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STRENGTH AND COST COMPARISION OF BAGASSE CONCRETE WITH THE APPLICATION OF CERAMIC WOOL AS THERMAL INSULATOR FOR BUILDING COMPONENTS (WALL & ROOF)

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Abstract - - *Thermal insulation to concrete building plays an important role in environment sustainability especially energy saving buildings. Sugarcane Baggase Cinder (SBC) is an industrial by product generated in large quantities from sugar industries employing the cogeneration process. Buildings are one of the largest consumers of energy worldwide. In this work the Sugarcane Bagasse Cement Concrete (SBCC) and ceramic wool as thermal insulation to the building components are studied. In this project Cost and Strength comparison is of conventional and sugarcane bagasse cinder concrete for housing board scheme is done. The tested results showed that by replacing of SBC can do up to 50% instead of cement and by keeping 10% of Lime and Coal Cinder at constant proportion. The SBCC can be economical than the other conventional concrete. Thermal insulation in concrete are materials or combinations of materials that are used to provide resistance to heat flow, should have low conductivity for building application in order to represented of a temperature gradient, has an important effect on the heat exchange between the building interior and the ambiance. The use of thermal insulation in building walls and roof does not only contribute in reducing the required air-conditioning system size but also in reducing the annual energy cost. Additionally, it helps in extending the periods of thermal comfort without reliance on mechanical air-conditioning especially during inter seasons periods. Therefore, proper use of thermal insulation in buildings enhances thermal comfort at less operating cost.*

Key Words: **SBC, SBCC, Ceramic wool, Thermal Insulation**

1. INTRODUCTION

Concrete is formed by mixing of binder, voids filler, and volume filler, from the presence of solution. Due to increase in the demand of cement there is needed to find the alternative material without compromising the strength and durability of the concrete. Baggasse ash concrete is mixed proportion industrial waste products like baggasse cinder, lime and coal ash. And for voids filler M-sand, for volume filler normal coarse aggregates is used. Expanding the sum of industrial wastes in concrete isn't without shortcomings. At high levels, issues may be experienced with expanded set times and moderate strength improvement, leading to low early- age qualities or strength. With altering the mass of binders with water cement ratio, the proper strength has been checked. There are numerous benefits of a home insulation. Protection will include the consolation to the building, make a more advantageous domestic environment, decrease the electric bills and have a positive natural effect. Including domestic separator to an existing domestic will control the temperature, making the living environment more agreeable; particularly in places of extraordinary climate. The building which covered with these insulators will end up more advantageous.

1.1 Baggasse Cinder Concrete Roof and thermal insulation

Baggasse ash concrete is mixed proportion industrial waste products like baggasse cinder, lime and coal ash. And for voids filler M-sand, for volume filler normal coarse aggregates is used. Expanding the sum of industrial wastes in concrete isn't without shortcomings. At high levels, issues may be experienced with expanded set times and moderate strength improvement, leading to low early- age qualities or strength. With altering the mass of binders with water cement ratio, the proper strength has been checked with the variation proportions of bagasse cinder.

Warm exchange through insulation material happens by impulse of conduction, whereas heat loss to or warm gain from air happens by impulse of radiation and convection. Heat passes through sustainable materials by implies of conduction and the range at which this happens depends on the warm conductivity of the fabric in the address and the temperature drive. Generally, the thickness is inversely proportional to heat conductivity.

1.2 Review Technique on SBCC and Thermal Insulation

The necessary tests were conducted on the sugarcane baggasse to find out the cementations property behavior initially. The mortar cubes are casted to find out the binding strength of the cementations material present in the ratio of 1:3, 1:4 and 1:6, in which we have got the 1:3 as the better results to precede further procedures. Later on concrete cube has been casted with altering different proportions of binding materials (Baggasse, Lime, Fly ash And Cement). The best penetration value obtained is 6mm from bottom and 34mm from top, and best binding property and workability with the help of additional chemical CONPLAST 420 is achieved at BA-50%, Cement-20%, Fly ash-10%, and Lime-20% with considering the 0.15 of Liquid [1].

Because of large amount of baggasse cinder is used in the concrete, its heat absorbing capacity on its surface will

increase. This will leads to thermal uncomfortable to the human being. May leads to access extra cooler effects like fans, coolers and ACs, which will increase the extra electrical charges. In this project ceramic wool is used as thermal insulator to reduce the amount of heat transmission and makes human comfortable. By conducting several experimental results it is concluded that thermal insulation is indirectly proportional to heat transmission.

