

# Analysis the Strength of Soil by Using Stabilizer like Lime, Cement & RBI Grade 81 Stabilizer and their Comparative Result Analysis

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**Abstract:** Soil stabilization is a process which helps to improve the properties of soil such as shear strength, stress parameters, Atterberg limit etc. by mixing external agent and compact it. The requirement of engineering soil can be achieved by such processes. Soil stabilization can be explained as the modification of the soil properties by chemical or physical means in order to enhance the engineering quality of the soil. In order to improve its strength, durability, workability, stiffness, permeability, compressibility, sensitivity etc. by blending or mixing it with additives. In this present study, we are comparing the properties of soil by mixing calcium based stabilizers; Cement Lime and RBI Grade 81 at different percent to analysis properties variance and their effects. Cement stabilization and lime stabilization are traditional method whereas the stabilization through RBI Grade 81 stabilizer is the latest research works and is used in construction nowadays. The tests were performed as per IS specifications. RBI Grade 81 stabilization shows effective results over Lime and Cement stabilization techniques.

**Index Terms - Soil Stabilization, Lime, Cement, RBI Grade 81 Stabilization, CBR Method, Atterberg Limit.**

## I. INTRODUCTION

Stabilization is a term being discussed with increasing frequency at every gathering of highway or paving engineers. Soil is the basic foundation for any civil engineering structures which is required to bear the loads without failure. In some cases, soil may be weak which cannot resist the loads, soil stabilization are needed. Soil stabilization can be explained as the modification of the soil properties by chemical or physical means in order to enhance the engineering quality of the soil".

According to writer, "Soil stabilization may be defined as a modification of parent soil into a new soil so as to improve its bearing or load absorbing characteristics. Such an effect may be accomplished by mechanical consolidation (compaction) or by the incorporation within the soil of certain additives which would provide the desired qualities of permanent stability. Soil stabilization is a major trend in India where the infrastructure is developing at a very fast speed. A large area of our country is covered with expansive soil with their poor engineering properties and is not suitable for construction. Soil stabilization is the process which involves enhancing the physical properties of the soil in order to improve its strength, durability, workability, stiffness, permeability, compressibility, sensitivity etc. by blending or mixing it with additives. Mainly there are three types of soil stabilization; dewatering, compaction or adding chemicals. This paper was focused on adding chemicals; Lime, Cement and RBI Grade 81 independently in the soil.

## Objectives of Soil Stabilization

The main objectives of the soil stabilization are to improvement in the bearing capacity of the soil, its resistance to weathering process and soil permeability. Unstable soils creates significant problems for pavements or structures, therefore soil stabilization techniques are necessary to ensure the good stability of soil so that it can successfully sustain the load of the superstructure particularly in case of soil which are highly active, also it saves a lot of time and millions of money when compared to the method of cutting out and replacing the unstable soil.

## II. Material used in the Research Work

These are calcium based materials that when in contact with water or in the presence of pozzolanic minerals reacts with water to form cementitious composite materials. The materials used in this study are:

