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STABILIZATION OF BLACK COTTON SOIL USING ADDITIVES

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ABSTRACT

For any type of structure, the foundation is very important, and it must be strong to support the entire structure. For the sturdy foundation the soil around it plays a very critical role. To work on soils, we need to have proper knowledge about their properties and factors which affect their behaviour. This paper presents the experimental study undertaken to investigate the suitability of using several types of additives and how they improve the stabilization properties of black cotton soil

Key words**: *Black cotton soil, Quarry dust, lime, Granite Stone dust, Foundry Sand***

I. INTRODUCTION

Black cotton soils also called Regur soils are generally clayey, deep and impermeable. These soils expand and become sticky during rainy season causing deep cracks into the soil. Chemically black soils consist of lime, iron, magnesium, alumina and potash but they lack in nitrogen, phosphorus and organic matter. Because of their capacity to hold water, they are suitable for cultivation of cotton hence called as black cotton soil.

Black cotton soil is one of major soil deposits of India. They exhibit high rate of swelling and shrinkage when exposed to changes in moisture content and hence have been found to be most troublesome from engineering consideration

II. MATERIALS

1. Properties of quarry dust:

The quarry dust is formed by the processing of the granite stones which broken downs into the coarse aggregates of varied sizes. Advantages of Quarry dust is the specific gravity depends on the nature of the rock from which it is processed, and the variation is much less. Risk of Quarry dust is shrinkage is more in while in comparison to that of the natural river sand.

2. Properties of granite waste:

The granite waste is a by-product produced in granite factories while cutting huge granite rocks to the desired shapes. About 3000 metric ton of granite waste is produced per day as a by-product during manufacturing of granite tiles and slabs from the raw blocks. Economic way of stabilization because granite which is available in huge quantity from granite industries. The properties of waste depend upon the granite from which it is taken

3. PROPERTIES OF LIME

Lime in the form of quicklime (calcium oxide – CaO), hydrated lime (calcium hydroxide – Ca[OH]2), or lime slurry1 can be used to treat soils. Quicklime is manufactured by chemically transforming calcium carbonate (limestone –CaCO3) into calcium oxide. Hydrated lime is created when quicklime chemically reacts with water. It is hydrated lime that reacts with clay particles and permanently transforms them into a strong cementitious matrix. Most lime used for soil treatment is "high calcium" lime, which contains no more than 5 percent magnesium oxide or hydroxide. On some occasions, however, "dolomitic" lime is used. Dolomite lime contains 35 to 46 percent magnesium oxide or hydroxide. Dolomite lime can perform well in soil stabilization the use of lime for stabilizing plastic montmorillonite clays has been increasing in favour during the last few decades because it lowers volume change characteristics. Generally, the amount of lime required to stabilize expansive soils ranges from 2 to 10% by weight. The addition of lime to clay soil provides an abundance of calcium ions (Ca2+) and magnesium ions (Mg2+). These ions tend to displace other common cations such as sodium (Na+) and potassium (K+), in a process known as cation exchange. Replacement of sodium and potassium ions with calcium significantly reduces the plasticity index of the clay.

4. PROPERTIES OF FOUNDARY SAND

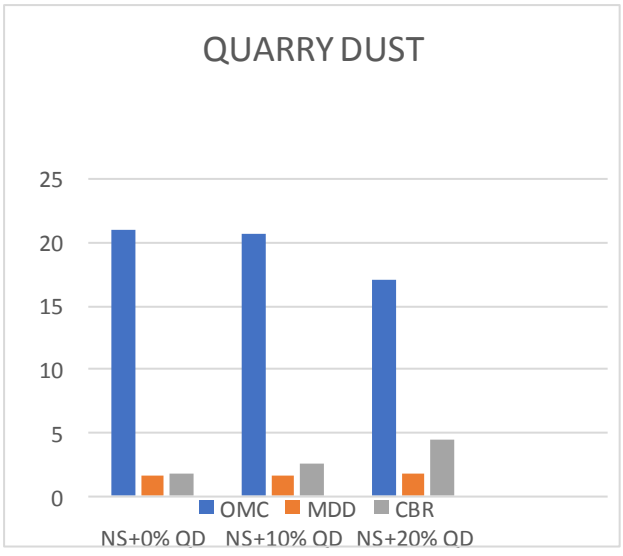
Metal foundries use large amount of sand as part of metal casting process. Foundries successfully recycle and reuse the sand many

