It has been known that the characteristic strength of fire-exposed concrete columns is dramatically reduced. Therefore, the study presents a proposed method for repairing and rehabilitating the fire-exposed concrete columns using ferrocement jackets. Thus, the main objective in the present work herein is to examine the effectiveness of that proposed method for strengthening the fire-exposed concrete columns. To fulfill this goal, this thesis divided into two main parts, the first part is the experimental program, and the second is the analysis using the general FE-program ANSYS. A Primary analysis is conducted first, to determine the different parameters that may affect the efficiency of ferrocement jackets. This primary analysis showed many parameters can be examined which are; the type of reinforcing mesh, mesh opening shape (hexagonal & square), dimensions of openings in wire-mesh, and volume fraction of reinforcement & (longitudinal & transverse), mesh opening orientation & type of reinforcing mesh, mesh opening shape (hexagonal & square), dimensions of openings in wire-mesh, and volume fraction of reinforcement & (longitudinal & transverse), mesh opening orientation & type of reinforcing mesh, mesh opening shape (hexagonal & square), dimensions of openings in wire-mesh, and volume fraction of reinforcement & (longitudinal & transverse).

A finite element analysis was conducted to model the rods. Four different types of reinforcing steel meshes were used, three types of expanded wire-mesh and one type of welded wire-meshes. Parameters on strengthening columns using ferrocement, such as: i) the cross-sectional area and the characteristic concrete strength of the origin columns, ii) the thickness and the characteristic strength of the mortar layer. The experimental and the analytical results showed that for concrete column specimens exposed to fire, the failure load of columns were obviously smaller than columns not exposed to fire by percentage of 25% for normal strength concrete columns and of 35-39% for high strength concrete columns. In addition, for strengthened columns, the results showed that, all column specimens restored more than their original strength of 125-446% and 101-409% for normal and high strength concrete columns, respectively. Consequently, efficiency of jacketing normal strength concrete columns by ferrocement is better than the efficiency of jacketing high strength concrete columns. It was found that the use of steel stiffener rods in addition to wire-mesh, wrapping the wire-mesh by spiral technique, and characteristic strength of the origin columns by normal and high strength concrete columns.

Key Words: strengthening, concrete, columns, fire.