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INCREASING DURABILITY OF CONCRETE BY USING POLY VINYL ALCOHOL FIBRE

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Abstract:

In the past, attempts have been made to impart improvement in tensile properties of concrete members by way of using conventional reinforced steel bars and also by applying restraining techniques. Although both these methods provide tensile strength to the concrete members, they however, do not increase the inherent tensile strength of concrete itself. Concrete is a mixture of Cement, Fine aggregate, Coarse aggregate and Water. Plain concrete possesses a very low tensile strength, limited ductility and little resistance to cracking. Internal micro cracks are inherently present in the concrete and its poor tensile strength is due to the propagation of such micro cracks, eventually leading to brittle fracture of the concrete.

Keywords: Fine Aggregate, Concrete, Tensile.

1. INTRODUCTION

In plain concrete and similar brittle materials, structural cracks developed even before loading, particularly due to drying shrinkage or other causes of volume change. The width of these initial cracks seldom exceeds a few microns, but their other two dimensions may be higher magnitude. It has been recognized that the addition of small, closely spaced and uniformly dispersed fibers to concrete would act as a crack arrest and would substantially improve its static and dynamic properties. This type of concrete is known as Fiber Reinforced Concrete. Fiber reinforced concrete can be defined as a "composite material consisting of mixtures of cement, mortar or concrete and discontinuous, discrete, uniformly dispersed". Continuous meshes, woven fabric and long wires or rods are not considered to be discrete fibers. In the past, attempts have been made to impart improvement in tensile properties of concrete members by way of using conventional reinforced steel bars and also by applying restraining techniques. Although both these methods provide tensile strength to the concrete members, they however, do not increase the inherent tensile strength of concrete itself. Steel fibers are one of the most commonly used fiber. Generally, round fibers are used. The diameter may vary from 0.25 to 0.75 mm. The steel fibers is likely to get rusted and lose some of its strengths. But investigations have shown that the rusting of the fibers takes place only at the surface. Use of steel fiber makes significant improvement in flexural, impacts and fatigue strength of concrete, it has been extensively used in various types of structures, particularly for overlays of roads, airfield pavements and bridge decks. Different types of steel fibers are used in concrete. But the recently introduced steel fiber by name "Dramix glued steel fibre".

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2. LITERATURE REVIEW

In this paper, the impact toughness, autogenous shrinkage, chloride penetration resistance, permeability resistance and abrasion resistance performance of prepared concrete reinforced with Polyacrylonitrile fiber (PAN fiber) were researched. The PAN fiber volume concentration percentages of cement were 0, 0.5%, 1.0%, 1.5% and 2.0%, respectively. The results showed that with the addition of PAN fiber, the toughness and durability performance were improved. Compared to the reference sample, the impact energy was significantly improved. The absorbed energy prevent specimens from deterioration by the mechanisms of matrix cracking, PAN fiber/matrix interface debonding, fiber pull-out and fiber rupture. Fiber reinforced concrete has so far been successfully used in slabs on grade, shotcrete, architectural panels, precast products, offshore structures, structures in seismic regions, thin and thick repairs, crash barriers, footings, hydraulic structures and many other applications.

This paper presents a brief state-of-the-art report on mechanical properties and durability of fiber reinforced concrete. Civil infrastructure around the world the problem is at the apparent lack of durability in our construction materials, inability on part of the owners to provide timely maintenance, absence of advanced condition assessment tools and lack of long-lasting, cost effective repair materials and technologies. This paper will present data to support the argument that fiber reinforced concrete (FRC) is an ideal material for achieving these goals. In this study, the nylon fiber volume fraction (0, 0.5 and 0.1%) and the amount of added latex (0, 5, 10 and 15% of the cement weight) are varied, and the slump. Compressive strength, flexural strength, chloride ion penetration, abrasion resistance and impact resistance are measured. Increasing the latex content improved the flexural strength, permeability resistance, abrasion resistance and impact resistance of the LMNFRC.

3. METHODOLOGY

As for its low cost and satisfactory engineering properties, concrete is widely applied in the infrastructure construction in the world. However, concrete is typically characterized as quasi-brittle and low tensile strength. When the concrete is loaded, the initially and discontinuous micro cracks are appeared in this matrix, which limits the development of concrete science. The added micro-fiber can overcome these weaknesses and control the crack propagation effectively, which finally improved the mechanical and durability performance of concrete. As it glued in a bunch the ditachement and dispersion will be in a more regulated manner avoiding ballooning of fibers. On account of the typical shape of fiber it functions efficiently in the concrete.

