

# CONSTRUCTION METHODOLOGY OF FILLER SLAB

P.P. Sawant<sup>1</sup>, Rudresh Atmaram Padate<sup>2</sup>, Gunjan Dilipraj Dhuri<sup>3</sup>, Aryan Vaibhav Asolkar<sup>4</sup>,  
Tanishka Gurudas Gawas<sup>5</sup>, Tanisha Gurunath Bange<sup>6</sup>

Department of civil engineering, Yashwantrao Bhonsale Polytechnic, Sawantwadi, Sindhudurg, Maharashtra

\*\*\*

**Abstract** - Filler slab is an innovative and economical roofing technique used in building construction to reduce the consumption of concrete and steel without compromising structural performance. The basic concept of filler slab technology is the replacement of concrete in the tension zone of the slab with lightweight filler materials such as clay tiles, bricks, terracotta pots, or other locally available materials. Since concrete in the tension zone contributes little to structural strength, replacing it with filler materials helps reduce dead load and construction cost. This paper presents the concept, materials, methodology, and basic calculations of a filler slab model and highlights its economic and environmental advantages.

**Key Words:** Filler Slab, Sustainable Construction, RCC Slab, Low-Cost Housing, Concrete Reduction.

## 1. INTRODUCTION

Concrete is one of the most widely used construction materials in the world. Conventional reinforced cement concrete (RCC) slabs consume large quantities of cement and steel, increasing the weight and cost of buildings. A large portion of concrete in slabs lies in the tension zone where it contributes little to structural strength. Filler slab technology replaces this unnecessary concrete with lightweight filler materials. This technique reduces the dead load of the structure, lowers construction cost, and improves thermal insulation while maintaining structural safety.

### 1.1 PROBLEM DEFINITION

1. In a small town, builders noticed that every new house used thick, heavy concrete slabs that consumed a lot of cement and steel, making homes expensive and structures unnecessarily heavy.
2. We realized that much of the concrete in these slabs wasn't even doing any real work — it just added weight without contributing to the strength of the building.
3. As prices of cement and steel increased, homeowners struggled to afford strong yet economical roofs. Builders started searching for ways to reduce costs without compromising safety.
4. We became aware that excessive use of cement also harms the environment by increasing carbon

emissions, yet sustainable alternatives were rarely used.

5. This led to the idea of using Filler Slabs, where waste or local materials could replace unnecessary concrete, reducing cost, saving resources, and creating eco-friendly buildings.

### 1.2 SCOPE OF PROJECT

1. The project studies the design and construction of a filler slab as an alternative to a conventional RCC slab.
2. The project focuses on reducing concrete in the tension zone without affecting strength.
3. It includes the selection of suitable filler materials like clay tiles, pots, or lightweight blocks.
4. Cost estimation and comparison with normal slabs are part of the study.
5. The project evaluates savings in cement, steel, and overall construction cost.
6. It examines environmental benefits by promoting eco-friendly materials.

### 1.3 OBJECTIVES

1. To reduce construction cost by minimizing the use of concrete in the tension zone of the slab.
2. To maintain structural strength and safety while using alternative filler materials like clay tiles or pots.
3. To promote sustainable and eco-friendly construction by using locally available and low-energy materials.
4. To study and compare the performance of filler slab with conventional RCC slab in terms of strength, economy, and durability.

## 2. LITERATURE SURVEY

### 2.1 Design and Analysis of Filler Slab Using Terracotta Fillers

• **Author:** Janmesh Bhoir, Prathamesh Ade, Kuwar Gupta, Aditya Lokaret, Jessly Rajan.

• **Published on:** 08/08/2023

In the gracefully developing industry of construction, the cost of the project plays an important role, which is mainly determined by the concrete. To reduce the quantity of concrete without compromising the Strength of concrete, filler slab technology has been used. The primary idea behind employing filler-slab Technology is to decrease the amount of concrete in the tension zone, as not all concrete in this zone contributes to the tensile properties. Instead, lightweight, inert, and inexpensive filler materials are utilized to replace this non-contributing concrete, without compromising the quality and structural stability of the building. In the design of a two-way slab, the filler material is positioned between the reinforcement spacing, ensuring adequate cover. Terracotta pots are used as filler materials Overall, filler slabs offer a cost-effective and sustainable alternative to traditional solid slab construction, with several benefits such as improved thermal insulation, aesthetic appearance, and reduced environmental impact.

