# Effect Of Recycled Materials On The Properties Of Concrete For M20 Grade Of Concrete

*NRI Institute of Technology, Guntur, Andhra Pradesh* *NRI Institute of Technology, Guntur, Andhra Pradesh*

## ABSTRACT

*The concrete plays the most important role in the infrastructure development. Even though steel structures are also in existence the concrete structures plays a vital role among the two. The concrete is made up of cement, coarse aggregate, fine aggregate and water. In this paper we had studied about the properties of concrete such as water absorption and compressive strength by replacing the fine aggregate with 5 & 10% steel and5 & 10% of wood waste respectively. The water absorption and compressive strength of the concrete are the important properties of concrete which will shows the impact on dampness and durability of the structure and we also made an attempt to compare the results between normal concrete i.e., M20 grade concrete, 5 & 10% recycled steel waste and 5 & 10% recycled wood waste.*

*Keywords: wood powder,steel powder Replacement*

## 1. INTRODUCTION

Concrete is the composite material composed of aggregate bonded together with fluid cement which hardens over time. Most use term "concrete" refers to Portland cement concrete or concretes made with other hydraulic cement, such as climent fondu .However road surfaces are also a type of concrete "asphaltic concrete ", where the cement material is bitumen.

In Portland cement concrete (and other hydraulic cement concretes), when aggregate is mixed together with the dry cement and water, they form into fluid mass that is easily moulded in shape. The cement reacts chemically with the water and other ingredients to form a hard matrix which binds all the materials together into a durable stone-like material that has many uses. Often, additives (such as pozzolans or super plasticizers) are included in the mixture to improve the physical properties of the wet mix or the finished materials. Most concrete is poured with reinforcing materials (such as rebar) embedded to provide tensile strength, yielding reinforced concrete. Famous concrete structures include the Hoover Dam, the Panama Canal and the Roman pantheon. The earliest large scale users of concrete technology were the Ancient Romans, and concrete was widely used in the Roman Empire.

The Colosseum in roman was built largely of concrete, and the concrete dome of the pantheon is the world's largest unreinforced concrete done. Today, large concrete structures (for example, dams and multi-storey car parks) are made with reinforced concrete. After the Roman Empire collapsed, use of rocks became rare technology was redeveloped in the mid-century. Today concrete is the most widely used man-made material (measured by tonnage).

## 2. OBJECTIVES

The objectives of this study are as follows:

a) To investigate the best mix proportion of the partial replacement for fine aggregate in concrete cement in concrete.

b) To investigate the feasibility of the partial replacement of above material in concrete by determining the destructive and non-destructive tests.

c) Based on the test results, to suggest a most approximate level of adding steel waste and wood waste.

## 3. SCOPE OF THE STUDY

The scope of the study is to establish to achieve the objectives and this study will be mainly concentrated on experimental works. Experiments regarding compression strength and split tensile strength on the partial replacement steel waste and wood waste in concrete will be carried out in order to study the behavior of concrete. All testing methods and procedure are specified according to Indian Standards.

## 4. LITERATURE REVIEW

### Reena.k, Mallesh. M

In the present investigation a simple mix design procedure proposed by Nan Su was used by changing the Nan-Su's coefficient for calculating the cement content i.e. C=7f1c and water cement ratio to achieve M20 grade SCC. In the present work a wide range of SCC mix were developed using fly ash as a filler material along with Portland cement of 43 grade. To qualify Self-Compacting Concrete mixes Slump flow, V-funnel, L-Box, U-Box tests were conducted and the fresh properties obtained are checked against the specifications given by EFNARC guidelines. Compressive strength tests were conducted to know the strength properties of the mixes at the age of 7 and 28 days of curing. It has been observed that for Nan- Su's coefficient 11 i.e. C=11f1c the M20 grade SCC is achieved by satisfying all the requirements given by EFNARC guidelines.

### R. Kamala, B. Krishna Rao

In this industrial world, recycling construction material plays an important role to preserve natural resources. These studies seek to greener environment since it seeks to develop recycle waste material for construction. The use of recycle aggregates and solid wastes from construction and demolition waste is showing a prospective application in construction and as alternative to primary and natural aggregate. It conserves natural resources and reduces the space required for land fill disposal. In the laboratory the crushed tile aggregate has been tried as partial replacement substitute to convectional coarse aggregate in concrete making of cubes, cylinders, beams. These were cast and tested for compressive strength, split tensile and flexural

strength after a curing period of 7, 28, 56 days. The results indicate effectiveness of crushed ceramic waste as partial replacement of conventional coarse aggregate up to 40 percent, without affecting the design strength.