- Lime
- Cement
- RBI Grade 81 stabilizer

### III. METHODOLOGY

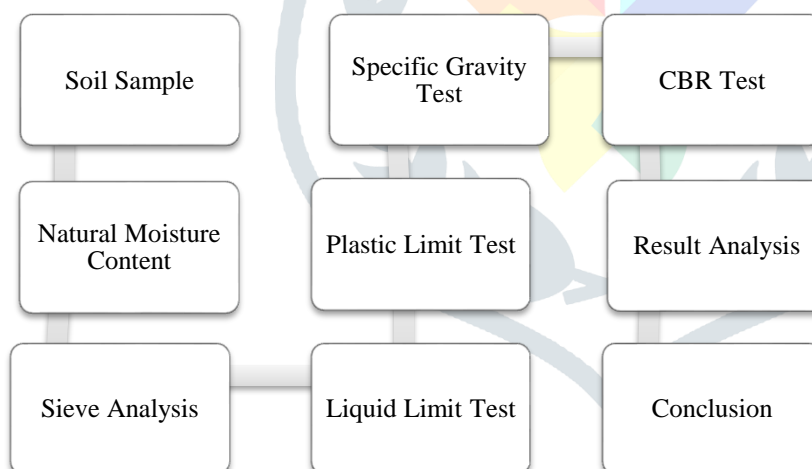
#### Sample Proportions

S.NO.	MIX PROPORTION
1	LOCAL SOIL
2	Soil+ Lime 2%, Lime 4%, Lime 6%
3	Soil+ Cement 2%, Cement 4%, Cement 6%
4	Soil+ RBI 81 2%, RBI 81 4%,RBI 81 6%

#### Test Conducted

- Natural Moisture Content [IS 2720 (part II)-1973]
- Wet Sieve Analysis[IS 2720(Part 4)-1985]
- Liquid Limit Test [IS 2720 (Part 5) – 1985]
- Plastic Limit Test [IS 2720 (part 5) – 1985]
- Specific Gravity Test [IS 2720(part 3)-1980]
- California Bearing Ratio (CBR) Test [IS 2720 (Part 16) – 1987]