times in a foundry. When the sand can no longer be reused in the foundry, it is removed from the foundry and is termed" Foundry Sand." Foundry sand is high- quality uniform silica sand that is used to make molds and cores for ferrous and nonferrous metal castings. Foundry sands typically comprise of >80% high-quality silica sand, 5-10% bentonite clay, 2-5% water and less than 5% sea coal. The metal casting industry annually uses an estimated 100 million tons of foundry sand for production. The physical and chemical characteristics of foundry sand will depend in great part on the type of casting process and the industry sector from which it originates

III. OBSEVATIONS AND RESULTS:

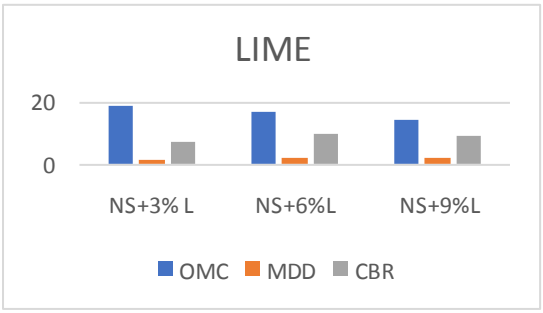
TABLE NO.1: EXPERIMENTAL TEST RESULTS

SR.NO	Soil mixes	OMC	MDD	CBR
1.	**QUARRY DUST**			
	NS+0%	21.1	1.6	1.75
	NS+10%	20.7	1.66	2.47
	NS+20%	17.1	1.69	4.46
2.	**LIME**			
	NS+3%	19	1.58	6.89
	NS+6%	17	1.64	9.56
	NS+9%	14	1.66	8.89



SR. NO	SOIL MIXES	OMC (%)	MDD (g/cc)	CBR

3.	**STONE DUST**			
	NS+5%	17	1.66	1.84
	NS+10%	16	1.68	4.65
	NS+15%	14	1.70	6.50
4.	**FOUNDRY SAND**			
	NS+5%	9.5	1.7	2.08
	NS+10%	8	1.79	3.67
	NS+20%	7	1.8	6.25



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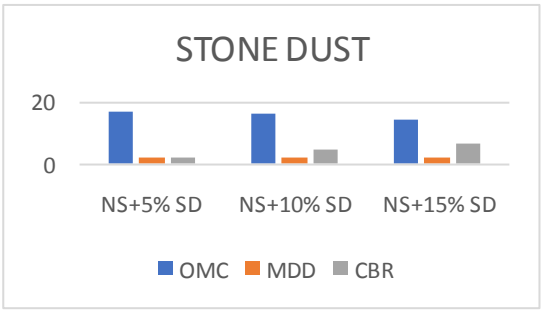

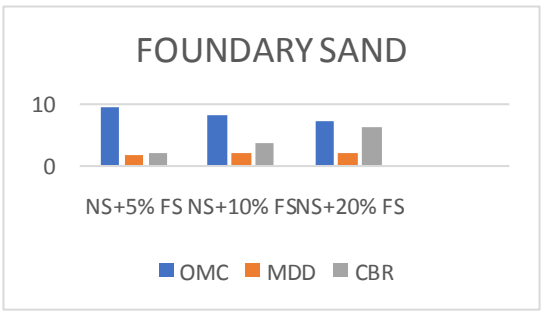

V. IV. CONCLUSIONS:

After studying various cases of addition of waste products to improve soil by various test i.e. OMC, MDD, and CBR test

Following conclusions were drawn

1. After addition of foundry sand and stone dust MDD has increased efficiently.
2. CBR value for black cotton soil in addition with lime has given better results compared to other admixtures.
3. Comparing all admixtures, foundry sand has given least OMC.
4. Overall all admixtures improve various characteristics of black cotton soil.

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