Use of Plastic Bottles And Demolished Material In Concrete

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Abstract-*The main purpose of this study is to explore the possibility of using plastic bottles and construction demolished material in concrete. Plastic bottles used for storing and selling drinking water are taken into consideration. Demolished concrete material obtained from destructing slab, column and beam are used. The reason for considering this study is due to increasing plastic pollution and inappropriate disposal of demolished material.*

Keywords-Plastic bottles, Demolished construction material, Concrete block.

I. INTRODUCTION

Due to rapid industrialization and urbanization, construction industry is increasing. There is rapid development of cities as well as villages. Increase in development leads to increase in pollution. In last 15 years, plastic pollution is increasing due to inability in disposing plastic wastes. These plastic wastes are hazardous to the environment. Also new development leads to demolition of the old structures. The leftover material is difficult to be disposed in the environment. Also increase in concrete quantity gives rise to extinction of its raw materials. Hence to overcome all the problems this research has been carried out.

Recycling of plastic is costly and hence not a sustainable solution to the increasing crises. Hence instead of recycling plastic, reusing them is a better option. Andreas Forses originated the idea of using plastic bottles in concrete in Eco-Tec 2001. PET bottles were used along with mortars between then in wall construction.

Demolished waste can be obtained from destruction old structure, bridges, and airports, concrete roadbeds etc. As natural aggregate are depleting, use of demolished material as aggregate is a better option. Recycling demolished waste helps to protect natural resources. It also helps to reduce environment pollution.

This research emphasizes in determining the strength of concrete using plastic bottles and demolished material together. This study attempts to verify this method by testing the compressive strength of the concrete for validation.

II. METHODOLOGY

2.1 Materials

Cement

Cement used for the test was Vasavadatta cement of 43 grade confirming to IS 8112-2013. Table no. 1shows the following properties of cement.

Table 1: Properties of Cement

Physical Properties	**Result**	**Requirement as per IS 8112-2013**
Soundness	1.0	10 Max
Initial Setting Time	110	Min 30 min
Final Setting Time	280	Max 600 min
Sp. gravity	3.15	3-3.5

Fine Aggregate

Natural Sand was used as fine aggregate. Table 2 shows properties of natural sand w.r.t IS 2386(Part-1).

Table 2: Properties of Natural Sand

Physical Properties	**Test Results**
Specific gravity	2.73
Water Absorption	2.42%
Moisture content	1.83%

Coarse Aggregate

Crushed granite stone obtained from local quarries were used as coarse aggregate. Minimum size of coarse aggregate was 10 mm and maximum size of coarse aggregate was 20 mm. Properties of aggregate were determined by IS 2386(Part 3) in table 3.

Table 3: Properties of 20 mm coarse aggregate

Physical Properties	**Test Results**
Specific gravity	2.88
Water Absorption	1.11 %
Moisture content	0.20%

Demolished Material

Demolished material obtained from destruction slab, column and beam is taken into consideration. Size of material is 20mm.

Plastic bottles

Plastic bottles used by companies for storing and selling drinking water are used. Its diameter ranges from 65mm to 70 mm. height of bottle taken into consideration ranges from 85mm to 90mm.

2.2 Experimental Procedure

150 mm * 150 mm * 150 mm specimen size concrete blocks were made. Total 12 blocks of concrete were made. Mix proportion of M25 was taken as per IS 456 and IS 10262-2009. Water cement ration taken into consideration as per IS code 456. Plastic bottles were filled with concrete using demolished material with M25 mix design. These bottles were later place at the center of the cube and then the cube was filled with M25.

Fig 1. Length of Plastic Bottle.

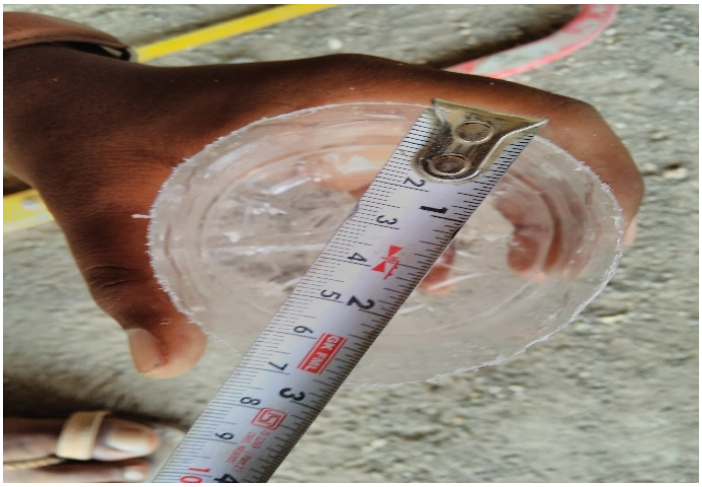

Fig 2. Diameter of Plastic bottle.

Fig 3. Filling of empty Plastic Bottles with mortar using Demolished Material as coarse aggregate.

Fig 4. Placing of Plastic Bottle filled with Demolished Material into M25 Cube.

III. RESULT

Table no. 4: Compressive Strength of M25 Concrete with Plastic Bottles and Demolished Material

SR. NO	DESCRIPTION	CUBE 1	CUBE 2	CUBE 3	MEAN
1	7 Days	20.00	18.22	19.55	19.25
2	14 Days	21.64	20.67	21.22	21.17
3	21 Days	23	24.55	24.67	24.07
4	28 Days	25.33	26.22	27.11	26.22

Table no. 5: Compressive Strength of M25 Concrete without Plastic Bottles and Demolished Material

SR. NO	DESCRIPTION	CUBE 1	CUBE 2	CUBE 3	MEAN
1	7 Days	22.22	20.44	23.14	21.92
2	14 Days	23.98	24.86	24.22	24.35
3	21 Days	27.21	24.54	26.97	26.24
4	28 Days	28.44	26.67	27.55	27.55

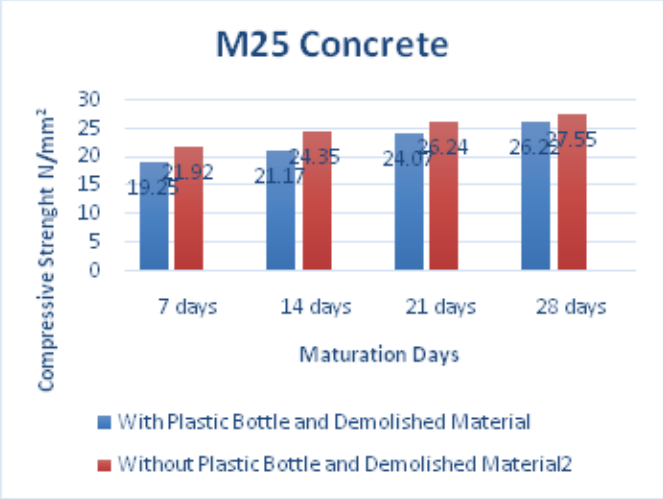

Fig. 5: Comparison of M25 Concrete

IV. CONCLUSION

- Using Plastic bottle and Demolished Material in Concrete M25, it was found that the compressive strength decreases by 5%.
- The experiment helps in saving raw material but fails to attain the required strength.
- As 7 more days are required for curing of specimen the time required for the completion of cycle is more.
- As material is being save, the product is a cost effective.

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