

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

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**Abstract :** 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 self-weight of slabs, usually preferred slabs are voided slabs or hollow slabs. Such slabs have benefits such as reduced weights, economical longer spans, reduced floor-to- floor heights etc. Cost reductions in roofs/ floors are gained through the choosing of filling a part of 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 filler slab when considered over a conventional slab, considering the parameters of thermal performance, materials, construction technique and acoustical benefits.

**IndexTerms - Filler slab, RCC slab, Alternative construction techniques, Cost efficient, Thermal performance, Material efficiency.**

## I. INTRODUCTION

A concrete slab is a common structural component of contemporary buildings. Slabs in buildings mainly support dead load and live load. As a large portion of the building's weight is because of the dead load, reducing self- weight of slabs is important to reduce the total cost of the structure. The increase of slab thickness makes a slab heavier, and it leads to increase structural elements and base size. Thus, it makes building consume a lot of materials like concrete and steel. One of the alternative techniques to reduce this increase in slab weight is to adopt slab with hollow roofing tiles, normally referred as filler slabs. Filler-slab technology is nothing however an alternate of R.C.C. slab in which concrete and steel are used along to construct RCC block, is in their individual properties as separate building materials and their individual limitation.

Concrete is good in accepting compression and steel is good in taking tension. Thus, Reinforced Cement Concrete (RCC) slab is a product which can resist both compression and tension. The basic aim behind the use of filler-slab technology is to reduce the use of substantial amount of concrete below the neutral axis. A lot of Concrete below the neutral-axis does not contribute to the tensile properties, thus serves only as filler material. This portion of concrete are often replaced by regionally accessible and lightweight weighted filler materials like double-layer Mangalore tiles, hollow burnt bricks or conventional bricks, hollow Concrete blocks, etc., that area unit more cost effective, locally available and possess better thermal insulation properties. It reduces the burden of the block as these materials area unit lightweight in weight as compared to the traditional R.C.C. slab that uses concrete only. This successively reduces the amount of reinforcement utilized in the slab thereby reducing the value of the slab

## II. DESIGN AND DURABILITY

National building code of India 2005 specifies the filler slab is acceptable and approves to the provisions of relevant components relating to material, style and construction and therefore the material, method. Work offered is for the purpose intended. The Authority may approve any such alternative as Ferro cement construction, row-lock (rat trap) bond in masonry, stretcher bond in filler slab and filler slab provided it is found that the planned various is satisfactory and conforms to the provisions of relevant components relating to material, style and construction which material, method, or work offered is, for the purpose supposed, a minimum of similar to that prescribed within the Code in quality, strength, compatibility, effectiveness, fire and water Resistance, sturdiness and safety.

### 2.1 Design Parameters

Filler slab can be designed like a conventional RCC slab, however the reduction in dead load is due to the filler material and the spacing of reinforcement as per the size of the filler material should be taken under consideration. The thickness of filler material should not be more than the depth of the neutral axis. For a slab thickness of 125mm, the filler material depth should not exceed 60mm. The size and form of the filler material chosen ought to follow to the design needs. Shape and size of filler material decides the quantity of concrete to be replaced in the tension zone. Form cost consideration, effective compaction and ease in pouring concrete a minimum of 25% of the concrete should get replaced by filler material.

### 2.2 Construction of filler slabs

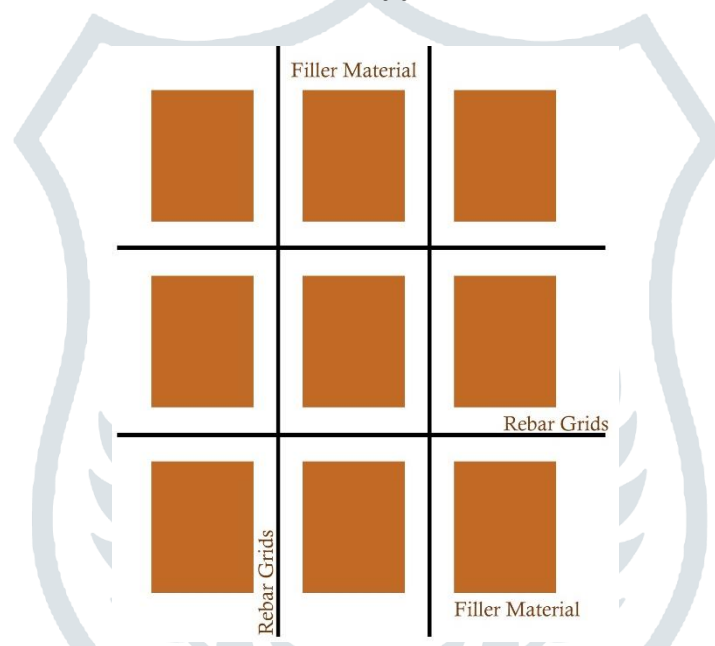
Important construction steps for filler slab are as mentioned below.

