Stabilization, Waste.*

## I. INTRODUCTION

Plastic is inseparable part of today's lifestyle. It is used for making food containers, plastic tableware, disposable cups, plates, cutlery, packaging, protecting and even disposing covers of all kinds of consumer goods. With the advent of industrial revolution, plastic seemed to be a cheaper and effective raw material for mass production of goods. Today, every vital sector of the economy starting from agriculture to packaging, automobile parts manufacturing to communication tools, and building construction, all has been virtually revolutionized by the applications of plastics. Plastic in different form is toxic in nature. It is piling up both in urban and rural areas. There it results in water stagnation and associated hygiene problems. Plastic waste otherwise a hazard to the environment can be reused productively in the construction of roads and pavements with longer life.

## II. SOIL STABLIZATION TECHNIQUE

Soil's strength and durability can be improved upon by blending and mixing materials with it this is called soil stabilization. Soil stabilization is a process that improves the physical properties of the soil, such as increased shear strength, resilience, etc.

These improved properties can be achieved by the addition of suitable materials like cement, lime , fly ash, etc. Costs for these additives have increased in recent years which opened the door wide for the development of other types of soil additives, which should be cost effective. These materials should either be waste such as

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plastic, bamboo, etc. Stabilization of soil by plastic plays an important role in reducing the plastic from environment which can't be recycled or reused. The use of plastic products such as plastic bags, bottles, etc is increasing day by day leading to several environmental problems. Therefore disposal of plastic waste without environmental hazards has become a real challenge. Hence this plastic is used as a cost effective and profitable soil stabilizer.

### 2.1. Plastic As A Stabilizer In Road Making

Waste polythene bags and other material of same nature which can't be recycle or reused takes hundreds of years to degrade and can't be burnt off as burning will release hazardous toxic gases in atmosphere, therefore this plastic is mixed with road building material as its presence is in abundance and contributes in:

- Increasing the shear strength.
- Increasing the tensile strength.
- Increasing durability of structure.

