ISSN:2348-2079

Volume-6 Issue-2

International Journal of Intellectual Advancements and Research in Engineering Computations

Experimental investigation of partial replacement of nylon fiber in solid block

M.Karthick[1], R.Mytheeswaran[2], S.Sethupathy[3], P.Balasubramaniyan[4], K.C.Denesh[5]

[1234](UG students, Civil Engineering Department, Nandha Engineering College, Tamilnadu, INDIA)

[5](Assistant Professor, Civil Engineering Department, Nandha Engineering College, Tamilnadu, INDIA

ABSTRACT

This project deals with experimentally on study of nylon fiber on solid block ratio of 1.3**:**8(cement**:** sand**:** metal). Nylon was the first truly synthetic fiber to be commercialized. All nylon absorbs moisture depends on temperature, crystalline & humidity. It provides secondary reinforcement that is always positioned in compliance with building codes. Savings time and money be eliminating the purchase, storage handling, cutting & placing of wire mesh. Allows block to reach its designed strength and integrity without the used for welded wire .It inhibits plastic shrinkage. Compatible with all other admixtures, surface treatments and finally finishes like regular concrete. In the designed solid block the crusher sand was admixture with 12.5%, 15%, 17.5%, 20% of nylon fiber. The mechanical properties such as compressive strength were tested for conventional block.

Key words: *Cement, Fine aggregate (crusher sand), Coarse aggregate, Nylon fiber, minimize the cracks.*

1. INTRODUCTION

Nylon is a generic designation for a family of synthetic polymers, based on aliphatic or semi-aromatic polyamides. Nylon is a thermoplastic silky material that can be melt-processed into fibers, films or shapes. It was also used to make tires, tents, ropes, ponchos, and other military supplies. At the outset of the war, cotton accounted for more than 80% of all fibers used and manufactured, and wool fibers accounted for nearly all of the rest solid blocks are substitutes for conventional bricks and stones in building construction. They are easier to place and also confer economics in foundation cost and consumption of cement. In comparison to conventional bricks, they offer the advantages of uniform quality, faster speed of construction, lower labour involvement and longer durability. In view of these advantages, hollow blocks are being increasingly used in construction activities.

Extensive research work on solid block has established that addition of various types of fibers such as metallic and non-metallic fiber like (steel), glass, synthetic, and carbon, in plain concrete improves strength, toughness, ductility, post-cracking resistance, etc.

It is obvious that the behavior of solid block depends on the orientations, distributions, aspect ratios, geometrical shapes and mechanical properties of Fibers in concrete mixtures. The orientations and distributions of Fiber affect the properties of solid block such as toughness, strength, ductility and crack width.

2. MATERIAL USED

- Cement
- Coarse aggregate
- Fine aggregate
- Nylon Fiber
- Water

CEMENT

Locally available Ordinary Portland cement (OPC) of 53grade has been used physical properties are mentioned table in below.

S.No	Property of 53 grade cement	Result
1.	Specific gravity	3.15
2.	Consistency	33%
3.	Initial setting time	30 min
4.	Final setting time	600 min

FINEAGGREGATE

Crusher Sand was collected from quarry is used as affine aggregate is passed through the sieve of 90 micron. IS 383 (1970) is followed for fine aggregate.

S.No	Property	Result
1.	specific gravity	2.6
2.	Fineness modulus	4.67%
3.	Water absorption	1.0%

COARSEAGGREGATE

Locally available crushed stone aggregate are used which have the size of below 12mm used for the project.

S.No	Property	Result
1.	specific gravity	2.8
2.	Water absorption	0.5%

NYLON FIBER

Nylon fibers are imparted by the base polymer type, addition of different levels of additive, manufacturing condition and fiber dimensions. Currently only two types of nylon fiber are marketed for concrete. Nylon is heat stable, hydrophilic, relatively inert and resistance to a wide variety of materials. Nylon is particularly effective imparting impact resistance and flexural toughness and sustaining and increasing the load carrying capacity of concrete following first crack.

Fig.1 Nylon Fiber

Table 1 Properties of Nylon Fiber

TEST	PER BAG YARD IN CONCRETE
Tensile strength	130-140ksi
Young's modulus	750ksi
Melt point	435 F (225 C)
Alkali resistance	Excellent

Acids &salts Resistance	Good
Electrical conductivity	Low
Thermal conductivity	Low
Ultraviolent resistance	Excellent
Specific gravity	1.16
Fiber length	¾”
Color	Blue

WATER

Water cement ratio (w/c) of 0.45 was used in the preparing of concrete and for this purpose portable water used for mixing and curing purpose.

