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Use of Waste Foundry Sand (WFS) and Crushed Waste Glass (CWG) on Stabilization of Black Cotton Soil- Review

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Abstract - *In India expansive soil is one of the major soil deposits .Expansive soil exhibits Shrinkage and Swelling when comes in contact with moisture and creates a lot of problem from engineering consideration. It also known as " Black Cotton soil. The Black Cotton soil has been a problem for geotechnical and highway engineers due to its high shrinkage and swelling characteristics. Recently many researchers used different types of industrial waste to stabilize Black Cotton soil like boggish ash, sea shell powder, RBI 81, lime etc. as low cost material used in various projects and to save the environment. Foundry sand and Crushed Waste Glass powder have been reviewed for soil stabilization in this review article. Ferrous and non-ferrous metal casting waste material is known as foundry sand, and glass powder is the waste glass of the glass industry. Glass powder have properties like high temperature and resistance to chemical attack very fine and inert material.*

Keywords: Soil Stabilization, Expansive soil, Foundry sand, Glass powder, Dry Density, CBR, Free Swell Index

1. INTRODUCTION

Soil stabilization is defined as the engineering approach which is adopted to reduce the defects in soil such as compressibility, settlement as well as to enhance the engineering properties of soil by alteration of its physical properties. It can be done in two ways, first by mechanical stabilization, in which materials are added to the soil and second by chemical stabilization, in which chemical reactions occurs between the soil particles and additives.

Here, in this project, Stabilization will be performed with the help of Waste Foundry Sand (WFS) and Crushed Waste Glass Powder (CWG) in various projects. Both of these are waste products and their disposal is a big concern for the entire world. The beneficial use of these wastes will not only reduce the space it takes up in our landfills but also it will enhance our efforts to protect our environment. Many issues arise from the growth of industry, one of which is the proper and efficient disposal of its waste. Many significant environmental issues are caused by toxic waste. Thus, the only way to dispose of hazardous waste in the building industry is to use it.

2. LITERATURE REVIEW

Torase et al., 2019 10% Foundry sand and 20% Rice husk Ash has experimental scrutiny on soil stabilization in different quantities. The consequence of this analysis shows that an average change in soil is seen with the addition of Rice husk ash and Foundry sand. Soil is also an excellent material for Soil stabilization. [1].

Tripti and Kuldeep2019 performed an experimental soil stabilization test with various percentages of some waste material melting sand and marble dust. 22% Waste Foundry sand and 16% Marble dust gives best result and improves the Bearing capacity of soil and CBR value improves at great extent.[2].

Johnson and Naeethu2019 Performed various tests on soil to test the impact of foundry sand on CBR value.20% Foundry Sand is best utilization with soil.

Ajeet et al., 2018 Performed various tests and analysis on use of FA and WFS. With Waste Foundry Sand (.25%) and Fly Ash (FA) 1% MDD and CBR value improves at great extent. stabilization. (4)

Gowtham etal.2018 Various tests were conducted by using Glass waste and Plastic Waste and the best result comes out at 4% glass waste and 6% Plastic Waste are useful for improvement of Soil geotechnical properties[5].

Premlatha et al., 2018 Investigated the use for soil stabilization of plastic waste and foundry sand. It shows that 17.5% Plastic Waste and 40% Foundry Sand Waste gives best results and provides stability to the soil and also 10% construction cost is reduced. **Matthew and Olusegun2018** performed experimental scrutiny on the use of glass fiber at 0.8% to3% by 0.4% variation in each test and the result shows that with addition of 1.2 % to 1.6 % glass fiber increases CBR value and Dry density. [6].

Razvi etal, 2016 In this investigation on Soil stabilizing with Waste Foundry Sand (WFS) and Fly Ash (FA), the results shows that the thickness of subgrade soil decreases, which is more precise than conventional and also fly ash provides soft and smooth surface. [8].

Kumar et al., 2016 0 to20% Waste Foundry Sand replaced with soil has been experimentally tested for soil stabilization. The effect of the evaluation shows that, with an improvement in foundry sand, CBR rose from 8.9 percent to 18.21 percent. Sand foundry

It is a good material for soil stabilization and demonstrates great improvement. [9].

3. Data Analysis

Author	Year	Name of Paper	Material used	Percentage of material	Result
Torase et al	2019	Soil Stabilization using Rice Husk Ask and Foundry Sand	Foundry Sand, Rice Husk Ask	Rice Husk Ask (5%, 10%15%20%), Foundry sand (10%)	The consequence of this protection suggests that the incorporation of Foundry sand and rice husk ash reflects a significant change in soil.
Kuldeep an tripti	2019	Stabilization of Soil using Marble dust and Foundry Sand	Marble dust and Foundry Sand	22% WFS and 13% Marble dust	Maximum CBR value comes at 22%WFS and 16% marble dust
Naeethu and johnson	2019	Effect Of WFS on CBR characteristics of soil	Foundry sand	20% WFS by weight	20% utilization WFS with soilis best combination. It creates maximum MDD value
Ajeet et al	2018	Stabilization of soil with WFS and Fly ash	WFS and Fly ash	1% Fly ash 0.25 % WFS	MDD achived at 1%fly ash and 0.25 %wfs
Gowtham et al	2018	Stabilization of Clay soil using Plastic waste and Glass Waste	Plastic waste and Glass powder	4% glass powder and 6% plastic powder	Addition of 6% Plastic Waste and 4% Glass Powder give best result for the improvement of geotechnical properties of soil.
Premlath a etal	2018	Use of Waste Foundry Sand and Plastic Waste in Flexible pavement	Waste Foundry Sand and Plastic Waste	F.S (50%) and Plastic Waste(0 to 20%)	Foundry Sand(40%) and Plastic Waste(17.5) gives best stability and cost of construction also reduced to 10%.
Mathew and Oluseg un	2018	Stabilization of Soil by the addition Glass Fiber	Glass fiber	0.4% to 3% Glass Fiber proportion (0.4% variation in each tests) by weight	By addition of this CBR and MDD improves to a great extent with (1.2 to1.6%)
Razvi et al	**2017**	Using F.A.(Fly Ash) and FS(Foundry Sand)	Fly Ash and Foundry Sand	0.25% FS and 1% Fly Ash	Thickness of Subgrade soil layer is reduced
Kumar et al	**2016**	Using of Waste Foundry Sand Stabilization of Subgrade Soil	Waste foundry sand	FS (5 to20%)	CBR increases from 8.9% to 18.22%

4. Conclusions

1. From the results of the experiment, it shows that the foundry sand is a fine soil stabilization substance, because the foundry sand consists of high silica that helps increase the strength of materials.

2. By using Glass Fiber as a stabilizing material MDD and OMC improves at great extent

3. With 30 percent utilization of foundry sand to the weight of soil, we have achieved MDD value, it is the best mix.

4. By using Waste Foundry Sand for the stabilization of soil, OMC is improved.

5. CBR values increase up to a variable percentage (5 percent to 7 percent) by using Glass Fiber and Foundry Sand.

6. CBR and Maximum Dry Density are increased by adding glass fiber (1.2 percent to 1.6 percent).

7. 1% FA and 0.25% WFS addition with Soil gives good results by increasing CBR value and MDD value upto to a great extent.

8. Soaked CBR value improves from (2.44 percent to 5.1 percent) and MDD (maximum dry density) also increases by adding 40% Waste Foundry Sand(WFS) in Clay type Soil.

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