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EXPERIMENTAL INVESTIGATION ON PARTIAL REPLACEMENT OF FINE AGGREGATE USING BAGASSE ASH

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Abstract— Sugarcane Bagasse Ash(SCBA) deals with increasing demand and consumption of fine aggregate for an alternate filler and excellent binder is bagasse ash are eco friendly and contribute towards the required target strength of the concrete Fibrous waste product obtained from sugar mill by product called bagasse.Replacement of fine aggregate as bagasse ash act as a excellent thermal insulators.Partially replaced in the ratio of 10% 20% 30% by weight of the fine aggregate.The properties of fresh concrete are tested like slump cone test and for hardened concrete compressive strength at age of 28 days.

Keywords — Sugarcane Bagasse Ash,M20 Grade concrete,Partial Replacement.

I. INTRODUCTION

Due to Ozone depletion of earth temperature increases day to day .The bagasse ash is a good thermal insulator with property which is equals to glass fiber.Concrete plays a vital role in this initiative development.

Conventional building materials such as cement , aggregate , steel and timbers are increasingly become expensive and scarce .

In recent past good attempts have been made for the successful utilizations of various industrial by product to prevent pollution.

Bagasse ash is the by product from sugarcane mill and number of attempts have been made to provide local alternatives to use of river sand as a fine aggregate in conventional concrete to minimize the cost and maximize the strength Bagasse ash used alternative to the river sand in the construction process.

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II. OBJECTIVE

1. The main objectives of this project is to determine the effectiveness of sugarcane Bagasse ash(SCBA) as a replacement of fine aggregate in concrete.
2. To overcome the scarcity of river sand
3. To reduce the depletion of river bed the bagasse ash comes into play as a alternatives for fine aggregate.

III. EXPERIMENTAL PROGRAMME

1) Cement

Ordinary Portland cement 53Grade conforming to IS: 269 – 1976.Ordinary Portland cement, 53Gradewas used for casting all the Specimens. Different types of cement have different water requirements to produce pastes of standard consistence. Different types of cement also will produce concrete have a different rates of strength development. The choice of brand and type of cement is the most important to produce a good quality of concrete. The type of cement affects the rate of hydration, so that the strengths at early ages can be considerably influenced by the particular cement used.

2) Fine Aggregate

Locally available river sand conforming to Grading zone II of IS: 383 – 1970. Clean and dry river sand available locally will be used. Sand passing through IS 4.75mm Sieve will be used for casting all the specimens.

3) Coarse Aggregate

Locally available crushed blue granite stones conforming to graded aggregate of nominal size 12.5 mm as per IS: 383 – 1970. Crushed granite aggregate with specific gravity of 2.77 and passing through 4.75 mm sieve and will be used for casting all specimens. Several investigations concluded that maximum size of coarse aggregate should be restricted in strength of the composite. In addition to cement paste – aggregate ratio, aggregate type has a great influence on concrete dimensional stability.

Table 1.1: Components of Bagasse Ash

COMPONENT	MASS%
SiO2	78.34
Al2	8.55
Fe_2O	3.61
CaO	2.15
NA_2O	0.12
K_2O	3.46
MnO	0.13
TiO2	0.50
BaO	<0.16
P2O5	1.07
LOSS OF IGNITION	0.42

4) Bagasse Ash

The sugarcane Bagasse consists of approximately 50% of cellulose, 25% of Hemicelluloses and 25% of lignin. Each ton of sugarcane generates approximately 26% Of Bagasse(at a moisture content of 50%) and 0.62% of residual ash. The residue after Combustion presents a chemical composition dominates by silicon dioxide(Sio2).

In spite of being a material of hard degradation and that presents few nutrients, the Ash is used on the farms as a fertilizers in the sugarcane harvests. The sugarcane Bagasse ash was collected during the cleaning operation of a boiler operating in sugar Factory.

IV. MATERIAL TEST:

Specific Gravity Test Result

SAMPLES TAKEN	W1 in Kg	W2 in Kg	W3 in Kg	W4 in Kg	SPECIFIC GRAVITY G
SOIL	0.62	0.82	1.54	1.42	2.5
BAGASSE ASH	0.62	0.82	1.53	1.42	2.22

Mix design

The following mix propotion is arrived:

WATER	CEMENT	FINE AGGREGATE	COARSE AGGREGATE
186Kg	372Kg/m3	554kg/m3	1203kg/m3
0.50	1	1.49	3.2

Mix ratio=1:1.49:32

CONTENT FOR ONE CUBE

0.15 x 0.15 x 0.15 = 0.003375m3

Cement =0.003375X372	=1.25kg/cube
sand =0.003375X554	=1.86kg/cube
Aggregate =0.003375X1203	=4.00kg/cube

V. RESULT AND DISSCUSSION

COMPRESSIVE STRENGTH VALUES OF SAMPLES

1) TYPE 1

The details of crushing load for the given sample type 1 for 100% of fine aggregate is tabulated in the given table .

