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Design of Precast Insulated Wall Panel that can be Altered with Conventional Burnt Brick

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ABSTRACT

The modern day construction techniques have made the rate of development so high, that all the conventional construction methods and materials has been altered with new ideas and implementations. Every aspects of the constructions has been benefited because of this. When we say about walls, especially in India, a large market is depended on the conventional burnt brick which are made from soil clinkers. Installation of these bricks is a costly affair which required lots of skilled labour and handsome amount of time. So, this project contributes in modern construction techniques which can be opted at the basic practice level in the market. The project includes designs for the precast walls panels for framed structures along with an insulation which can contribute as a part of green building. The panels were tested for the compression test and thermal resistivity test. As the framed structures does not transfer load through walls. In this case these panels could be handy and could reduce a lot of time and labour for installation of walls. Moreover this panels reduces the thermal power requirements of a building contributing into green building along with a smooth finishing.

Keywords: Precast wall Panels, Framed Structure, Green Building, Insulation, Smooth Finishing.

I. INTRODUCTION

In India, a large portion of market is depended on soil clinker bricks as an element of brick walls. The problem with these soil bricks is they required a lots of process which need to be done before final installation. They need to be soaked in water to remove air voids, placing one be one which consumes lot of time, need more skilled labour for installation, cement mortar is need to smooth the walls surface commonly known as "plaster". Due to all the above listed phenomena this soil brick become a hectic for their use.

This project has come up with a lot of aspect to avoid all the above listed problems. These precast panels has been designed to be used in framed structure in the building. These panels are divided into 2 parts i.e. the wythe and the core. The outer layers of the panels are of concrete and the core is filled with polystyrene sheets. Since the load passing through the walls in framed structure is negligible as compared to that of load bearing structure, these panels possess a quite good strength when subjected to compression. The polystyrene sheets acts as a heat reflector which reflect the sunrays in hot summer season reducing the thermal demand of the building. In winter season again these polystyrene sheets traps the heat inside which again result into reduction in thermal energy demand of the building.

A. Design of Precast Panels

This particular design panel is a typical sandwich wall panel and the 2 main component of the panels are

1. Concrete wythe
2. Insulation.
3. Connector.

The dimensions of the panel is 30.5 cm* 30.5 cm*7cm.
Classification of thickness - (20-30-20) mm where 30mm & 40 mm are thickness of concrete wythe and thickness of insulation respectively.

1. Concrete Wythe

The strength of the panel is totally depended on the 2 outer layer of the concrete. These layer are to resist all the compressive forces which are created in between the structural element in the framed structure.

Characteristic of concrete

- Design mix- M20 i.e. (1:1.5:3) cement: sand: aggregate.
- Water cement ratio- 0.5.
- Size of aggregates – 10-15mm.
- Sand – locally available.

2. Insulation

The main properties of the precast panel was achieved with the help of insulation provided in between 2 layer of concrete. The insulation used for this was 'sheets of polystyrene'.

Characteristics of Insulation

- Thickness of material- 30mm
- Length & width – (28*28) cm respectively.

3. Connector

In order to hold all the sub layers of the panels they were connected with straight thin steel bars of 5 mm diameter. During the time of casting the panel the connector was installed and which was resulted in increase in strength of the panel.

4. Wire Mesh

In order to hold the concrete wythe layer stiff each layer of concrete was fixed with wire mesh in it. The mesh was of steel wire of diameter 2mm. The mesh was flexible in texture.

Casting of Panel

Dimension of panel- (30.5*30.5*7) cm
Quantity of material raw materials-
Cement- 1 kg
Sand – 1.5kg
Aggregate- 3 kg
Water 0.5 litre

The line of action of casting the panel is as follows

- Calculation of volume of concrete required.
- Weight batching of raw materials.
- Dry mixing of cement, sand, aggregates.
- Addition of water in interval and mixing it.
- Casting the panel horizontally
- Laying one layer of concrete
- Applying insulation sheets with connector.
- Applying second layer of concrete.
- Allowing it for settlement.
- Curing for 28 days by immersing in water.

B. Testing of Panel

As the panels were designed to be used as an alternative to burnt brick walls so it was necessary that the panels should resist more compressive pressure as compared to that of burnt brick masonry wall.

There is a comparative test were conducted between a brick panel and concrete panel the compressive strength of a burnt brick wall masonry was very poor as it involves failure of mortar joints. The mortar joint is not that strong as compared to concrete panels. So the panels were showing satisfactory results when were compared with burnt brick panels.

Thermal Resistivity of Panel

Insulation level are specified by **R-Value**. **R-Value** is a measure of **insulation' s**tability to resist heat traveling through it. The higher the **R-Value** the better the thermal performance of the **insulation**

The standard R-value for polystyrene is **3.9-4.4**[20]

Compression Testing of Panels
The panels were tested in compression testing machine in the college campus. The panels were tested in compression testing machine.

Sr.no	Size of panel	Load(N)	Strength(Mpa)

	(cm)		
1	30.5*30.5*7	205	17
2	30.5*30.5*7	210	17

II. CONCLUSION

The results of this project shows that the use of these panels would reduce a lot of time in constructions, along with this it would reduce the overall thermal power requirement of the building. One of the silent feature of this project is these panels provide a smooth finishing surface as a result need of plastering is avoided. Due to all the above factors it can be concluded that these precast insulated concrete panels could be altered with conventional burnt bricks.

III. REFERENCES

[1]. David. C. Saimon, "Full scale testing of the precast sandwich panel" in A.C.I structural journal, title no- 94-S32.

[2]. http://inspectapedia.com/insulation/Insulation_Values_Table.php#Styrene