ORIGINAL RESEARCH PAPER
Volume - 9 | Issue - 11 | November - 2020 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

INVESTIGATION ON LIGHT WEIGHT CONCRETE PANEL

Engineering

P.Vinodhkumar Assistant Professor, Meenakshi College of Engineering, Anna University, Chennai

R.Vinodhkumar* Assistant Professor, Meenakshi College of Engineering, Anna University, Chennai*Corresponding Author

P.Kalaivani Assistant Professor, Meenakshi College of Engineering, Anna University, Chennai

ABSTRACT

To replace the conventional method of construction with an alternative method of CLC (cellular light weight concrete) panels. The CLC panels reduces the direct cost saving due to reduced labour, reduce materials and cheaper construction equipment. Low weight of the product also reduces logistical cost. The simple design efficient production easy transportation and quick erection of building unit reduces time-line of the project of all sizes by upto 60%. The monolithic structure created by the panel is conjection with concrete enables it to withstand earthquake hurricanes and high winds. The CLC panel brings uniformly high quality to a construction project of any size. CLC panel is an excellent thermal insulator. It maintains the indoor temperature and lower HVAC (Heating Ventilating and Air Conditioning) cost 50% - 70%. It's also fire proof, moisture proof, sound proof. 25% of weight of a regular masonry wall, which alleviates the fixed, loads of structure and facilities its upgrade to the existing building.

KEYWORDS

CLC, Compression test, Fly Ash, HVAC, Water Absorption Test,

INTRODUCTION

The use of LWC (Lightweight concrete) has been a feature in the construction industry for centuries, but like other material the expectations of the performance have raised and now we are expecting a consistent, reliable material and predictable characteristics.

Structural LWC has an in-place density (unit weight) on the order of 90 to 115 lb / ft³ (1440 to 1840 kg/m³) compared to normal weight concrete a density in the range of 140 to 150 lb/ft³ (2240 to 2400 kg/m³). For structural applications the concrete strength should be greater than 2500 psi (17.0 MPa). The concrete mixture is made with a lightweight coarse aggregate. In some cases a partly or the entire fine aggregates may be a lightweight product. Lightweight aggregates used in structural lightweight concrete are typically expanded shale, clay or slate materials that have been fired in a rotary kiln to develop a porous structure. Other products such as air-cooled blast furnace slag are also used. There are other classes of non-structural LWC with lower density made with other aggregate materials and higher air voids in the cement paste matrix, such as in cellular concrete. The following are the types of LWC,

Pumice – is used for reinforced concrete roof slab, mainly for industrial roofs in Germany.

Foamed Slag – was the first LWA suitable for reinforced concrete that was produced in large quantity in the UK.

Expanded Clays and Shales – capable of achieving sufficiently high strength for prestressed concrete. Well established under the trade names of Aglite and Leca (UK), Haydite, Rocklite, Gravelite and Aglite (USA).

Sintered Pulverised – fuel ash aggregate – is being used in the UK for a variety of structural purposes and is being marketed under the trade name Lytag.

Cellular Lightweight Concrete (CLC):

Cellular Lightweight Concrete (CLC) is one of the recent emerging technologies in making concrete. It has many advantages when compared to the normal conventional concrete. Fly ash is considered as one of the waste industrial product that cannot be easily disposed. It solves the problem of disposal of flyash and at the same time it reduces the cost of the construction. Therefore, flyash based CLC is considered as environment friendly sustainable material produced with least energy demand.

The density is considerably reduced by using fly ash based cellular lightweight concrete than normal concrete and at the same time, the strength is not affected by appropriate design mix. The manufacturing process of this type of concrete does not involve any high cost techniques. Manufacturing process of CLC is similar to normal concrete and in this additionally foam generating machine is used.

