



## Effect of Main Factors on Fracture Mode of Mortar, A Graphical Study

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### Abstract

One of the most effective ways to identify the concrete properties is to understand further about the cement mortar, which is a mixture of cement paste and fine aggregate. In order to identify the behavior of cement mortar, all required materials including cement, fine aggregate, water as well as the different ratios of each material should be investigated. The main objective of this research is to study the effectiveness of main parameters of mortar on the fracture mode and related factors. Specifically 26 mixing designs of flexural mortar with three cement strength classes (32.5, 42.5 and 52.5 MPa), three water to cement (W/C) ratios (0.25, 0.3 and 0.35) and three sand to cement (S/C) ratios (2.5, 2.75 and 3) were first prepared. The prepared samples were then tested using a stress-strain apparatus. Some pictures were finally taken from the fracture surfaces to investigate the mode and angle of fractures. The results indicated that any change in the main parameters of mortar changes the fracture mode and the fracture angle.

*Keywords:* Cement Mortar; Water to Cement Ratio; Sand to Cement Ratio; Fracture.

### 1. Introduction

Nowadays, obtaining information about the concrete and cement materials seems to be necessary due to several reasons such as the increase of construction [1] and the wide applications of concrete in different structures like buildings [2] dams [3], nuclear power plant [4] and bridges [5]. According to different standards, physical and mechanical properties of mortar have a direct effect on concrete properties. On the other hand, due to the fact that the concrete is widely used in daily life [6-9], studying the parameters of mortar does essentially help the concrete to be applied in structures. In their experiments, different scholars have figured out the concrete to be an integrated homogenous material [10] which consists of cement mortar and coarse aggregates. To obtain the information about cement mortar, the properties of the constituents of mortar including fine aggregates, cement and water should be studied [11].

One of the most important properties of mortar is the compressive strength [12, 13] taken into account in all constructions projects. Many scholars have conducted several research works on the effects of different parameters including water to cement (W/C) ratio, sand to cement (S/C) ratio and aggregate type S/Con the compressive strength and related factors such as porosity, workability and durability of mortar [14-20]. As instance, Singah et al. studied the effect of W/C ratio on mechanical properties of cement mortar such as compressive and tensile strengths [14]. The effect of different types of aggregates on the compressive strength of mortar was studied by Bumanis et al [16]. Snuck et al. investigated the effect of W/C ratio and aggregate grade on the workability and hardened properties of mortar [20].

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