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CRUSHING LOAD VALUES FOR TYPE 1

S.NO	DAY	CRUSHING LOAD (KN)			AVERAGE (KN)
		SAMPLE 1	SAMPLE 2	SAMPLE 3	
1	7	210	211.4	207.56	209.6
2	14	240	239.2	244.5	241.23
3	28	275	274.3	269.82	273.04

2) TYPE 2

The details of crushing load for the given sample type 2 for (90% of fine aggregate and 10% bagasse ash) is tabulated in the given table.

CRUSHING LOAD VALUES FOR TYPE 2

S.NO	DAY	CRUSHING LOAD (KN)			AVERAGE (KN)
		SAMPLE1	SAMPLE2	SAMPLE3	
1	7	198	201.21	207.6	202.27
2	14	231	230.4	233.8	231.73
3	28	263	260.6	264.14	262.58

3) TYPE 3

The details of crushing load for the given sample type 3 for (80% of fine aggregate and 20% bagasse ash) is tabulated in the given table .

CRUSHING LOAD VALUES FOR TYPE 3

S.NO	DAY	CRUSHING LOAD (KN)			AVERAGE (KN)
		SAMPLE1	SAMPLE2	SAMPLE3	
1	7	203.25	204.3	208.6	205.38
2	14	232.6	231.5	236.8	233.63
3	28	263	265.87	268.14	265.29

4) TYPE 4

The details of crushing load for the given sample type 3 for (70% of fine aggregate and 30% bagasse ash) is tabulated in the given table.

CRUSHING LOAD VALUES FOR TYPE 4

S.NO	DAY	CRUSHING LOAD (KN)			AVERAGE (KN)
		SAMPLE1	SAMPLE2	SAMPLE3	
1	7	205.5	207.6	209.43	207.51
2	14	236.5	233.4	239.8	236.56
3	28	270	265.4	271.7	269

ULTIMATE LOAD VALUES FOR SAMPLE (7^{th} day)

SAMPLES	PERCENTAGE OF FINE AGGREGATE & BAGASSE ASH %	ULTIMATE LOAD (KN)
TYPE 1	100&0	209.6
TYPE 2	90&10	202.27
TYPE 3	80&20	205.38
TYPE 4	70&30	207.51

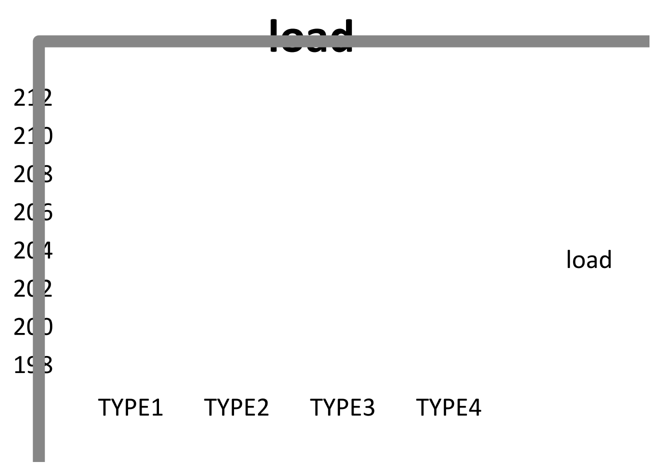


Fig 1 : Comparison of ultimate load of this samples (7^{th} day)

ULTIMATE LOAD VALUES FOR SAMPLE (14th day)

SAMPLES	PERCENTAGE OF FINE AGGREGATE &BAGASSE ASH	ULTIMATE LOAD (KN)
TYPE 1	100&0	241.23
TYPE 2	90&10	231.73
TYPE 3	80&20	233.63
TYPE 4	70&30	236.56

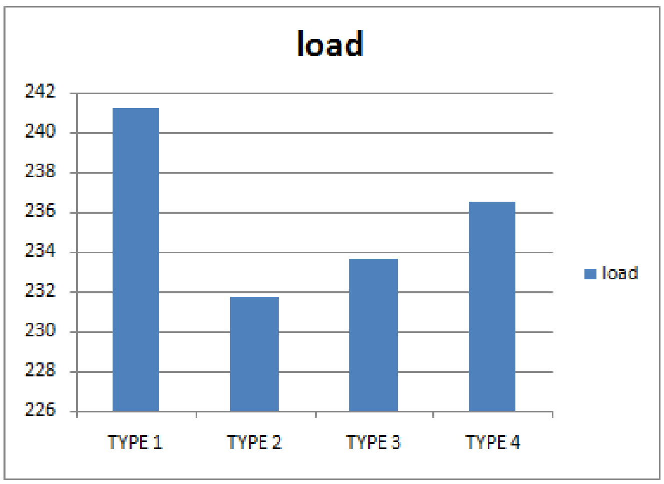


Fig 2 : Comparison Of Ultimate Load Of This Samples (14th Day)

