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ijirset@gmail.com

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Red Soil Stabilization by Using Steel Slag and Sea Shell Powder

Prof.Sagar E. Bhoyar

Assistant Professor, Dept. of Civil Engineering, Sinhgad Institute of Technology and Science, Narhe, Pune, India

Ajay B. Kashid, Aditya G. Kadam, Gopalnandan P. Ghogare, Ranjeet S. Kadam, Mayur B. Kamble

UG Students, Dept. of Civil Engineering, Sinhgad Institute of Technology and Science, Narhe, Pune, India

ABSTRACT: Soil stabilization is one of the most important for the construction which is widely used in connection with road pavement and foundation construction because it improves the engineering properties of soil such as strength, Stability and durability. Soil stabilization is any process which improves the physical properties of soil such as increasing shear strength, bearing capacity etc, which can be done by use of controlled compaction, adding of suitable add mixes like steel slag, sea shell powder. In this present investigation evaluate the geotechnical index properties of red soil and stabilized red soil by using different percentages of Steel slag and Sea shell powder.

KEYWORDS: Red soil, seashell powder, standard proctor test, Casagrande apparatus, Pycnometer bottle

I. INTRODUCTION

Red soil, also known as lateritic soil, is a common soil type found in many tropical and subtropical regions around the world. While it possesses certain agricultural potential, red soil is often characterized by its low strength and poor load-bearing capacity, making it unsuitable for various construction applications. Soil stabilization techniques play a pivotal role in transforming this naturally occurring red soil into a robust and versatile construction material. This research project delves into an innovative approach for red soil stabilization, utilizing a combination of steel slag and seashell powder. By harnessing the unique properties of these materials, we aim to enhance the strength, durability, and overall suitability of red soil for infrastructure development and land reclamation projects. The fundamental challenge associated with red soil, beyond its agricultural limitations, is its susceptibility to erosion, compaction, and poor load-bearing capacity. Traditional soil stabilization methods often rely on cement or lime-based additives, which can be expensive and environmentally taxing. The need for sustainable and cost-effective solutions has led to the exploration of alternative materials. Steel slag, a byproduct of the steel manufacturing industry, offers remarkable potential as a soil stabilizer. Its high-density nature, coupled with latent hydraulic properties, make it an intriguing candidate for improving the engineering characteristics of red soil. Seashell powder, derived from discarded seashells, contributes to this innovative solution by offering additional binding and reinforcing properties. Red soil is a type of soil that develop in a warm temp moist climate Inder deciduous forest, improvement of some properties of soil for improved constructability but does not provide the designwith a having thin organic and in- organic mineral layers overlying a yellowish brown leached layer resting on alluvium red layer. Red soil generally derived from crystalline rock. They are usually poor growing soils , low in nutrias and humus and difficult to cultivate because of its low water holding capacity. In Indiacovering a area of 3.5 lakhs sq.km and 10.6% of India's area.

II. METHODOLOGY

Collecting the sample of red soil and performing the laboratory test on red soil. Red soil is stabilized by using the seashell powder and steel slag.

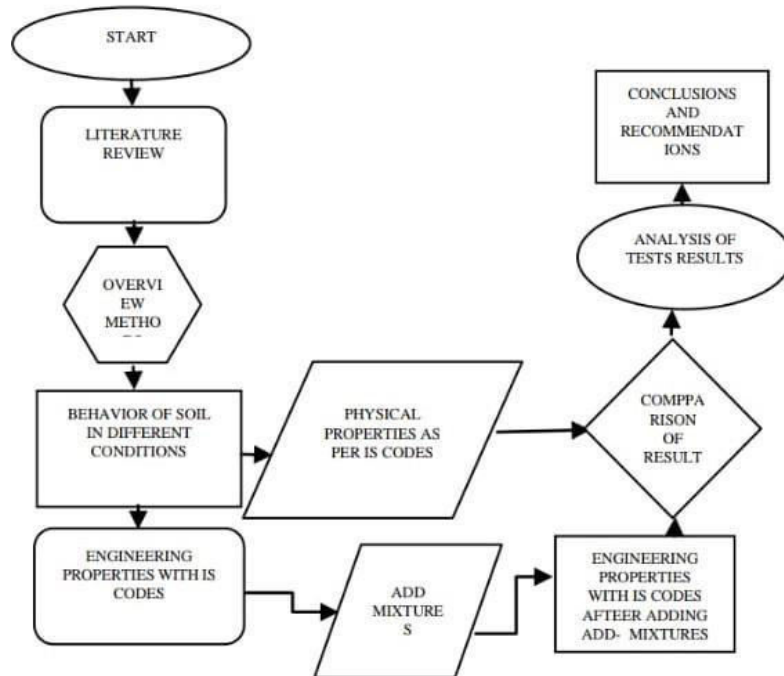


Figure 1 Methodology flow diagram

2.1 MATERIALS :

2.1.1 Red Soil :

Red soil is a type of soil that typically develops in warm, temperate, and humid climates and comprise approximately 13% of Earth's soils. It contains thin organic and organic-mineral layers of highly leached soil resting on a red layer of alluvium.

