

# Improving Coarse Aggregate with Plastic Fibers in Concrete Cube

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## ABSTRACT

Plastic bags which are commonly used for packing, carrying vegetables, meat etc creates a serious environmental problem. Plastic bag last in environment up to 1000 years because of plastic bag last so long the number of plastic bag accumulated increases each year. Disposal of large quantity of plastic bag may cause pollution of land, water bodies and air. The proposed concrete which is made up by adding plastic in concrete may help to reuse the plastic bag as one of the constituent's material of concrete, to improve the certain properties of concrete. The properties of concrete containing varying percentages of plastic were tested for compressive strength and Split tensile strength and shows that an appreciable improvement in tensile strength of concrete can be achieved by introducing cut pieces of plastic bags.

**Keywords**—Compressive Strength Split Tensile Strength, Plastic Bag, And Environmental Problems

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## I. INTRODUCTION

Generation of plastic waste is one of the fastest growing areas. Every year more than 500 billion plastic bags are used (nearly one million bag per minute). Hundreds of thousands of sea turtles, whales and other marine mammals die every year from eating discarded plastic bag for mistaken food. On land many animals suffer from similar fate to marine life. Collection, hauling and disposal of plastic bag waste creates an additional environmental impact. In a landfill or in environment, Plastic bags take up to 1000 year to degrade. Many researches were conducted to use industry by products such as fly ash, silica of concrete. R.Lakshmi and S. Nagan suggested

the use of E- Plastic particles along with fly ash to improve the properties of concrete. Dr. M. Shivraja used the coir fibers as concrete composites for disaster prone structures. Flume, glass cullet, coir fibers, e-plastic waste in concrete to improve the properties

## II. RESEARCH SIGNIFICANCE

Plastic bags which are used for carrying goods become a waste after use and create environmental problems. Large amount of plastic waste produced every year. Recycle and reused of plastic require vast manpower and processing cost thus the very small amount of plastic recycled and reused and rest going into landfills, incinerators and dumps. Here author

suggested the use of these plastic bags pieces in a concrete as a plastic fiber to improve the properties of concrete. Use of plastic has a dual advantage cost of material is low also it solve the problem of disposal of plastic up to some extent.

### III. MATERIALS

#### 1. Cement

**Table 1.1: Properties of Cement**

Physical Properties	Test Results	Requirement as per IS 8112-1989
Standard Consistency	28.7 %	-
Initial Setting Time	43 Min.	Minimum 30 Min.
Final Setting Time	240 Min.	Maximum 600 Min.
Specific gravity	3.21	-
Compressive strength in N/mm <sup>2</sup> after 3 days	30.5	
Compressive strength in N/mm <sup>2</sup> after 7 days	37.5	
Compressive strength in N/mm <sup>2</sup> after 28 days	47	

Cement used for the test was ordinary Portland cement of 43 grade confirming to IS 8112- 1989. Various test were carried out, result of which shown in Table.1.0

##### a) Fine Aggregate

Natural river sand was used as fine aggregate. The properties of sand were determined by conducting tests as per IS 2386 (Part- I). The results are shown in Table.1.2

##### b) Coarse aggregate

Crushed granite stones obtained from local quarries were used as a coarse aggregate. The maximum size of coarse aggregate used was 20 mm. The properties of aggregate were determined by conducting test as per IS: 2386 (Part – III). The results are tabulated in Table.1.3

**Table 1.2: Properties of Fine Aggregate**

Physical Properties	Test Results
Specific gravity	2.65
Fineness Modulus	2.8
Water Absorption	0.65%
Bulk Density (N/m <sup>3</sup> )	
Free Moisture Content	0.2%

**Table 1.3: Properties of Coarse Aggregate**

Physical Properties	Test Results
Specific gravity	2.6
Fineness Modulus	2.98
Water Absorption	0.5 %
Bulk Density (N/m <sup>3</sup> )	
Free Moisture Content %	0.1 %
Aggregate Impact Value %	12
Aggregate Crushing Value %	23

##### c) Water

Portable water free from impurities and salt used for casting and curing the concrete blocks as per IS – 456-2000.

