

# Use of Melted Plastic in Concrete

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**Abstract**—Solid plastic waste is increases day by day. It is major threat to the environment. Also causes the bad effect on human health. 73 %industries are related to the plastic which is biodegradable. Plastic polythene bags polythene bottles are most commonly used in large quantity. As other for concreting aggregates are not properly available so the solid waste plastic is used as replacement of sand i.e., fine and coarse aggregates. To determining the efficiency of plastic over aggregates various test are conducted in laboratory at room temperature such as slump test, flexural test, toughness index, compressive strength. For test cubes are casted and after 3 days, 7 day, 14 day, 28 day test is taken and average result is calculated. The plastic use in concrete gives the better replacement of plastic over aggregates and major problem of solid waste plastic can be solve easily.

**Index Terms**—melted plastic, concrete

## I. INTRODUCTION

Solid waste plastic is growing up day by day in all over world due to rapid in industrialization and urbanization. Due to less manpower very small amount of plastic waste is recycled and remaining waste hazards to environment. Nearby 500 million bags are used per year. Due to plastic waste causes the bad effect on marine biodiversity. Plastic waste takes the 900 to 1000 years to degrade properly. Animals such as cow, pig are eating food which cover in plastic. This plastic damages the respiratory system and other. Badly effect on cows I.e milk quantity and quality is decreases. The reuse of plastic waste is essential to save natural resources. Government agencies and different non-government organization are work for controlling to reduce the plastic waste and reuse and recycle i.e. disposing of plastic waste. The manufacturing of plastic mix concrete polyethylene terephthalate, plastic bags, bottles are used to increase strength, durability of concrete.

## II. RESEARCH SIGNIFICANCE

Now a days the natural resources decreasing. Aggregate used for making concrete are not properly available. The melted plastic waste is major problem so plastic is best replacement over an aggregate. In this plastic is heated at high temperature (110° to 120°C) and cooled then used in manufacture of concrete to achieve better strength. Use of plastic waste over aggregates the problem regarding to waste plastic is easily solve up to certain level.

## A. Materials

### 1) Cement

Cement used for making concrete is 53 grade as per IS 12269-

TABLE I  
CHEMICAL COMPOSITION OF CEMENT

1	Lime	CaO	60-67%
2	Silica	SiO <sub>2</sub>	17-25%
3	Iron oxide or ferrous oxide	Fe <sub>2</sub> O <sub>3</sub>	0.5-0.6%
4	Alumina	Al <sub>2</sub> O <sub>3</sub>	3-8%
5	Gypsum or calcium sulphate	CaSO <sub>4</sub>	3-4%
6	Sulphur trioxide	SO <sub>3</sub>	1-3%
7	Alkalies such as soda and potash	Na <sub>2</sub> O, K <sub>2</sub> O	0.1-1%
8	Magnesium oxide	MgO	0.1-4%

TABLE II  
PROPERTIES OF CEMENT

S. No.	Physical properties	Test result	Requirement as per IS12269-1987
1	Standard consistency	27.4	—
2	initial setting time	30 min	30 min max.
3	Final setting time	305 min	600 min max.
4	Compressive strength	3 days-32.3 7 days-44.6 28 days-55.9	—
5	Soundness test	10 mm	—
6	Fineness modulus	2246 sq\cm\gm	2250 sq\cm\gm

1981.

Various test are carried out on 53 grade cement as shown in Table-2.

### 2) Aggregate

The material which is used for making mortar or cement is called as aggregate. It can reduce the shrinkage and economy. It occupy 70 % to 80% of volume of concrete.

- *Fine aggregate*

The aggregate pass through 4.75 mm IS sieve and retain on 75 micron IS sieve is called as fine aggregate. River sand is used in manufacture of concrete.

- *Coarse aggregate*

The aggregate passing through 75mm is sieve and retain on 4.75 mm IS sieve is called as coarse aggregate.

To know the properties of aggregate fineness modulus test is

conducted.

- *Plastic*

Waste plastic bags and bottles are used for manufacturing of concrete.

- *Water*

For making concrete and curing the water is used is free from carbonate and bicarbonate of sodium and potassium and other impurities. Suitability of concrete is checked by its 3,7,28 days strength comparing with cubes are made from distilled water. If compressive strength up to 90% then source of water is accepted.

- *Concrete mixes*

Concrete mixes are basically prepared according to M20 grade with sufficient water.



Fig. 1. Waste plastic bottles

**B. Test on Concrete**

**1) Compressive strength**

Compressive strength of cement indicates the compressive strength of the cemetery mortar cubes in 1:3 proportion. For this test 3 cubes are casted in mold having size 7.07×7.07×7.07 cm. Concrete filled mold in atmosphere at least 90% humidity for 24 hours in humidity chamber at 27°C+ 2°C. After 24 hours mold are open and submerge in clean fresh water. After 3,7,28 days from manufacture of cubed the test is carried out on compression testing machine. The compression load is applied 35N/sq mm/min.

TABLE III  
 COMPRESSIVE STRENGTH

Per. Of plastic	0.00	0.70	1.40	2.10	2.80
3 days	2.1	2.27	2.57	3.2	3.7
7days	2.5	2.6	3.67	4.7	4.1
28 days	3.06	3.7	4.1	4.9	4.35



Fig. 2. Compressive strength

**2) Compressive strength**

The concrete is strong in tension but weak in tension so it is important to calculate the tensile strength of concrete. It is carried out in 15 cm diameter and 30 cm height cylinder and 3,7,28. Days test carried out and result is take.

**3) Slump cone test**

To determine the workability of concrete slump cone test is carried out as per IS 1199-1956.

**III. RESULTS**

**A. Compressive Strength**

After addition of melted plastic aggregate in concrete up to certain level the plastic gives the average strength compare to the sand and other aggregate. But after certain level compressive strength of concrete starts to decrease. The test results are presented in Table-3.

**B. Tensile Strength**

After 3, 7 and 28 days the tensile strength test is carried out. It observed that the tensile strength of concrete is tend to increases.

**IV. CONCLUSION**

1. The compressive strength is decreases when plastic is added in concrete more than 2.1%. After 2.1 % concrete losses its strength. When plastic fiber is used in concrete plastic losses its strength when plastic is more than 1%.i.e melted plastic better than fibrous plastic.
2. In case of tensile strength, it is increases by adding of melted plastic. So plastic useful in increasing tensile strength of concrete.
3. After at all, it is see that the plastic is best replacement over aggregates. The disposal of plastic can be done more efficiently.
4. It observed that it requires less curing.
5. Low permeability of water and other solutions.
6. It is better in chemical resistance.

**REFERENCES**

[1] Shetty, Concrete technology (Theory and plastic).  
 [2] Hemant Sood, Laboratory manual on concrete technology.  
 [3] Y. Ohama, M. Kawakami and K. Fukuzawa, "Polymers in Concrete," 1<sup>st</sup> edition, 1997, E & FN Spon.