Durability Studies on Various Concrete Mixes – A Review

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Abstract: Concrete is one of the most widely used construction material obtained by utilizing (preferably) locally accessible ingredients like sand, cement, water and aggregates. There is an essential need for addition of both chemical and mineral admixtures in concrete to improve its performance. Hence varieties of admixtures such as coconut fiber, fly ash, glass powder, nylon fibers etc. have been successfully used so far. Hence an attempt has been made in the present paper to analyze and summarize the durability tests performed on various concrete mixes in comparison to normal mixes.
Durability of any concrete mix may be understood as its ability to resist any act of deterioration i.e. either due to chemicals or due to weather or any other reason.

Index Terms **– Durability, Regime. DPS, Bentonite, GGBS.**

I. INTRODUCTION

Concrete is one of the most frequently used durable building materials. It gives superior resistance to fire when compared with wooden construction and gains strength with time. Concrete structures can have a long service life. Concrete has gained the privilege of being the largest manmade material used in the world. It has relatively much high compressive strength, but has much lower tensile strength. The coefficient of thermal expansion of concrete is also very low and its shrinks as it matures. Due to shrinkage and tension all concrete structures crack up to some extent. Internal micro cracks are inherent in concrete.

The present paper aims to summarize the extensive works carried out on various non conventional material used in concrete mixes.

II. LITERATURE REVIEW

S.Hemalatha and Dr.A.Leema Rose studied the performance of cement concrete with varying percentage of glass fiber of varying percentage i.e. 0.33%, 0.66%, 1.00%, 1.33%, 1.66% and 2.00%. Based on experimental investigation they concluded that addition of Glass Fiber in plain concrete increases the strength and durability characteristics. They determined the optimum dosage of 1% for glass fibers.

M. Almograbi worked on Durability study of lightweight concrete material made from date palma seeds. He concluded that the use of date palma seeds (DPS) as aggregates in concrete economies the natural resource and minimizes the environmental impact. The results obtained from his study provided good information for the durability of lightweight concrete produced from date palma seeds (DPS). The, results showed that, the behavior of date palma seeds (DPS) concrete is similarly to the other conventional lightweight concretes in terms of durability properties.

J. R. Correia et al. worked on effects on concrete durability of using recycled ceramic aggregates. He concluded that ceramic recycled aggregate are suitable in terms of compressive and tensile strength. The main problem encountered was excessive water absorption of aggregates which could be partially solved by pre – saturation method of aggregates. He further concluded use of recycled ceramic aggregates suitable on a condition that suitable exposure classes must be considered.

K. Sreenivasa Sudheer et al. worked on durability of concrete by partial replacement of cement by bentonite. He found that the compressive strength of bentonite mixes was reduced at the age of 28 days. A little bit Weight loss was observed in alkali solution whereas high percentage of weight loss was observed in acid attack for all mixes. He concluded that the increase in the compressive strength of concrete mix with bentonite was due to the increase in age but not because of the sulfate and alkali attacks.

Chetna M. Vyas et al. studied the durability properties of concrete with partial replacement of natural aggregates by recycled coarse aggregates. They determined the optimum dosage of recycled coarse aggregate to be 40%.They also concluded that Recycled coarse aggregate can be used as Construction Material but judicious decisions are to be taken by engineers.

T.Karun Kumar and N.Priyanka carried experimental study on properties of strength and durability of concrete by partial replacement of fine aggregate with copper slag and cement with egg shell powder for M - 30 and M - 40 grades concrete. They determined the optimum percentage of copper slag to be 20% - 40%.

A.H.L.Swaroop et al. worked on durability studies on concrete with Fly Ash & Ggbs. They studied the effect of sea water and 1% of H_2SO_4 on the concrete mixes by immersing the cubes for 7days, 28days and 60days in above solutions and the respective changes in both compressive strength and weight reduction were observed. It was conclude that concretes made by GGBS and Fly

Ash had good strength and durability properties when compared with normal conventional aggregate in severe environmental conditions.

Darshan S. Shah and Jayeshkumar Pitroda worked on an experimental study on durability and water absorption properties of pervious concrete. Their results indicated that pervious concrete of 1:6 concrete mix proportion had less water absorption and more durability and pervious concrete of 1:10 mix proportion had less durability and more water absorption. They further concluded that durability and water absorption are inversely proportional to each other.

Sanjith J et al. Studied on Durability Characteristics of High Strength Ferrochrome Slag Aggregate Concrete in Chloride and Sulphate Regime. They concluded that the physical properties of ferro chrome slag aggregate are higher as compared to conventional aggregates. They also concluded the optimum dosage of ferro chrome slag to be 75%.

P Daisy Angelin and P Ravi Kishore worked on Durability Studies on Concrete with Manufacturing Sand as a Partial Replacement of Fine Aggregate in HCl Solution. They concluded 60% as the optimum dosage of manufacturing sand as the partial replacement of fine aggregate.

III. CONCLUSION

As per the extensive studies carried out on various non conventional mixes it can be foreseen that the usage of various materials in concrete need varying dosage in percentage. Also the strength increments for different mixes are different. However every material used has been successful since it increased the compressive strength, flexural strength or split tensile strength to some extent. Also some of the mixes have been found to perform satisfactorily under severe chemical environments. But there is still excessive need for the extensive studies of these materials performance under extreme environmental conditions.

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