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A REVIEW STUDY OF M30 CONCRETE PROPERTIES DUE TO INCORPORATION OF GLASS FIBRES

Rajdeep Singh[1], Magandeep Bishnoi[2]
[1]M. Tech Scholar, [2]Asst. Professor
Department of Civil Engineering, Om Institute of Technology & Management, Hisar (Haryana)

Abstract: The poor and unsatisfactory performance of conventional concrete under aggressive environmental conditions has necessitated the researchers and engineers to look for new concrete composites. This new generation technology introduces the discrete glass or synthetic fibres added into the conventional concrete to modify it's properties. Fibers are generally utilized in concrete to manage the plastic shrink cracking and drying shrink cracking. They also help in modifying the permeability of concrete and therefore reduce the flow of water. Various mix proportions of concrete were prepared by the addition of stainless Glass fibres of diameter 0.00125 mm with aspect ratio 857.1. Different properties of concrete e.g. compressive strength , Flexural strength and Split tensile strength at 7 & 28 days have been studied.
Keywords: Stainless Glass Fibres, Compressive Strength, Flexural Strength and Split Tensile Strength.

I. INTRODUCTION

For a long time concrete was considered to be a very durable material requiring a little or no maintenance. The assumption is largely true, except when it is subjected to highly aggressive environments. We build concrete structures in highly polluted urban and industrial areas, aggressive marine environments, harmful sub-soil water in coastal areas and in many other hostile conditions where other materials of construction are found to be non-durable. The poor and unsatisfactory performance of conventional concrete under aggressive environmental conditions has necessitated the researchers and engineers to look for new concrete composites. The innovative use of concrete must contemplate explorations of areas , in use of new shapes, materials and technique of construction. Concrete is such a versatile material that such attempts of contemplation are quite possible. In modern age one cannot think of construction work without concrete. Plain concrete has two major deficiencies ; a low tensile strength and allow strain at fracture. The tensile strength of concrete is very low because plain concrete normally contains numerous micro cracks. Hence Fibres are generally utilized in concrete to manage the plastic shrink cracking and drying shrink cracking In FRC, thousands of small fibres are dispersed and distributed randomly in the concrete during mixing, and thus improve concrete properties in all directions.That‟s why the addition of fibre with concrete improved the concrete properties such as workability, brittleness, strength, corrosion resistance and ultimately increased life of the structure. A major advantage of using fibre reinforced concrete besides reducing permeability and increasing fatigue strength is that fibres addition improves the toughness or residual load carrying ability after the first crack. This concrete is known as Glass fibre reinforced concrete (GFRC). Reinforcing capacity and proper functioning of fiber is based on length of fiber, diameter of fiber, the percentage of fiber and condition of mixing, orientation of fibers and aspect ratio. Aspect ratio is ratio of length of fiber to its diameter which plays an important role in the process of reinforcement. GFRC contains only less than 3% of fibres and aspect ratio below 100.

II. LITERATURE REVIEW

As we know the properties of concrete gets improved due to the incorporation of Glass fibre. Large no. of papers have being published which tells about the compressive strength, flexural strength and split tensile strength of concrete according to their opinion. ENRICO PAPA [1] shows the Experimental characterization and numerical simulations of a syntactic-foam/glass-fibre composite sandwich : A review on the results of an experimental and numerical investigations performed by the author on the mechanical behaviour of a composite sandwich initially designed for naval engineering applications. S.LEIGH PHOENIX[2].Investigation is carried out on modeling the statistical lifetime of glass fiber/polymer matrix composites in tension. ANDREA BODDY[3] This paper deals with the long-term results of study investigating the chloride permeability resistance of concrete having high reactivity metakaolin (HRM). FISHER.A.K [4] Research studies were carried out on the durability of cellulose fibre reinforced concrete pipes in sewage applications. In the communities, infrastructure concrete pipes are the integral components, being used in for a wide range of purposes from storm water drainage to external casing for composite piles. Its usage as sewage pipes is to be considered of both the strength characteristics and a long term durability of the pipes in aggressive environment. LULU BASHEER [5] The author made a review on the mechanism of concrete deterioration to highlight the transport mechanism relevant to each of the deterioration mechanism. RAMAKRISHNA.G [6] This paper explain the results of difference in chemical composition and tensile strength of coir, sisal, jute and Hibiscus cannabinus when they are subjected to wetting and drying alternatively and continuous immersion for 60 days in three media (water, saturated lime and sodium hydroxide). BARLUENGA.G[7]An experimental program developed by AR fiber producer, was conducted, to estimate the cracking control ability of alkali resistant (AR) glass fibers in standard concrete and SCC. CHOTITHANORM.C[8]

