Available online at www.CivileJournal.org

Civil Engineering Journal

Vol. 4, No. 9, September, 2018

Effects of Waste Glass Powder on the Geotechnical Properties of Loose Subsoils

Muhammad Siyab Khan [a*], Muhammad Tufail [a], Mateeullah [a]

[a] *Lecturer, Sarhad University of Science and Information Technology, Peshawar, 25000, Pakistan.*

Received 02 April 2018; Accepted 14 July 2018

Abstract

Foundation soils are most affected by different problems when it comes to the loose soil having low shear strength and bearing capacity. Failure of the soil with settlement and shear arises when the shear stresses in the soil exceed the limit. This study is keen to observe the effects of utilization of waste broken glass in the enhancement of Geotechnical properties of soil by performing different laboratory tests. Collection of the soil sample from was concluded from Pabbi, Peshawar, KPK, and Pakistan, which is a low strength soil, are also being called soft soil having low bearing capacity. Furthermore, this particular soil was needed to be enhanced. The physical, chemical and engineering properties of virgin soil were contemplated and the soil was treated with added substances of Glass Powder to stabilize the local soil. Addition of Glass Powder was finished in different proportions that are 4%, 8% and 12% etc. Performance of different tests as Gradation, Specific Gravity, Standard Proctor compaction, Atterberg Limits, Direct Shear, CBR and so forth were done. The results were concluded, based on the Glass Dust stabilization analysis. It was obtained that pulverized glass can be effectively used as a soil stabilizer as mainly the strength characteristics were observed to be valeted. The Results showed that the gradation of soil is narrow from the particle size analysis. Plasticity index (P.I), Liquid limit (L.L) and plastic limit (P.L) were decreased with the addition of Glass powder. The reason behind decreasing P.I is maybe the fact that the Glass powder is cohesionless. Ideal percentage of Glass Powder as a stabilizer is 8%. Such improvements included an achievement of the highest CBR obtained at the 4%, 8% and 12% of powdered glass content. The reason is that the glass is pozzolanic material when blended with soil gives additional strength. The achievement of the increasing rate of the values of angle of internal friction on 4% and 8% and decreasing rate of values obtained at 12% powdered glass substances. Cohesion rate decreases up to 8% and starts increasing at 12%. Maximum dry density increasing as the density of glass is higher than such soil and Optimum moisture content (OMC) is decreasing because of low absorption capacity of glass. The study showed that the best stabilizer for the case study (Pabbi, Peshawar) is the Glass Powder and the optimum dose is 8 %.

Keywords: Glass Powder; Stabilization; CBR; Specific Gravity; LL; PL; PI.

1. Introduction

Soil stabilization is the alteration of soils to enhance their physical properties. It can increase the shear strength of a soil, control its shrink-swell properties and improve its load bearing capacity. Soil stabilization can be utilized on roadways, parking areas, site development projects, airports and many other situations where sub-soils are not suitable for construction. It can also be used to treat a wide range of subgrade materials varying from expansive clays to granular soils as well as improve other physical properties of soils such as increasing their resistance to erosion, dust formation or frost heaving. Clay soils exhibit generally undesirable engineering properties. They tend to have a low shear strength which reduces further upon wetting or other physical disturbances. They can be plastic and compressible; expand when wetted and shrink when dried. Some types expand and shrink greatly upon wetting and drying, thereby, exhibiting some very undesirable features. Cohesive soils can creep over time under constant load, especially when the shear stress is

* Corresponding author: siyab.btech@suit.edu.pk

http://dx.doi.org/10.28991/cej-03091137

➢ This is an open access article under the CC-BY license (https://creativecommons.org/licenses/by/4.0/).

© Authors retain all copyrights.