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RESEARCH ARTICLE

Cost Comparison of R.C.C. Structure using CLC blocks with Burnt Clay Bricks.

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Abstract

Construction work is increases now a day in our country with a great speed. Therefore the cost of construction work is seems to be an expensive work for any type of building. So there is need to find a way to overcome with these problem such that the building can be constructed and also the cost can be saved. Among the cost saving and also related to an environment, bricks can be taken as a good example. Because in the manufacturing of bricks smoke and some harmful gases produces at a large scale which may harm our environment. So as to overcome and to reduce such problems Cellular light weight concrete blocks can be used at an alternative with burnt clay bricks which is also eco-friendly. This project shows the analysis and comparison between the two same G+12 building with different material in terms of bricks. The bricks which are taken for first building analysis is burnt clay bricks and for second building analysis is cellular light weight concrete blocks. This analysis is done by STAAD-Pro software and in result shows the reduction in overall cost of construction by using CLC blocks.

Introduction:-

The bricks play an important role in terms of material in any type of building. The bricks can be classified as burnt clay bricks, cellular light weight concrete blocks with different densities, AAC blocks etc. In the manufacturing of cellular light weight concrete blocks the energy required is very less as compare to conventional bricks, therefore no harmful gases and no pollution has been created in manufacturing CLC blocks. Also there are three different grade of density in CLC blocks and all these are having less density as compare to the red bricks density. Therefore two same G+12 high rise building is taken and compared by changing the material in these two building in terms of bricks. As the cellular lightweight concrete block are light in weight so the dead load will act on the structure is less. If the dead load is less than the reinforcement is reduced, size of the member are reduced, concrete is also reduced to a large scale, the surface of the CLC blocks are well finish so there is no need of plaster of coarse sand on the wall means saving of coarse sand, reduced the cement and also the overall cost construction of the building is also reduces. And the building will be constructed in a low budget with saving the environment. This analysis is done by the software STAAD-Pro.

Material And Block Dimensions:-

Cement:-

The cement which is used for manufacturing CLC block is Ordinary Portland cement (OPC) which having 53 grade confirming to IS 12269:1987. The specific gravity of cement which is required in CLC block is 3.5.

Water:-

The water which is required in the manufacture of CLC blocks is potable water and whose pH value lies between 6.5 to 8.5

Fly Ash:-

In thermal power plant the bye product which is used is Fly Ash. According to IS code i.e. IS 3812(part-1) fly ash is used and Fly ash is thoroughly mix with the cement which is using.
The nominal dimensions of the CLC blocks are as follows:-
Length: 400,500 or 600 mm
Height: 200 or 300 mm
Width: 100, 150, 200 or 250 mm

Foaming Agent:-

CLC Blocks made with (Profo) Protein Based Foaming Agent are environmentally safe. They are bio–degradable and low toxic to the aquatic organisms.The foaming agent which is used in the CLC blocks should be kept airtight and the temperatures should not exceeding 25 degree centigrate. There are several foaming agents such as Neopor, Profo etc.

Types Of Bricks:-

Bricks have been classified into following types such as CLC blocks, burnt clay bricks, AAC blocks.
Burnt clay bricks:- These bricks having density in the range of 1900kg/m^3 to 2100kg/m^3.CLC blocks also divided into three more types of grades i.e.
Grade A: - These grades of blocks are used for load bearing units and have a block density in the range of 1200 kg/m^3 to 1800kg/m^3.
Grade B: - These grades of blocks are used for non load bearing units and have a block density in the range of 800kg/m^3 to 1000kg/m^3.
Grade C: - These grades of blocks are used for providing thermal insulation and have a block density in the range of 400kg/m^3 to 600kg/m^3.

Comparison Between The Properties Of Clc Blocks Of Grade B And Burnt Clay Bricks:-

S.No.	Parameters	Burnt Clay Bricks	CLC Bricks
1.	Basic Raw Material	Agricultural soil, coal	Cement, Fly ash, Foaming agent
2.	Density (kg/m^3)	1900-2100	800
3.	Compressive strength(kg/cm^2)	30	35
4.	Thermal Conductivity	Better	Very good
5.	Water absorption (%)	20 %	12.5 % for 800 kg/m^3 density
6.	Aging	NO	Gains strength with age
7.	Labor requirement	100 %	50 % of normal brick
8.	Ease in working	Normal	Very easy
9.	Eco-Friendliness	-Process creates smoke, - Uses high energy for firing, -Agricultural soil is wasted	- Pollution free - Least energy requirement - Consume fly ash which is waste from thermal power plant - Uses no agricultural soil