## 2.2 Benefits of Filler Slab over R.C.C Slab

- **Author:** Aditya Sainath, Sangeeta Das
- **Published on:** 01/08/2020

The whole weight of the building is taken away by the self-weight of the reinforced concrete. In order to reduce the usage of concrete and the self-weight of slabs, the usually preferred slabs are voided slabs or hollow slabs. Such slabs have benefits such as reduced weights, longer spans, reduced floor-to-floor heights, etc. Cost reductions in roofs/floors are gained through the choice of filling a part of the concrete in the tension zone with cheaper materials. In the context, with the use of waste material in building construction and solving its disposal problem, a technology has been developed at the Central Building Research Institute (CBRI), Roorkee, India, to build reinforced floor/roof slab with multiple materials as filler material. This paper discusses about the benefits of a filler slab when compared to a conventional slab, considering the parameters of thermal performance and materials, construction technique and acoustical benefits.

## 2.3 Filler Slab as a Substitute for Customary Roofing Mechanism

- **Author:** Harshal Khandekar, Tanmay Khamkar, Rahul Bagu, Mayank Pawar, Prof. K. H. Ghorpade
- **Published on:** 02/06/2023

Lightweight structural components called filler slabs are utilized in building construction, particularly for roofing applications. Contrary to traditional solid slabs, filler slabs use non-structural fillers in the lowest part of the slab, such as lightweight aggregates or waste materials. While preserving structural integrity and load-bearing capability, this design maximizes the use of concrete. The investigation of alternative technologies has been prompted by the rising need for eco-friendly and affordable roofing solutions. A possible method for building roofs that are both inexpensive

and environmentally friendly is the filler slab, which is one such invention. As an alternative to conventional roofing technology, infill slabs are described.

## 2.4 A Review on “To examine and compare filler slab technique and rat trap bond as an alternative low-cost construction technology”

- **Author:** Siddhant N. Bhagat, Sneha S. Sawant.
- **Published on:** 10/06/2022

India is a developing country with only 20% of the highest paid group. Affordable housing can be considered affordable for a low- or middle-income person if the family can get a unit of housing for up to 30% of the family income. The low-income group of developing countries often do not have access to the housing market. Affordable housing is a related and closely related budget and seeks to reduce construction costs through better management, efficient use of local resources, skills and technologies without sacrificing the energy and health of the building. The “Rat Trap Mouse and Filler Slab” approach can be applied to a housing project to achieve cost effectiveness and structural stability without compromising the strength and durability of the system. In this project, we work on Rat Trap Bond and Filler Slab Concept for an alternative low-cost construction material. It was analysed in this case study of Ajni in the Nagpur district of Maharashtra.

## 2.5 Design and Analysis of Filler Slab

- **Author:** Mahananda R K, Vikas Mendi and Raveesh R M.
- **Published on:** 2020

Filler slab technology is an innovative and cost-effective technology where the dead load of the slab is reduced by replacing the concrete with filler material. The concept behind the use of filler-slab technology is to reduce a substantial portion of concrete in the tension zone, since all the concrete in the tension zone contributes to the tensile properties. This concrete is replaced with lightweight, inert and inexpensive filler without compromising the quality and structural stability of the structure. A two-way slab is designed; the filler blocks are placed between the reinforcement spacing by providing a cover of 20mm. The filler materials are granite dust and foundry sand. This filler slab is analysed using STAAD. Ro and ANSYS software. Filler slab is compared with the conventional slab of the same size. This study describes the Structural behavior and cost effectiveness of the filler slab when compared to the standard slab.