## Ashish Kumar parashar and Rinku parashar

Fiber Reinforced Concrete (FRC) is a composite material consisting of cement based matrix with an ordered or random distribution of fiber which can be steel, nylon, polythene etc. The addition of steel fiber increases the properties of concrete, viz., flexural strength, impact strength and shrinkage properties to name a few. A number of papers have already been published on the use of steel fibers in concrete and a considerable amount of research has been directed towards studying the various properties of concrete as well as reinforced concrete due to the addition of steel fibers. Hence, an attempt has been made in the present investigations to study the influence of addition of Lathe Machines waste material as fibers at a dosage of 5% to 30% by weight of cement. The properties studied include compressive strength. The studies were conducted on a M20 mix and tests have been carried out. The results are compared and conclusions are made.

## 5.REPLACEMENT MATERIALS

### 5.1 Wood

The hard fibrous material that forms the main substance of the trunk or branches of a tree or shrub, used for fuel or timber.

**Advantages of Using wood powder**

1. It is readily and economically available.
2. Easily machinable.
3. Amenable to fabrication into an infinite variety of sizes and shapes using simple onsite building techniques.
4. Exceptionally strong relative to its weight.
5. A good heat and electrical insulator.
6. It is a renewable and biodegradable resource

### 5.2Steel

A hard, strong grey or bluish-grey alloy of iron with carbon and usually other elements, used as a structural and fabricatingmaterial.

**Advantages of steel powder**

1. Steel is lighter than wood
2. It can built faster with steel
3. Steel is incredible versatile
4. It is environmentally friendly

### 5.3 Concrete Mix Design

Concrete Mix Design of grade M 20has been done as per of the recommended guidelines of IS: 456-2000. The weight ratio of mix proportion is **1:1.751:3.086** keeping water-cementitious ratio as 0.5.

### 5.4 Compressive test

**Table:1 Compressive strength for normal concrete for 7 days**

| S.no | Sample no | Peak load(KN) | Peak stress ($N/mm^2$) |
|---|---|---|---|
| 1 | Sample 1 | 410.8 | 17.96 |
| 2 | Sample 2 | 423.6 | 18.26 |
| 3 | Sample 3 | 402.3 | 17.42 |

**Table: 2 Compressive strength for 5% wood powder for 7 days**

| S.no | Sample no | Peak load(KN) | Peak stress ($N/mm^2$) |
|---|---|---|---|
| 1 | Sample 1 | 357.4 | 13.80 |
| 2 | Sample 2 | 316.0 | 13.50 |
| 3 | Sample 3 | 324.8 | 14.20 |

**Table: 3 Compressive strength for 5% steel powder for 7 days**

| S.No | Sample no | Peak load(KN) | Peak stress ($N/mm^2$) |
|---|---|---|---|
| 1 | Sample1 | 432.6 | 22.18 |
| 2 | Sample 2 | 408.6 | 19.23 |
| 3 | Sample3 | 441.2 | 23.02 |

**Table: 4 Compressive strength for 10% wood powder for 7 days**

| S.no | Sample no | Peak load(KN) | Peak stress ($N/mm^2$) |
|---|---|---|---|
| 1 | Sample 1 | 302.0 | 9.80 |
| 2 | Sample 2 | 292.4 | 9.20 |
| 3 | Sample 3 | 308.6 | 10.50 |

**Table: 5 Compressive strength for 10% steel powder for 7 days**

| S.no | Sample no | Peak load(KN) | Peak stress ($N/mm^2$) |
|---|---|---|---|
| 1 | Sample 1 | 428.6 | 18.32 |
| 2 | Sample 2 | 412.4 | 17.48 |
| 3 | Sample 3 | 432.1 | 17.68 |

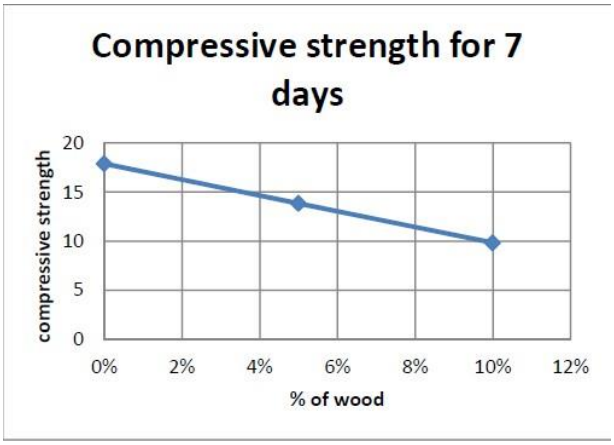
**Table : 6 Compressive strength for 5% wood powder for 28days**

| S.no | Sample no | Peak load(KN) | Peak stress ($N/mm^2$) |
|---|---|---|---|
| 1 | Sample 1 | 490.45 | 21.79 |
| 2 | Sample 2 | 435.3 | 19.34 |
| 3 | Sample 3 | 506.7 | 22.52 |