1. The filler material to be used must be waste materials or materials which are locally available and lighter than concrete.
2. The shuttering for slab is done as for a conventional RCC slab.
3. A minimum bottom cover of 15mm is kept when erection the shuttering that forms a grid and filler material will be placed centrally in every space of the grid. No filler material is provided in bands of concrete along the sting of the slab. The width of those concrete bands is minimum 300mm. The reinforcement spacing in these bands is smaller than spacing round the filler materials.
4. After all the filler materials are placed any concealed work etc., should be placed within the spaces between the filler material then concrete is poured between the filler materials and top of it to attain slab thickness.
5. Concrete vibrators must be avoided in bottom portion of slab as they will disturb the location of the filler materials. Manual tamping is advised.

6. Reinforcement layout for a filler slab using compressed earth blocks as filler material of size 230mm x 190mmx50mm.



*Figure 1 Clay pots used as filler material in the construction of filler slab*



*Figure 2 Reinforcement for filler slab*



*Figure 3 filling of filler material for filler slab*

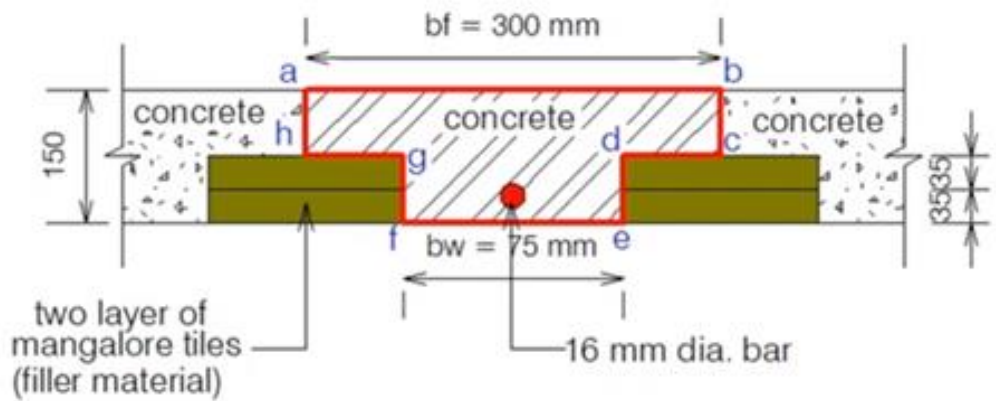


Figure 4 Cross-section of filler slab

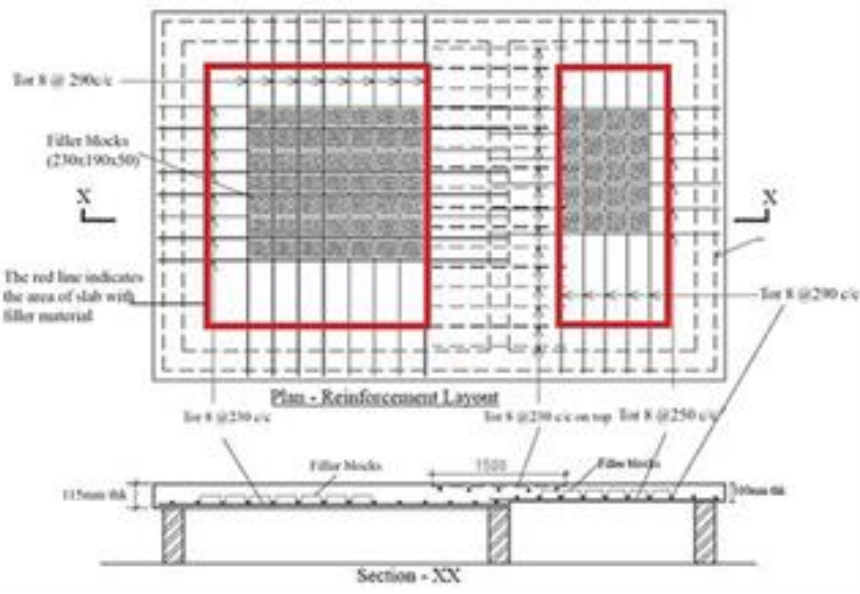


Figure 5 Reinforcement layout of filler slab

### 2.3 Materials suitable for filler slab

Filler material should be inert in nature. It shouldn't react with concrete or steel in RCC slab constructed. Filler materials water absorption capacity should be checked for as it will soak the hydration water from concrete. Filler material should be light in weight, in order that overall weight of the slab reduces and the load onto the foundations is reduced.

Filler material should be of low cost so that its cost is much lesser than the cost of the concrete it replaces. This is important to achieve economy. Filler material should be of a size and cross-section, which may be accommodated within the spacing of the reinforcement and thickness wise might be accommodated within the cross section of the slab. Filler material texture should blend with the desired ceiling finish requirements so as not to provide an ugly ceiling pattern.

### 2.4 Thermal Performance

The thermal performance index for the RC cellular concrete filler slab roof and the conventional RC slab roof with same roof treatment are given in the below table and it is seen that with an equivalent roof treatment, the filler slab is thermally superior to standard RC slabs.

**Table 1 Thermal Performance of Filler slab and conventional RC slab**

<b>Specification of roof slab</b>		<b>TPI</b>
I.	150 mm thick cellular concrete filler slab with 90 mm thick lime concrete	85
