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# A Review Paper on Partial Replacement of Aggregate by using Plastic Waste

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**Abstract:** *There are many studies evaluating industrial by product in cement as binder and aggregate in concrete industries. In the recent decades, the efforts have been made to use industry by products such as Fly ash, silica fume, ground granulated blast furnace slag, glass cullet, etc., in civil construction. The potential application of industry by-product in concrete is as partial aggregate replacement or as partial cement replacement, depending on their chemical composition and grain size. In this study, the effects of use of such waste product on resultant properties of concrete mix are studied. This waste product is used as replacement of coarse aggregate.*

**Keywords:** Compressive strength, concrete, plastic waste, Paver Block, workability

## I. INTRODUCTION

The rapid industrialization and urbanization in the country leads lot of infrastructure development. This process leads to several problems like shortage of construction materials, increased productivity of waste and other products. This paper deals with the reuse of waste plastic as partial replacement of coarse aggregate in M20 concrete. Usually M20 concrete is used for most constructional works. Waste Plastic were immediately added in 0%, 2%, 2.5%, 3%, 3.5%, 4%, 8% , and 10% to replace the same amount of Aggregate. Tests were conducted on coarse aggregate, cement, and waste plastic to determine their physical properties. Paver blocks of size 200mm X 200mm X 60mm was casted and tested for 7, 14, and 21 days strength.The result shown that the compressive strength of M20 concrete.Paving blocks have made a fast inroad into the construction industry, and have almost become the defector choice. Most construction firms nowadays prefer paving blocks over slabs, asphalt, stone or clay. Mass production of paving blocks has reduced their price, and made it easily affordable. With the advent of paving block machines, it has become even simpler to complete their laying. Concrete blocks are mass manufactured to standard sizes. This makes them interchangeable. Typical concrete paving blocks have one smooth face and one rough, although some paving blocks so come with reversible surfaces (can be used both sides). The performance characteristics of concrete paving blocks make it suitable for the heaviest duty applications, able to support substantial loads and resist shearing and braking forces. These blocks come in different colours. The colours typically come from metallic oxides. However, these colours tend to fade over a period of time, so it is helpful to exercise caution while selecting them! Concrete paving blocks are the most preferred choice for laying of pavements driveways, etc.

### 1.1 Advantages of using plastic in concrete

- Extreme versatility and ability to be tailored to meet specific technical needs.
- Lighter weight than competing materials reducing fuel consumption during transportation.
- Durability and longevity.
- Resistance to chemicals, water and impact.
- Excellent thermal and electrical insulation properties.
- Comparatively lesser production cost.
- Far superior aesthetic appeal.

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## II. EXPERIMENTAL WORK

### 2.1 Materials

**Aggregates (Coarse and Fine Aggregates) :**

Various properties of aggregates can influence the performance of concrete; therefore various considerations have to be kept in mind while selecting the material. Aggregates used in present study, were tested for their specific gravity and other properties and results have been tabulated. ¬ Cement Ordinary Portland cement of 43 – grade was used as it satisfied the requirements of IS: 269 – 1969 and results have been tabulated ¬

**Mixing and Curing Water**

IS: 456 – 2000 (Cl. 2.20) water, used for mixing and curing of concrete. Permissible limits for solids in water are as per IS: 456 – 2009. The maximum permissible limit of chloride content in water for RCC work has been reduced from 1000mg per litre in IS: 456 – 1978 to 500mg per litre in IS: 456 – 2000. In addition to these requirements acidity and alkalinity for water has to be considered. ¬ Plastics Plastics that cannot be degraded further is been powdered into fine particles. These plastics con-sits mainly of High Density Polyethylene (HDPE). ¬

**Casting and Curing**

Usually M20 concrete is used for most constructional works, hence in this project M20 concrete is taken and waste plastics is used as Replacement of aggregate. Aggregates such as 0%, 2%, 2.5%, 3%, 3.5%, 4%, 8% and was added in percentage, in order to replace the same amount of Aggregate.

