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Evaluation of Strength Properties of Fresh and Hardened Concrete Containing Waste Plastic

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Abstract: ***Now a day the disposal plastic is being manufactured in huge amount.*** ***According to (Ministry of Environment and Forests) is stated that 15, 000 tons of plastic waste is generated every day, out of which 9, 000 tons is collected and processed, but 6, 000 tons of plastic waste is not being collected*** ***and many research are going on to find out the its alternative solution because it's have low biodegradability and it is very big issue to the sustainability of the environment and the plastic if burnt it is emitted the toxic gases and the plastic if decomposing it is decreases the fertility of the land and construction industry are best solution of using waste plastic and it is use in Different percentage (i.e. 0%, 1.5% ,2.5% and 3.5%) by the weight of cement and also workability of concrete. The studies is conduct on concrete M20 tests have been carried out as per the recommendation procedure of relevant codes the result are show on 3days, 7days and 28 days compressive strength and Flexural Strength. The sample with added waste plastic of 1.5% shows better results after 28 days in comparison.***
Keywords: compressive strength, Flexural Strength, waste plastic:

I. INTRODUCTION

Disposal of plastic waste in an environment is considered to be a big problem due to its very low biodiversity and the presence in large quantity, generation of waste plastic is one of the fastest growing area every year more than 500 billion plastic bags are used. Hundreds of thousands of sea turtles, wheals 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 disposal of plastic bag waste creates an addition environment impact. In a landfill or in environment, plastic bag takes up to 1000 year to degrade. Disposal of waste plastic consumer bags from the domestic waste has become a major problem to agencies in the town and cities. (According to survey of central pollution control board) 18 march 2016. Plastic are used due to their characteristics like versatility, lightness, hardness, chemical resistance, etc.In that respect is a major possibility of utilizing the waste plastic in the construction industry, by mixing plastic waste in concrete batch.And we can consume large quantities of waste plastic by mixing in concrete mass.[1]BabooRaiET.Al (2012) - stated that use of virgin waste plastic mix in concrete with and without super plasticizerisincreasingthe compressive strength by 5% after addition of super plasticizer and the Flexural strength decreases with increase in percentage of waste plastic and effect of super plasticizer is irrelevant on flexural strength. [2] MalekBatayneh et al. (2006)-Stated that the use of Selected wastematerial in concrete mixes. The main finding of this research work is that the waste materialcould be reused as partial substitutes for sand or coarse aggregate in concrete mixers. [3] M. muzafarAhmed et al' (2013)-stated that the recycled plastic is partial replacement of C.A.The compressive as well as tensile strength are reduced and thermal strength also recorded with the addition of plastic.[4] Kali Ramuje (2013) -stated that when polypropylene fiber is added with different percentage of waste plastic fiber is used in FRC the optimum solution is established when 1.5% of polypropylene fiber is added in concrete.

II. MATERIALS

The materials used are given below.

A. Cement

Portland Pozzolana Cement (Ultratech) Fly ash based conforming to (IS: 1489-1991). The physical properties of cement were obtained by conducting appropriate tests.
Specific gravity is 2.9
Fineness-2% retaining on a 90 micron sieve

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B. Coarse Aggregate

Locally available 20mm and 10mm size crushed granite with specific gravity is 2.87 and water absorption 0.13%.

C. Fine Aggregate

River sand was used and found to be Zone I with its specific gravity 2.66 and water absorption 1.

D. Water

Water used was clean drinking fresh water can be used for concrete mixing.

E. Waste Plastic

Disposal cup used as the waste plastic

Picture- waste plastic

III. EXPERIMENT AND RESULT

Table No. 1 Mix Proportion

Material by weight (KG)				
Mix Waste Plastic%	Cement	FA	Waste Plastic	w/c Ratio
0	394.30	755.44	0	0.40
1.5	394.30	755.44	5.91	0.40
2.5	394.30	755.44	9.85	0.40
3.5	394.30	755.44	13.80	0.40

A. Workability Test Result of Concrete

The slump value determines the workability of concrete. Each sample of concrete was tested for workability. Waste Plastic was added as per IS: 1999 -1959. The test should be performed in 2-5 min after mixing of concrete and the slump value should be held between 100 to 120 mm. Workability also tested at each mix proportion. The slump was considered in mm and the sample result was noted.

Table No.3.1 shows the workability test result of concrete.

