Experimental Research on the Combined Effect of Bagasse and Steel Slag for the Mechanical and Durability Possessions of Concrete

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Abstract*: Concrete was the first material to be used as the construction material. Concrete has good strength in compression but its tensile strength is less as compared to compressive strength Concrete has fine cracks and pours .Carbon is the only mineral that influence the strength of steel maximum .Carbon increase strength and brittleness in a material which is present in steel as well as bagasse. Sand is natural resources and the rate of sand increases day by day due to high demand .On the other hand wastes of steel industries like steel slag is harmful for environment. Steel slag has been studied to put on various kind of construction like buildings and pavement .It was observed that the 10-15% replacement of cement by bagasse is optimum range which gives the high compressive strength and replacement of F.A within range of 30-40% with steel slag gives high value of compressive strength. The aim of research was to discuss the fresh and hardened properties of both material together repacing the cement with percentage of 5%,10%,15% and 20% and fine aggregate was replace with steel slag with 10%,20%,30% and 40%. Behave substitution of some cement by bagasse and fine aggregate by steel slag decreases the cost of material.

***Index Terms*: Steel slag, bagasse ash, compressive strength, split tensile strength and flexural strength.**

I. INTRODUCTION

Growing countries as India, solid waste management is presently most important estate n vision of environmental feature .In India ,solid wastes are generated about 960 million per annum .India is the second largest country in the production of sugar. Sugarcane bagasse is a by-product from sugar making process and it is used in construction material. Each 1000kg of crushed sugarcane will produce 270kg of wet bagasse .Sugarcane bagasse contains cellulose ,hemicelluloses and lignin of 50%, 25% and 25% Approx. 26% bagasse are produced by sugarcane having 50%moisture content and 0.62%of residual ash. O-SCBA sample was collected at the Morinda co-perative sugar mills ltd .Morinda, Punjab. Which produce sugar. The temperature used in boiler to burn the sugarcane from 300 degree to 600 degree Celsius. Specific gravity of baggase is very less as compared to cement and the specific surface area is more.

Class of steel slag collection is too chief, appropriate class of slag aggregate enhance the compressive strength of concrete in a better way. The mass of steel slag is yet high .Corrosion is possible only when air and water are available .volume of fe2o3 is much higher than the volume of feO but this does not happen in case of stainless steel which contain chromium.

Table 1: Chemical composition of Steel Slag

Constituent	Composition (%)
CaO	40 - 52
SiO_2	10 - 19
FeO	10 - 40 (70 - 80% FeO, 20 - 30% Fe2O3)
MnO	5 - 8
MgO	5 - 10
Al_2O_3	1 - 3
P_2O_5	0.5 - 1
S	< 0.1
Metallic Fe	0.5 - 10

II. MATERIAL

2.1. AGGREGATE

Strength of aggregate is determined by aggregate crushing value test which is performed on the particles passing through 12.5mm sieve and retained over 10mm sieve. Strength is the inherent property of material and does not depend upon the method of testing. Angular aggregate leads to the formation of strong mix as it offers better inter particles locking and higher bond strength.

2.2.CEMENT

OPC Grade 43 is used throughout the work. OPC contains lime (62-67%), silica(17-25%), alumina(3-8%), calcium sulphate (3-4%), iron oxide(3-4%), magnesia (1-3%), sulphur(1-3%), alkalies (0.2-1%).

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Table 2: Substantial Properties of OPC 43 grade cement

S.NO.	Particular	Values Opted	IS:8112-2013
1	Specific gravity	3.12	3.10-3.15
2	Primary setting time	33 min	30 min
3	End setting time	182 min	600 min
4	Consistency	32%	30-35%

Table 3

Mix	Steel Slag (%age)	Bagasse (%age)	Water Cement Ratio
C	0	0	0.40
M1	10	5	0.40
M2	20	10	0.40
M3	30	15	0.40
M4	40	20	0.40

III. EXPERIMENTAL WORK

3.1 Slump Test

This method is commonly used to find the workability of concrete in field and in laboratory due to its facility of its production .The slump value found of concrete mix is 12.When the mould is completely filled, it is lifted in vertically upward direction that causes the concrete to subsidize where this subsidence is referred as slump value and it is dstant used to indicate the feasiblity of the concrete.

3.2 Compressive Test

This test is performed in order to check the compressive strength of the cement. Compressive strength of concrete is determined either using cubical, cylindrical or prismoidal mould.

