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Effect of High-Strength Materials on Axial Capacity of CFT Columns

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The review of existing codes and standards revealed that the design provisions for CFT members with high strength materials are still limited. This paper addresses this gap and suggests simple design equations for high strength square CFT columns using a three-step approach. The first step consists of collecting the experimental database of high-strength square composite column tests from the literature and assessing the possibility of developing the design equations for high-strength CFT columns. The second step consists of developing a nonlinear model for calculating the capacity of high-strength CFT columns using a large number of experimental data by applying gene expression programming. The third step consists of assessing the performance of the proposed relation using the common and modified coefficient of determination (R and rm), root-mean-square error (RMSE), mean absolute percentage error (MAPE), and gradients of regression lines (k and k'). An analysis is also carried out to propose a strength reduction factor (ϕ) for the proposed design equation. The results demonstrated that the proposed model has acceptable efficiency in the range of the experimental database parameters, and the suggested relation can be utilized for the pre-design of high-strength CFT columns.

Keywords: Axial strength; concrete filled steel tube, high-strength concrete, high-strength steel, gene expression programming

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