



Improvement of Geotechnical Properties of Cohesive Soil Using Crushed Concrete

Mahdi O. Karkush ^{a*}, Sarah Yassin ^b

^a Assistant Professor, Department of Civil Engineering, University of Baghdad, Baghdad, Iraq.

^b M.Sc. Student, Department of Civil Engineering, University of Baghdad, Baghdad, Iraq.

Received 26 April 2019; Accepted 22 July 2019

Abstract

Some natural resources such as gravel are not renewable, therefore, it is necessary to reduce the use of such resources and replace them with other recycled, economic, and environmentally friendly materials. Recycled crushed concrete aggregates demolished from old buildings and blocks of waste concrete can be used to replace the natural aggregates. The present study focused on using recycled crushed concrete in improvement the chemical and geotechnical properties of soft soil having undrained shear strength of 6.78 kPa. The soft soil samples were mixed with 5, 10, and 15% of crushed concrete. The blocks of waste concrete are grinded by mills to get crushed concrete which passing sieve no. 4. Such aggregates are lighter than natural aggregates and provide a good deformation modulus when mixed with soil. In Iraq, there are hundred thousand tons of concrete blocks used as fences and now considered wastes after removing these security fences, so it's important to interest from recycling of such materials to be used in the improvement wide region of soft soils in Iraq. The results of tests showed increasing the undrained shear strength of soft soil by 175-193.5% and reduced the compressibility of soft by 25-31% measured in terms of compression index.

Keywords: Improvement; Crushed Concrete; Soft Soil; Mixing; Geotechnical Properties.

1. Introduction

The design of the foundations of different structures such as buildings, dams, bridges etc. requires knowing the geotechnical properties of the foundation soil, therefor, laboratory tests are performed to investigate the geotechnical properties of soil. Soils should have adequate bearing capacities to support heavy structures and reduce the compressibility under the applied loads. Therefore, it is important to improve the bearing capacity of weak and soft soils using sustainable materials such as wastes. The results of permanent deformation characteristics of recycled asphalt pavement (RAP), recycled crushed aggregate (RCA), and aggregates of dense grading under triaxial cyclic loads showed that RCA has the lowest permanent deformation among the three materials [1, 2]. The layers of crushed concrete recycled from old demolished structures have self-cementing properties which causes a growth in stiffness of soil mixed with such materials [3]. The fine fraction of the recycled aggregates must be removed if the recycled concrete materials are to be used in drainage layers because the fine particles have the potential for gaining strength by cementing the particles of soil which reduces permeability of soil and efficiency of drainage layer [4].

Molenaar and van Niekerk (2002) studied the behavior of unbound base course materials made from masonry rubble and recycled concrete. The results showed that these materials can be used in road bases due to their good quality [5].

* Corresponding author: mahdi_karkush@coeng.uobaghdad.edu.iq

 <http://dx.doi.org/10.28991/cej-2019-03091397>



© 2019 by the authors. Licensee C.E.J, Tehran, Iran. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC-BY) license (<http://creativecommons.org/licenses/by/4.0/>).