Effect of Steel Fiber and Confinement on Capacities of RC Columns in Dissipating Seismic Energy

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ABSTRACT

Abstract – *The design of columns in highly seismic risk zones is required to ensure they can resist earthquake shocks. The design includes the adequacy of the main reinforcement ratio and confinement. The main column reinforcement ratio is governed by the code to be in the range of 1%<r_s<6%. Furthermore, the column confinement from transverse steel must be strong enough to carry the column shear forces and it has to be able to ensure the column ductility. The use of other materials in concrete also indicates a significant influence in terms of ductility improvement. Column ductility can be measured by its capability to dissipate earthquake energy. For this reason, a study is carried out on the combination of the simultaneous use of confinement and steel fiber to look into its impact on its capability of energy dissipation. This combination involves column confinement using rectangular stirrups with various spacings (s_h = 50, 65, and 80 mm). The use of steel fiber is based on the volumetric ratios, namely V_f = (0, 0.5, 1, 1.5, 2)%. The main column reinforcement all uses r_s = 2.48%. The column is applied with a constant axial force Pa = 0.121A_g.f'_c and quasi-cyclic P_h. The quasi-cyclic force is assumed to represent the earthquake force. The results show that all column test specimens satisfy the acceptance criteria requirements of ACI 374.1-05. This means that by introducing steel fiber in the range V_f = 0-2%, the column no longer requires to use of stirrups s_h = 50 mm but may use s_h = 80 mm instead. This is due to its energy dissipation capabilities also conforms to the requirements of ACI 374.1-05.*

Kata Kunci: *Code, column, disaster risk reduction, ductility, energy dissipation, fiber volumetric ratio, stirrup spacing.*