Compressive strength = load at failure/cross sectional area

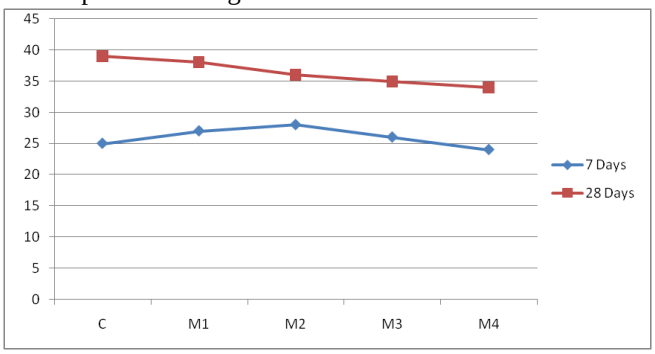

Figure 1: Compressive Strength Test Result

3.3 Flexural tensile strength test

Flexural tensile strength of concrete was determined with the help of the mould of size 150mmx100mmx100mm be casted and determined the strength after 7 days and 28 days as per IS 516-1959.

Flexural strength of beam =PL/BDD

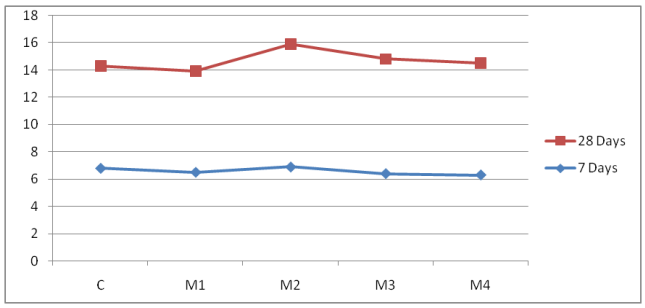

Figure 2: Flexural tensile strength test

3.4 Splitting cylinder test

It is also referred as Brazilian test. In this test the cylindrical specimen of size (length 130mm and dial 150mm is used) and is loaded horizontally in between the platens of the compression testing machine. The great advantages of this test are that the same specimen and apparatus can be used for testing of both compressive strength and tensile strength.

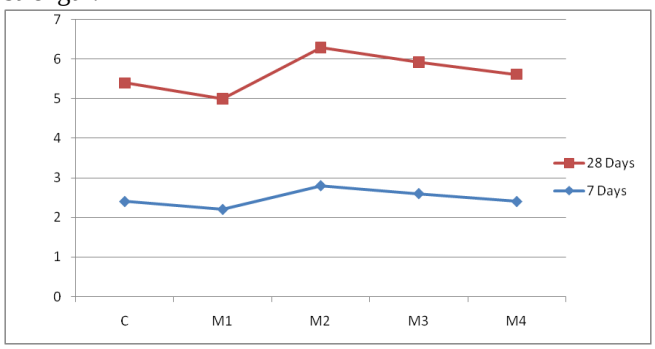

Figure 3: Splitting Cylinder test

3.5 Ultrasonic pulse velocity test

The apparatus of this test consist of a transmitter and receiver. The principal of this test is based upon the fact that velocity of the sound is depends upon the modulus of elasticity and density of solid.

Pulse Velocity (km/sec)	Quality of Concrete
>4.5	Excellent
3.5-4.5	Good
3-3.5	Moderate
<3	Doubtful

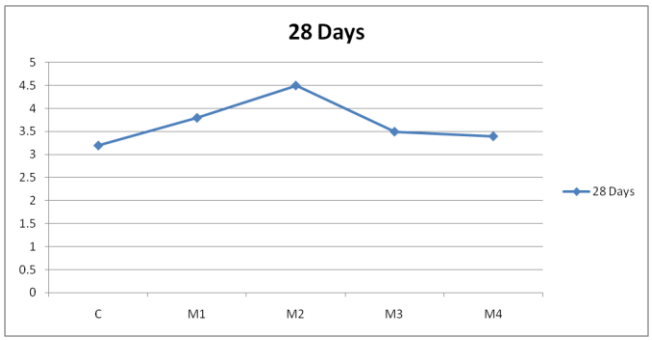

Figure 4: Ultrasonic pulse velocity Test Result

IV. CONCLUSION

The use of steel slag as fine aggregate increases the density of concrete, but partial replacement of cement by bagaase to steel slag can control the density.

- The uses of steel slag and baggase reduce the cost of material.
- M2 design mix shows the excellent results of ultrasonic pulse velocity.
- Steel slag increases the compressive strength flexural strength and splitting tensile strength in design mix of M2 and M3.
- Bagasse ash also increases the strength up to replacement of cement up to 15%.
- Due to uses of Steel slag, the concrete increases the volume which is control by bagasse which devote the light weight structure.

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