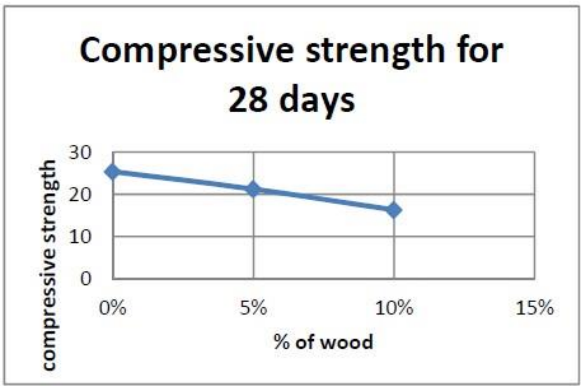
**Table :7 Compressive strength for 5% steel powder for 28days**

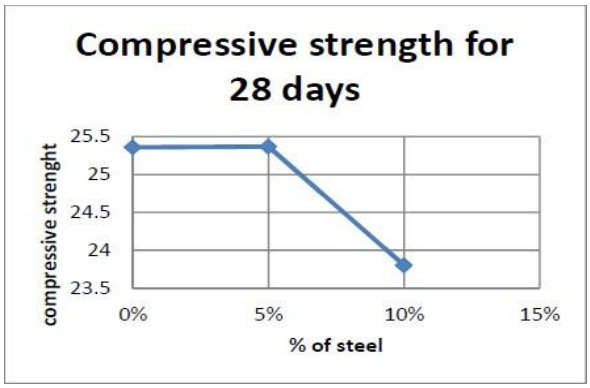
| S.no | Sample no | Peak load(KN) | Peak stress ($N/mm^2$) |
|---|---|---|---|
| 1 | Sample 1 | 452.6 | 24.98 |
| 2 | Sample 2 | 460.2 | 26.16 |
| 3 | Sample 3 | 454.6 | 24.98 |

**Graph: 1 Compressive strength test results for 7 days**

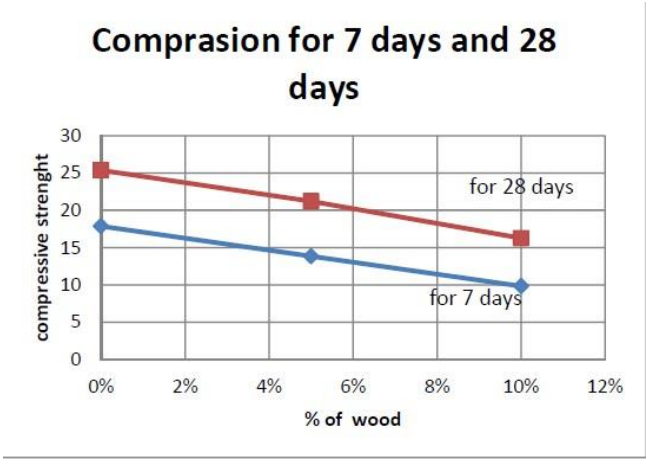


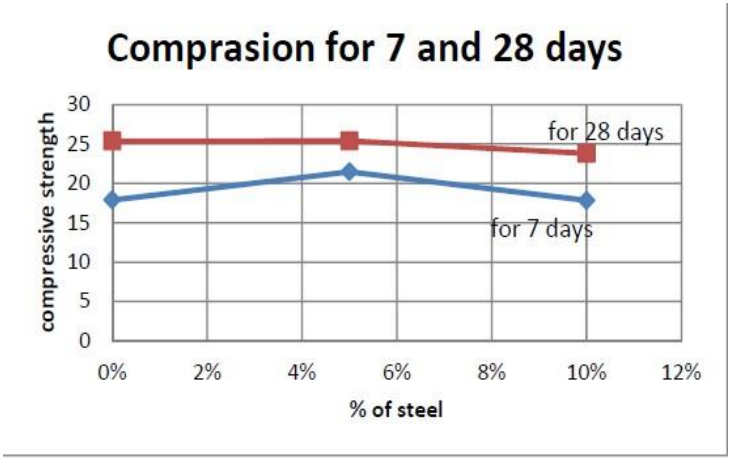

**Graph: 2 Compressive strength test results for 28 days**




**Graph: 3 Comparison of compressive strength for 7 days and 28 days**




## 6. DISCUSSIONS

1. The experimental work of our study shows that the water absorption value is less for the replaced with 10%
recycled steel waste compared with normal M20 grade concrete and the water absorption value is less for the normal M20 grade concrete compared with 5 & 10% recycled wood waste.
2. The results also shows that the compressive strength value is more for the 5% recycled steel waste when compared to normal M20 grade concrete and compressive strength is more for normal M20 grade concrete when compared with 5 & 10% recycled wood waste. The above results are finally tabulated and concluded.
3. Finally, we want to conclude that the 5% steel waste will give more strength when compared to normal concrete.

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