



Effect of Cement Consumption Optimization on Durability and Mechanical properties of concrete

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Abstract

various regulations have always discussed the mixing ratio in concrete mixtures. This study investigates the durability and compressive strength of the concrete samples with water/cement ratios of 0.41 and 0.44 and different cement contents varying from 300 to 400 kg.m⁻³. Results showed that neither a constant water/cement ratio nor the reduction of cement content has an undesirable effect on compressive strength. Nonetheless, this even can enhance the concrete durability in some instances. Naturally, the decline of water/cement ratio affects the concrete efficiency but concrete slump can be kept at an acceptable level by addition of admixtures.

Keywords: Concrete Mixing, Durability, Compressive Strength, Water/Cement Ratio

1. Introduction:

Among the materials which are widely consumed by human being, Concrete takes the third place after water and food (krishnaswami, 2009). This is made by mixing the certain ratios of fine-grained and coarse-grained cement. The mixture becomes rock- hard when taking shape. As time passes, the chemical reactions between water and cement enhance the concrete strength. The strength, durability and other properties of concrete depend upon the property of components, ratio of materials, vibration method and other controlling methods which are used during mixture preservation and emptying process (NagabhuShana and sharada-bai, 2011; kett, 2010). Different variations in each of these factors can affect the quality of concrete. Therefore, the process of concrete mixtures optimization involves the specification of concrete composition so that the properties of fresh or hardened concrete are optimized (a certain property of concrete minimized or maximized) (Goderziam et al, Amir et al, 2012; Chris and Roozbe, 2009; Abdal-Aleam and Arumairay, 2012).

The combination of design methods in different countries, for example BS, USBR, and ACI standards of mixing plans, are generally based on the relations between the empirical tables and graphs gained from growing researches (Adegbola and Dada, 2012). All these instructions seek to reduce cement consumption by keeping water/cement ratio at a constant level (Behrouzi Khah et al, 2012).

According to the previous studies, the reduction of cement consumption at constant water/cement ratios has no side effect on concrete properties. Thus, this study aims to determine the optimum percentage of the cement consumed in concrete mixtures.

Since cement production process is a polluting industry, reduction of cement consumption and determination of its