

# PRE-CAST PARTITION WALL PANELS DEVELOPMENT

Prof. B R Shilpa

*Assistant professor, Department of Civil Engineering R R Institute of technology Bangalore, Karnataka, India*

*Bipin Kumar Mandal, Bhola Sah, Sujan Rajbhor Chaudhary, Nilesh Kumar Mandala*

*U G Students, Department of Civil Engineering R R Institute of technology Bangalore, Karnataka, India*

*Shilpacv.10@gmail.com*

**Abstract-** The growing demand for faster and more resource-efficient construction industry today is shifting toward cleaner, and more affordable building systems. Traditional brickwork and on-site concrete methods, although widely used, are slow, labor-intensive, and often environmentally expensive. Because of this, prefabricated or pre-cast wall panels have become an important alternative. These panels are manufactured in a controlled environment, transported to the site, and installed quickly, reducing project time and improving quality consistency (RESM, 2025).

## I. INTRODUCTION

The growing emphasis on sustainable building materials has sparked an interest in earth walling systems. The Mud-Concrete (MC) technology, combining concrete's strength and durability with traditional mud-based construction methods, offers an affordable, load-bearing wall system for indoor comfort. However, challenges arise when creating thin non-load-bearing walls due to shrinkage-related Defects (17th International journal conference, 2024). Among the different types of prefabricated wall systems such as solid concrete panels, hollow-core systems, sandwich panels, and fiber-reinforced panels there is a growing interest in developing sustainable, low-carbon, and cost-friendly materials. One such emerging solution is the Pre-Cast Mud-Concrete (MC) Panel, which blends the age-old concept of earthen construction with modern precast technology. Development of pre-cast mud-concrete (MC) partition wall panels presents a sustainable alternative to conventional concrete construction (MDPI, 2023)

The development of pre-cast partition wall panels is driven by the demand for faster, more sustainable, and cost-effective construction methods. The use of off-site manufactured panels in modern construction, particularly the evolution of pre-cast concrete sandwich panels (PCSPs), offers superior performance in terms of strength, durability, insulation, and installation speed compared to

traditional methods like brick or block work. (R discovery, 2022). Pre-cast partition wall panels are non-load-bearing elements that are manufactured off-site in controlled factory condition and transported to the construction site for installation. (IS SP23, 1982).

The development of these panels focuses on creating efficient, durable, and cost-effective solutions for dividing interior spaces in various types of building. The ongoing development in pre-cast partition wall panel technology aims to provide faster, more efficient, sustainable, and high quality solutions for interior wall construction, meeting the evolving demands of building industry. Mud-concrete (MC) uses locally available soil mixed with a small amount of stabilizer, usually cement or lime, to improve strength and durability. Instead of using traditional mud walls that are cast in place, MC panels are pre-cast, meaning the panels are produced off-site in moulds and then used as interior partition walls.

This approach makes the system faster, cleaner, and more practical for modern buildings. (Research Gate, 2020) With rapid urbanization and the need for affordable and eco-friendly building techniques, MC panels can become a strong alternative for non-load-bearing partitions in residential, institutional, and commercial buildings. Pre-cast partition wall panels have emerged as a transformation elements in modern construction, offering rapid, sustainable, and efficient alternatives to traditional masonry drywall partitioning systems. As urbanization increases and demands for cost-effective, durable, and quick , pre-cast wall panels are increasingly embraced across residential, commercial and industrial development.