Table 1 Properties Of Red Soil

sr no	Parameters of soil	Result
1.	Water Content	43.18%
2.	Specific Gravity	2.6
3.	Liquid Limit	50%
4.	Plastic Limit	32.89%
5.	Dry Density	1.391 g/cm ³



Figure 2 Red Soil



Figure 2 Steel Slag



Figure 3 Sea Shell Powder

III. TESTING ON RED SOIL

3.1 Liquid Limit

The Liquid Limit Test, a fundamental geotechnical test, is used to determine the moisture content at which a soil transitions from a plastic to a liquid state. This test is vital in characterizing the plasticity and consistency of fine-grained soils, such as clays and silts, which are commonly encountered in construction and geotechnical engineering.



Figure 4 Liquid Limit Test

3.2 Plastic Limit

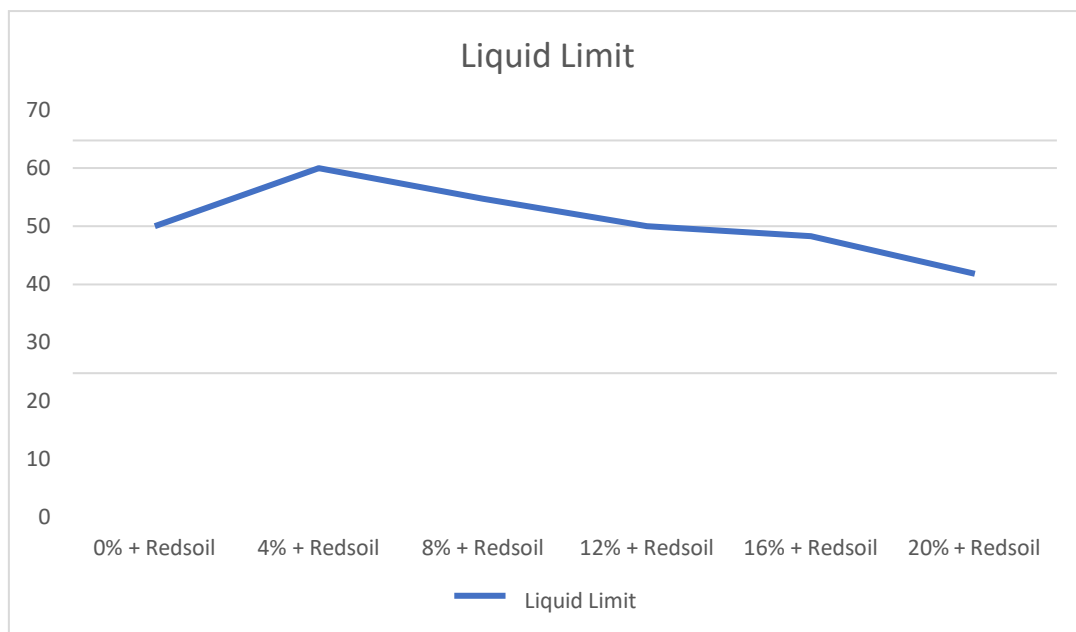
Plastic Limit is determined by repeatedly remolding a small ball of moist plastic soil and manually rolling it out into a 1/8in thread. The Plastic Limit is the moisture content at which the thread crumbles before being completely rolled out.