#### FLOW CHART DIAGRAM FOR METHDOLOGY

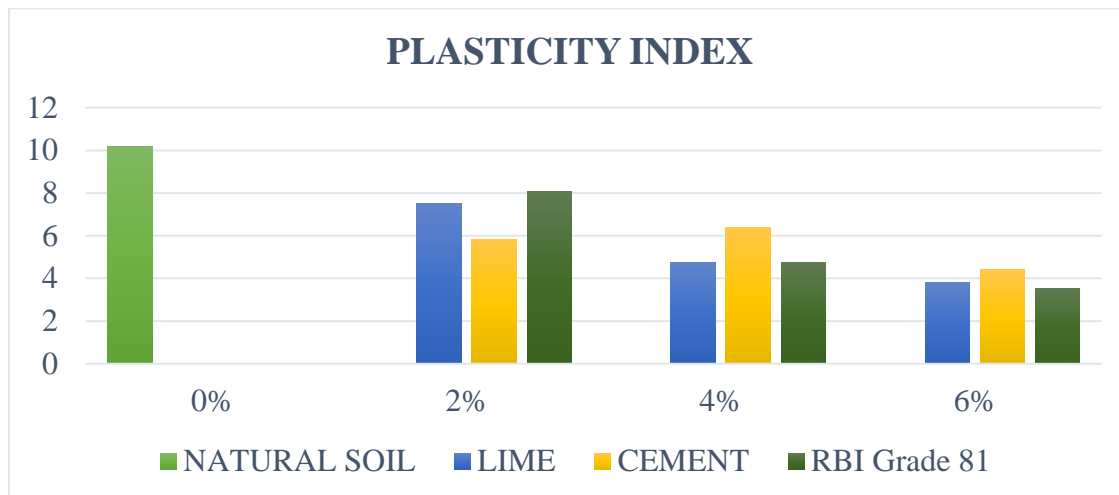


### IV.RESULT AND DISCUSSION

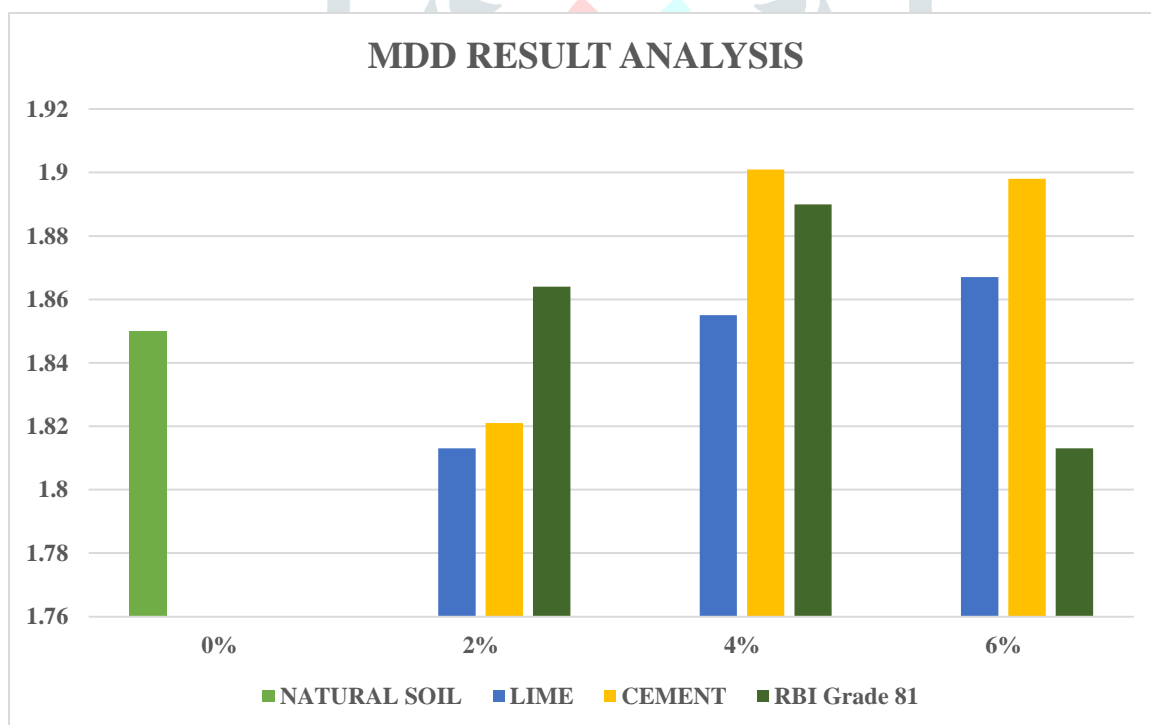
RBI Grade 81 is an eco-friendly, cost effective stabilizer which can use with any type of soil whereas cement and lime have their assumptions. No exothermic reaction occurs during stabilization process hence cracks don't occur in the soil.