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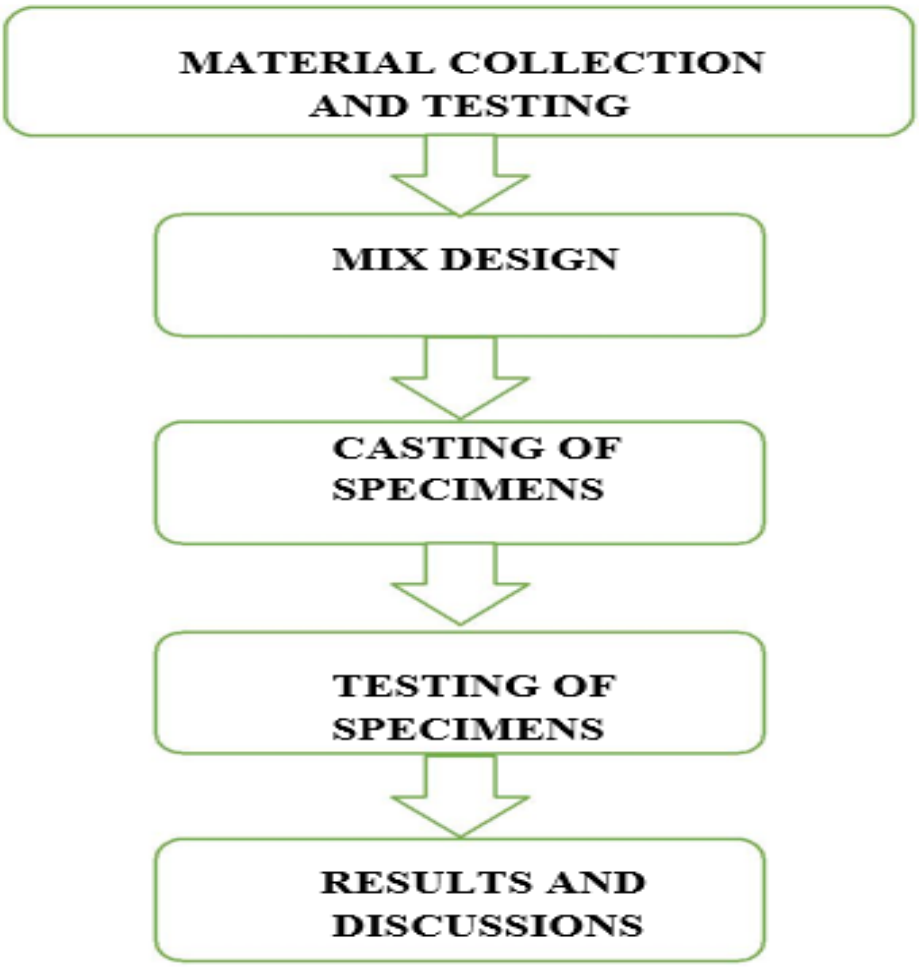

Fig.1.General Block Diagram

4. MATERIAL COLLECTION

The Portland Pozzolona Cement is a kind of Blended Cement which is produced by either intergrinding of OPC clinker along with gypsum and pozzolonic materials in certain proportions or grinding the OPC clinker, gypsum and Pozzolonic materials separately and throughly blending them in certain proportions. Pozzolaa is a natural or artificial material containing silica in a reactive form.

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Fig.2.Cement

It is essential that pozzolana be in a finely divided state as it is only then that silica can combine with calcium hydroxide (liberated by the hydrating Portland cement) in the presence of water from stable calcium silicates which have cementious properties. The Portland Pozzolana Cement produces less heat of hydration and offers greater resistance to the attack of aggressive waters than normal Portland Cement. Moreever it reduces the leaching of calcium hydroxide liberated during the setting and hydration of cement.

AGGREGATE

Aggregates are the important constituents in concrete. They give body to the concrete, reduce shrinkage and effect economy. One of the most important factors for producing workable concrete is good gradation of aggregate. Good grading implies that a sample fractions of aggregates in required proportions such that the sample contains minimum voids. Sample of the well graded aggregate containing minimum voids require minimum paste to fill up the voids in the aggregate. Minimum pastes will mean less quantity of cement and less water, which will further mean increased economy, higher strength, lower shrinkage and greater durability.

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Fig.3. Fine Aggregate

Aggregate comprises about 55% of the volume of mortar and about 85% volume of mass concrete. The maximum size of aggregate used in this work is 12.5mm. Aggregates which is passed through 4.75 IS sieve is termed as fine aggregate. Fine aggregate is added to concrete to asist workability and to bring uniformity in mixture. Usually, the natural river sand is used as fine aggregate.

Fig.4. Coarse Aggregate

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Important thing is to be considered is that fine aggregate should be free from coagulated lumps. The factors that affect concrete properties are aggregate size, shape, texture, strength and surface moisture. Large size aggregates used will result in reduction of cement content, reduction in water requirement, and reduction of drying shrinkage. From practical consideration, a maximum size of 4.75 mm is generally applied.

