CHAPTER ONE

INTRODUCTION

1.1 GENERAL

The performance of structural materials, such as concrete in fire conditions is critical to the evaluation of building behaviour. A number of prior investigations on this subject have been made. These analyses were based on the "plane section" theory.

A study of RC columns is important because these are primary load bearing members, and column failure could be fetal for the stability of the entire structure on fire.

This study presents a survey of the available previous work carried out to study the effect of fire on the mechanical and thermo-physical properties of concrete, steel reinforcement and bond between them.

In Recent years, the construction industry has shown significant interest in the use of high performance concrete (HPC). This is due to improvements in structural performance, such as high strength concrete and durability, that it can provide compare to traditional, normal strength concrete (NSC). Generally, concrete up to a compressive strength of 40 Mpa is referred to as normal strength concrete, while concrete with compressive strength in excess of 40 Mpa is classified as high strength concrete (HSC). HPC is typically characterized by high strength, good workability and durability and HSC is a subset of HPC.

The properties of high strength concrete material, the effect of high temperature on it, behaviour of HSC columns, the factors affected the fire performance of HSC, in general, and spalling in particular ,will also presented.

1.2 RESEARCH OBJECTIVES

1. Studying the effect of fire on the behaviour of loaded flexural and compression elements made with normal strength and high strength concrete.
2. Providing a reliable and economical technique that can allow testing of the flexural and compression elements exposed to fire.
3. Comparing the behaviour of normal strength and the high strength concrete beams when they are exposed to fire while they are loaded.
4. Comparing the behaviour of normal strength and the high strength concrete columns when they are exposed to fire while they are loaded.

1.3 RESEARCH PLAN

The reinforced concrete flexural and compression elements will be casted of two different concrete mixes, which are Normal Strength Concrete Mix (NSCM), and High Strength Concrete Mix (HSCM).

The research program comprises experimental studies, where the experimental program will be carried out on thirty reinforced concrete beams exposed to flexural load and fire simultaneously. Also, the experimental program will be carried out on thirty reinforced concrete columns exposed to axially compression load and fire simultaneously.

1.4 THESIS LAYOUT

This thesis consists of six chapters classified as follow:

Chapter 1 Introduction.

Chapter 1 includes a general review, goals, objectives and main contents of thesis.

Chapter 2 Literature review.

Chapter 2 includes a review on the available research studies on the behaviour of normal and high strength concrete beams and columns exposed to elevated temperature.

Chapter 3 Experimental work.

Chapter 3 presents the experimental program including the test of the normal and high strength concrete beams and columns and materials, instrumentation, testing setup and procedure.

Chapter 4 Analysis of the experimental results of reinforced concrete beams.

Analysis and discussion on the experimental results and observations to investigate the effect of elevated temperature on normal and high strength beams are introduced in chapter 4.

Chapter 5 Analysis of the experimental results of reinforced concrete columns.

Analysis and discussion on the experimental results and observations to investigate the effect of elevated temperature on normal and high strength columns are introduced in chapter 5.

Chapter 6 Summary and conclusions.

Conclusions and recommendations for further research work are drawn in this chapter.