## II. METHODOLOGY

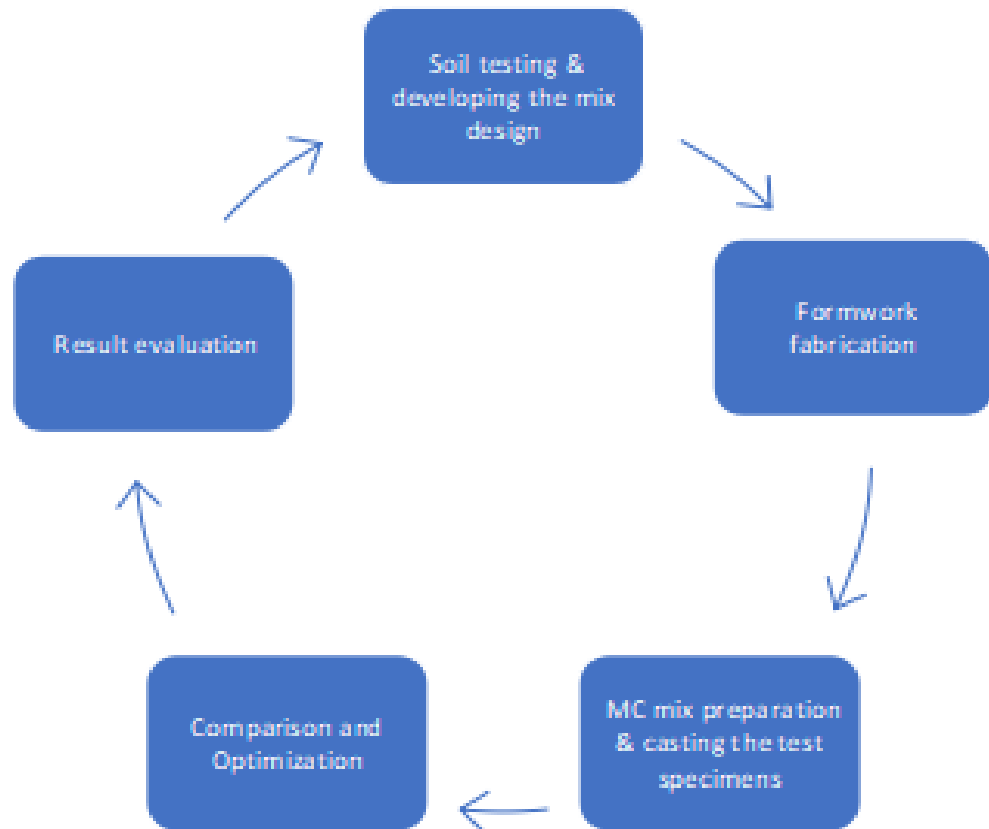
This methodology involves casting of mud concrete panels with conventional concrete This entire methodology is done on the basis of systematic plan

and the results obtained are reliable, and suitable for the comparison between mud concrete panels and conventional concrete panel.

The quality and suitability of constituents are one of the major factors which influences in any

construction or product development. Locally available materials are selected to ensure practicality, economy and sustainability.

The materials used include cement, soil, coarse aggregate, nylon fibre (for strengthening) and water



**Fig1: Flow chart of Methodology**

Ordinary Portland Cement (OPC) of 53 grade or M15 grade cement is used for both mud-concrete panels and conventional concrete panels. The soil used in this test was collected from a nearby location to reflect real site condition sand naturally available soil to meet economical .The soil washed and oven-dried and sieve analysis is done through 4.75 mm. For both concrete panels and mud-concrete panels, crushed stone aggregate was used as coarse aggregate. The aggregate improves the load-carrying capacity and reduces shrinkage. To reduce and control shrinkage cracks in order to

improve the serviceability of the mud-concrete panel nylon fibers of length 25 mm were added to the mud-concrete mix. Fiber reinforcement helps in controlling plastic shrinkage, improving crack resistance, and enhancing durability.

Water plays a crucial role in hydration of cement and for achieving proper workability. Care was taken to avoid impurities such as salts or organic matter, as they may affect strength and durability of the panel. In order to achieve the panel with desirable properties it is necessary to check and test each

III. RESULTS AND DISCUSSION

**Table1: Comparison between Concrete Panel and Mud-Concrete Panel**

Particulars	MC panel	Concrete panel
Compressive Test	9 N/mm <sup>2</sup>	15 N/mm <sup>2</sup>
Water Absorption Test	9.7 %	8.02 %
Durability Test	Very good- Moderate	Very good
Hardness Impression Test	Moderate hardness and medium strength.	High hardness and good strength.
1m Drop Test	Very minor cracks developed	No cracks developed
Efflorescence Test	Very little efflorescence was observed	No efflorescence was observed

It is a significant findings that Mud- Concrete Panels, which incorporate soil and a reduced amount of cement, can achieve performance properties similar to traditional Concrete Panels in key areas. The results and discussion of the implications for each test, assuming the panels have been designed to exhibit comparable performance

The primary difference between the M15 grade concrete panel and the mud concrete panel of the same dimension lies in their strength and environmental characteristics. The M15 grade panel, with a compressive strength of 15N/mm<sup>2</sup>. is significantly stronger and more durable due to its cement- based composition, making, it suitable for moderate load bearing application and environments requiring high moisture resistance. Conversely, the mud concrete panel, with 9N/mm<sup>2</sup> strength, offers good structural capacity and is considerably more sustainable and environmentally friendly, having a lower embodied energy.materials before use of it.

