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Neural Network Approach in Assessment of Fiber Concrete Impact Strength

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ABSTRACT

Use of neural network approaches in order to estimate mechanical and characteristics of concrete are common, in this regard, after making concrete samples in a laboratory the results of the laboratory are estimated by neural network. A drop impact test is used in order to evaluate impact strength of concrete samples; data obtained from the test usually has high dispersion. Various researches have been conducted to evaluate impact strength of concrete samples but no effort has made yet to predict impact strength of concrete by compressive, flexural strength. In the research, using neural network approach of ANN the impact strength of concrete is predicted from mixture design, compressive and flexural strength. In this regard, a numerical relation and range between compressive, flexural and impact strength have been predicted by collecting laboratory data from previous researches. Results for using neural network to estimate the compressive and flexural strength of concrete has shown that using this tool for estimating compressive and flexural strength of concrete is appropriate because the correlation coefficient between the estimated data and the laboratory data is near to 1.

Key words: Neural network, Impact strength, Compressive, Flexural strength.

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1. INTRODUCTION

Impact strength is a criterion for the hardness of a material which is defined as an ability of polymer or polymeric composite material to withstand a sudden applied energy. ACI and various concrete regulations have suggested drop hammer test for evaluating impact strength of fiber concretes. This test has been used in papers due to simplicity and cheapness. Data obtained from this test mostly has high dispersion so that coefficient of variation among various data is higher than 29&. Using statistics is common for estimating correlation coefficient in compressive strength and concrete impact strength data so that most of available statistical data obtained from the drop hammer test are about fiber concretes. In this regard, many researchers have conducted research on impact strength of concrete with its mechanical characteristics in laboratory. For example, Ong et al. (1) indicate more energy absorption of concrete slabs reinforced by steel fiber with hooked ending comparing to slabs reinforced by fiber of polypropylene and polyvinyl alcohol against impact caused by low velocity projectiles. Zhang et al. (2) in their researches on depth of penetration of impacts on high strength concretes found that the more strength of concrete, the less depth of penetration of impacts. Schleyer et al. (3) studied behavior of high strength fiber reinforced concretes against explosion and concluded that this type of concretes has better performance than standard concretes. Maundens (200) has evaluated behavior of fiber concretes and their impact strengths, compressive strength of the built concretes has been between 60 MPA and 120 MPA, and results have shown variation of fibers in mixer can have a significant effect on increase or decrease in impact strength (4). Mastali et al. (2015) have evaluated behavior of compressive, tensile and impact strength of concrete samples. In the research, glass fibers as additive have been used in concrete, as well statistical methods have been evaluated in order to find the appropriate distribution of probability for compressive and flexural strength of concrete and also impact strength (5). Nikoui et al. (2015) have evaluated flexural and compressive behavior of fiber concretes of PPS and their strength against impact. In the research, probability distribution function have been drawn