ULTIMATE LOAD VALUES FOR SAMPLE (28th day)

SAMPLES	PERCENTAGE OF FINE AGGREGATE &BAGASSE ASH	ULTIMATE LOAD (KN)
TYPE 1	100&0	273.04
TYPE 2	90&10	262.58
TYPE 3	80&20	265.29
TYPE 4	70&30	269

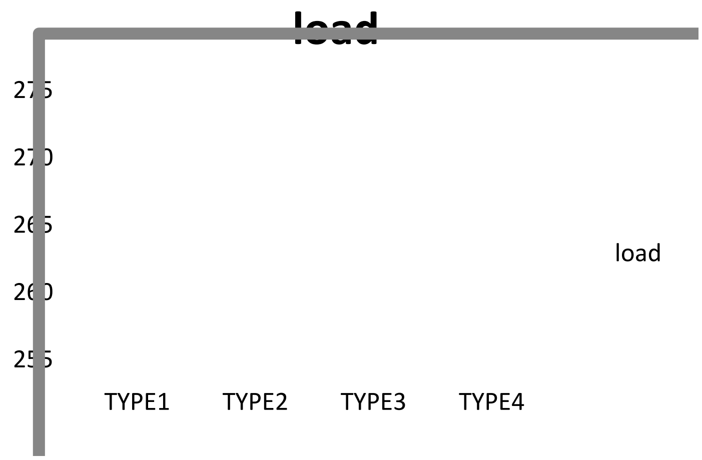


Fig 3: Comparison of ultimate load of this samples (28th day)

Compressive strength value of the samples (7th day)

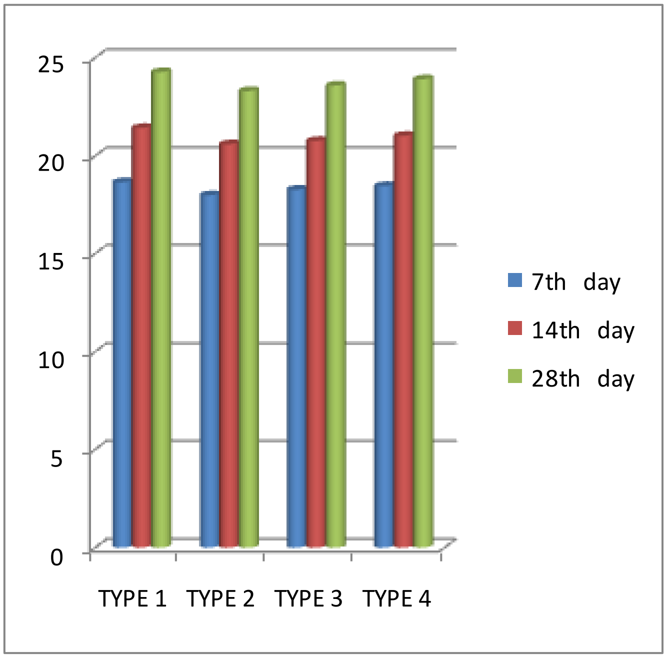
SAMPLES	PERCENTAGE OF FINE AGGREGATE &BAGASSE ASH	COMPRESSIVE STRENGTH ($N\backslash mm^2$)
TYPE 1	100&0	18.63
TYPE2	90&10	17.97
TYPE3	80&20	18.25
TYPE4	70&30	18.44

Compressive strength value of the samples (14th day)

SAMPLES	PERCENTAGE OF FINE AGGREGATE &BAGASSE ASH	COMPRESSIVE STRENGTH ($N\backslash mm^2$)
TYPE 1	100&0	21.42
TYPE2	90&10	20.59
TYPE3	80&20	20.76
TYPE4	70&30	21.02

Compressive strength value 0f the samples (28th day)

SAMPLES	PERCENTAGE OF FINE AGGREGATE &BAGASSE ASH	COMPRESSIVE STRENGTH (N\mm^2)
TYPE 1	100&0	24.27
TYPE2	90&10	23.3
TYPE3	80&20	23.58
TYPE4	70&30	23.9



Comparison of Compressive strength of the samples

VI. COMPRESSION STRENGTH VALUES OF THE SAMPLES

The charts shows the various compression strength for the different type of samples used .

The compressive strength of type 4 sample is higher.

Hence it is clear that the proportion of 70% fine aggregate and 30% of bagasse ash gives compressive strength then other samples.

VII. CONCLUSION

From the test results the following conclusions are drawn

- Minute compressive strength reduction is observed variably depending on the percentage use of aggregate and bagasse ash.
- Overall cost reduction of the construction is observed with 30% replacements of fine aggregate and bagasse ash the strength attained reduces invariably from 10%-15% as compared to normal concrete
- Since minute non uniform variations are obtained in the strength of Bagasse ash concrete. It can be effectively used for low strength concrete mixes.

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