



## **ANALYSIS OF PROPERTIES OF CONCRETE USING NYLON FIBER AS FIBER REINFORCEMENT ADMIXTURE**

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**DOI:** <https://doi.org/10.5281/zenodo.889525>

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### **Abstract**

As building industry evolves, stronger more durable and increasingly specialized products are in demand fiber reinforcement took an important role, fiber reinforcement to meet requirement changed with material composition and patterns such as fiber mesh, micro fibers, macro fibers, etc. In this paper analysis of properties of concrete using nylon fiber as fibre reinforcement admixture is studied and verified the strength of concrete to the normal Portland cement. Using nylon fiber the compressive strength and flexural of concrete has increased to very limited extend. As the friction between concrete and nylon fiber is very less, so it gives very less interlocking between concrete.

**Keywords:** Nylon Fiber Reinforcement; Flexural Strength; Compressive Strength; Grade of Concrete.

**Cite This Article:** Vishal Gadgihalli, Ramya M S, Sindu Shankar, Raghavendra Prasad Havanje Dinakar, and Babitha Rani H. (2017). "ANALYSIS OF PROPERTIES OF CONCRETE USING NYLON FIBER AS FIBER REINFORCEMENT ADMIXTURE." *International Journal of Research - Granthaalayah*, 5(4) RASM, 63-66. <https://doi.org/10.5281/zenodo.889525>.

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### **1. Introduction**

Nylon is a synthetic polymer. Nylon is thermoplastic silky materials [1] that can be melting processed into fibers, films or shapes [2]. Nylon is a tough material that is difficult to tear and exhibits excellent abrasion resistance. Nylon has relatively high melting temperature of 2560c/4500f. It is a hygroscopic material and on the molecular level tends to absorb moisture from the surrounding environment. Nylon fiber decomposes under sunlight so often UV resistance additives are used. Nylon is not affected by using, molds and mildew and is not eaten by insects. Fiber is a small piece of reinforcing material possessing certain characteristics properties. They can be circular or flat. The aspect ratio of fiber ranges from 30 to 150. Fiber-

reinforcement material will increase structural integrity. Fiber in concrete has limited effect on the impact resistance of the material [3] [4]. Studies were performed using waste carpet fibers in concrete as an environmentally friendly use of recycled carpet waste [5].

Fiber reinforcing does an excellent job controlling cracking in concrete using fiber reinforcing will improve the flexural strength of concrete. Nylon fibers are recyclable as they can be molded again by heating it. Now a day different types of polymer fibers are produced such as PET, polypropylene monofilament fibers etc. are used.

Using nylon fiber for reinforcement is ideal for tapping and precast work.

Nylon fiber used as fiber-reinforcement admixture will increase the strength of concrete, very limited literature found related to this study, the author just compared his work with general ordinary Portland cement.

## 2. Methodology

Nylon fibers that are bought for mixing must be thoroughly verified as they must be free from surface cracks. These nylon fibers must be mixed as an admixture. These steel fibers are brought for utilization using “aspect ratio”. Suitable process requires suitable time of mixing ingredients with correct proportion as per Indian standard codes. Care must be taken such that the concrete must not be mixed with excess water as water makes less interlocking with nylon fibers.