Objective of CLC panels:

- To Improve the quality of construction
- To Reduce the cost of construction
- To reduce the time period of construction
- Availability of more carpet area
- To reduce the weight of the building

Merits of CLC panels:

- Effective and durable thermal insulation
- Effective in high sound insulation
- Effective in high fire protection
- Lower water absorption and vapor barrier
- Long life, low maintenance
- High load bearing capacity at low weight
- Lightweight, fast and economic construction

Materials used in this project are

Cement, Fly ash, Fine aggregate, Foaming agent and Water

PROCESS OF MAKING CLC WALL PANEL:

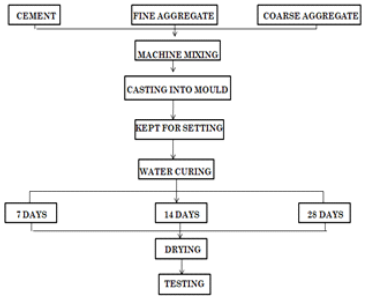

Fig 1 – Flowchart of process of making CLC wall panels

TESTING – In this study, the proportions carried out are 1:0.6:1.2, 1:0.8:1.6 and 1:1:2 and the strength attained in compression testing and water absorption test of wall panels are shown in pictorial representation.,

Tab 1 – Mix Proportions

S.No	Particulars	Mix ratio		
1	Cement	1	1	1
2	Fly Ash	0.6	0.8	1
3	Sand	1.2	1.6	2
4	Foaming Agent	40%	40%	40%

Tab 2 – Wall panel – Compression Test Result

Mix Ratio	Days of Curing	Strength Attained (kN/m2)
1:0.6:1.2	7 days	7.56
	14 days	11.67
	28 days	16.72
1:0.8:1.6	7 days	9.65
	14 days	15.58
	28 days	21.65
1:1:2	7 days	12.45
	14 days	19.68
	28 days	27.68

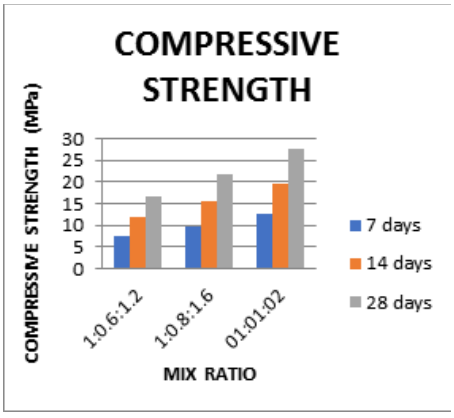

Fig 2 – Pictorial representation of compression test results

Tab 3 – Wall panel – Water Absorption Test Result'

Mix Ratio	Days Of Curing	% Of Water Absorbed
1:0.6:1.2	7 days	4%
	14 days	8%
	28 days	24%
1:0.8:1.6	7 days	5%
	14 days	9%
	28 days	26%
1:1:2	7 days	6%
	14 days	8%
	28 days	27%

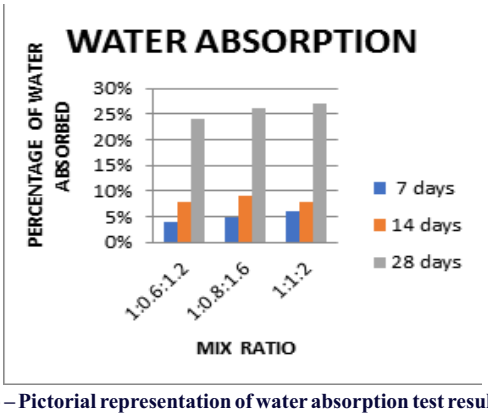

Fig 3 – Pictorial representation of water absorption test results

CONCLUSIONS:

- From this, we conclude that M25 mix ratio has more strength when compared to other materials. Hence, it can be preferred for construction purposes.
- We conclude that the CLC panel makes the construction cost less by creating more carpet area.
- Compared to the ordinary wall, the CLC panel has high load bearing capacity though its weight is very less.
- The CLC panel requires less maintenance cost with durability, efficiency and affordability.

REFERENCES:

1. D.A.Bournas, Experimental Investigation and Analytical Modeling of Prefabricated Reinforcement Concrete Sandwich Panels.
2. Beijing.P.R.China, Environmental Friendly Building Material Technologies for low cost housing.
3. Dewald Barnard, Light Steel Construction and Modular Homes as Altenative Building method in South Africa.
4. J.A.Lee, H.Keely, A.Rosenfed, E.Stulee, J.Colco, A.Gadgil, Affordable Safe Housing Based on Expanded Polystyrene Foam and Cementitious coating.
5. Mohammad Paniehpour, Abang Abdullah Abang Ali and Yen Lei Voo, Structural Insulated Panels: Past, Present, Future.
6. Nanlum, A study of Alternative Construction Methods in the Pacific Northwest.
7. Gordon Cooke, Stability of Lightweight Structural Sandwich Panel Exposed to fire.