Structural Plan Of The G+12 Residential Building :-

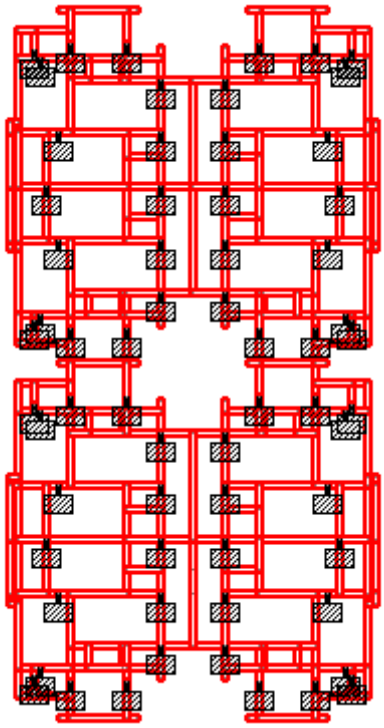

Fig.1:- Structural Plan of G+12 residential building

Comparison For Total Reinforcement:-

The reinforcement in the beam and column which is save on the project by using Cellular light weight concrete blocks of Grade B density i.e. 800kg/m3 is **36280 kg**. Also in the raft foundation the total reinforcement has been save by using cellular light weight bricks is **9000 kg**. So the total reinforcement which is saving in the project is **45280 kg.** by using cellular lightweight bricks in the existing structure at the replacement with red burnt clay bricks. By this the building can be built in a economical way as compared to the existing structure.

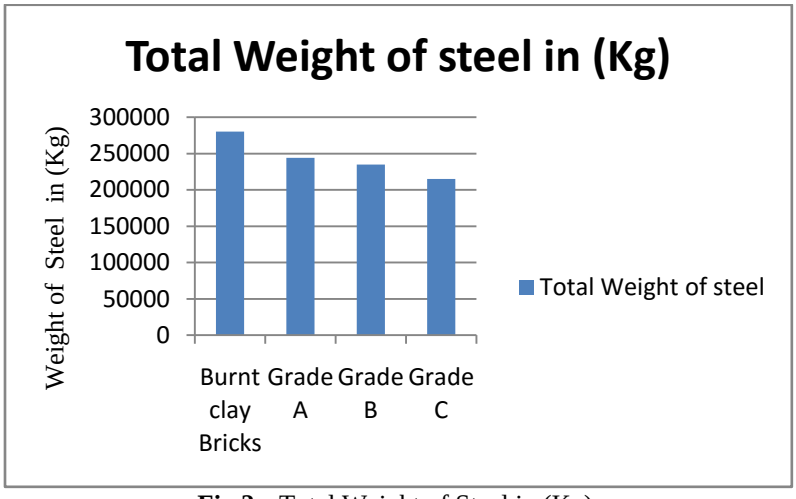

Fig.2:- Total Weight of Steel in (Kg).

From the above graph following observation has been made that the overall steel for a building by using burnt clay bricks is greater as compare to the cellular lightweight concrete block of density grade B. In Cellular lightweight concrete blocks there will be a approximately **16%** overall steel is reduced as compare to burnt clay bricks.

Comparison Of Coarse Sand And Concrete:-

When CLC blocks of Grade B are using in the structure at the replacement of burnt clay bricks than there will be no need of coarse sand for the plaster. Therefore by this approximately **2730 m^3** of coarse sand can be saving. And this is shown below by the help of bar chart.

The size of the member also reduced to a great extent due to the lightweight concrete blocks. Therefore the quantity of concrete is reduced approximately **358 m^3**. Also **175 m^3** of concrete has been saved in the raft foundation. So the overall concrete has been save in the project is **533 m^3**. And this can be shown below by the help of bar chart.