II.	100 mm thick RC slab with 90 mm thick lime concrete	134
III.	150 mm thick filler slab with 75 mm thick mud-phuska & 50 mm thick tiles	75
IV.	100 mm thick RC slab with 75 mm thick mud-phuska & 50 mm thick brick tiles	110

### 2.5 Sound absorption

The sound absorption properties of slab with filler material and slab with concrete are 0.27 % and 0.1 %. Thus, it can be concluded, if the raw ceiling of the filler slab is superior to usual RC slab in sound absorption and it is suitable for class rooms, lecture halls, conference halls, auditorium etc.

### 2.6 Leak Proof

The slab is tested for leakage by ponding water over it continuously for seven days. If no dampness was observed below the slab then it shows that the construction is done properly and there is no chance of leakage in filler slab. Though, as an ample measure of caution, it is advisable to have a waterproof treatment above the roof slab.

### III. DESIGN OPTIMIZATION

In 2006 Prof. Ing. Petr Hajek, Csc., Czech Technical University in Prague, has studied ferroconcrete floor slab with integrated installation fillers made from recycled plastic materials and he has suggested installation of shells as filler material which are made from recycled non-sorted plastics obtained from municipal waste. The reduction of weight of RC floor slabs is extremely important especially regarding current requirements for material savings, other economic and environmental criteria. The study focuses on the planning optimization for floor slabs with fillers produced from recycled non-sorted plastic from municipal waste. The fillers enable construction of floor slabs with an integrated cavity for conduction of the installation.

It is possible to use this principle for monolithic, reinforced monolithic and prefabricated floor slabs. Cost ford director P.B.Sajan focused on the pocket formed by the contours of the tiles makes a superb thermal insulation layer. A HUDCO-sponsored test administered at the Anna University in 1988 proved that a filler slab was nearly as good because the conventional one in terms of load bearing capacity.

### IV. CONCLUSION

Through the above literature it can be observed that a conventional R.C.C slab consumes more amount of materials such as steel, concrete etc., and the dead load is being increased because of this consumption, But a filler slab usually consumes less amount of building materials as the voids in reinforcement are filled with hollow blocks which are lighter in weight and these fill the gaps and reduce material consumption, which in turn reduces the dead load and cost of the slab. Thermal performance of a filler slab is much higher than a R.C.C slab. Filler slab proves acoustically good when compared.

### Figures and Tables

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