

## Lightweight Panel System

Vikrant Pawar<sup>1</sup>, Suraj Patil<sup>2</sup>, Saurabh Ranim<sup>3</sup>, Vishal Sakat<sup>4</sup>

B.E. Student, Department of Civil Engineering, Viva Institute Of Technology.

**Abstract**—The rapid population growth and urbanization have made a massive demand for the construction materials. Masonry walls are the major component in the housing sector and exhibit poor performance against the uncertain loads. Further, the structure requires heavier sections for carrying the dead weight of masonry walls. The present investigations are carried out to develop a simple, lightweight and cost effective technology for replacing the existing wall systems. The lightweight concrete is developed for the construction of wall panel. The EPS(Expanded Polystyrene) beads are mixed and developed lightweight mixture. This wall panel is tested for the in-plane compression loading. The experimental and analytical results were compared. The finite element study predicted the ultimate load carrying capacity of the panel with reasonable accuracy. The present study showed that the lightweight panel is well suitable for the lightweight sandwich wall panels.

**Keywords:** Light weight materials, EPS beads, Low cost, Wall panels, Structural behavior.

### I. INTRODUCTION

Evolution of the development in construction activities around the world, the demand for construction materials is increasingly exponentially. Furthermore, the wall constructed with conventionally masonry system contributes higher dead weight to the structure. The reduction in the weight of the wall will significantly reduce the dead weight of the structure which results in overall reduction in size of structural components.

In this included conventional design guidelines as well as materials. This research is based on a case study for wall panels constructed out expanded polystyrene panels (EPS). This proposed system will contributes towards sustainable development with its cost effectiveness and optimized usage resources.

### II. OBJECTIVES

- Studying the mechanical characteristics of expanded polystyrene wall panels, such as compressive strength, water absorption, density.
- Developing procedure for processing polystyrene waste into a lightweight based construction materials.
- Analyze and compare the lightweight panel system with masonry walls.

### III. METHODOLOGY

#### 3.1 Methodology:

The lightweight panel is developed in the preliminary study is proposed for the inner core material in the sandwich panel. A sandwich panel size is 1\*1\*0.1m is cast with lightweight inner core infill. Several mix trials are tried and the EPS beads of 3mm size were uniformly sprayed into the normal mortar and mixed thoroughly. Water cement ratio is chosen by weight ratio to produce compacting materials at the bottom layer, fibre cement board is first laid, levelled. The lightweight mortar for the inner core is prepared and the laid on the fibre cement board at the thickness of 70mm to 80mm. The light weight mortar is laid over the board and levelled properly. After the levelling, fibre cement board is placed on the mortar properly and levelled. The overall panel thickness is maintained to 100mm. The panel is cured for 28 days and prepared for testing. The panel is weighed and shifted to test floor for testing. The test specimen is cleaned, whitewashed and grid lines are marked. Over the marking wet plaster of paris is applied and panel is positioned at right location. A 1000kn impact jack is fixed in the loading frame and the load is measured using 1000kn load cell and cross checked with the pressure gauge fixed in the hydraulic jack. The load is applied in increasing steps and the corresponding response of the panel is observed. The crack developed on the panel surface are marked with a pencil mark and the failure pattern is observed .

#### **IV. CONCLUSION:**

- The lightweight concrete with a higher percentage of EPS bead is suitable for sound and heat insulation.
- It gives the good strength at lower cost and also it is light weight and have longer durability and environment friendly.
- This panels are easy to transport, handle and install.
- The cost of this panel is 30%-40% less than conventional masonry wall.

#### **REFERENCES**

- [1] S.Geetha, M.Selvakumar (2015) "Lightweight Composite Wall Panels With Polypropylene Fibres" Vol.4 pp.2321-7308.
- [2] S.Grija, P.sivakumar (2014) "Novel Ferrocement Light Weight Wall Panels" Vol. 9 pp.4645-4657.
- [3] Kothari akash, Chaudari Balasaheb (2017)"Light Weight Precast Concrete Panel by Using Polystyrene" Vol. 6 pp. 2347-6710.
- [4] PLN Fernando (2015)"Optimum mix for Light Weight Compound Sandwich Wall Panel" Vol. 4(2).
- [5] K N Lakshmikandhan (2017)"Investigation on Wall Panel Sandwiched With Lightweight Concrete" 2017