### 3. METHODOLOGY

#### 3.1 PRACTICAL METHODOLOGY FOR THE PROJECT



#### 3.2 DETAILED METHODOLOGY

The methodology of a filler slab model involves studying the structural concept, preparing the slab design with proper reinforcement detailing, and identifying the tension zone where concrete can be replaced with lightweight filler materials such as clay tiles or pots. In the model, reinforcement bars are arranged as per design, filler materials are placed between them, and concrete (or plaster for the model) is poured and cured properly. The filler slab is mainly used in residential and low-cost housing projects to reduce the construction cost and dead load of the structure. Its necessity arises from the need to eliminate unnecessary concrete in the tension zone, reduce material consumption, promote eco-friendly construction, and achieve an economical yet structurally safe roofing system.

#### 3.3 MATERIAL REQUIRED

1. Cement – For preparing concrete or plaster mix.
2. Fine Aggregate (Sand) – Used in concrete mix.
3. Coarse Aggregate – For concrete preparation (optional in small models).
4. Water – For mixing and curing.
5. Steel Bars (Reinforcement rods) – Main bars and distribution bars.
6. Binding Wire – For tying reinforcement bars.

7. Clay tiles / Clay pots / Terracotta blocks – Placed in tension zone to reduce concrete usage.

8. Plywood / Thermocol Sheet – Base platform.

9. Fevicol or Adhesive – For fixing parts in the model.

10. Measuring scale, cutter, and small tools – For shaping and alignment.

#### 3.4 CONSTRUCTION OF FILLER SLAB

- Base Preparation Use a flat plywood or thermocol sheet as the base of the model to provide stable support for the slab.

- Edge Shuttering Fix small thermocol or cardboard strips along the edges to create the boundary of the slab and maintain its thickness.

- Levelling and Alignment Check the base and side shuttering to ensure the surface is level and the slab thickness is uniform.

- Surface Preparation Apply a thin layer of oil, vaseline, or adhesive sheet on the base to prevent plaster or model concrete from sticking, allowing easy removal after curing.



Fig -1: Slab Formwork

- Cutting and Bending Bars Cut small steel rods or thin wires according to the slab dimensions and bend them as required to form the main and distribution reinforcement for the model.

- Placing Main Reinforcement Position the main bars along the length of the slab, keeping proper spacing to simulate actual structural reinforcement.

- Placing Distribution Bars Place smaller bars perpendicular to the main bars, tying them together with thin binding wire or adhesive to maintain stability.

- Ensuring Proper Cover Maintain a small gap between reinforcement and base (using small spacers or cardboard pieces) to simulate concrete cover and prevent direct contact with the base.



Fig -2: Arrangement Details for Filler Slabs

- Preparing Concrete/Plaster Mix For the model, prepare a small quantity of cement and sand mix (1:2 or 1:3 ratio) with water to achieve a smooth, pourable consistency.
- Placing Filler Materials Arrange the clay tiles, clay pots, or other filler materials in the tension zone between the reinforcement bars before pouring the concrete/plaster.
- Pouring the Mix Carefully pour the prepared mix over the reinforcement and filler, filling all gaps and ensuring the mix surrounds the fillers and bars properly.
- Curing the Slab Model Keep the model moist by covering it with a wet cloth or spraying water for 7–10 days (or until plaster sets) to allow proper curing and prevent cracks.



Fig -3: Curing of a filler slab

- Surface Levelling After curing, remove any uneven spots on the top surface of the model using a small trowel or sandpaper to make it smooth and uniform.

- Edge Finishing Trim or smooth the edges of the slab to match the dimensions and remove any excess material from the formwork.

- Surface Polishing Lightly polish the surface using sandpaper or a soft brush to improve the appearance and demonstrate a finished look for the model.

- Final Inspection Check the slab for cracks, alignment, and proper placement of fillers and reinforcement, ensuring the model accurately represents the actual filler slab construction.