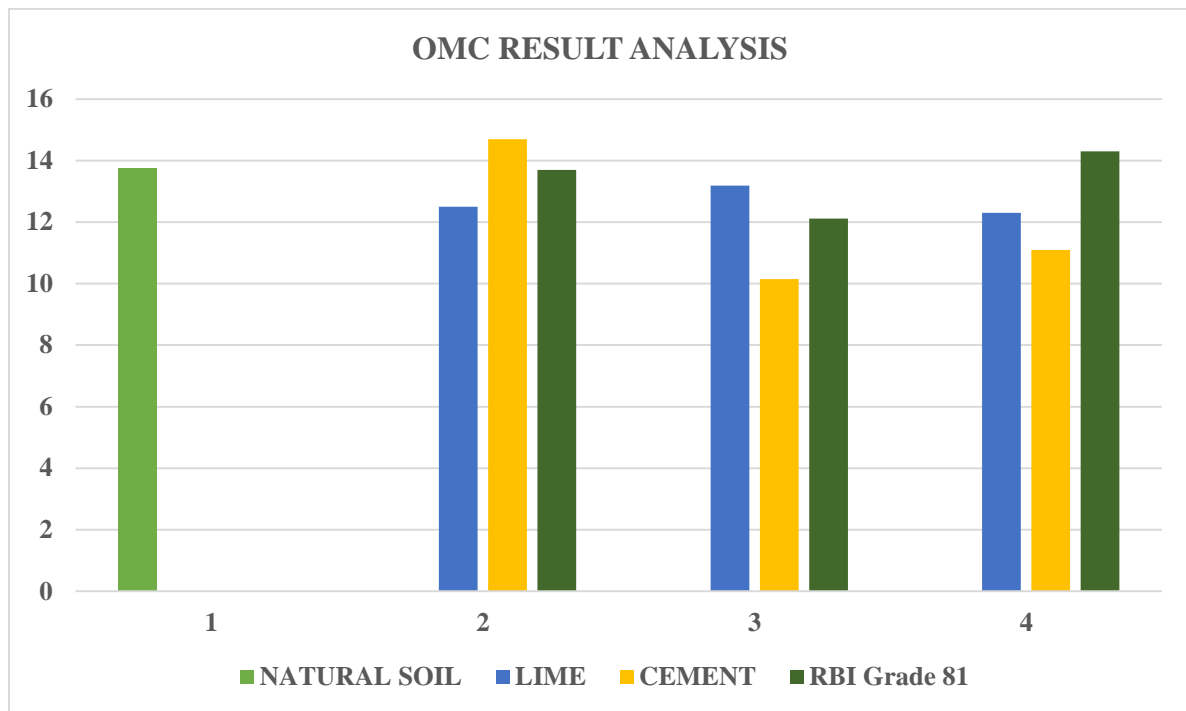
COMPARISON OF RESULTS OF TREATED AND UNTREATED SOIL

➤ Comparison of Plasticity Index of Soil

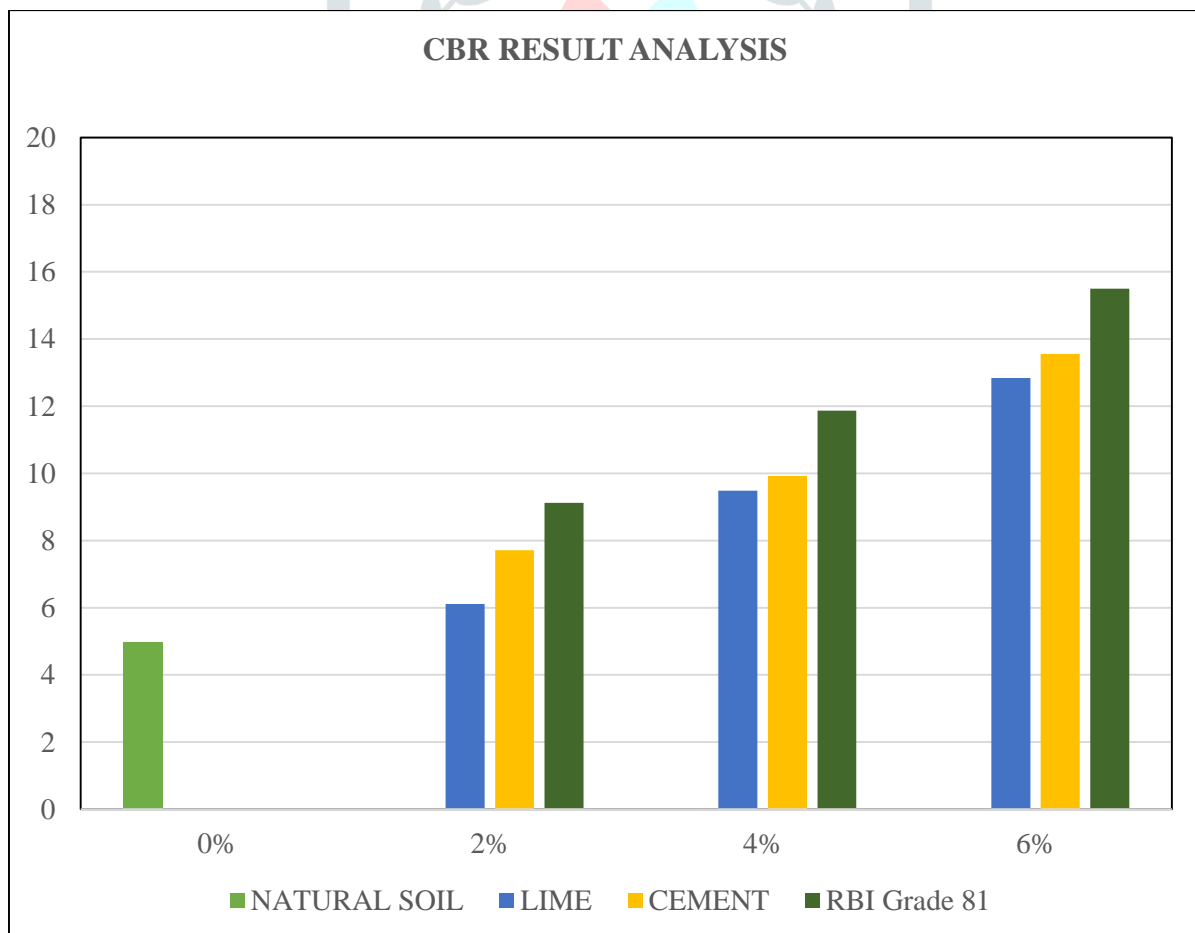


➤ Comparison of OMC and MDD of treated and untreated Soil





➤ **Comparison of CBR values**



**V. CONCLUSIONS**

On the basis of experimental study, the following conclusion is found:

- According to the Unified Soil Classification System, the black cotton soil sample has been categorized as OI (Organic clay of medium plasticity).
- In study shows the, Liquid Limit of Natural Soil was found is 39.01% , while adding 2%, 4% and 6% Lime, Cement and RBI Grade-81 Liquid Limit decreases i.e. 35.12%,33.65% and 37.90% for RBI Grade 81, For Lime 36.53%,34.69% and 33.69% and for Cement 33.69%, 32.60% and 30.80% respectively

- The Plastic Limit of natural soil was found 28.84% while adding 2%, 4% and 6% Lime, Cement and RBI Grade-81 the value of Plastic Limit Increases i.e. 27.88%, 28.89% and 34.38% for RBI Grade-81, For Lime 29.02%, 29.95% and 29.89% and for cement is 27.88%, 26.20% and 26.41% respectively.
- The Plasticity Index value for Natural soil is 10.17%, the value is decreases with addition of 2%,4% and 6% Lime, Cement and RBI Grade-81 i.e. 6.39%, 5.71% and 4.23% for RBI Grade-81, 7.51%, 4.474% and 3.8% for Lime and 6.39%, 5.71% and 4.23% for Cement respectively.