Figure 5 Plastic Limit Test

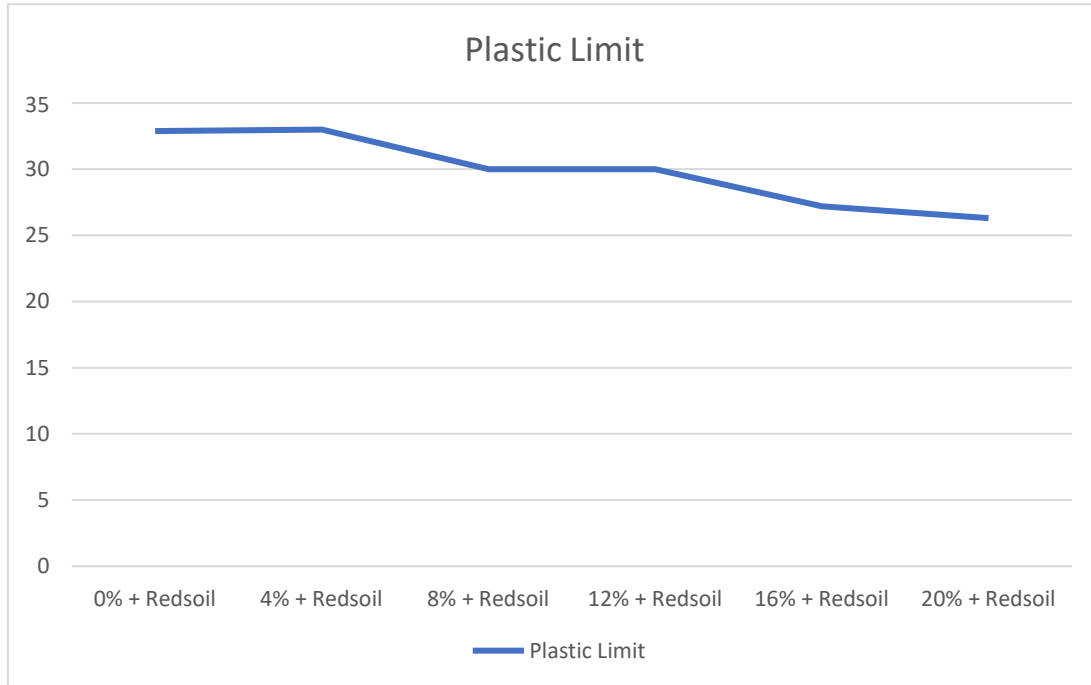
IV. TEST RESULT

1.1 Liquid Limit Test

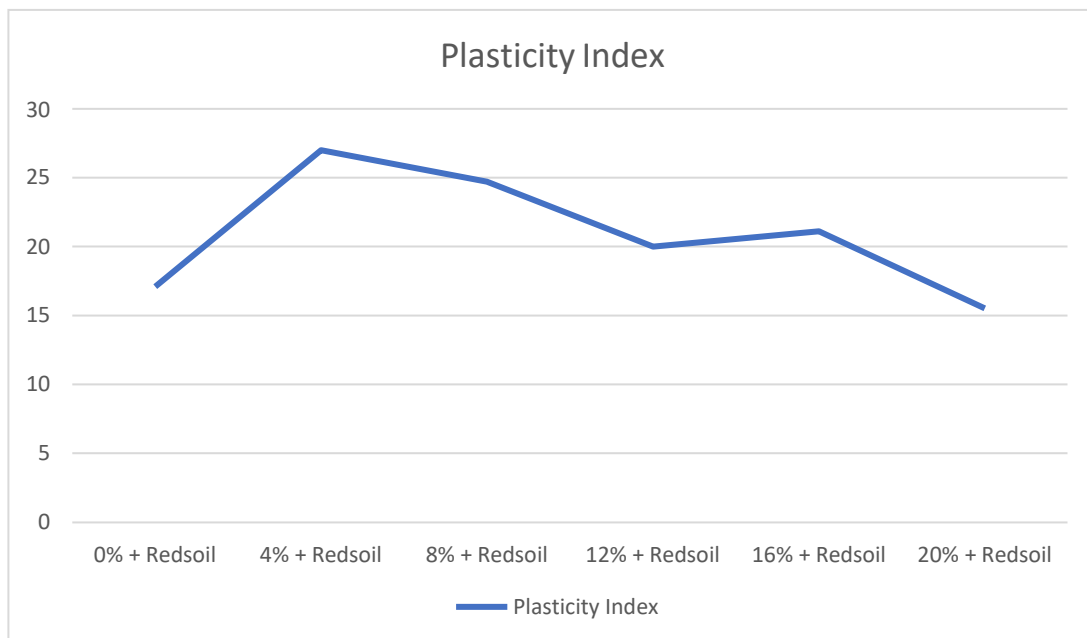




1.2 Plastic Limit



1.3 Plasticity Index



V. CONCLUSION

- 1) The Liquid limit of Red soil goes on increasing upto proportion of steel slag is 8%.
- 2) The Liquid limit of Red soil goes on increasing upto proportion of Sea shell Powder is 8%.
- 3) The plastic limit of Red soil goes on increasing upto proportion of steel slag is 8%.
- 4) The plastic limit of Red soil goes on increasing upto proportion of Sea shell Powder is 8%.

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