##### d) Plastic

Pieces Polyethylene bag shown in fig.1.1, which are commonly used for the packaging and carrying goods are used in concrete



**Fig. 1.1: Polyethylene bags**

##### e) Concrete Mixes

Control mix concrete and modified concrete with varying percentages of pieces of waste plastic bags were represented in Table. All the mixes prepared are according to M 20 grade of concrete with w/c ratio 0.4



**Fig.1.2:Concreteblockswithplasticpieces**

**f) Compressive Strength Test**

Compressive strength test were carried out on 150mm X 150 mm X 150 mm specimen for that three cube were prepared for each mix. Strength of each cube were evaluated after 3,7 and 28 days respectively. Test was carried out as per IS 14858:2000. Result of compressive strength test was presented in Table.1.4

TABLE 1.4 COMPRESSIVE STRENGTH TEST RESULT N/mm <sup>2</sup>						
Mix Description						
Percentage of Plastic	0.00%	0.20%	0.40%	0.60%	0.80%	1.00%
7 Days	16.25	14.28	12.9	11.26	9.25	8.2
14 Days	20.3	18.34	17.58	15.23	13.26	12.65
28 Days	25.92	23.2	22.1	20.26	19.85	20.2

**g) Split Tensile Strength**

Tensile strength is one of the basic and important properties of concrete. Concrete is very good in compression but weak in tension and this is one of the drawbacks of concrete. Split tensile strength test were carried out on a cylindrical specimen 150 mm in diameter and 300 mm long. Specimen shall be tested after 3, 7, and 28 days respectively. Result of split tensile test was presented in Table.1.5

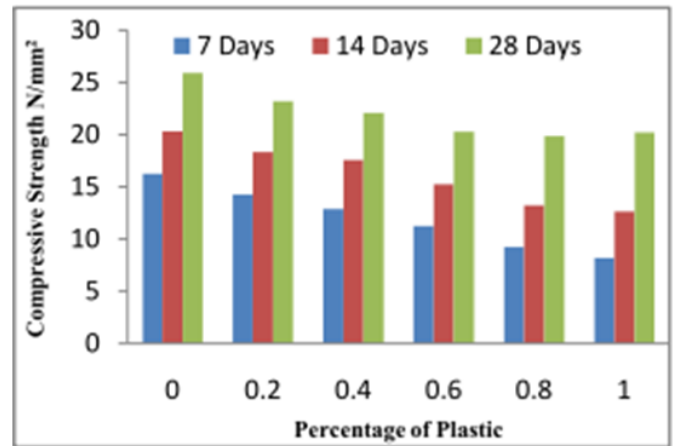
TABLE 1.5 SPLIT TENSILE STRENGTH TEST RESULT N/mm <sup>2</sup>						
Mix Description						
Percentage of Plastic	0.00%	0.20%	0.40%	0.60%	0.80%	1.00%
7 Days	1.54	1.85	2.35	2.83	3.12	3.85
14 Days	1.82	1.96	2.63	2.98	1.8	3.12
28 Days	4.12	4.38	4.92	5.16	5.57	5.12