- The California bearing ratio (CBR) of the soil alone is obtained as 4.96% and it is increased with addition of admixtures, 6% RBI grade 81 has maximum CBR value when it is cured 7 days and soaked for 96 hours.
- The percentage increases in CBR value of RBI Grade 81 is 9.12%, 11.87% and 15.50% ,with respect to lime where as 6.11%, 9.48% and 12.84% and with respect to cement is 7.71% ,9.92% and 13.55% when added with 2%, 4% and 6% respectively.
- Optimum moisture content result the for RBI Grade 81 is 13.7%,12.12% and 14.3%,For lime is 12.5% 13.19%and 12.3% and for Cement for is 14.7%, 10.15%and 11.1% which shows the RBI Grade shows the Maximum OPC value among Lime and cement.
- Maximum Dry Density, the RBI Grade show better result among the cement and Lime that is RBI Grade value is 1.864%, 1.89% and 1.813%, For Lime is 1.813%, 1.855%,1.867% and for cement 1.864%, 1.901%,1.898%.
- The result shows that all three admixtures (Lime, Cement and RBI Grade 81) have positive impact on soil.
- It shows that at same dosage, RBI grade 81 is more effective than Lime and Cement. The potentially reduce the ground improvement cost by adopting RBI grade 81 stabilizers.

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