

Prediction of workability of concrete using design of experiments for
mixtures

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Abstract

In this study, the effects and the interactions of water content, SP-binder ratio, and water-binder ratio on the workability performance of concrete were investigated. The experiments were designed based on flatted simplex-centroid experiment design modified from standard simplex-centroid one. The data gotten from the design was used to build the concrete slump model using neural networks. Research reported in this paper shows that a small number of slump experiments can be performed and meaningful data obtained with the experiment design. Such data would be suitable for building slump model using neural networks. The trained network can be satisfactorily used for exploring the effects of the components and their interactions on the workability of concrete. It has found that a high water content and a high SP/b ratio is essential for high workability, but achieving this by increasing these parameters will not in itself guarantee high workability. The w/b played a very important role in producing workability and had rather profound effects; however, the medium value about 0.4 is the best w/b to reach high slump without too much effort on trying to find the appropriate water content and SP/b.

Keyword : fly ash, superplasticizer, water-binder ratio, slump, workability, artificial neural networks, design of experiments.