

# Review of Light Weight Building Structure using Analysis Software

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**Abstract**— Concrete structures are prone to earthquake due to mass of the structures. primary use of structural lightweight concrete (SLWC) is to reduce the dead load of a concrete structure, which allows the structural designer to reduce the size of the structural members like beam, column and footings which results in reduction of earthquake forces on the structure. In this paper we are reviewing the past research work done related to light weight building concept and related terminologies.

**Keywords:** Review, Analysis, Light Weight, Software, Structure

## I. INTRODUCTION

A tall building is a multi-story structure in which most occupants depend on elevators [lifts] to reach their destinations. Now a days due to growth of the population Housing has developed into an economy generating industry. Given this demand, while high-rise building structures have become a solution in the metropolitan cities.

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 / ft<sup>3</sup> (1440 to 1840 kg/m<sup>3</sup>) compared to normal weight concrete a density in the range of 140 to 150 lb/ft<sup>3</sup> (2240 to 2400 kg/m<sup>3</sup>). For structural applications the concrete strength should be greater than 2500 psi (17.0 MPa).

Following papers are reviewed in this paper as follows:

- 1) Khudhair and Farid (2004) [14] Considered that Energy stockpiling in the dividers, roof, and floor of structures might be upgraded by embodying reasonable stage change materials (PCMs) inside these surfaces to catch sun-powered vitality straightforwardly and increment human solace by diminishing the recurrence of inner air temperature swings and keeping up the temperature closer to the coveted temperature for a more extended timeframe. This paper abridges the examination and investigation of warm vitality stockpiling frameworks joining PCMs for use in building applications. Explores on warm capacity in which the PCM is typified in solid, gypsum wallboard, roof, and the floor has been continuous for quite a while and is discussed. The issues related with the use of PCMs as to the choice of materials and the strategies used to contain them are likewise examined.
- 2) Ozyildirim (2011) Lightweight cement (LWC), with its lessened weight and enhanced toughness, empowers longer ranges, fewer piers, and lifespan for scaffold structures. The present accentuation on overhauling structures makes LWC very alluring as a development material since superstructures with more extensive shoulders or more paths can be redesigned without

significant work on the substructure. The reason for this investigation was to assess the thickness (unit weight), part rigidity, and flexible modulus of LWC blends under various relieving conditions to accomplish a superior comprehension of the LWC properties that are basic for durable and savvy structures. Further, the examination analyzed the relationship between the consequences of the quick chloride penetrability test and the surface opposition test utilizing the Wenner test to explore whether the last could be utilized to foresee the porousness of LWC blends, as it is quicker and more helpful.

- 3) Hyunjoo Kim et. al. (2011) [13] Fusing vitality effectiveness and supportable green plan highlights into new/existing structures have turned into the best need as of late to fabricate proprietors, planners, contractual workers, and office supervisors. This paper means to address why conveyance of a vitality proficient building isn't only the consequence of applying at least one disconnected advancements. Or maybe, it can best be acquired utilizing a coordinated entire building process all through the whole undertaking improvement process, which drives building planners to produce a lot of information amid vitality reenactments. The creators saw that even a straightforward vitality displaying run produced pages of information with a wide range of factors. The volumes of vitality displaying information obviously overpower customary information investigation strategies, for example, spreadsheets and specially appointed inquiries with such a large number of components to be considered.
- 4) Frauke et.al. (2011) [15] considered that Low vitality structures have pulled in heaps of consideration in recent years. A large portion of the examination is centered on building development or elective vitality sources. In opposite, this paper introduces a general system of limiting vitality utilization utilizing current vitality sources and negligible retrofitting however rather utilization of cutting-edge control methods. We centre on the investigation of vitality funds that can be accomplished in a building warming framework by applying model prescient control (MPC) and utilizing climate forecasts. The fundamental detailing of MPC is portrayed with accentuation on the building control application and tried in a two months test performed on a genuine working in Prague, Czech Republic.
- 5) Parisio et. al. (2012) [12] considered that how Model Predictive Control (MPC) and climate expectations can expand the vitality effectiveness in Integrated Room Automation (IRA) while regarding inhabitant comfort. IRA manages the concurrent heating, ventilation and air conditioning (HVAC) and visually impaired situating and electric lighting of a building zone to such an extent that the room temperature, and in addition CO<sub>2</sub> and