5. ANALYSIS

The cube specimens is of the size 150x150x150mm. if the largest nominal size of aggregate does not exceed 20mm, 10cm size cubes may also be used as an alternative cylindrical specimens have a length equal to twise the diameter.

Fig.5. Compressive Strength Test

They are 15cm diameter and 30cm long. Smaller test specimens may be used but the ratio of the diameter of the specimen to the maximum size of aggregate, not less than 3 to 1 is maintained. Compressive Strength of concrete was found out at 7^{th} and 28^{th} day for conventional concrete and Poly vinyl alcohol fiber rein forced concrete. Polyvinyl alcohol fiber content were added to the concrete by 0%, 0.1%, 0.2%, 0.3% and 0.4% in weight of cement. The size of cubes to find out compressive strength of concrete are 150 X 150 X 150 mm. Compressive Strength of concrete was found out at 7^{th} and 28^{th} day for conventional concrete and Poly vinyl alcohol fiber rein forced concrete. Polyvinyl alcohol fiber content were added to the concrete by 0%, 0.1%, 0.2%, 0.3% and 0.4% in weight of cement. The size of cubes to find out compressive strength of concrete are 150 X 150 X 150 mm

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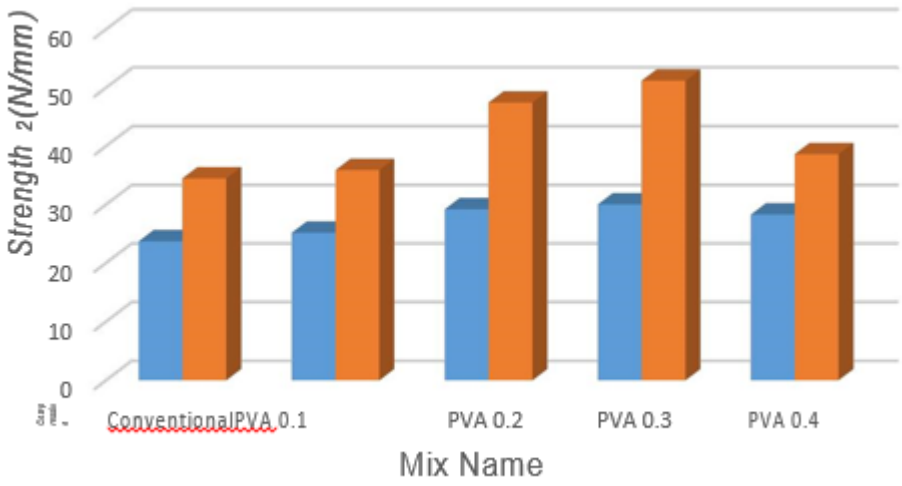

Fig.6. Compressive Strength of Concrete (N/mm^2)

CONCLUSION

From the results of this experimental investigation, the following conclusions are drawn on concrete without and with poly vinyl alcohol fiber. With the addition of poly vinyl alcohol fibers leads to increase in compressive strength, split tensile strength and modulus of rupture with age and with the increase of poly vinyl alcohol fiber content up to 0.3% compared to control concrete at 28 day. Compared to conventional concrete poly vinyl alcohol fiber reinforced concrete specimens attains 48.5% higher compressive strength, 50.4% higher split tensile strength, 21.4% higher modulus of rupture. When immersed in Magnesium Sulphate solution (MgSo4) for 90days, the poly vinyl alcohol fiber reinforced concrete weight was 17.2% less compared to 28th day poly vinyl alcohol fiber reinforced concrete and 29.8% higher than the conventional concrete.

REFERENCES

1. A.Sumathi, K.Saravana Raja Mohan, Study on the Strength and Durability Characteristics of high strength concrete with steel fibers, International Journal of ChemTech Research, Vol.8, No.1, pp 241 –248, 2015.

2. R.Anandakumar, A.Seeni, Dr.C.Selvamony and Dr.M.S.Ravikumar, Durability Study on Basalt Fiber Reinforced Polymer (BFRP) Composites Wrapped Specimens for Retrofitting of RCC piles, International Journal of Engineering Research & Technology (IJERT), Vol. 3, Issue 11. November 2014.

3. Shen-jun Fan, Mechanical and Durability Performance of Polyacrylonitrile Fiber Reinforced Concrete, Material Research.

4. A.L.Ardeshana, Dr. Atul K Desai, Durability of Fiber Reinforced Concrete of Marine Structures, International Journal of Research and Applications, Vol.2, Issue 4, July –August 2012, pp.215-219.