



Soil Stabilisation Using Plastic Waste for Pavement Design

Guided by:

Prof. Kalpana Sahoo

ADITYA SINHA, RISHUMANI
SCHOOL OF CIVIL ENGINEERING

ABSTRACT

- The design of the flexible pavement layers to be laid over the subgrade soil so the estimation of subgrade strength and traffic volume to be carried.
- The design of the various layers of pavement are dependent on the subgrade soil strength over which they are going to be laid.
- Weaker sub grade causes high amount of failures on surface of flexible Pavements like Pot holes, various types of cracks and rut depth which is supposed to reduce ride quality of vehicles.
- In this "Soil Stabilization using Plastic Waste for pavement design", Plastic Waste is used in the construction of Pavements and reducing the waste for land filling and making utilization of raw material in the embankments of pavements.
- Here an attempt has been made to stabilisation of red soil with various percentage i.e 0%, 4%, 6% of Plastic bottle strips.

INTRODUCTION

- ❖ Waste management is still a challenge in Worldwide which is brought about by urbanisation, increase population and industrial growth.
- ❖ The crust of a Pavement, whether flexible or rigid, rest on a foundation of the soil on an embankment or cutting, normally as subgrade. Subgrade can be defined as a compacted layer, generally constructed with the availability of local material assumed to be 500 or 300 mm in thickness
- ❖ Subgrade performance mainly depends on three of the basic characteristics :- load Bearing capacity, Moisture Content, Shrinkage/ Swelling
- ❖ The desirable properties of subgrade soil as a highway materials are:- Stability, Compaction, Strength, Low shrinkage, Proper Drainage, Incompressibility.
- ❖ The most common parameter used to evaluate Pavement layer strength is the California Bearing Ratio (CBR).

AIM & OBJECTIVES

- ❖ Environmental impact when soil is reinforced with waste bottle plastic strips
- ❖ Improve shear strength
- ❖ Reduce the compressibility of soil
- ❖ Improve load carrying capacity of soil
- ❖ Increase CBR value of the soil

METHOD

- ❑ Determining specific gravity of Soil
- ❑ Determining Liquid Limit of Soil
- ❑ Determining Plastic Limit of Soil
- ❑ Determining Shrinkage limit of soil
- ❑ Plastic is cut into pieces as Strips
- ❑ Plastic Strips are mixed with soil
- ❑ Compaction test (STANDARD PROCTOR TEST)
- ❑ Determining OMC & MDD of Soil for:-
 - Soil with 0% FIBRE
 - Soil with 4% FIBRE
 - Soil with 6% FIBRE
- ❑ CBR Value :-
 - Determining CBR Value of soil without FIBRE
 - Determining CBR Value of Soil with 4% FIBRE
 - Determining CBR Value of Soil with 6% FIBRE

RESULTS

PHYSICAL PROPERTIES OF SOIL

Properties of Soil	
Specific Gravity of Soil	2.58
Liquid limit of Soil	47.33%
Plastic Limit of Soil	28.68%
Shrinkage Limit of Soil	12.3%

Fig:-OMC of soil with 0%, 4%, 6% plastic strips

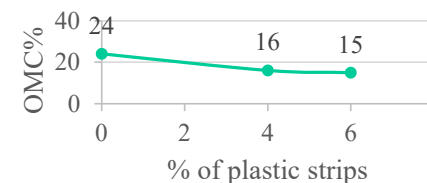


Fig:- MDD of Soil with 0%, 4%, 6% plastic Strips

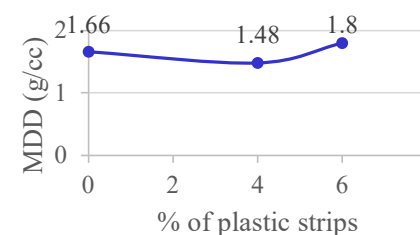
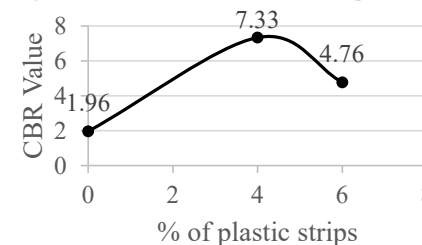


Fig:-CBR Value of Soil with 0%, 4%, 6% plastic Strips



Standard Proctor Test apparatus



CBR test apparatus



Plastic strips



Red soil mixed with strips

CONCLUSION

- ❖ In this study, the **CBR** value of the Red soil is improved with addition optimum content of waste bottle strips in it.
- ❖ Optimum Moisture Content(OMC) of Red soil is reduced to achieve Maximum Dry Density (MDD) at lower percentage of water content.
- ❖ Now, we can make use of **plastic as soil stabilising agent** for improving the properties of soils with proper proportion of plastic must be there, which **helps in increasing the CBR** of the soil.
- ❖ It can be concluded that **CBR** value of Red soil goes on **increasing upto 4% Plastic content** in the soil and there on it decreases with increase in plastic content.
- ❖ Hence, we can say that **4% plastic content is the optimum content** of stabilizers used in stabilisation of the Red soil
- ❖ Hence, increase the strength of the pavement.
- ❖ Using plastic as a stabilizer in soil, helps in reducing land fill of wastes, incineration of plastics.

ACKNOWLEDGEMENT

It is with immense pleasure that we express our sincere sense of gratitude and humble appreciation to **Prof. Kalpana Sahoo** for her invaluable guidance in the preparation of this project. Without her support and guidance, the present work would have remained a dream. We would also like to thank **Prof. Dr. B. G. Mohapatra, Dean, School of Civil Engineering, KIIT University**, for providing necessary facilities. We take this opportunity to thank all our scholar friends & family for their valuable support and encouragement throughout the preparation of this work. We also thank all those who have directly or indirectly helped us in completion of this work.

March, 2019

REFERENCES

- [1] SOIL MECHANICS AND FOUNDATIONS
By:-
Dr. B.C. Punmia, Er. Ashok K. Jain, Dr. Arun K. Jain
By:-
LAXMI PUBLICATIONS (P) LTD
- [2] V. Mallikarjuna I, T. Bindu Mani, SOIL STABILIZATION USING PLASTIC WASTE. IJRET: International Journal of Research in Engineering and Technology eISSN: 2319-1163 | pISSN:2321-7308
- [3] Dr. Dhatrik. A. II, konmare s. D.2, PERFORMANCE OF RANDOMLY ORIENTED PLASTIC WASTE IN FLEXIBLE PAVEMENT. IJPRET, 2015; Volume 3(9):193-202