

# Experimental Study Comparison of Performance of Concrete with Waste Paper, Steel Fiber & Carbon Fibers

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**Abstract**— The necessity of providing low-cost, sustainable housing has led to greater interest in alternative construction materials. For enhancing performance of concrete admixtures are used in conventional concrete. In this terms conventional concrete means cement, Aggregate, water only. And admixtures terms as recycle or waste material like paper, carbon fibers & steel fibers. The combination of these conventional concrete with admixture produces a new construction material, which may provide a way to produce affordable housing on a large scale. Present study involves different strength aspect experiment i.e. compression, split tensile, flexural strength on a concrete. And compare between conventional concrete & additives (admixture) like waste paper, steel fibers and carbon fibers. Thus additives mass content will use are 10%, 15% and 20% by total mix proportion M20 grade of concrete. Experiment done on both fresh & hardened concrete as per IS specimen.

**Keywords:** Admixtures, Carbon Fibers, Steel Fibers & Waste Paper

## I. INTRODUCTION

Concrete is the mostly used as a construction material in the world. The reason for its mass use is that it provides good workability and can be moulded to any shape. Every structure is constructed to full fill requirement and hence to meet this purpose, modification. The necessity of providing low-cost, sustainable housing has led to greater interest in alternative construction materials. A term has been coined for a relatively new material basically made of waste paper, cement, and water. The necessity of providing low-cost, sustainable housing has led to greater interest in alternative construction materials. A term has been coined for a relatively new material basically made of waste paper, cement and water. It is called 'papercrete'. Papercrete is a slightly misleading name. It implies a mix of paper and concrete, hence paper-crete. But more accurately, only the Portland cement part of concrete is used in the mix- along with other additives to improve its behavior under compressive load, the basic components are still the same. The combination of these materials produces a way to produce affordable housing on a large scale. To use of waste paper, carbon fiber & steel fiber in convention concrete, concrete durability will be increases.

## II. OBJECTIVE OF INVESTIGATION

- To study the physical properties of concrete mixed with waste paper, steel fibers and carbon fibers by conducting durability tests.
- To study the flexural behavior of concrete mixed with waste paper, steel fibers and carbon fibers by experimental investigations conducting four point bending tests.

- To conduct split tensile strength test on of concrete mixed with waste paper, steel fibers and carbon fibers.
- To compare the flexural performance of concrete mixed with waste paper, steel fibers and carbon fibers composite beam with conventional steel reinforced concrete (SRC) beams.

## III. GUIDELINES

### A. Material

#### 1) Cement

Ordinary Portland cement 53 grade are used in this investigation.

#### 2) Fine aggregate

Locally available river sand.

#### 3) Coarse aggregate

Locally available crushed stone.

#### 4) Water

Potable water is use

#### 5) Papercrete

Papercrete gets its name from the fact that most formulas use a mixture of water and cement with cellulose fiber. The fiber is usually acquired from recycled newspaper, and phone books due to availability and low cost. Dried Papercrete has low strength, but this characteristic is only due to the large air content in the bricks which allow them to compress rather than crumble and brake.

#### 6) Steel Fibers

Also, Steel fibers are added with concrete to increase the structural properties, particularly tensile and flexural strength. The extent of improvement in the mechanical properties achieved with SFRC over those of plain concrete depends on several factors, such as shape, size, volume, percentage and distribution of fibers.



Fig. 1: Steel Fiber (a) Straight (b) End-hooked

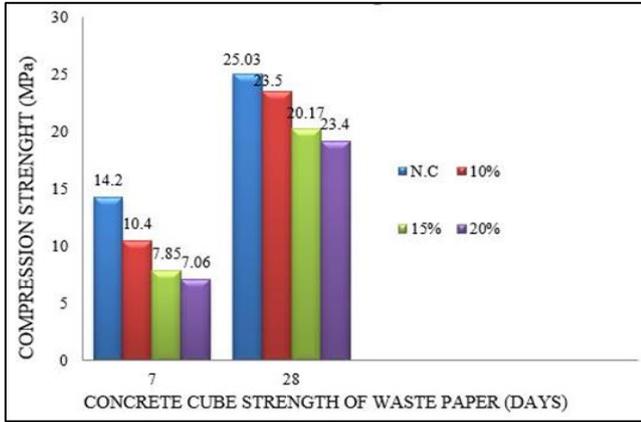
#### 7) Carbon Fiber

The effect of carbon Fiber addition on the properties of concrete increases with fiber volume fraction, unless the Fiber volume fraction is so high that the air void content becomes excessively high. (The air void content increases with fiber content and air voids tend to have a negative effect on many properties, such as the compressive strength.) In addition, the workability of the mix decreases with fiber content.

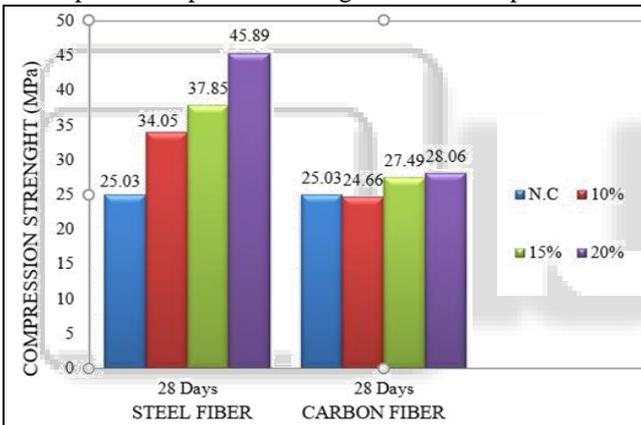
**B. Guidelines for Designing**

The cubes (150mm x 150mm), cylinders (150mm dia & 300mm deep) & flexure beams (200x150x700mm) of both conventional and fiber reinforced concrete specimens were casted. Each layer was compacted with diameter steel rod 25 blows with 16 mm diameter steel rod and fiber reinforced concrete