Road construction steps**:**

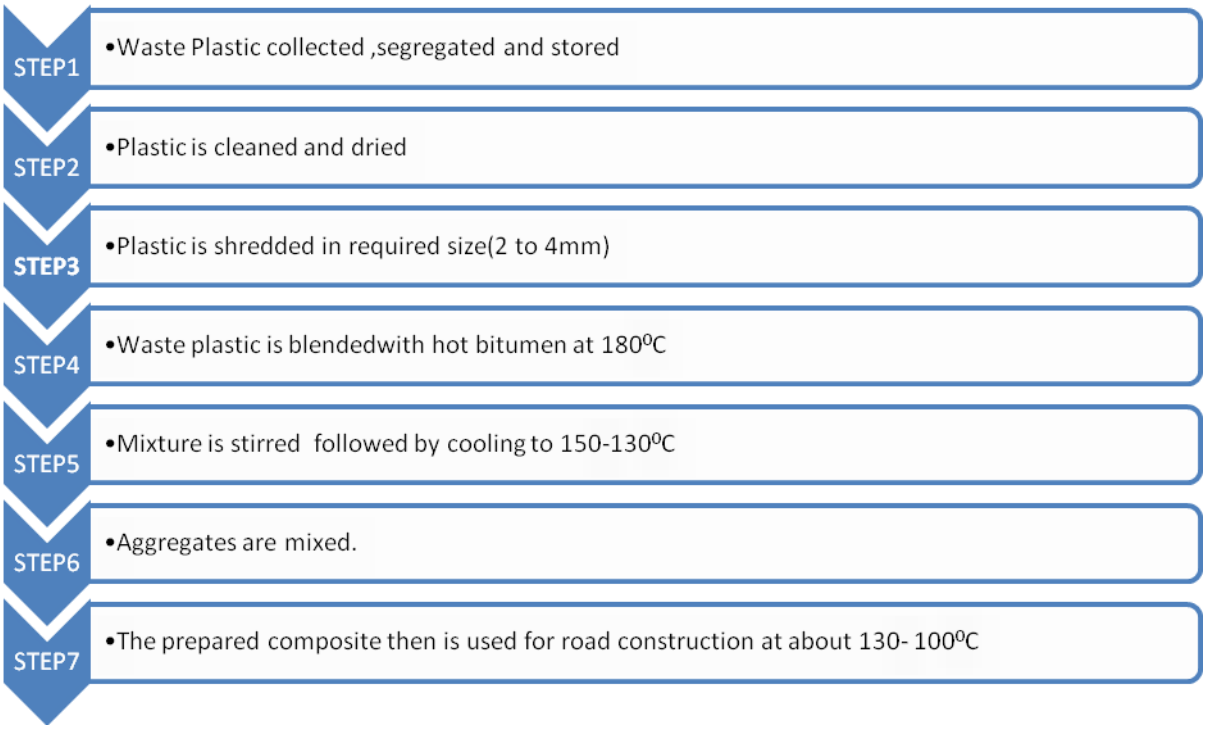


**Fig. 1: Schematic Flow Diagram plastic road Construction Process**

#### 2.1.1. Advantages of Plastic tar Road

The threat of disposal of plastic will not solve until the practical steps are not initiated at the ground level. A well constructed Plastic Tar Road will result in the following advantages:

- Increased road strength (increased Marshall Stability Value)
- Better resistance to water and water stagnation

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- No stripping and have no potholes
- Increased binding and better bonding of the mix
- Increased load withstanding property
- Decreased consumption of bitumen
- Reduced pores in aggregate and hence less rutting and raveling
- Better soundness property
- Reduced maintenance cost of the road
- Increased life span of the road
- Decreased plastic leaching
- No effect of radiation( like UV)

Picture:1

Picture:2

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Picture:3 Plastic Road Construction

### 2.1.2. Bottle Brick Technology

Packing sand into plastic bottles is a technique that started few years ago in India, South and Central America. Named "bottle brick" technology, the compacted sand inside the bottles is almost 20 times stronger than bricks. The best part is that for a developing country like India where many people do not have much money to spend on building materials, their houses will estimate to cost 1/3 of a house made of concrete and bricks.

## III. BOTTLE BRICKS FROM PLASTIC WASTE

Bottle Bricks are a simple and accessible technology that can transform everyday plastic materials into a useful material – plastic bottles are stuffed full of trash until they are as compact as bricks. Bottle Bricks can be used to build houses, school buildings, and other structures for increasing the strength.

**Process: –** Inorganic waste material (plastic bags, plastic wrappers, etc.) are collected, dried and stuffed into a clean plastic bottle with the help of wooden stick or spoon. The bottle brick's strength increases with the increased stuffing densities, which helps in cleaning the plastic stuff from environment around and solve land filling problem to some extent.

Bottle brick technology has the following advantages over conventional bricks and other construction materials.

1. Low Cost (1\3 of normal).
2. Non-Brittle Nature (Unlike Bricks)
3. Bullet Proof.
4. Heat Proof.
5. Absorbs abrupt shock loads- (non-brittle, therefore can take up heavy loads without failure).
6. Re-usable
7. Less Construction Material.
8. Easy to build.
9. Green Construction.
10. Unique Design

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**Picture:4 Bottle Brick Wall Structure**

**Picture:5 A House Constructed By Bottle Bricks**

## IV. CONCLUSION

India has more than 4.25 million Km of roads. If only some of them are constructed or repaired using this technique, there will be less waste plastic littered on the road. This process is eco-friendly, as the resources required are directly coming from waste .Segregating plastic from the MSW at municipal yard involves application of resources, the cost of which runs into crores of rupees. A substantial amount of this can be saved. The use of plastic wastes has significantly helped in ground improvement. It can significantly enhance the properties of the soil used in the construction of roads infrastructure. Results include a better and longer lasting road with increased load bearing capacity. This technique of soil stabilization can be effectively used to meet the challenges of the society , producing useful material from non-useful waste materials. Therefore, this project is the challenges of society, not the amount of plastic waste, the production of valuable materials from waste makes sense to reduce the creation of a sustainable society.

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