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Study on Behaviour of Concrete by Replacing Cement Partially with Powdered Glass and Sandling Wood

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ABSTRACT

The consumption of cement in concrete industries growing day via day. Concrete is the most extensively used development fabric in civil engineering enterprise due to the fact of its excessive structural power and stability. The most vital phase of concrete is the cement. Use of cement on my own as a binder fabric produces massive warmness of hydration given that the manufacturing of this uncooked cloth its large quantity of CO2. The CO2 emission from cement is very unsafe to the environmental changes. The concrete enterprise is searching for supplementary cementitious cloth with the goal of decreasing the CO2 emission which is damaging to environment. The nice way of lowering CO2 emissions from the cement enterprise is to use the industrial via merchandise or use of supplementary cementing cloth such as fly ash, silica fume, noticed dirt ash and metakaolin. In this existing experimental work an try is made to change cement in part by using Saw dirt Ash (SDA) and Glass powder to overcome these problems. The cement has been changed by means of SDA in the proportion of 10%, 20%, 30% and with the aid of glass powder in the share of 2% by using weight of cement for M20 grade mix, it was once examined for compressive power and cut up tensile energy at the age of 7, 14, and 28 days and in contrast with these of traditional concrete.

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1. INTRODUCTION

There is want for lower priced constructing substances in imparting sufficient housing for the growing populace of the world.

The fee of traditional constructing substances continues to expand as the majority of the populace continues to fall beneath the poverty line. Thus it is essential to use a supplementary nearby cloth as choice for the building of low price structures in each rural and city areas.

A massive quantity of concrete is ate up by way of the building industry.

The manufacturing of Portland cement is no longer solely steeply-priced and power intensive however it additionally produces massive quantity of carbon emissions, the manufacturing of cement poses environmental issues due to emissions of gaseous pollutants.

The emissions of toxic gases like CO2, NO etc. by way of cement manufacturing groups have developed the herbal environmental air pollution and international warming due to the depletion of ozone layer.

Some industrial wastes have been studied for use as supplementary cementing substances such as noticed dirt ash, fly ash, silica fume, metakaolin etc. Here we use Saw Dust Ash and glass powder as a substitute for cement in concrete. Sawdust or wooden dirt is a derivative or waste product of woodworking operations such as sawing, milling, routing, drilling and sanding. It is composed of pleasant particles of wood.

2. METHODOLOGY

The project work encompassed many different yet definite activities as shown in the following flow chart.

- Collection and preparation of samples
- Analysing properties of materials
- Mix design
- Casting and curing of concrete
- Testing the concrete
- Result and discussion
- Conclusion

3. MATERIALS TEST

3.1. COMPARISION OF TEST RESULTS OF CEMENT AND SAW DUST ASH

PROPERTIES		CONVENTIONAL CEMENT	SAW DUST ASH
FINENESS MODULUS		225 m2/Kg	189m2/Kg
SOUNDNESS		10 mm(max)	1.1mm(min)
SETTING TIME	INITIAL	30 min	105min
	FINAL	60 min	260min

Fig 3.1 Vicat Apparatus

4. MIX DESIGN

4.1. MIX DESIGN FOR CONCRETE:

The mix design was carried out for M20 grade of concrete and it was done as per IS: 10262-2009.

STEP 1: Data for materials supplied

A. CEMENT

1. Specific gravity = 3.05
2. Average compressive strength for 7 days = 40 N/mm2

B. COARSE AGGREGATE (20mm)

1. Specific gravity = 2.63
2. Water absorption = 0.26 %

C. FINE AGGREGATE

1. Specific gravity = 2.6
2. Water absorption = 6.5 %

STEP 2: Target mean strength

A. Statistical constant, k = 1.65
B. Standard deviation, s = 4.6

STEP 3: Selection of w/c ratio

A. As required for TMS = 0.5
B. As required for moderate exposure = 0.55

Assume water- cement ratio as 0.5

STEP 4: Determination of water and sand content for w/c ratio 0.6

Max aggregate size of 20mm

A. Water content = 186 Kg/m3
B. Sand as percentage of total aggregate by absolute volume = 35% Thus, for w/c = 0.5

Net water content = 180.42 kg/m3
Net sand percentage = 33%

STEP 5: Determination of cement content

W/c ratio = 0.5
Water content = 180.42 Kg/m3
Thus, cement content = 360.84 Kg/m3 adequate for moderate exposure.

STEP 6: Determination of coarse and fine aggregate Assumed entrapped air as 2%. Thus,

A. 0.98 m3= [180.42+360/3.05+{1/0.33}X{FA/2.6}]/1000
B. 0.98 m3=[180.42+360/3.05+{1/0.67}X{FA/2.63}]/1000

Fine aggregate = 584 Kg/m3
Coarse aggregate = 1223.8 Kg/m3

Materials	Quantity
Water (lit/m3)	180.42
Cement (Kg/m3)	360
Fine aggregate (Kg/m3)	584
Coarse aggregate (Kg/m3)	1223.8

Material quantity for conventional concrete

4.2. MATERIAL PARAMETERS:

1. Grade of concrete - M20
2. Type of cement - OPC 33 Grade
3. Fine aggregate < 4.75mm
4. Coarse aggregate - 20 mm
5. Water cement ratio - 0.5

