

# A Study on–Effect of Plastic Bottle Pieces as an Additive on Compressive Strength of Concrete

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**Abstract**—In the present day, the increase in population has put tremendous pressure on a city's infrastructure. This has correspondingly led to an increase in infrastructure developmental activities leading to both vertical and horizontal expansion of cities. With the increase in construction works, the demand for construction materials (i. e. cement, sand, aggregates, etc. ) has increased to a large extent. Consequently the prices of these construction materials are also increasing day by day.

It is also seen that, such rapid development, is also accompanied with a change in lifestyle of the general populace due to increasing economic benefits, job opportunities, spending power, other facilities, etc. With such developments and changes, the waste products/materials generated by a city have also increased and thus have to be managed properly. One such waste product/material is plastic. Due to their relatively low cost, ease of manufacture and imperviousness to water, plastics are used in an enormous and expanding range of products from paper clips to spaceships. However, plastic due to its non-biodegradability can have harmful effects on the environment and ecosystem.

In this experimental study, an attempt has been made to correlate plastic and concrete used in construction. Here, waste plastic bottle pieces are used as an additive in concrete and studies have been conducted to focus on the behaviour of compressive strength of cube mould under various proportions of plastic bottle pieces.

**Keywords:** Aggregates, construction material, additive, plastic

## 1. INTRODUCTION

Plastics are polymers, a very large molecule made up of smaller units called monomers which are joined together in a chain by a process called polymerization. Plastic is now a regular material that is being used on a daily basis. Plastic is everywhere either in the form of food containers, financial transactions (Debit/Credit cards, plastic money), storage, baggage, stationary items, electronic and electrical products and every foreseeable item that a human being can think of. Plastic as a product is now like a regular feature of manufacturing, consumption, and service activities. But due to improper disposal of plastic as waste product cause great harm to environment.

In this experimental study an attempt has been made to make use of waste plastic bottle as a part of construction material. The plastic used in this experimental study were "Polyethylene Terephthalate (PET). "

## 2. SCOPE AND OBJECT OF STUDY

The study is carried out mainly for the following purposes:

- To reuse Polyethylene Terephthalate (PET)
- To use PET as a additive in concrete
- To find out the effect of PET on compressive strength of concrete.

## 3. Methodology

### 3.1 Collection of materials

The details of collected samples are given below-

**Aggregate:** Collected from Basistha quarry, Guwahati, 781029. Aggregate used in this study are passing 20mm IS sieve.

**Cement:** Collected from PATAR ENTERPRISE situated in Basistha, Guwahati, 781029. Cement used in this study is STAR CEMENT.

**Sand:** Collected from PATAR ENTERPRISE situated in Basistha, Guwahati, 781029. Sand used in this study is passing through 4. 75µ IS sieve.

**Plastic:** Waste plastic bottle from BORAGAON LANDFILL, Guwahati, 781035 and ROYAL CAFETERIA, Guwahati, 781035. They were cut in square shape of 1cm x 1cm in area. The uniformity of the pieces was maintained by visual inspection as shown in Figure 1. Scissors and blade were used to cut the pieces.



Fig. 1: Plastic bottle pieces

### 3. 2 Laboratory works

The collected materials were used to prepare concrete cubes(15cm×15cm) using different quantities of plastic (The amount of plastics are taken with reference to weight of cement. ) . These moulds were then used to calculate the compressive strength of concrete as per IS:516-1959. The quantities of materials used to prepare test samples(Concrete cubes)are shown in Table 1.

Table 1: Quantities of materials

Sampl e No	Cement(k g)	Sand(k g)	Aggregat e(kg)	Plastic(kg)	Plastic( %)
1	1. 4725	2. 208	4. 417	0	0
2	1. 4725	2. 208	4. 417	0. 0441	3
3	1. 4725	2. 208	4. 417	0. 0294	2
4	1. 4725	2. 208	4. 417	0. 0147	1

### 3. LABORATORY TEST RESULTS

Table 2: Compressive strength value

Different percentage of plastic	14days strength (N/mm <sup>2</sup> )	28days strength (N/mm <sup>2</sup> )
0	19. 78	24. 80
1	18. 445	22
2	12. 885	15. 335
3	10. 22	12. 665

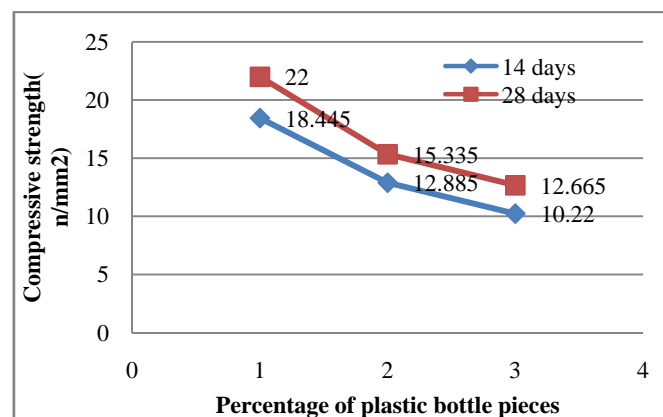


Fig. 2: Graphical representation of compressive strength

### 4. DISCUSSION AND CONCLUSION

The graph obtained from the experimental data shows a decreasing trend of compressive strength with the increasing content of plastic bottle pieces. Some of the reasons drawn for such decreasing trend of compressive strength.

Since the shape of the aggregates is an important characteristic since it affects the workability of concrete. The pieces were use as additives to concrete by maintaining square shape. May be such shape made it a poor concrete

The uniformity of pieces were maintained by visual inspection. No scientific method was used to maintain uniform shape of the pieces.

The pieces were smooth on almost all sides. The smooth surface of the pieces could not bind well with the cement hence making it a poor concrete.

Futher research work need to be done on this subject.

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