% of Waste Plastic	Slump Value
0	85
1.5	82
2.5	77
3.5	72

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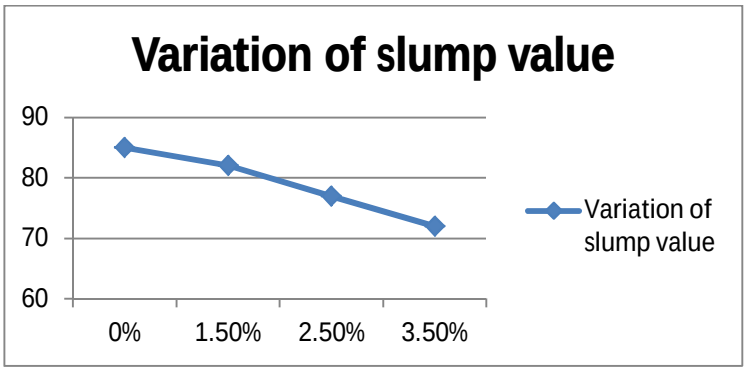
Graph No.1 Graphical Representation of Workability



B. Compressive Strength of Concrete Cube

The compressive strength was determined to find out the behavior of waste plastic in compression. Preparation of the specimen and testing were done as per IS: 516-1959. The specimens of size 150×150×150 mm were caste with the required mix proportion and were cured for 28 days Compressive testing machine of loading rate 10 KN/Sec was used for the test. The loading was continued gradually and maximum load applied on the specimen was noted figure 3.2 shows the compressive strength of waste plastic. Compressive strength was obtained by dividing the maximum load by the area of cross- section of the specimen.

Compressive strength =F/A N/mm^2

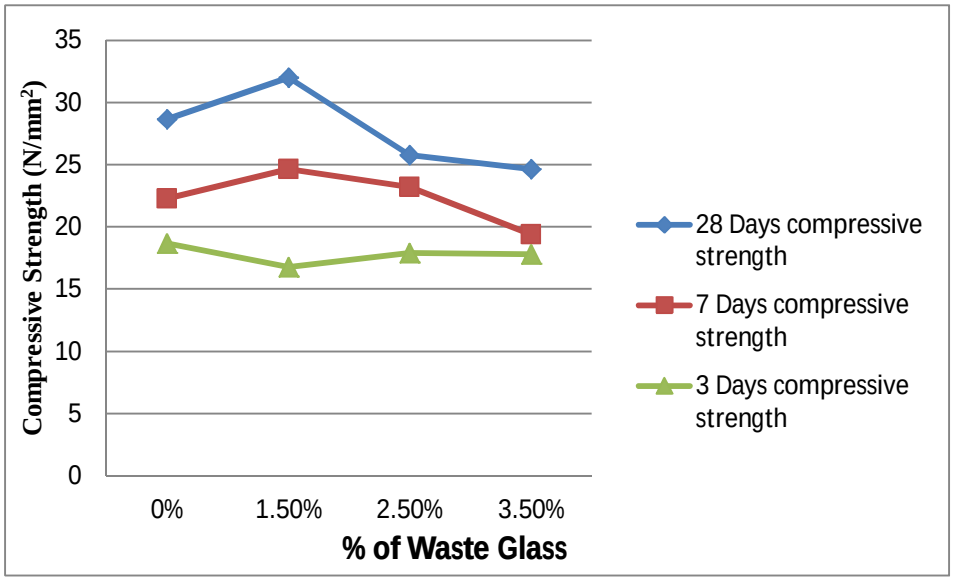
Where- F= Failure load in Newton

A= Area of cross – section of specimen in mm^2

WP%	3 Days Compressive Strength	7 Days Compressive Strength	28 Days Compressive Strength
0	18.70	22.30	28.65
1.5	16.80	24.65	32.00
2.5	17.90	23.20	25.80
3.5	17.82	19.40	24.65

Table 3.2: Compressive strength test results in N/mm^2

Graph No.2 Graphical Representation of Compressive strength



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C. Flexural Strength

The flexure strength is obtained for the beams. The beams were placed in CTM, bat the arrangement for that is different. Additional setups were installed in the CTM. It includes four points load setup, two at bottom side and two at upper side. The rate of loading was o.1KN/Sec.

The flexure strength for the beam can be determine by using formula:

$\sigma_{c} = 3PL/4bd^2$ { if cracks occurs at the middle, third span of the beam.}

$\sigma_{c=} 3Pa/4bd^2$ {if the cracks occurs at the outer third span of the beam}

Where,

P= load in KN

L=length of beam

B=width of beam

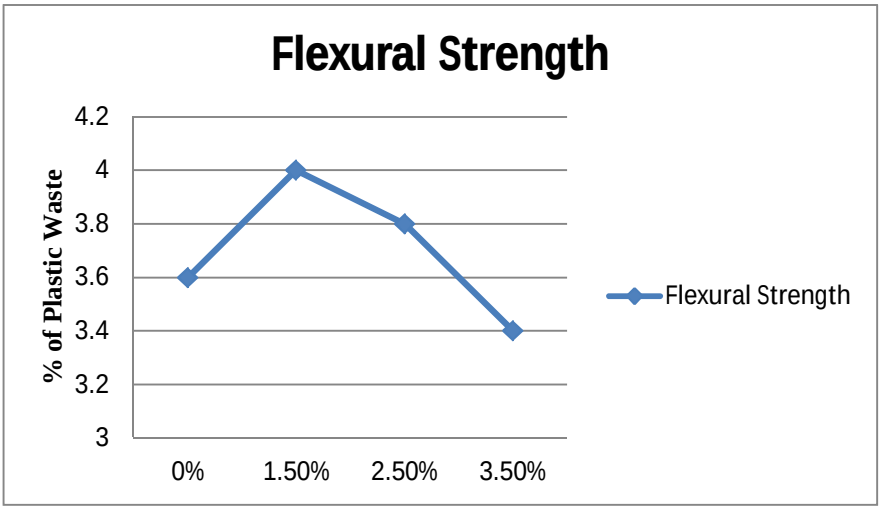
D=depth of beam

a = distance between cracks and the nearest support.