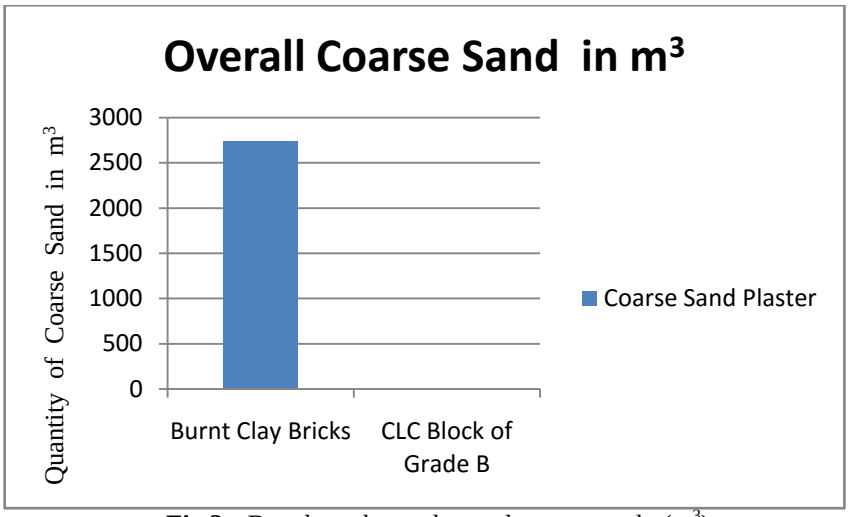

Fig.3:- Bar chart shows the total coarse sand (m^3)

From the above graph following observation has been made that the overall coarse sand for a building by using burnt clay bricks is greater as compare to the cellular lightweight concrete block of density grade B . In Cellular lightweight concrete blocks there will be 0**% coarse sand** or can say there is no need of coarse sand as compared to burnt clay bricks.

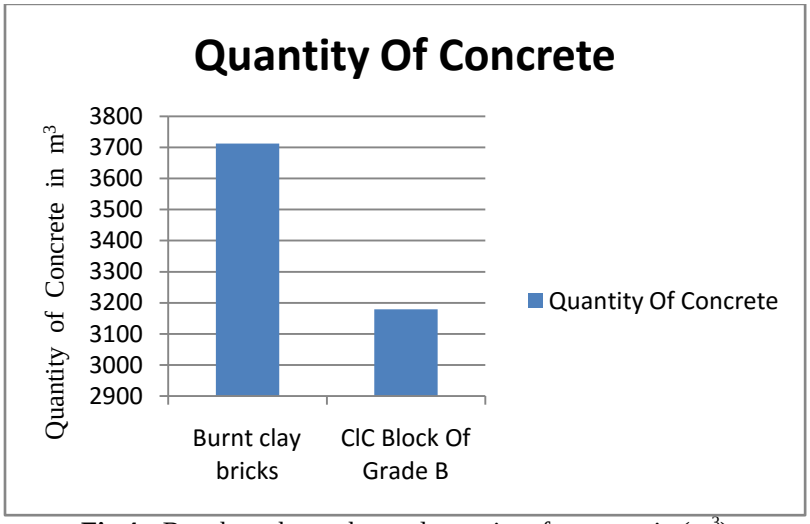

Fig.4:- Bar chart shows the total quantity of concrete in (m^3)

From the above graph following observation has been made that the overall Concrete for a building by using burnt clay bricks is greater as compare to the cellular lightweight concrete block of density Grade B. In Cellular lightweight concrete blocks there will be an approximately 14.3 **%** overall concrete is reduced as compare to burnt clay bricks.

Comparison Of Cement Due To Coarse Sand Plaster:-

When CLC blocks of Grade B are using in the structure at the replacement of burnt clay bricks than there will be no need of coarse sand for the purpose of plaster. Therefore by this approximately **2730 m^3** of coarse sand can be saving. When there is no need of coarse sand in cellular lightweight concrete block for plaster than approximately 15600 cements of bag can be save in the entire projects.

