

## 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 ( $150 \times 150 \times 150 \text{ mm}^3$ ), three cylinders (100 dia. and 200mm height), and one prism ( $100 \times 100 \times 350 \text{ mm}^3$ ) 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  $1833 - 2031 \text{ kg/m}^3$  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

