

Effect of Exposure Condition, Free Water–cement Ratio on Quantities, Rheological and Mechanical Properties of Concrete

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Abstract

This research paper explores the effects of environmental exposure conditions, water/cement ratio and cement content on the rheological and mechanical properties of concrete. Even though the grade of concrete is identical, environmental exposure conditions with respect to water–cement ratio significantly controls the quantities of ingredients of concrete. Properties of fresh concrete such as slump value and compaction factor are changing with respect to cement content. It is possible to determine relations between them. Experimentation had been carried out under different water–cement ratios (0.3, 0.36, 0.4, 0.45 and 0.5) with and without the use of chemical admixture to establish graphical relationships. Mechanical properties are determined with respect to age and the effect of admixture. Suggested fresh concrete relations are quite suitable for concretes with and without utilization of chemical admixtures. Workability of concrete depends upon the dose of chemical admixtures such as superplasticizer and time-period after mixing of all ingredients of concrete. Sincere effort had been made to establish the relationship among slump loss, time-period after mixing and dosage of ingredients for different water–cement ratios through graphical representation. Relationship among water–cement ratio, quantity of cement per cubic meter, slump in mm and compaction factor are determined. The quantity of ingredients with respect to various environmental exposure conditions with and without chemical admixture is presented graphically. It was observed that slump values versus cement content and compaction factor show linear variation. Experiments show desired compressive strength couldn't be achieved without superplasticizer in case of higher grade concrete.

Keywords

- **Environmental exposure condition**
- **Water/cement ratio**
- **Rheological and mechanical properties of concrete**
- **Slump**
- **Compacting factor**