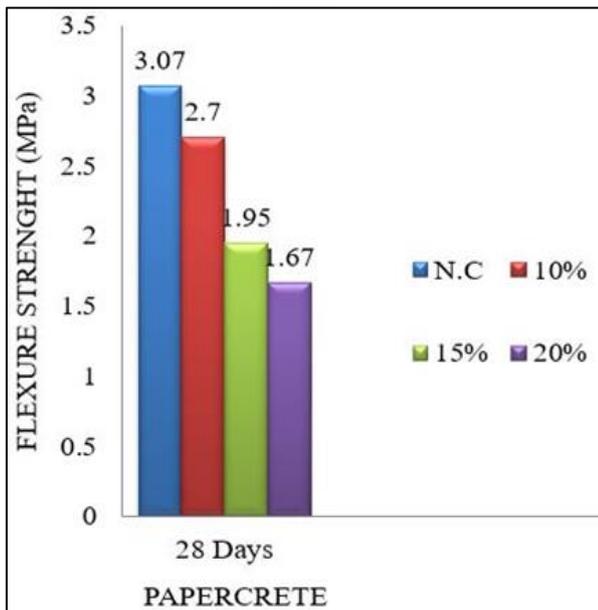
**C. Figures & Table**



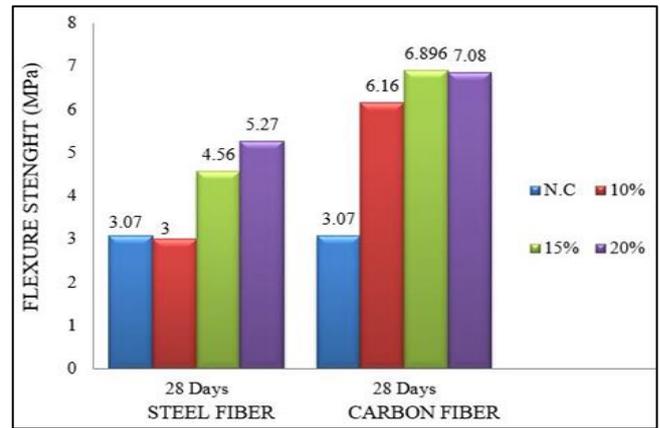
Graph 1: Compressive Strength of Waste Paper Cubes



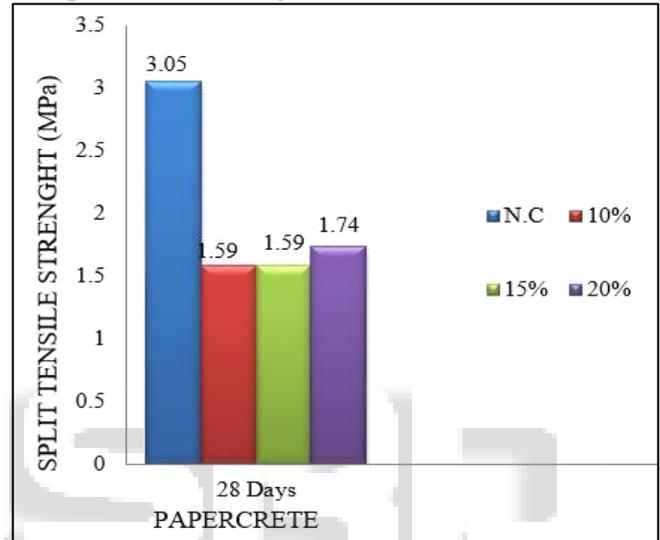
Graph 2: Compressive Strength of Steel & Carbon Fiber Cubes



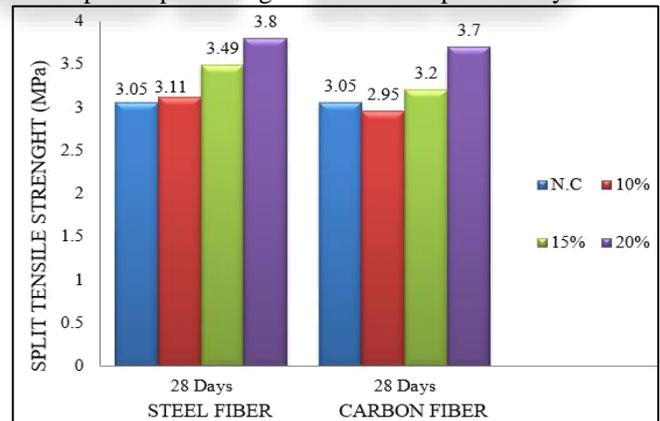
Graph 3: Flexure Strength Papercrete Beam



Graph 4: Flexure Strength of Steel & Carbon Fiber Beam



Graph 5: Split Strength Tensile of Papercrete Cylinder



Graph 6: Split Tensile Strength Steel & Carbon Cylinder

**IV. CONCLUSIONS**

- [1] The optimum mass content of papercrete was found out to be 10% by weight of cement and other mass content had been fail. In short, if paper contain increases greater than 10% then concrete failed in compression, flexure & split strength.
- [2] Papercrete result also failed as compared with another fibers as per result obtained.
- [3] The optimum mass content of steel fiber and carbon fiber was found out to be 20% by weight of cement.

- [4] Compression strength steel fiber in all mass content greater than carbon fiber.
- [5] Flexure strength of carbon fiber concrete is less than steel fiber.
- [6] In case of Split strength of carbon fiber concrete is greater than steel fiber.
- [7] But both steel & carbon fiber result are achieved greater than mix designed concrete or convention concrete.

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