Thermo-mechanical beahvior of steel-concretecomposite columns under natural fireincluding heating and cooling phases

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Abstract : In recent years, concrete filled tubular(CFT) columns have become popular among designersand structural engineers, due to a series of highlyappreciated advantages: high load-bearing capacity,high seismic resistance, attractive appearance, reducedcolumn footing, fast construction technology and highfire resistance without external protection. In a fire, thedegradation of the material properties will cause CFTcolumns to become highly nonlinear and inelastic,which makes it quite difficult to predict their failure. Infact, it is possible to fail during heating or cooling phaseof fire. In this paper, the behavior of axially loadedconcrete filled square hollow section columns subjectedto natural fire conditions has been studied. The mainobjective of this study is to highlight the phenomenon ofdelayed collapse of this type of columns during or afterthe cooling phase of a fire, and then analyze theinfluence section size. The results show that criticalconditions with respect to delayed failure arise muchmore for massive sections.

Keywords : Natural fire, Fire resistance, composite column, cooling phase, residual strength