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Prediction of California Bearing Ratio of a Black Cotton Soil Stabilized with Waste Glass and Eggshell Powder using Artificial Neural Network

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Abstract : The laboratory test process to determine the California bearing ratio (CBR) of black cotton soils is not only overpriced but also time-consuming as well. Hence advanced prediction of CBR plays a significant role as it is applicable In pavement design. The prediction of CBR of treated soil was executed by Artificial Neural Networks (ANNs) which is a Computational tool based on the properties of the biological neural system. To observe CBR values, combined eggshell and waste glass was added to soil as 4, 8, 12, and 16 % of the weights of the soil samples. Accordingly, the laboratory related tests were conducted to get the required best model. The maximum CBR value found at 5.8 at 8 % of eggshell waste glass powder addition. The model was developed using CBR as an output layer variable. CBR was considered as a function of the joint effect of liquid limit, plastic limit, and plastic index, optimum moisture content and maximum dry density. The best model that has been found was ANN with 5, 6 and 1 neurons in the input, hidden and output layer correspondingly. The performance of selected ANN has been 0.99996, 4.44E-05, 0.00353 and 0.0067 which are correlation coefficient (R), mean square error (MSE), mean absolute error (MAE) and root mean square error (RMSE) respectively. The research presented or summarized above throws light on future scope on stabilization with waste glass combined with different percentages of eggshell that leads to the economical design of CBR acceptable to pavement sub-base or base, as desired.

Keywords : CBR, artificial neural network, liquid limit, plastic limit, maximum dry density, OMC