**a) Compressive Strength**

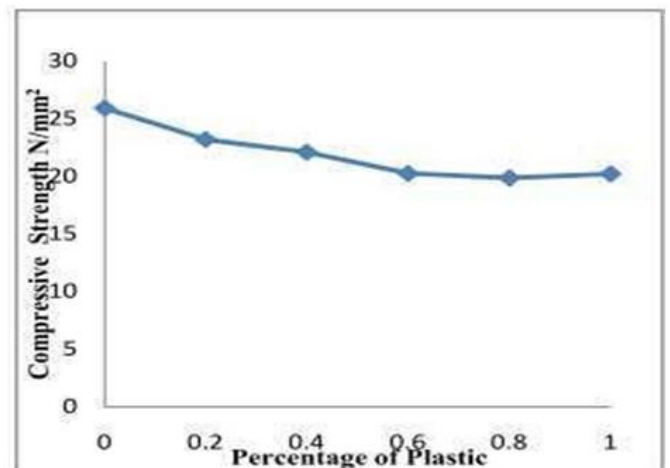
The 3 days, 7 days and 28 days compressive strength result were represented in Table.1.4. As shown in fig 1.3 & fig 1.4 the compressive strength of concrete goes on reducing with increase in percentage of plastic pieces but the rate of reducing compressive strength is very low. This reduction in strength may be due to reduction in bonding due to introduction of plastic pieces.

**b) Tensile Strength**

Result of Split tensile strength after 3 days, 7 days, and 28 days were represented in Table.1.5. Improvement in splitting tensile strength after addition of plastic piece in concrete was observed which is shown in graph



**Fig.1.3:Variationofcompressivestrength**



**Fig.1.4: Variation of 28 days compressive strength with various percentage of plastic**

**IV. RESULT AND DISCUSSION**

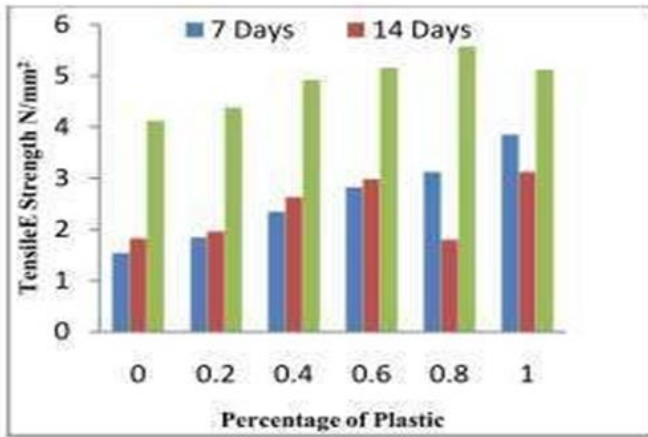


Fig.1.5:Variationoftensilestrength

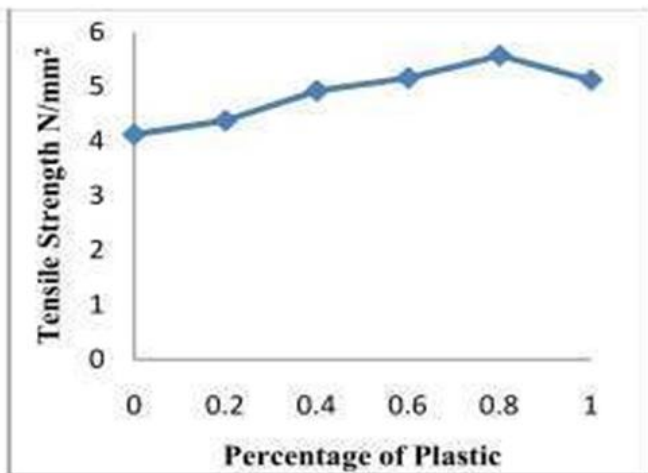


Fig.1.6: Variation of 28 days tensile strength with various percentage of plastic

## V. CONCLUSION

Based on the Experimental result following points are summarized with regard to effect of plastic on the properties of concrete

- Compressive strength of concrete is affected by addition of plastic pieces and it goes on decreasing as the percentage of plastic increases. Addition of 1% of plastic in concrete causes about 20% reduction in strength after 28 days curing.
- The splitting tensile strength observations show the improvement of tensile strength of concrete. Up to 0.8% of plastic improvement of strength recorded after that addition of strength of concrete decreases with addition of plastic.
- Thus it is concluded that the use of plastic can be

possible to increase the tensile strength of concrete

- From the above discussion it is identified that the use of plastic can be possible to improve the properties of concrete which can act as one of the plastic disposal method.

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