SUMMARY

The excellent performance of concrete filled tubular columns (CFT columns) and increased use of high strength concrete (HSC), coupled with the current rules in some countries, particularly in Europe, through the Eurocode 4 (EC4) does not include the possibility of design CFT columns filled with this material, highlights the need to update the regulations to include the possibility of designing CFT columns with HSC.

This Thesis aims to update the existing formulation EC4 so as to design CFT columns with circular section filled with HSC.

The formulation for the design of CFT columns with circular section quantifies the increased resistance which occurs due to the effect of passive confinement. Such passive confinement occurs when you have a steel jacket on the outside of a concrete core which restricts lateral deformations that occur therein. As a result, the resistance which is able to withstand the concrete increases significantly, also increasing the overall resistance of the CFT columns. A model of concrete which takes into account the lateral deformations, both elastic and plastic through the Poisson's ratio and the dilatancy angle respectively was developed to properly reproduce the evolution of lateral deformations, key in the study of confinement.

New stress-strain curves and dilatancy angles definition curves were obtained. These curves governs relationship between stress and strain of concrete passively confined. The dilatancy angle definitión curves provide the dilatancy angle values of concrete according to the strenght and the confinament.

The defined numerical model was calibrated and validated with many experimental tests.

A parametric study was developed, allowing the development of a new formulation for calculating the resistance of CFT columns with circular section and HSC.