Target strength of concrete was determined by the equation

Target Nylon fibers required =  $f'_{ck} = f_{ck} + 1.65(s)$ —[eq1],

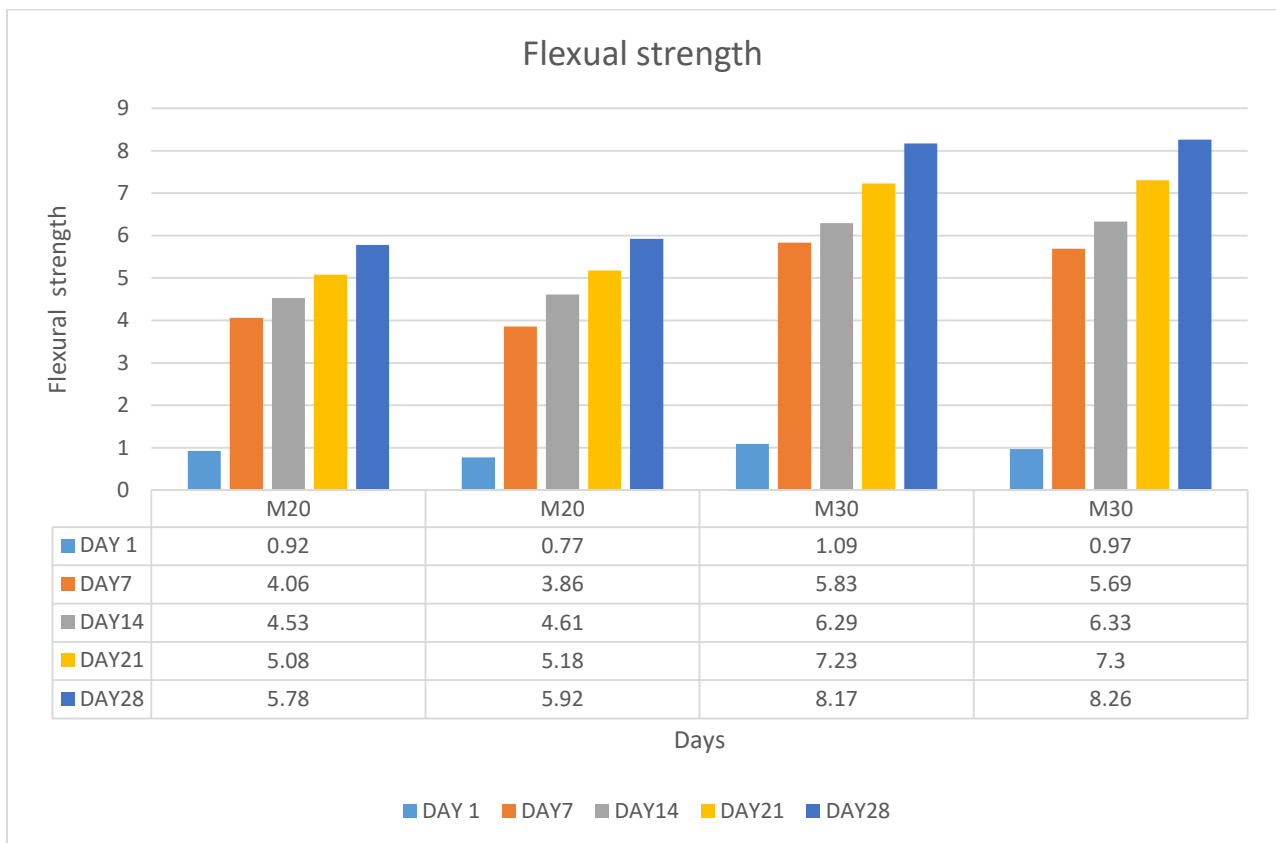
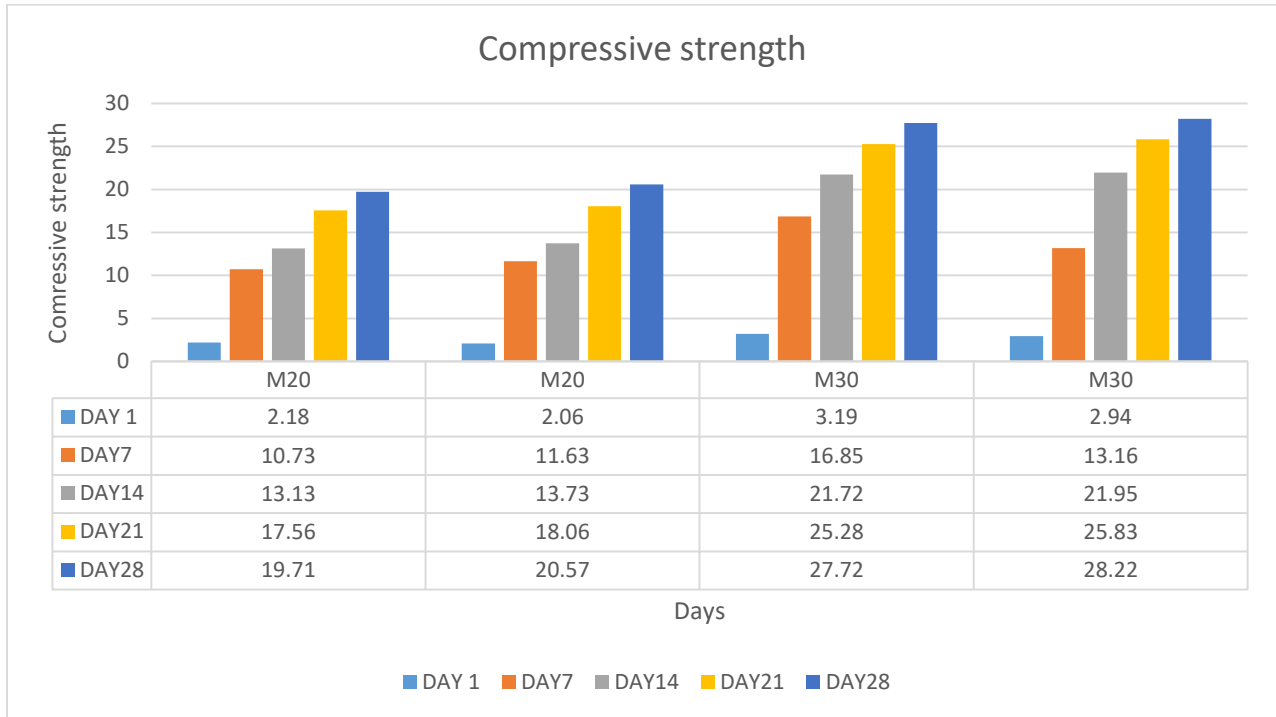
According to the standard code IS10262-2009.

The amount of nylon fiber as reinforcement admixture was calculated from the following equation,

Volume of hair =  $(\text{mass of chemical admixture} / \text{specific gravity of admixture} * 1000)$ —[eq2].

The specific gravity of fibers used for reinforcement varies from 0.86 to 6.65. The specific gravity of hair 1.84 was considered in this study by Le-Chatelier principle [6][7] the cube casted for the size  $15\text{cm}^3$ . The compression and flexure strength were tested for 1, 7,14,21,28 days after casting.

### 3. Results and Discussions



#### 4. Conclusions & Recommendations

From fig (1) it can be observed that M20 and M30 grade concrete with nylon fiber as fiber reinforcement admixture show gradual increment in withstanding compressive strength that is 20.67 and 28.22 M pa compared to normal concrete with 19.71 and 27.725 M pa respectively for 28 days. About 4.18% and 1.77% increment in the increment in compressive strength by M20 and M30 grade of concrete respectively.

Fig (2) indicates the increment of flexural strength that is 5.92 and 8.26 M pa obtain by nylon fiber concrete reinforcement compared to normal concrete obtaining 3.78 and 8.17 M pa, this clearly indicates about 2.36% and 1.09% increment in flexural strength by respective grades of concrete.

This represents that the bonding within concrete increases by using nylon fiber as admixture. Thus helps in reduction of cracks and enhances durability.

#### Acknowledgements

Special thanks for Goutham Gadgihalli, Hithesh Nagothu, Megha.R for helping me in completing this work successfully. And I also thank my parents, teachers, friends and all elders who supported me.

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