- luminance levels, remain inside given solace ranges. MPC is a propelled control strategy which, when connected to structures, utilizes a model of the building elements and takes care of an advancement issue to decide the ideal control inputs. In this paper, it is accounted for on the improvement and investigation of a Stochastic Model Predictive Control (SMPC) technique for building atmosphere control that considers the vulnerability because of the utilization of climate forecasts.
- 6) Vanissorn et. al. (2012) <sup>[4]</sup> In an auxiliary plan, a perfect circumstance in material sparing is to decrease the heaviness of the structure without trading off on its quality and functionality. Another lightweight sandwich strengthened solid area has been produced with a novel utilization of lightweight concrete as infill material. The area, in particular, LSRC segment, is appropriate for use as a bar or chunk individuals. Exploratory examinations concerning the quality of bars with LSRC area indicates promising outcomes under both flexural and shear tests. In view of the test outcomes, the flexural limit of LSRC bars was observed to be relatively indistinguishable to the limit of the proportionate strong shaft. The shear limit of the LSRC pillars was expectedly decreased because of the low compressive quality of the lightweight cement infill material. ANSYS 12.1 was utilized to create three-dimensional nonlinear limited component models of LSRC bars and was checked against the test results.
  - 7) Zulkarnain et al. (2013) <sup>[5]</sup> examined that compressive quality of frothed concrete is mostly an element of dry thickness and is just marginally influenced by the level of bond supplanted by silica smolder. An extensive extent of silica foam did not essentially influence the long haul compressive quality. The compressive quality of froth concrete with silica fume is higher than the froth concrete without silica fume and the distinction of quality between froth concrete with silica and control tests is roughly the equivalent for all age.
  - 8) Walvaren et. al. (2014) <sup>[9]</sup> Because of various reasons, new intrigue formed into the utilization of lightweight total cement. Inside the extent of this improvement, a modernized code for lightweight cement must be composed. With the end goal to help this advancement, various research ventures have been done. The point of the examination was to confirm the propriety of various plan techniques for lightweight cement. The conduct of different kinds of lightweight cement has been contemplated.
  - 9) Sobuz et. al. (2014) <sup>[7]</sup> Traditional building materials are generally utilized in a creating nation like Malaysia. Test outcomes show that the compressive quality of cement diminished as the level of the OPS expanded in each blending proportion. Different properties of OPS concrete, in particular, modulus of the break, modulus of flexibility, part rigidity, and thickness, were likewise decided and contrasted with the comparing properties of regular cement. Monetary investigation additionally demonstrates a conceivable cost decrease of up to 15% because of the utilization of OPS as coarse total. At long last, it is reasoned that the utilization of OPS has awesome potential in the generation of basic lightweight cement.
  - 10) Grethel (2015) <sup>[3]</sup> Potential market to utilize auxiliary lightweight cement is expanding in Mexico because of the tall structure development, tilt-up, and precast industry. Basic Lightweight Concrete can be intended to get comparative execution to typical weight concrete and to offer a weight-quality proportion more productive in basic components. The greater part of the cases, the minimal expense of lightweight cement is repaid by size decrease of basic components, a decline of strengthened steel, diminish dead heap of structures, which implies worldwide costs decrease of the undertaking. Basic lightweight cement is approved in three levels of harmony thickness: 1500 kg/m<sup>3</sup>, 1700 kg/m<sup>3</sup> and 1900 kg/m<sup>3</sup> with various measurements of lightweight engineered particles.
  - 11) Siram (2015) <sup>[6]</sup> here author inferred that Foams framed from protein-based surfactants have less air pocket estimate, are more steady and have a more grounded shut air pocket structure contrasted with the froth created utilizing engineered surfactants. Thus, they are high quality froth cements. The thickness of froth concrete is the capacity of the volume of froth that is added to the bond glue. The compressive quality of frothed concrete is an opposite capacity of the thickness of the material.
  - 12) Ningobam et. al. (2016) [8] Traditional building materials are generally utilized in a creating nation like Malaysia. This kind of material is exorbitant. Oil palm shell (OPS) is a sort of cultivating strong waste in the tropical area. This paper intends to explore quality attributes and cost investigation of cement delivered utilizing the degree of OPS 0– half on traditional coarse total with the blend extents 1 : 1.65 : 2.45, 1 : 2.5 : 3.3, and 1 : 3.3 : 4.2 by the heaviness of conventional Portland bond, stream sand, squashed stone, and OPS as a substitution for coarse total. The comparing w/c proportions were utilized: 0.45, 0.6, and 0.75, separately, for the characterized blend extents. Test outcomes prove that the compressive quality of cement diminished as the level of the OPS expanded in each blending proportion. Different properties of OPS concrete, in particular, modulus of the break, modulus of flexibility, part rigidity, and thickness, were likewise decided and contrasted with the comparing properties of regular cement. Monetary investigation additionally demonstrates a conceivable cost decrease of up to 15% because of the utilization of OPS as coarse total.
  - 13) T. Subramani et. al. (2017) <sup>[2]</sup> The PC helped examination is finished by utilizing E-TABS to discover the powerful horizontal load framework amid dynamic stacking in the light-weight solid building. The execution of the building is assessed as far as Lateral Displacement and Story Drifts. The examination found that Response range investigation lessened parallel dislodging and storey float because of dynamic burdens contrast with the static investigation for every single broke down model. RCC developments have more weight and bigger cross areas for basic individuals. In our examination about powerful parallel load framework amid dynamic stacking in lightweight solid building contrasting with RCC part.