3.EXPERIMENTAL METHODOLOGY

The mix design was done in accordance IS: 2572(2005). A ratio of 1:3**:**8 (cement**:** sand**:** Chips metal) confers higher strength, while a ratio of 1.5:6 can be employed for normal load bearing construction. By using this proportion value the volume of cement, fine aggregate, and coarse aggregate are estimated. The Ordinary Portland cement (OPC 53 GRADE), Good stone aggregate and quary sand of was used as coarse aggregate and fine aggregate. For this study of solid block (300×150×200mm) were casted by replacement of fine aggregate by Nylon fiber (12.5%, 15%, 17.5%, 20%) Then further tested are conducted such as workability then it will be casted.

CASTING OF SOLID BLOCK

Fig.2 Casting of Solid Block

4. CURING OF SOLID BLOCK

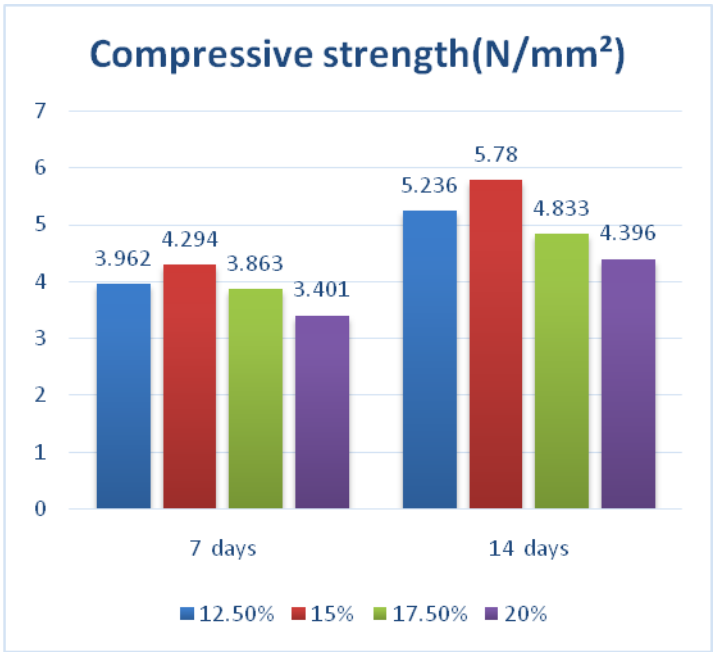
Casting of block after the completion of 24 hours mould will be removed then cured by using portable water. The specimen is fully immersed in portable water for specific age 7, 14, 28, days. After the completion of curing it will be tested.

5 .TESTING OF SOLID BLOCK

Fig.3 Compressive strength test

Table2. Compressive strength test result at 7, 14 & 28 days

S.No	Mix in %	Average compressive strength (N/mm²)		
		7 days	14 days	28 days
1	12.5%	3.962	5.236	6.643
2	15%	4.294	5.780	6.982
3	17.5%	3.863	4.833	5.247
4	20%	3.401	4.396	5.147



6. RESULT AND DISCUSSION

Compressive Strength

The compressive strength is determined by dividing the maximum of failure load of the specimen during the test by the cross sectional area of the specimen. The normal solid block and the percentage of replacements in special block are crushed at different (7, 14, 28 days) are show in table & graph details.

$$\text{Compressive strength} = \frac{P}{A} (\text{N/mm}^2)$$

7. CONCLUSION

The following conclusion can be drawn from the results obtained from the experimental investigations.

The specimen cast with 12.5% Nylon fiber replacement by crusher sand gives better compressive strength of 1.1% increased to compare to conventional solid block.

The specimen cast with 15% Nylon fiber replacement by crusher sand gives better compressive strength of 1.18% increased to compare to conventional solid block.

The specimen cast with 17.5% Nylon fiber replacement by crusher sand gives better compressive strength of 1.13% increased to compare to conventional concrete.

Comparison to four different percentages of replacements, the strength will not reduce when compare to conventional concrete.

8. REFERENCES

[1].Monita Olivia and Hamid R. Nikraz. Strength and Water Penetrability of Fly Ash Geopolymer Concrete. ARPN Journal of Engineering and Applied Sciences, Vol. 6(7), 2011.

[2].Shankar H. Sanni1 and R.B.Khadiranaikar. Performance of geopolymer concrete under severe environmental conditions. International Journal of Civil And Structural Engineering, Vol.3(2), 2012.

[3]R. Anuradha, V. Sreevidya, R. Venkatasubramania and B.V. Rangan. Modified Guidelines for Geopolymer Concrete Mix Design Using Indian Standard. Asian journal of Civil Engineering, vol. 13(3), pp.353-364, 2012. [4]IS:2185 (Part II)-1983. Specification For concrete masonry units Part II Hollow and solid light weight.

[5].B. Vijaya Rangan, Djwantoro Hardjito, SteenieE.Wallah, and Dody M.J. Sumajouw. Geopolymer: Green chemistry and sustainable development solutions, pp.133-137.