Strength and Durabilitry of Fibre Reinforced Quarry Dust Concrete

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Abstract : Concrete has been the popular construction material used since the past until now. Normally the concrete is mixed from cement, sand, stone and water sometime with use admixture. The basic objective of this study was to identify the alternative material for fine aggregate. Because the construction industry expects a serious shortage of river sand in our country. In such a situation the Quarry rock dust can be an economic alternative material to the river sand. Quarry dust has been rampantly used in different construction purposes but replacement technology has emerged as an innovative development to civil engineering material. The use of quarry dust in concrete is desirable because of its benefits such as useful disposal of by products, reduction of river sand consumption as well as increasing the strength parameters and increasing the workability of concrete (Jain et. al., 1999). It is used in large scale in the highways as a surface finishing material and also used for manufacturing of hollow blocks and lightweight concrete prefabricated Elements etc., In this paper study of M50 grade concrete consider a water cement ratio 0.37 for the hundred percentage replacement of fine aggregate (river sand) with steel fiber using Indian Standard method. the replacement of hundred percentage strength and durability properties of fresh and hardened concrete.Tests were conduct on cubes, cylinder and beams made of Quarry Dust with 5% steel fiber, the results were compared with the Natural river Sand Concrete. An attempt has also been made to durability studies on Quarry Dust when compared with the Natural river Sand concrete.

Keywords: Steel fibre,Quarry dust,conventional concrete

I. INTRODUCTION

Concrete is homogeneous mixture of binding material, coarse aggregate, fine aggregate and water. It is the most widely used building material. This is because of its versatility. It has desirable engineering properties. It can be made on site using easily available materials.The use of concrete for low cost housing and rural housing has not been extensive. There are many areas where there could be a considerable increase in the use of cement based products.The global consumption of natural sand is very high, due to the extensive use of concrete. In general, the demand of natural sand is quite high in developing countries to satisfy the rapid infrastructural growth, in this situation developing country like India facing shortage in good quality natural sand. Particularly in India, natural sand deposits are being depleted and causing serious threat to environment as well as the society. Increasing extraction of natural sand from river beds causing many problems, loosing water retaining sand strata, deepening of the river courses and causing bank slides, loss of vegetation on the bank of rivers, exposing the intake well of water supply schemes, disturbs the aquatic life as well as affecting agriculture due to lowering the underground water table etc are few examples.In the recent past good attempts have been made for the successful utilization of various industrial by products (such as flyash, silica fume, rice husk ash, foundry waste) to save environmental pollution. In addition to this, an alternative source for the potential replacement of natural aggregates in concrete has gained good attention. As a result reasonable studies have been conducted to find the suitability of granite quarry dust in conventional concrete.This project presents the feasibility of the usage of Quarry dust as hundred percent substitutes for Conventional Concrete with some addition of 5% of steel fibre to be added in the total volume of concrete.

II. MATERIALS AND METHODS

2.1 Quarry dust:

Crushed rock aggregate quarrying generates considerable volumes of quarry fines, often termed “quarry dust”. The finer fraction is usually smaller than5mm in size. The use of quarry dust in concrete is desirable because of the benefits such as useful disposal of a by-product, reduction of river sand consumption and increase in strength. Quarry dust has rough, sharp and angular particles, and as such causes a gain in strength due to better interlocking. Quarry dust has been identified as possible replacement for sharp sand in concrete works.Hence, quarry dust can be reasonably used as alternative to river sand. quarry rock dust does not contain silt or organic impurities and can be produced to meet desired gradation and fineness as per requirement. This consequently contributes to improve the

strength of concrete.quarry dust as a cohesion less sandy material acquired either naturally (which is rare) or artificially by the mechanical disturbance of parents rocks (blasting of rocks) for construction purposes, composed largely of particles with a diameter range of 0.05mm to 5.00mm.

2.2 Steel fibre:

Steel fiber have been used in concrete since the early 1900s. the early fibers were round and smooth and the wire was cut or chopped to the required lengths. The use of straight, smooth fibers has largely disappeared and modern fibers have either rough surface, hooked ends are crimped or undulated through their length. Modern commercially available steel fibers are manufactured from drawn steel wire, from slit sheet steel or by the melt extraction process which fibers that have a crescent shaped cross section. Typical steel fibers have equivalent diameters of from 0.15mm to 2mm and length from 7 to 75mm. aspect ratios generally range from 20 to 100.Steel fiber is one of the most commonly used fibers. Round steel fibers have diameter in the range of 0.25 to 0.75 mm. Flat steel fibers have cross section ranging from 0.15 to 0.4 mm thickness by 0.25 to 0.9 mm width. Crimped and deformed steel fibers are available both in full length or crimped at ends only. Use of steel fibers makes significant improvements in flexural, impact and fatigue strength of concrete. Now-a-days steel fibers have been extensively used in overlays or roads, pavements, airfields, bridge decks, thin shells and floorings subjected to wear and tear and chemical attack.