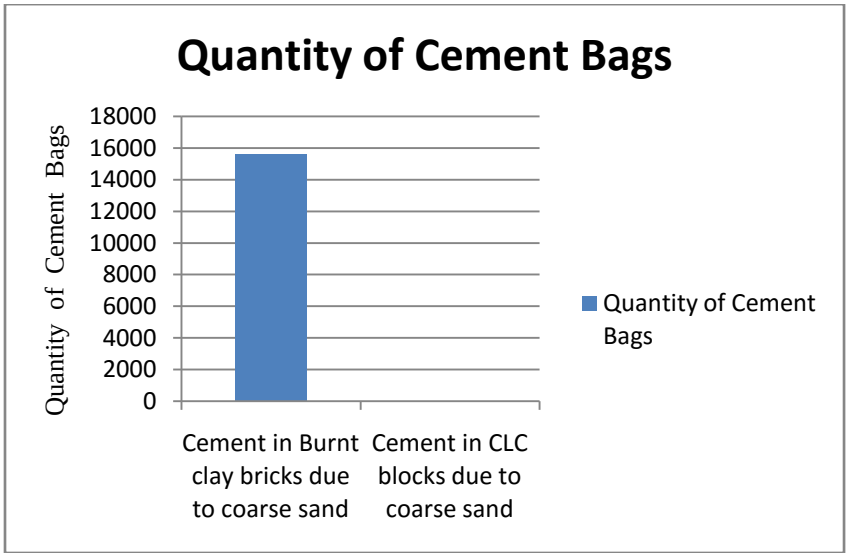

Fig.5:- Bar chart shows the total quantity of cement of bags

From the above graph following observation has been made that the overall Cement, when there is no use of coarse sand, for a building by using burnt clay bricks is greater as compare to the cellular lightweight concrete block of density Grade B . In Cellular lightweight concrete blocks there will be an approximately 15600 cement of bags is reduced as compare to burnt clay bricks.

Total Cost Comparison Of The Structure:-

The total cost of the superstructure when using burnt clay bricks is Rs.71248250 or approximately Rs. 71250000 and the total cost of the superstructure by using cellular light weight concrete blocks is Rs.59062540 or approximately Rs.59100000.

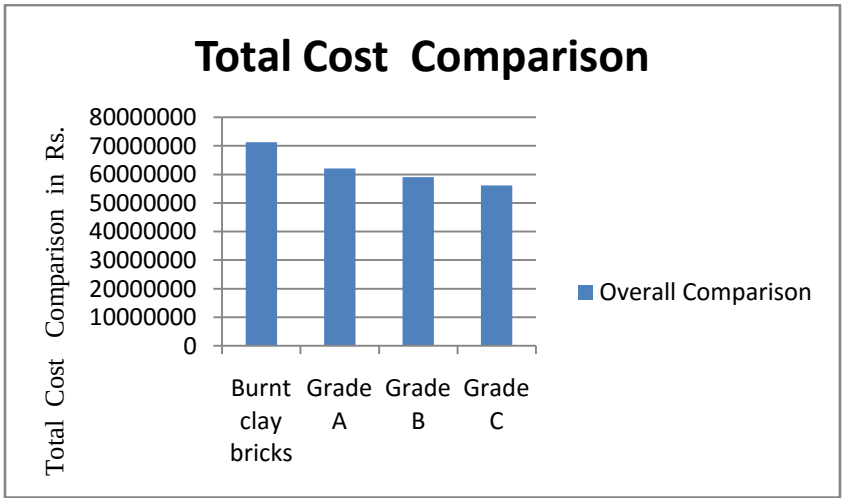

Fig.6:- Bar chart shows the total cost comparison in (Rs.)

From the above graph following observations has been seen that the overall cost for a building by using burnt clay bricks is greater as compare to the Cellular light weight concrete blocks. In Cellular light weight concrete block there will be a **17.15%** overall cost is reduced as compare to burnt clay bricks in present.
Hence by using Cellular light weight concrete block there will be a less carbon emission in the environment and also by using light weight block in a construction is economical and time saving.

Conclusion:-

1. The surface of the cellular light weight concrete blocks is well finished so there will be no use of coarse sand for plaster. Hence the coarse sand is not applying on the wall for the plastering so there will be saving of cement approximate. 16380 cement of bags in present.
2. The size of the members of the structure has been reduces due to use of cellular light weight concrete blocks in comparison of burnt clay bricks.
3. As the sizes of the members reduces therefore the quantity of concrete is reduces approx. 14.3% of the overall concrete.
4. As per the observation the reinforcement in the structure is reduce an approximately 16 % of the overall reinforcement in present.
5. Total cost of the superstructure loaded with burnt clay bricks is Rs.71250000 and for cellular light weight concrete blocks is Rs.59100000 which is less as compare to the burnt clay bricks. . In Cellular light weight concrete block there will be a 17.15% overall cost is reduced as compare to burnt clay bricks in present.
6. Hence Cellular light weight concrete blocks masonry was found to be economical as compared to conventional burnt clay bricks.
7. Due to reduction of concrete consumption and steel consumption carbon foot prints are reduced.

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