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Effect of Concrete Strength and Aspect Ratio on Strength and Ductility of Concrete Columns

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Abstract : This paper presents the effect of concrete compressive strength and rectangularity ratio on strength and ductility of normal and high strength reinforced concrete columns confined with transverse steel under axial compressive loading. Nineteen normal strength concrete rectangular columns with different variables tested in this research were used to study the effect of concrete compressive strength and rectangularity ratio on strength and ductility of columns. The paper also presents a nonlinear finite element analysis for these specimens and another twenty high strength concrete square columns tested by other researchers using ANSYS 15 finite element software. The results indicate that the axial force – axial strain relationship obtained from the analytical model using ANSYS are in good agreement with the experimental data. The comparison shows that the ANSYS is capable of modeling and predicting the actual nonlinear behavior of confined normal and high-strength concrete columns under concentric loading. The maximum applied load and the maximum strain have also been confirmed to be satisfactory. Depending on this agreement between the experimental and analytical results, a parametric numerical study was conducted by ANSYS 15 to clarify and evaluate the effect of each variable on strength and ductility of the columns.

Keywords : ANSYS, concrete compressive strength effect, ductility, rectangularity ratio, strength
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