Mix	w/c ratio	cement	Fine aggregate	Coarse aggregate
Design mix	0.5	1	1.5	3

Mix Proportion

5. RESULT

FIG 5.1 Compressive Strength

Table 5.1 compressive Strength Test result for conventional concrete

Compressive strength	LOAD (N) X 10^3	AVERAGE LOAD (N) X 10^3	(N/mm^2)	AVERAGE STRESS (N/mm^2)
7 days	296	296	13.07	13.16
	296		13.16	
	298		13.25	
14 days	404	404	17.96	17.96
	405		18	
	403		17.91	
28 days	453	454.33	20.13	20.2
	454		20.18	
	456		20.27	

Table 5.2 Compressive Strength Test for Saw dust ash concrete - 7days

% 0F REPLACEMET MATERIALS (Saw Dust ash)	LOAD (N) X 103	AVERAGE LOAD (N)X 103	STRESS (N/mm2)	AVERAGE STRESS (N/mm2)	STRENGTH ACHIEVED IN %
10 %	344	345.67	15.31	15.38	65.1%
	357		15.87		
	336		14.97		
20%	281	271	12.5	12.09	55.5%
	262		11.68		
	270		12.02		
30%	183	178	8.14	7.93	26.65%
	180		8.01		
	172		7.65		

Fig 5.2 Compressive Strength Test for Saw dust ash concrete - 7days

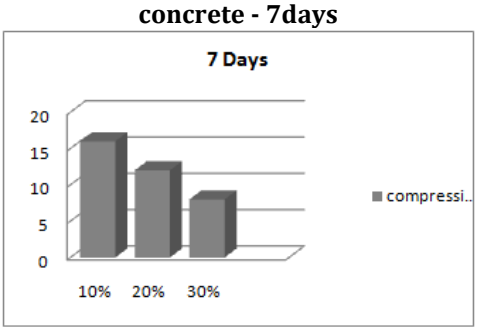


Fig 5.3 Compressive Strength Test for Saw dust ash concrete - 14days

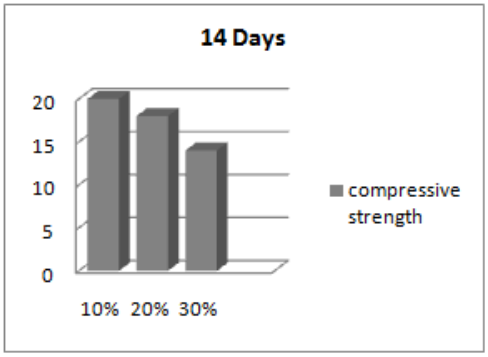
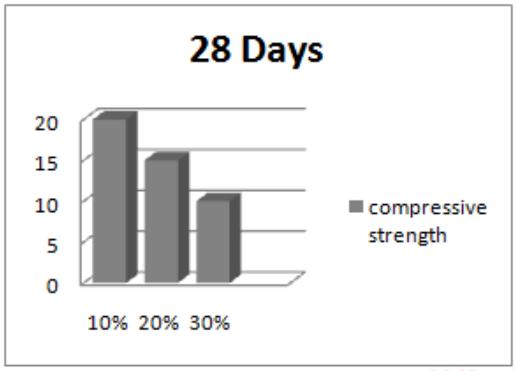


Fig 5.4 Compressive Strength Test for Saw dust ash concrete – 28 days

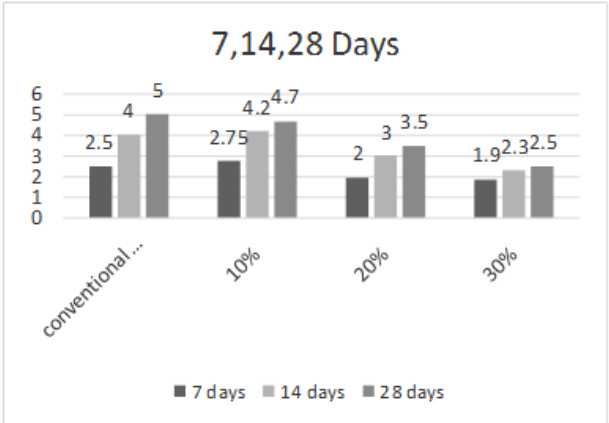


5.2. COMPRESSIVE STRENGTH OF CYLINDER:

Table 5.3 Compressive Strength Test For Cylinder

CYLINDER SPECIMEN	7 DAYS N/mm2	14 DAYS N/mm2	28 DAYS N/mm2
Conventional concrete	2.63	3.98	4.28
SDAC 10%	2.88	4.18	4.79
SDAC 20%	2.11	3.25	3.55
SDAC 30%	1.97	2.42	2.62

Fig 5.5 Compressive Strength Test For Cylinder 7,14,28 days



6. CONCLUSION

From the experimental investigations the following conclusions were made:

Saw Dust Ash and glass powder is a suitable material that can be used as a replacement of cement. The workability of concrete had been found to decrease with increase of Saw Dust ash. The Maximum compressive strength is attained at the replacement of cement By 10% of Saw dust ash and 2% of Glass Powder. The optimum SDA content is 10%.The replacement of cement by 10%with Saw Dust Ash shows maximum strength and it gradually decrease as the SDA percentage increases

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