**Table2: Result and Discussion**

Test Parameters	Concrete Panel	Mud-concrete Panel	Comparative Analysis
Compressive strength Test	15 N/mm <sup>2</sup>	9 N/mm <sup>2</sup>	Concrete panel demonstrates higher strength, indicating superior load-bearing capacity and a greater factor of safety.
Water absorption Test	8.02%	9.7%	Concrete panel exhibits lower water absorption than mud-concrete panel, indicating better resistance to moisture penetration, which translates to higher durability and less susceptibility to damage from freeze-thaw cycles or internal corrosion.
Axial resistance Test	Good resistance	Moderate resistance	Both panels show comparable performance in the short-term axial resistance test, suggesting that the difference in the mud-concrete panel's lower water absorption and higher strength.
Hardness Impression Test	High hardness and good strength	Moderate hardness and good strength	Concrete panel has a significantly higher surface hardness, indicating more resistance to surface abrasion, scuffing, and potential impact damage than mud concrete panel.
Efflorescence Test	No efflorescence was observed	Very little efflorescence was observed	Both panels performed well in the short-term efflorescence test, indicating no significant water uptake or salt crystallization on the surface.
1 m Drop Test	No cracks were developed	Very minor cracks were developed	Concrete panel has slightly better resistance than mud-concrete panel with negligible cracking from 1 m height.

IV. CONCLUSION

The comparative analysis of Pre-cast Concrete panels and optimized mud- concrete panels for use as non-load bearing partition walls leads to a balanced conclusions the strongly validates the MCP as viable and sustainable alternative, provided the design achieves parity in critical performance matrix. For application where both panels exhibits similar compressive strength, the MCP successfully fulfills the fundamental structural requirements for a partition wall, matching the Concrete panel’s ability to resist axial load necessary for handling and serviceability, with a significantly lower embodied carbon footprint due to reduced cement use.As Partition wall panel MC panel provides better compressive strength.As MC Panel gives 9.7% of water absorption indicating moderate to medium porosity.Indicating good quality pre-cast panel moderate durability in case of internal wall.The resulted product is economically beneficial.

In summary, the optimized mud-concrete panels is a technically sound and environmentally responsible substitute for the conventional concrete panel in precast partition applications; it successfully meets essential structural, durability, and serviceability standards, with the only notable comprises being a

lower tolerance for extreme impact loading, a factor easily mitigated through improved logistics and site managements protocols.

## REFERENCES

- [1] IS 456: 2000, Plain and reinforced concrete code book
  - [2] IS 1147: 1985, Code of practice for construction with large panel.
  - [3] Bailey, H., Hancock, D., 1990. Blockwork and Partition Walls, in: Brickwork 2 and Associated Studies. Macmillan Education UK, London, pp. 124-132
  - [4] Bandara, D.M.H.C., Arooz, F.R., Halwatura, R.U., 2016. Effect of Gravel size on strength of Mud Concrete, in: Civil Engineering Research Symposium 2016. Presented at the CERS-2016, Faculty of Engineering, University of Mortuwa, and pp. 62-65.
  - [5] "Analysis Of Brickwork Wall Panels Subjected To Lateral Loading Using Correctors" My Rafiq, Gc Zhou, Dj Easterbrook ( Vol- 16, Issue No.-02, 2014)
  - [6] "Analytical Model For Masonry Walls Strengthened With Vegetal Fabric Reinforced Cementitious Matrix From Composites And Subjected To Cyclic Loads" Ernest Bernat-Ma So And Lluís Gil (Vol-53.Issue No:-148, 2020)
  - [7] "An Innovative Clay Meta Brick-Based Motif To Enhance Thermal And Acoustic Insulation" Brahim Lemkali, Saad Bensallam, Muamer Kadic (Vol-02. Issue No:-07, 2023)
  - [8] "Simplified Analytical Methods For Prefabricated Concrete Wall Panel Building System With Alveolar-Type Joint" Yang Xiao, Xiaoyoung Luo, Minliang Xing, Zhen Pan (Vol-05, Issue No:- 13, 2023)
  - [9] "Developing Pre-Cast Partition Wall Panels Using Mud-Concrete" Hbgk Nayanajith, Fr Arooz -2024
  - [10] "Assessment Of Mechanical Performance Of Structural Mud Insulated Panels" Asad Khan, Mohammad Adil, Danhui Dhan, Muhammad Adeel Khan,-2024
- "Experimental Research On Behavior Of Prefabricated Pre-Stressed Thin Brick Masonry Veneer Panels" Robertas Zavalis, Aidas Jokubaitis, Arnoldas Sneideris, Zbynek Hlavac -2024