**Various test conducted in lab:**

1) Physical properties of cement

| | |
|---|---|
| Specific Gravity | 3.15 |
| Initial setting time | 38 min |
| Final setting time | 329 min |

2) Physical properties of plastic

| | |
|---|---|
| Specific Gravity | 0.95 |
| Density(gm/cc) | 0.58 |
| Melting Point | 75-100 |
| Softening Point | 110 |

3) Physical properties of aggregate

| | |
|---|---|
| Type of aggregate | Coarse |
| Specific Gravity | 2.6 |
| Water Absorption | 0.5% |
| Surface Moisture | Nil |
| Aggregate impact value | 18.57% |
| Aggregate crushing value | 17.88% |
| Los Angeles Abrastion value | 23.60% |

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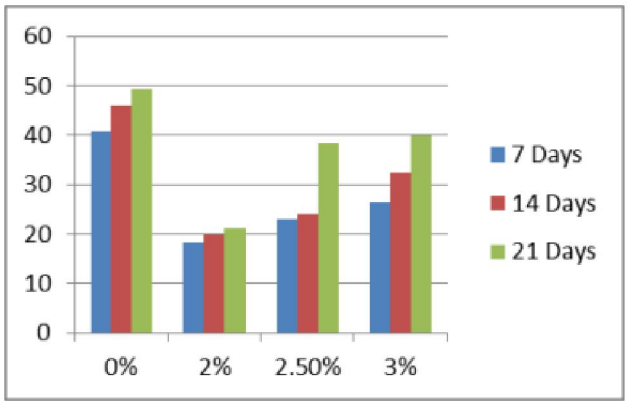
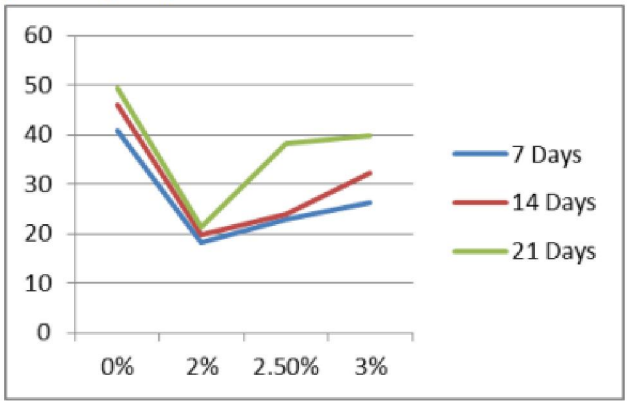
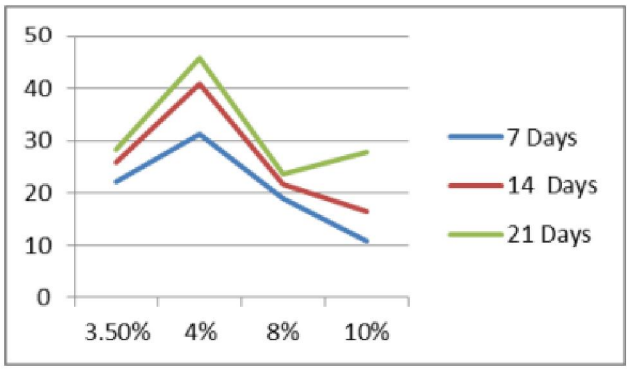
## III. GRAFICAL ANALYSIS:




Graph. 5.1 –Effect of change of different percentage of Aggregate on compressive strength of concrete with % plastic.




Graph 5.2- Comparison of compressive strength with different percentage of plastic

## IV. RESULT

Cubical specimens of size 200mm X 200mm X 60mm were cast for conducting compressive strength test for each mix. The compressive strength test was carried out as per IS: 516-1979. This test was carried at the end of 7, 14 and 21 days of curing.

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## V. CONCLUSION

The test conducted on material like Cement, Sand. Conventional aggregate having all the results within permissible limit as per IS codes. As compared to conventional concrete cubes, there is reduction in weight of concrete cubes containing plastic waste. For 15% partial replacement, there is less reduction and good strength. The compressive strength also decreases with increase in plastic contain in concrete. There is a reduction in cost of construction if plastic waste is use in some contain in place of coarse aggregate. It has been concluded that acceptable strength are 15% of plastic and 5% of fly ash in concrete is recommendable.

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