Fig -4: Filler Slab

### 3.5 CALCULATION

#### 1. Slab Dimensions & Volume Summary

To find the total volume of the slab, the following steps were taken:

- **1. Unit Conversion**

The initial dimensions in feet were converted to meters to standardize the calculation:

**Length:** 2 ft = 0.61 m

**Width:** 1.5 ft = 0.46 m

- **2. Area Calculation**

The surface area of the slab is determined by multiplying the length and width:

$$\text{Area} = 0.61 * 0.46 = 0.28 \text{ m}^2$$

- **3. Volume Calculation**

Using the assumed slab thickness of **75 mm** (0.075 m), the total volume is:

$$\text{Volume} = \text{Area} * \text{Thickness}$$

$$\text{Volume} = 0.28 * 0.075 = 0.021 \text{ m}^3$$

## 2. Volume Reduction by Pots

- Assume **regular pot diameter** = 100mm (0.1 m) and **height** = 70 mm (0.07 m).
- **Volume of one pot:**  
 $V = \pi r^2 h$   
 $V = 3.14 * (0.05)^2 * 0.07$   
 $V = 0.00055 \text{ m}^3$
- **For 6 pots:**  
 $6 * 0.00055 = 0.0033 \text{ m}^3$

## 3. Concrete Volume Required

Subtracting the volume of the pots from the total slab volume:

- **Concrete** = 0.021 - 0.0033  
Concrete = 0.0177m<sup>3</sup>  
approx. 0.018 m<sup>3</sup>

## 4. Concrete Material Quantity

- **Assume M20 mix:** (1: 1.5: 3)  
→ Total Parts = 5.5
- **Dry volume factor:** 1.54
- **Dry Volume Calculation:**

Dry volume = 0.018 \* 1.54 = 0.0277 m<sup>3</sup>

- **Cement Calculation:**

$1/5.5 * 0.0277 = 0.0050\text{m}^3$

- **Standard cement bag volume:** 0.035 m<sup>3</sup>

Cement = 0.14 bags approx. 7 kg

## 5. Steel Quantity (8 mm bars)

Assume grid spacing of 150 mm.

- **Bars along 2 ft direction:**  
0.61 / 0.15 approx. 4 bars  
Length per bar = 0.46 m
- **Total length:** 4 \* 0.46 = 1.84 m
- **Bars along 1.5 ft direction:**  
0.46 / 0.15 approx. 3 bars  
Length per bar = 0.61 m
- **Total length:** 3 \* 0.61 = 1.83 m

## 6. Total Steel Weight

- **Total Steel Length:**  
1.84 + 1.83 = 3.67 m
- **Weight of 8 mm bar:**  
Weight/m =  $d^2/162$   
Weight/m =  $8^2/162 = 0.395 \text{ kg/m}$
- **Final Steel Weight:**  
 $3.67 * 0.395 = 1.45 \text{ kg}$   
approx. 1.5 kg steel.

## 4. CONCLUSIONS

- **Cost-Effectiveness and Viability:** The studies conclude that filler slab technology is a cost-effective and viable alternative to traditional construction methods. It is an ideal solution for affordable housing, especially in developing

countries where reducing material costs is a priority.

- **Structural Integrity:** The structural strength of a filler slab is nearly the same as that of a conventional RCC slab. By replacing concrete in the tension zone—where it contributes little to strength—the slab maintains its load-bearing capabilities while significantly reducing dead load.
- **Material and Economic Savings:** From an economic standpoint, the technique saves approximately 30% of concrete consumption. This reduction in cement and steel requirements results in a significant decrease in the overall project cost without sacrificing quality.
- **Enhanced Thermal and Acoustic Properties:** Beyond structural savings, filler slabs improve the building's internal environment by providing better thermal insulation and acoustical benefits compared to solid slabs. This makes the technology particularly suitable for creating comfortable living spaces in various climates.
- **Environmental Sustainability:** The use of locally available, low-energy, or waste materials as fillers promotes eco-friendly construction. By minimizing the consumption of carbon-intensive cement, filler slab technology serves as a sustainable alternative that reduces the overall environmental footprint of the structure.