The investigation additionally discovered; parallel dislodging, story float regarding dynamic stacking in LWC area.

- 14) Muralitharan et. al. (2017) <sup>[16]</sup> Lightweight cement is generally acknowledged in the development business chiefly because of its low thickness. Pumice lightweight total (PLA) is a volcanic-root normal total of low particular gravity. It is conceivable to create lightweight cement of thickness up to 1450 kg/m<sup>3</sup> utilizing pumice having a dry thickness of 1200 kg/m<sup>3</sup> and sound protection properties, higher quality/weight proportion, better imperviousness to fire, and strength properties. The benefits of lightweight cement are: lessened mass, enhanced warm Performance of pumice lightweight total cement (PLAC) under cyclic stacking, or, in other words amid a tremor, is of prime significance. In the present investigation, the cyclic conduct of fortified PLAC light emissions review with length (L) 1500 mm, broadness (B) 100 mm and profundity (D) 150 mm have been considered in the research facility alongside control pillars.
- 15) Vandanapu and Krishnamurthy (2018) <sup>[1]</sup> Considered that Concrete structures are inclined to seismic tremor because of the mass of the structures, essential utilization of structural lightweight concrete (SLWC) is to decrease the dead heap of a solid structure, which enables the basic architect to lessen the measure of the basic individuals like a pillar, segment, and footings which results in the decrease of tremor powers on the structure. This paper endeavors to foresee the seismic reaction of a six-storied strengthened solid edge with the utilization of lightweight cement. An all-around composed six-story model is taken for study.
- 16) Ashik et. al. (2018) Here the authors paper was based on analysis of the various properties of Foam Based Concrete and the process of its preparation progress of silica fume effect on performance of foamed concrete. The two foaming agents were used in the analysis namely natural and synthetic. A partial replacement of binding material was done with silica fume which provides additional strength compared to foam concrete without silica fume. Constituents of the Foamed Concrete included cement, water, Fine Aggregate and air voids. The conclusive study of the author revealed that Foam Concrete can be prepared using the natural foaming agent and while comparing it with synthetic one, natural substances are widely available in the present world at least cost. As Natural Foam has further down consistency and sturdiness. Hence for a given proportion, the density of FC with natural foaming agents higher than that of foam concrete with synthetic foaming agents and Compressive strength of FC, both natural and synthetic, was influenced by the substitution of silica fumes.
- 17) Moon et. al. (2018) here the author extracted there study on "Green Building" which was an environmentally conscious building, designed, constructed and operated to minimise the total environmental impacts. Here the author identified that 5% of the world's carbon dioxide emission was attributed to cement industry leading to need for finding an optimal solution along with satisfying the civil construction needs. Here Foam concrete was

termed as new innovative technology for sustainable building and civil construction which fulfills the criteria of being a Green Material. The various advantages associated with Foam Concrete are generally stated as its both fire and water resistant and possess high sound and thermal insulation properties.

The author here concluded various advantages as foam concrete is more versatile product in comparison to bricks or dense concrete blocks, being a cheap substitute for dense concrete as reinforced structural elements acting as thermal insulating product. It was not only that the production process of FC is totally free of any environmental pollution, but it offers additional possibility of further reduction in environmental pollution by enabling Fly Ash - an industrial waste - to be used as one of the main constituent materials. FC being the typical concrete, it keeps gaining strength with time, so long as some moisture is available in the surroundings. It is therefore as weatherproof, termite resistant, fireproof and durable as any other concrete.

## II. CONCLUSION

Past researches demonstrated that Implementation of the lightweight solid structure is conceivable in structure work, analysts in past additionally expounded the work in utilizing diverse lightweight materials to improve solid properties. In our examination, we selected foam concrete for the plan of lightweight RC concrete, and to think about its benefits and negative marks over the ordinary structure and to oppose sidelong powers in elevated structure.

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