2.3DURABILITY

The durability of cement concrete is defined as its ability to resist weathering action, chemical attack, abrasion or any other process of deterioration, durable concrete will retain its original form, quality serviceability when exposed to its environment.

III. RESULT AND DISCUSSION

To study and compare the behavior of concrete using quarry dust as fully replacement of sand, experimental investigations as mentioned were carried out on concrete samples for their strength and properties. All these experimental investigations were carried out in the Concrete Laboratory. The concrete samples were cast with mix 1: 1.51: 3.11for control concrete and 1: 1.07: 3.11for quarry dust concrete (M50 grade). Summary of the test result for concrete mixes with fully replacement of fine aggregate using quarry dust and Steel fiber as recorded in tables.

Fig 3.1Test result of cube compression

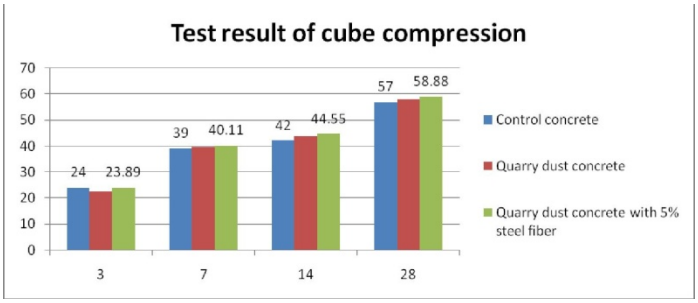

Fig 3.2Split Tensile Strength of Concrete

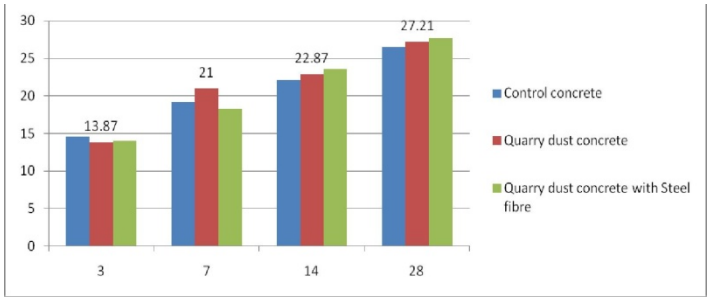

Fig 3.3Test Result of Beam for Flexural strength-M50 grade concrete

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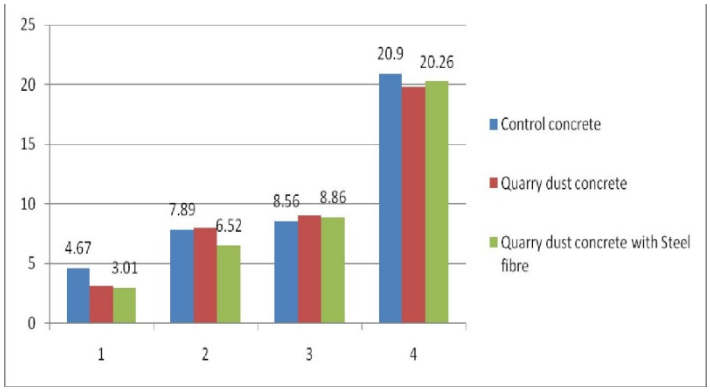

IV.CONCLUSION

The flexural and tensile strength properties were found to the compare closely with those for normal concrete. Compressive strength of cube test results were found to the compare closely with those for quarry dust concrete. Addition of wave cut steel fibers improved durability of concrete.The loss in weight and loss/gain in compressive strength of the cube specimen improved with age.Compressive strength of concrete increase with increase in fiber dosage upto 0.5% then it start decreasing.so the optimum percentage fiber found from experiment is 0.5% It is observed that the compressive strength and flexural strength of concrete can be decrease by fully replacement of quarry dust for river sand for fine aggregate. The results show that river sand can be compleletly replaced by quarry dust by 100%.Though there was a decrease in compressive strength initially the strength gained when quarry dust increased to 100 % replacing sand filling.

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