Flexural Strength Test Results

% of Plastic Waste	Strength (N/mm^2)
0	3.6
1.5	4
2.5	3.8
3.5	3.4

Graph No. 3 Graphical Representation of Flexural Strength Test



IV. CONCLUSIONS

Plastic Waste was added to concrete by proportion of 0%, 1.5%, 2.5% and 3.5%. On the basis of the results from the present study, following conclusions were drawn.

A. The material used in the experiments is good and workable

B. Compressive Strength of concrete reduced as the percentage of plastic waste increased.

C. Flexural Strength shows similar results to that of compressive strength.

D. The workability of concrete change significantly with the increase in the plastic waste content.

E. 3 days compressive strength at 2.5% and 3.5% plastic waste were higher than 1.5% of plastic waste

F. The maximum compressive strength and flexural strength was found in 1.5% of plastic waste concrete after the 7 days and 28 days of curing.

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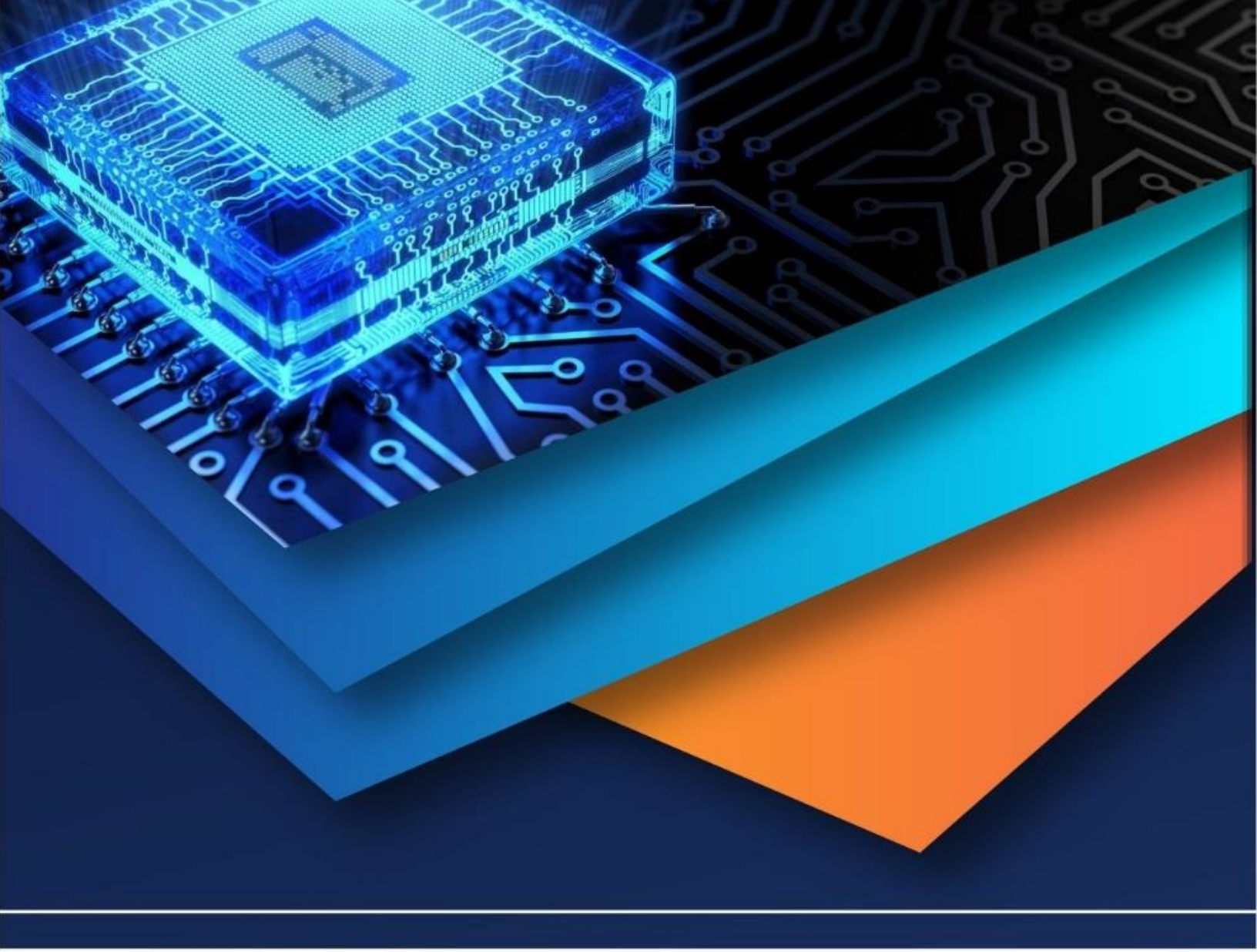

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