Mechanical Properties of Light Weight Aggregate Concrete Using Pumice as a Coarse Aggregate

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Abstract. This study investigates the mechanical properties of hardened lightweight coarse aggregate concrete (LWAC) using Pumice as a lightweight aggregate. Eleven concrete mixes were prepared to investigate the effects of pumice ratio to total aggregate, micro-silica to binder ratio (MS/b), and the water to binder ratio (*w/b*) on equilibrium density, compressive strength (f_{cu}), splitting tensile strength (f_{ct}), and modulus of rupture (f_r). The main parameters were performed by reducing Pumice to total aggregate ratio, reducing micro-silica to binder ratio, and water to binder ratio by reducing binder content. Six cubic specimens (150×150×150 mm^3), three cylinders (100 dia. and 200mm height), and one prism (100×100×350 mm^3) were used to investigate f_{cu}, f_{ct}, and f_r, respectively. All specimens were tested at 28 days. The specimens had a density of 1833 – 2031 kg/m^3 with a compressive strength ranged from 27 MPa to 44 MPa. The results showed that using micro-silica increases f_{cu}, f_{ct}, and f_r, along with an insignificant decreasing equilibrium density. Due to the low weight of Pumice compared to the other material of the mix, the result showed that decreasing the amount of Pumice increases the equilibrium density, f_{cu}, with decreasing in f_{ct}, and f_r of concrete. Also, increasing the *w/b* decreases equilibrium density, f_{cu}, f_{ct}, and f_r of concrete.

Keywords: Light weight aggregate, Concrete, Pumice, Coarse aggregate

Nomenclature

f_{ct}	Concrete splitting tensile strength of three cylinders
f_{cu}	Concrete compressive strength of three cubic samples
f_r	Modulus of rupture
LWAC	Lightweight aggregate concrete
MS/b	Microsilica to binder ratio
w/b	Water to binder ratio

1. Introduction

The high dead weight of a building is one of the main concerns that face the designers of concrete structures. Many researchers have studied the dead-weight reduction of the concrete structures using concrete with lower density and higher compressive strength. The seismic forces, which influence the