## 5. FUTURE SCOPE

### 1. Use of Alternative Eco-Friendly Materials

Future filler slabs can use recycled or industrial waste materials like plastic bottles, fly ash bricks, coconut shells, or polystyrene blocks to further reduce environmental impact.

### 2. Lightweight and Low-Cost Construction

Filler beams and slabs will continue to be used in low-cost housing and rural projects to minimize concrete and steel consumption, reducing dead load and construction cost.

### 3. Integration with Sustainable Building Practices

With green building certifications becoming common, filler beams can contribute to energy efficiency, thermal insulation, and lower carbon footprints in modern structures.

### 4. Technological Advancements in Design

Advanced structural software can optimize filler beam designs for higher spans, load bearing capacity, and hybrid materials, making them more efficient for commercial and residential projects.

### 5. Urban and Disaster-Resistant Applications

Filler beams can be adapted for earthquake-resistant or modular construction, especially in areas where lightweight, strong, and economical structures are needed.

## 5. Educational and Research Use

Filler slab and beam models will continue to be valuable in civil engineering education and research for studying sustainable construction techniques and material efficiency.

## ACKNOWLEDGEMENT

It is with great pleasure and heartfelt gratitude that we express our sincere appreciation to our project guide, Prof. P. P. Sawant Sir, for his valuable technical guidance, unwavering support, and efforts throughout the completion of this project. His expertise and encouragement have been truly instrumental in shaping our work.

## REFERENCES

1. T.S. Varghese, J.P. Shaj, 2013. Behaviour of RC Filler Slabs with Aerobic Microbial Bricks in RC Filler Slabs.
2. A. Madhumathi, S. Radhakrishnan, and R. Shanthi Priya, 2014. Sustainable Roofs for Warm Humid Climates.
3. Mr. Amit D Chougule, Mr. Manoj H. Mota, and Dr. Mrs. Ushadevi S Patil, 2015. To study the filler slab as an alternative construction technology.
4. S. Sundari, S. Sukumar, 2016. Study on filler slab using self-compacting concrete with terracotta pots as filler. From "Benefits of Filler Slab over R.C.C Slab": Study of properties of concrete made using Recycled aggregate and Industrial waste with special application to housing, Chapter-9
5. MR. Amit D Chougule, M. R. Manoj H. Mota, DR. MRS. Ushadevi S Patil "To study the filler slab as alternative construction technology- A review" Deepika Dinesh "Study on Flexural Behaviour of RCC Slab Filled with Hollow Roofing Tiles."

## BIOGRAPHIES



### **P.P. Sawant<sup>1</sup>**

Head of the Department,  
Department of civil engineering,  
Yashwantrao Bhonsale Polytechnic,  
Sawantwadi, Sindhudurg,  
Maharashtra



### **Rudresh Atmaram Padate<sup>2</sup>**

Final Year Student, Department of  
civil engineering, Yashwantrao  
Bhonsale Polytechnic, Sawantwadi,  
Sindhudurg, Maharashtra



### **Aryan Vaibhav Asolkar<sup>4</sup>**

Final Year Student, Department of  
civil engineering, Yashwantrao  
Bhonsale Polytechnic, Sawantwadi,  
Sindhudurg, Maharashtra



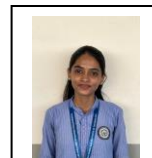
### **Gunjan Dilipraj Dhuri<sup>3</sup>**

Final Year Student, Department of  
civil engineering, Yashwantrao  
Bhonsale Polytechnic, Sawantwadi,  
Sindhudurg, Maharashtra



### **Tanisha Gurunath Bange<sup>6</sup>**

Final Year Student, Department of  
civil engineering, Yashwantrao  
Bhonsale Polytechnic, Sawantwadi,  
Sindhudurg, Maharashtra



### **Tanishka Gurudas Gawas<sup>5</sup>**

Final Year Student, Department of  
civil engineering, Yashwantrao  
Bhonsale Polytechnic, Sawantwadi,  
Sindhudurg, Maharashtra