Physical and chemical properties of ceramic wool as follows

Table 1.1 Physical properties	
Material	Ceramic fiber blanket
Product type	High temp. insulator 1200^0c
Colour	White
Density	64 Kg/m^3
Other features	25mm thickness

Table 1.2 Chemical properties	
Al_2O_3	35
SiO_2	50
Fe_2O_3	0.05
CaO	0.05
Na_2O_3	O.2
Leachable chlorides	traces

2. TESTS CONDUCTED ON SBC CONCRETE

Table 2.1 tests and results

Case no.	**PROPORTION**				**STRENGTH MPa**
	SBC	**CEMENT**	**COAL ASH**	**LIME**	
1	30	50	10	10	18.4
2	40	40	10	10	17.8
3	50	30	10	10	16.6
4	60	20	10	10	12.2
5	70	10	10	10	10.7
6	20	50	10	20	18.2
7	30	40	10	20	17.9
8	40	30	10	20	14.3
9	50	20	10	20	11.6
10	60	10	10	20	10.0

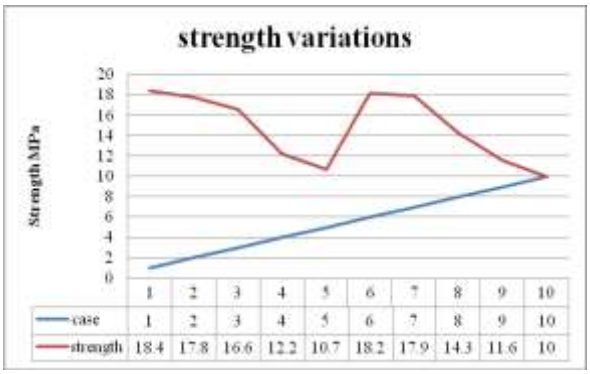

Fig. 2.1 strength variation

As the TABLE NO 2 illustrate the lime and coal ash percentage is kept constant at 10% and the variation in the bagasse cinder is done and in the second set of case number 6 to case number 10 the lime percentage is increased to the 20% and the characteristics of behavior in strength is studied.

In the second set of combination it has shown good strength results, but as the primary goal is to restrict to low cost building materials the consumption of sugarcane bagasse cinder should be more but without affecting the strength parameter. In the 1st set of case study from 1 to 5, the 3rd proportion have shown the better results at 10% of lime. After the use of case study proportion number 3, a wall is constructed to test for strength on UTM and we have got the results of 11.32.

3. TESTS ON THERMAL EFFECTS

To feel some thermal conductivity of human beings some of the trails and the experiments are conducted.

Case I: Without insulator to the concrete.

Case II: Insulator with concrete wall/roof.

Case III: Insulator with Black sheeted concrete roof.

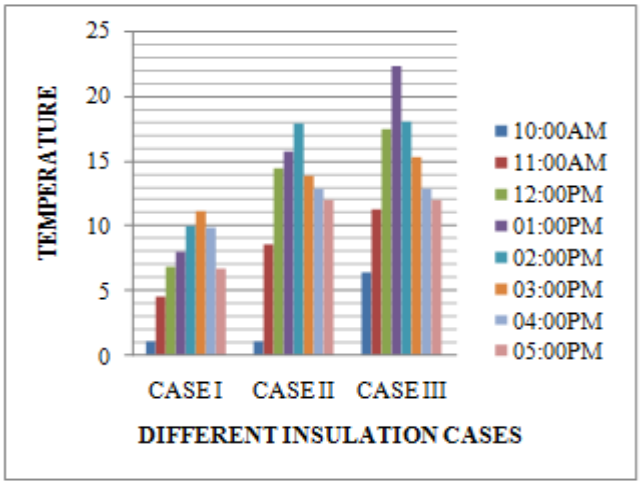

Fig: 3.1 Different Insulation Classes

Table 3.2 Temperature Measurements

Time	10:00 am	11:00 am	2:00 pm amnm	1:00 pm am am am	2:00 pm	3:00 pm pm	4:00 pm am am am	5:00 pm pm
Case (I)	1.2	4.6	6.9	8	10	11.2	9.9	6.7
Case (II)	1.2	8.6	14.5	15.8	18	14	13	12
Case (III)	**6.5**	**11.4**	**17.5**	**22.4**	**18.1**	**15.4**	**13**	**12**

There are several tests has been conducted of concrete component with the surrounding temperature and the temperature is measured with the help of digital thermometer. The obtained results are expressed in above graph.

By comparing all the results best obtained result is **case 3** which is minimizing the temperature up to 22.4^0C. this temperature can be affordable for buildings and houses.

4. CONCLUSIONS

From testing of all the parameters like penetration, workability, and compressive strength, SBC concrete is able to sustain about M20 grade concrete strength with the addition of CONPLAST 420 as super plasticizer.

From the application of thermal insulation heat transmission about 22.4^0C of temperature can be reduced. This is considered as economical for buildings, helps to save electrical bills, and gives comfort to the users.

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