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Project Report on

"MIX DESIGN AND STRENGTH CHARACTERISTICS OF REACTIVE POWDER CONCRETE"

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CHAPTER 1

INTRODUCTION

1.1 GENERAL:

BACKGROUND

Concrete is a widely used construction material dominating the construction industry worldwide. The use of cementations material can be traced back thousands of years ago to Italy, Greece, ancient Egypt and the Middle East. Portland cement, an important ingredient in modern concrete was first used in 1824 by Joseph ASP din in England and the production of Portland cement in the modern sense began about 20 years later by Isaac C. Johnson. According to Glasser world production of concrete exceeds currently1 billions tones per annum.

Although high-strength concrete is often considered a relatively new material, its Development has been gradual over many years. High strength concrete is an important member of the concrete family; its first use in significant quantities in major structures was in the early 1960s in Chicago, USA. As the development has continued, the definition of high-strength concrete has changed. In the 1950s, concrete with a compressive strength of 34 MPa was considered high strength. In the 1960s, concretes with 41 and 52 MPa compressive strength were used commercially and in the early 1970s, 62 MPa concrete was being produced. More recently, compressive strengths over 110 MPa have been considered for insitu applications in buildings and for prestressed concrete members. The concrete that was once known as high-strength concrete in the late 1970s is now referred to as high-performance concrete because it has been found to be much more than simply stronger: it displays enhanced performance in such areas as durability and abrasion resistance. High-performance concrete can be defined as an engineered concrete in which one or more specific characteristics have been enhanced through the selection and proportioning of its constituents. Densified with small particles concrete (DSP), macro defect free concrete (MDF) and reactive powder concrete (RPC)

have been marketed as high performance concretes in various countries. In 1990s, reactive powder concrete (RPC) was developed by the addition of supplementary material, elimination of coarse aggregates, very low water/binder ratio, application of super plasticizer, additional fine steel fiber reinforcement, and heat curing and application of pressure before and during setting. RPC compressive strengths range from 200 to 800MPa.

There is a growing use of RPC owing to the outstanding mechanical properties and durability. RPC structural elements can resist chemical attack, impact loading from vehicles and vessels, and sudden kinetic loading due to earthquakes. Ultra high performance is the most important characteristic of RPC. The markets in which high performance concrete applications will be competing are where durability characteristic dominates: any concrete structure that will have to face severe environmental conditions will be made with a high-performance concrete in order to increase its operational life. The benefits of high performance concrete are that to achieve each 1 MPa in a structural element, capacity needs less material when high performance concrete is employed. In addition, the lower maintenance requirements result in significant economic benefit. Moreover, in the composition of RPC, a partial substitution of cement by silica fume (which is a waste by-product of silicon alloy) results in less cement consumption (and hence less greenhouse gas emission). It is anticipated that RPC will find an increasing market in structures designed for impact loading conditions in the near future. However, there are insufficient studies to fully describe its dynamic behavior. In particular, fiber reinforced RPC possesses better ductility and tensile strength than normal concrete, yet there is insufficient understanding of its behavior under dynamic loading.