Experimentally studied and examined the resistance to chloride penetration of concrete with fly ash of varied finenesses. For this purpose, three different fly ash finenesses namely original fly ash, 45% fine portion and 10% fine portion. ASOKAN.P[9] Research is carried out on Assessing the recycling potential of glass fiber reinforced plastic waste in concrete and cement composites. ALEJANDRO ENFEDAQUE [10].This paper is on the experimental studies made on the analysis of glass fiber reinforced cement (GRC) fracture surfaces. Glass fiber reinforced cement (GRC) is a composite material formed by the combination of cement mortar matrix and chopped glass fibers bonded fibre reinforced polymer sheets. The authors concluded that the strengthened beams exhibit higher load carrying capacity. Ms. K.Ramadevi1, Ms. R. Manju [used the Polyethylene Terephthalate (PET) bottles for the reinforcement in concrete with dosage 1%, 2%, 4% and 6% . This paper proved that the replacement of fine aggregates with PET bottles reduces the quantity of river sand and also plastic fibres are proved to be more economical.

III. MATERIALS USED

Materials required for making GFRC essentially consist of cement, fine sand, coarse aggregates and Glass fibre. These materials are described below-

CEMENT : Ordinary Portland cement of 43 grade has been used in this experimental work. OPC 43 grade of ULTRATECH cement has been used after investigate the strength of cement at 28 days as per IS 4031-1988. The various properties of the cement are described in Table No. 1.

Table No. 1: Characteristics Properties of Cement

Sr. No.	Characteristics	Experimental value	Specified value as per IS:8112-1989
1	Consistency of cement (%)	33%	---
2	Specific gravity	2.98	3.15
3	Initial setting time (minutes)	35	>30 As Per IS 4031-1968
4	Final setting time (minutes)	282	<600 As per IS4031-1968
5	Compressive strength (N/mm^2) (i) 3 days (ii) 7 days (iii) 28days	 27.56 40.57 48.96	 >23 >33 >43
6	Soundness (mm)	1.00	10
7	Fineness of Cement	5%	10% As Per IS 269-1976.

FINE AGGREGATES: Locally available river sand passed through 4.75mm IS sieve has been used in the preparation of GFRC . It confirms to IS 383-1970 which comes under Zone I. The physical Properties of sand like Fineness Modulus ,Specific Gravity and water absorption are 3.25, 2.67 and 2.31% respectively.

COARSE AGGREGATES: The Coarse aggregate are obtained from a local quarry has been used. The coarse aggregate with a maximum size 20mm having a specific gravity 2.89. In this experimental work coarse gravel of 20mm and crushed aggregate of 10mm are mixed in 60:40. The physical Properties of coarse aggregates like Fineness Modulus, Specific Gravity are 2.31, 2.89 respectively

GLASS FIBRE: The glass fibres are of Cem-FIL Anti-Crack HD with Modulus of Elasticity 72 GPA, Filament diameter 14 microns, Specific Gravity 2.68, length 12mm and having the aspect ratio of 857. For 1 kilo gram, the number of fibres are 212million.

WATER: - Water used for mixing and curing was clean and free from injurious amounts of oils, acids, alkalis, salts and sugar, organic substances that may be deleterious to concrete. As per IS 456- 2000 Potable water is generally considered satisfactory for mixing and curing of concrete. Accordingly, potable tap water was used for the preparation of all concrete specimens.

IV. CONCLUSION

The introduction of small, closely spaced, randomly oriented fibers transfers an inherently brittle material with low tensile strength and impact resistance into a strong composite with superior crack resistance, improved ductility and distinctive post cracking behaviour prior to failure. A major advantage of using Glass fibre reinforced concrete besides reducing permeability and increasing fatigue strength is that fibres. The common person in their regular constructions could easily adopt these sustainable improvements or modifications.

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