Study on Fiber Reinforced Concrete

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Abstract— The concept of using fibers in concrete to improve resistance to cracking and fragmentation is old and intuitive. During the last 30 years different types of fibers and fiber materials were introduced and are being continuously introduced in the market as new applications. These fibers can be made of metals, natural, glass or organic materials. In the past three decades, extensive research on fiber reinforced concrete has shown that some types of fibers can be added to concrete to improve its durability and physical properties such as cracking induced by plastic shrinkage, drying shrinkage and thermal gradient on the surface of fresh and mature concrete due to the severe environmental conditions of the India has been marked as one of the several causal factors of deterioration of reinforced concrete in the country.

Key words: Fiber Reinforced Concrete

I. INTRODUCTION

The Concrete Reinforcement Fibers provided by us are extensively used in the building construction purposes. These Concrete Reinforcement Fibers are suitable in floor designing and layouts and building wall construction as these have high stress resistance, moist proof and excellent bonding capacity. Moreover, we offer our concrete mixtures to the customers at competitive prices.

The target of this research is to contribute to the knowledge of the properties of fiber reinforced concrete (FRC) comparing to plain concrete, helping to extend the use of the materials alternative materials as concrete reinforcements.

The presence of micro-cracks at the mortar-aggregate interface is responsible for the inherent weakness of plain concrete. The weakness can be removing by inclusion of fibers in the mix. The fibers help to transfer load at the internal micro-cracks. Such a concrete is called fiber reinforced concrete. Does the fiber reinforced concrete is a composite material essentially consisting of conventional concrete or mortar reinforced by fine fiber.

II. LITERATURE REVIEW

Jindal and Hassan (1984) found that the shear resistance of SFRC joints was greater than that of conventional joints. Steel fibers with a length of 1-in (25-mm), and an aspect ratio of 100 were used at a volume fraction of 2%. It was observed that SFRC increased the shear and moment capacities by 19% and 9.9% respectively. It was also observed that the failure mode for SFRC specimens was ductile.

Craig, Mahadev, Patel, Viteri, and Kertesz (1984) reported testing of half-scale seismic beam-column joints to show that SFRC can produce a more seismic resistant joint. Two variations of hooked end steel fibers were used at a volume fraction of 1.5%. One of the variations had a length of 1.18-in (30-mm) and an aspect ratio of 60. The other had a length of 1.97-in (50-mm) and an aspect ratio of 100. It was found that a joint with hooked end steel fibers provided better confinement than a plain concrete reinforced joint. It was also found that the SFRC joints had less structural damage, had a greater shear capacity, greater stiffness, and had approximately 15% increase in maximum moment at each ductility factor.

Lakshmipathy, and Santhakumar (1986) presented results of SFRC frame testing conducted at Anna University, in India. Two frames, representing a 7 level single bay frame, were constructed at 1/4 scale; one frame was made out of reinforced concrete and the other out of SFRC as show in fig.4.2. Fibers with a length of 1.57-in (40-mm) and an aspect ratio of 100 were used at a volume fraction of 1%. An earthquake loading was simulated by applying load via hydraulic jacks at the 7th, 5th and 3rd levels of the frame.

It was found that the SFRC frame had a ductility increase of 57% and a 130% increase in cumulative energy dissipation in comparison to the conventional joint.

A. Materials

1) Concrete

Concrete is a construction material composed of Portland cement and water combine with sand, gravel, crushed stone, or other inert material such as expanded slag or vermiculite. The cement and water from a paste which harden by chemical reaction into a strong, stone-like mass. The inert material are called aggregate, and for economy no more cement paste is use than is necessary to cote all the aggregate surface and feel all the voids. The concrete paste is plastic easily molded into any form or troweled to produce a smooth surface.

B. Cement

Cement is material, generally in powder form, that can be made into up paste usually by the addition of water and when molded or poured, will set into a solid mass. Numerous organic compound uses for adhering, or fastening material, are called cement.

C. Fine Aggregate

Fine aggregate/sand is an accumulation of grains of mineral matter derive from the disintegration of rocks. It is distinguish from gravel only by the size of the grains or particles, but is distinct from place which contains organic materials. Sand that have been sorted out and separated from the organic material by the action of current of water or by wind across a ride are generally quit uniform in size of grains.

D. Curse Aggregate

Course aggregate are the crush stone is used for making concrete. The commercial stone is quarried, crush and graded. Much of the crush stone use is granite, lime stone, and trap rock. The last is term used to designate basalt, gabbro, diorite and other dark colored, fine grained igneous rock. Graded crush stone usually consist of only one kind of rock and is broken with sharp edge.

E. Water

Water fit for drinking generally considered fit for making concrete. Water should be free from acid, oil, alkali, vegetables or other organic impurities. Soft water also produces weaker concrete. Water has to function in a concrete mix.

F. Reinforcement

The longitudinal reinforcement use were high yield strength deform bar of 12mm dia. The stirrups were made from mild steel bar 6mm dia. The yield strength of steel reinforcement use in this experimental program was determined by performing the slandered tensile test on three spacemen of each bar.

III. METHODOLOGY

Many researchers throughout the world have conducted testing of fiber added to concrete over the past three decades. This thesis aims to add to that body of knowledge.

A. Tests

- Terminology relating to concrete and concrete aggregates
- Test method for slump of hydraulic- cement concrete
- Practice for making and curing concrete test specimens in the laboratory
- Test method for time of setting of concrete mixtures by penetration resistance
- Practice for preparing precision and bias statements for test method for construction materials.

1) Terminology Relating to Concrete and Concrete Aggregates

The test method is intended to evaluate the effect of evaporation, settlement and early autogenously shrinkage on the plastic shrinkage cracking performance of fiber reinforced concrete up to and for some hours beyond the time of final setting.

The measured values obtained from this test may be use to compare the performance of concrete with different mixture proportions, concrete with and without a fiber, concrete containing various amount of different types of fiber, and concrete containing various amount and types of admixtures. For meaningful comparisons, the evaporative conditions during test shall be sufficient to produce an average cracks width of at least 0.5mm in the control specimens.

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