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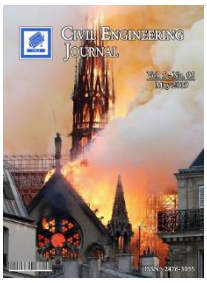
Civil Engineering Journal

Vol. 5, No. 5, May, 2019



Comparison Mechanical Properties of Two Types of Light Weight Aggregate Concrete

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Received 18 March 2019; Accepted 18 May 2019

Abstract

This paper presents the behavior of concrete properties by replacing the conventional coarse aggregate used in the concrete mixture by two types of lightweight aggregate; Expanded Perlite Aggregate (EPA) and Volcanic Pumice (VP). To fulfill this aim; three laboratory tests were applied; density, compressive strength, and abrasion resistance, that conducted to extrapolate the range of the changes in the properties of concrete with existence those types of aggregate in the mixture. Also, the volumetric proportion adopted as a strategy for replacing the coarse aggregate by EPA or VP in the concrete mixture. Then, the volumetric proportion ranged from 10% to 50% with the variation step was 10%. Therefore, ten concrete mixtures are prepared and divided into two groups; each group contains five concrete mixes to represent the volumetric replacement (10-50)% of conventional coarse aggregate by EPA or VP. On the other hand, one extra mixture designed by using conventional aggregate (coarse and fine aggregate) without any inclusion of EPA or VP to be considered as a reference mixture. The obtained laboratory results of this study proved that the density, compressive strength, and abrasion resistance readings of concrete decreased at any volumetric proportion replacement of coarse aggregate by EPA or VP. The decrease in density and compressive strength of concrete readings amounted the peak level at 50% replacing of coarse aggregate by EPA, which were 38.19% and 77.37%, respectively than the reference mixture. Additionally, the compressive strength is an important factor affecting the abrasion resistance of concrete mixture, and loss of abrasion decreased as compressive strength increased.

Keywords: Lightweight Aggregate Concrete; Volumetric Replacement; Density; Compressive Strength; Abrasion Resistance.

1. Introduction

Lightweight Concrete (LWC) is a versatile material that has a great interest and large industrial demand in recent years in a wide range of construction projects, despite its known use dating back over 2000 years. The mineral admixtures, fibers and prolonged age of curing are the effective parameters to control the shrinkage cracking in the LWC [1]. As regards to the economic aspect, the using LWC in the floor slabs would reduce the total costs of the tall buildings through decreasing the foundation volume, the amount of steel reinforcement, and vertical members' cross-sections that saves the used horizontal area [2].

The thermal conductivity of LWC is ranged from 0.2 to 1.0 W/m.K besides the oven dry density range from roughly 300 to not exceed 2000 kg/m^3, with a cubic compressive strength about 1 to more than 60 MPa. These ranges could

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http://dx.doi.org/10.28991/cej-2019-03091315