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PLANNING AND DESIGNING OF FILLER SLAB IN RESIDENTIAL BUILDING

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Abstract - This paper mainly aims on reduction of concrete volumes in buildings, without affecting the design criteria and enable us to make an economical construction. Extra reinforcement which is added in conventional concrete construction can be replaced by filler materials which replicates in reducing cost of slab up to 25%. Good thermal insulation is developed between gaps in tiles and gives aesthetic look too.

***Key Words*:** planning, designing, filler slabs, economical.

1. INTRODUCTION

Increase of population in urban cities results in increase of need for land for accommodation. Multi storied buildings are constructed in small area of land to compensate the population. In multi storied building large amount of concrete are used in making slab elements. This slab also contains many layers of reinforcement. The tension zone in concrete does not need any concrete except holding one. To reduce the dead weight of slab filler materials are introduced in tension zone of concrete slab as showed in fig.1

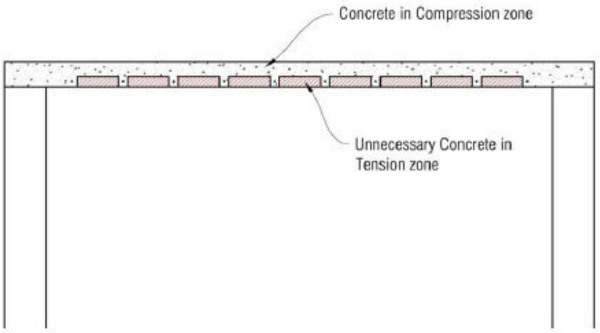

Fig. 1

2. FILLER SLAB

Filler slab constructing technology is an alternative method of slab construction which helps in reduction of concrete which is used in construction. Though filler slab technology is used more in various parts of India it has successful projection in south India.

These filler materials are added not to promote any strength in structure or durability in structure, replacement of unwanted concrete in tension zone of concrete slab. Filler materials which are mostly added in concrete slab are brick, mangalore tiles, terracotta pot and non degradable waste materials. These filler materials not only results in reduction of dead load in structure but also in development of good thermal insulation in Structural system. Fig. 2 shows alignment of filler materials.

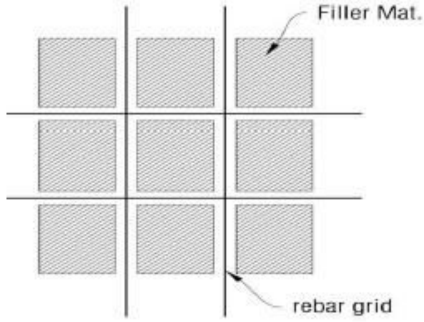

Fig. 2

Brick is considered to be a most effective filler material especially because of its proper shape and dimension. Fig. 3 shows filler slab constructing technology using standard bricks

Fig. 3

3. LITERATURE REVIEW

Balasubramani et.al (2017), in their journal, "Application of RCC Filler slab Floors and Roofs" explains about various application of filler slab in open land preservation and extension of vertical roofs. Also explains about eco-friendly nature of filler slabs used in construction.

Ayush Srivastava (2015), In his journal "Filler-Slab as a Continuous T-Beam Slab" indicated about the percentages of reduction in cost of construction using filler slab and also stated the various uses of filler material in slabs.

Amit D Chougule et.al (2015), in their review paper "To Study the Filler Slab as Alternative Construction Technology-A Review" explains about economic point view of using filler slab and aesthetic performance.

S.Sundari et.al (2016), in their journal "study on filler slab using self compacting concrete with terracotta pots as filler" explained about removal of concrete in tension zone using terracotta as a filler material reduces steel and concrete and creates an economic situation.

4. SLAB DESIGN

Slab is designed using limit state method, with codal provisions from I.S 456-2000 & SP 16.

DATA:

Size = 9.75 X 10.52
F_{ck} = 20KN/m^2
F_y = 415KN/m^2
Live Load = 2KN/m^2

TYPES OF SLAB:

Ly/Lx = 9.75/10.52
= 2.66< 2
Therefore, this is one-way slabs.

DIMENSION CALCULATION:

(a) Depth

d =span/28
=4000/28
d =145mm
Provide clear cover as 30mm
Therefore,
D =145+30
D = 175mm

(b) Length

L = Clear span + effective depth
= 4 + 0.145
= 4.145m

LOAD CALCULATION:

Self-weight = D× unit weight of concrete
= 0.175× 25
= 4.375 KN/m^2
Live load = 2 KN/m^2
Dead load = 3 KN/m^2
Floor finish = 1.5 KN/m^2
Total load = 6.5 KN/m^2
Design load (W_u) = 1.5 × 6.5
W_u = 9.75 KN/m

REINFORCEMENT DETAILS: (Both direction)

$M_u = 0.87 \times f_y \times A_{st} \times d\,(1- ((f_y \times A_{st}/f_{ck}\ b\ d))$
$=12.83\times106 = 0.87\times A_{st}\,(1-((415\times A_{st}/20\times1000\times145))$
A_{st} = 168mm^2
No of Bars = A_{st}/a_{st}
= 168/ (π/4) ×102)
= 2.13 nos. ≈ 3nos

Spacing,

S = $(a_{st}/A_{st}) \times 1000$
= (π/4) ×122)/168× 1000
S = 294.44mm≈ 300mm c/c
Provide 10mm Ø @ 300mm c/c distance.

DISTRIBUTION REINFORCEMENT:

A_{st}= 0.12 % of b D
= (0.12/100) ×1000×175
A_{st} = 210 ≈250mm^2

Spacing,

S = (ast/Ast) ×1000
= ((π/4) ×8^2/250) ×1000
S = 201.06mm≈300mm
Provide 8mm @ 300mm c/c distance.

CHECK FOR SHEAR FORCE:

$\tau_v = V_u/b\ d$
= 30×103
= 0.21 N/mm^2
$P_t = 100\ a_{st}/b\ d$
= (100×297) / (1000×145)
= 0.20 N/mm^2
τ_c = 0.22 (assume K_s = 1.25)
Therefore $\tau_c K_s$ = 0.22 ×1.25= 0.28 N/mm^2
$\tau_v < \tau_c K_s$ Hence Safe.

CHECK FOR DEFLECTION CONTROL:

(L/d) max= (L/d) basic× K_c× K_f ($K_C = K_F = 1$)
= 25× 1.4
= 35
(L/d) actual= Length/depth
= 4.145/0.145
= 28
(L/d) max> (L/d) actual.
Hence, the condition is satisfied.
The sectional details of filler slab is shown in fig.4

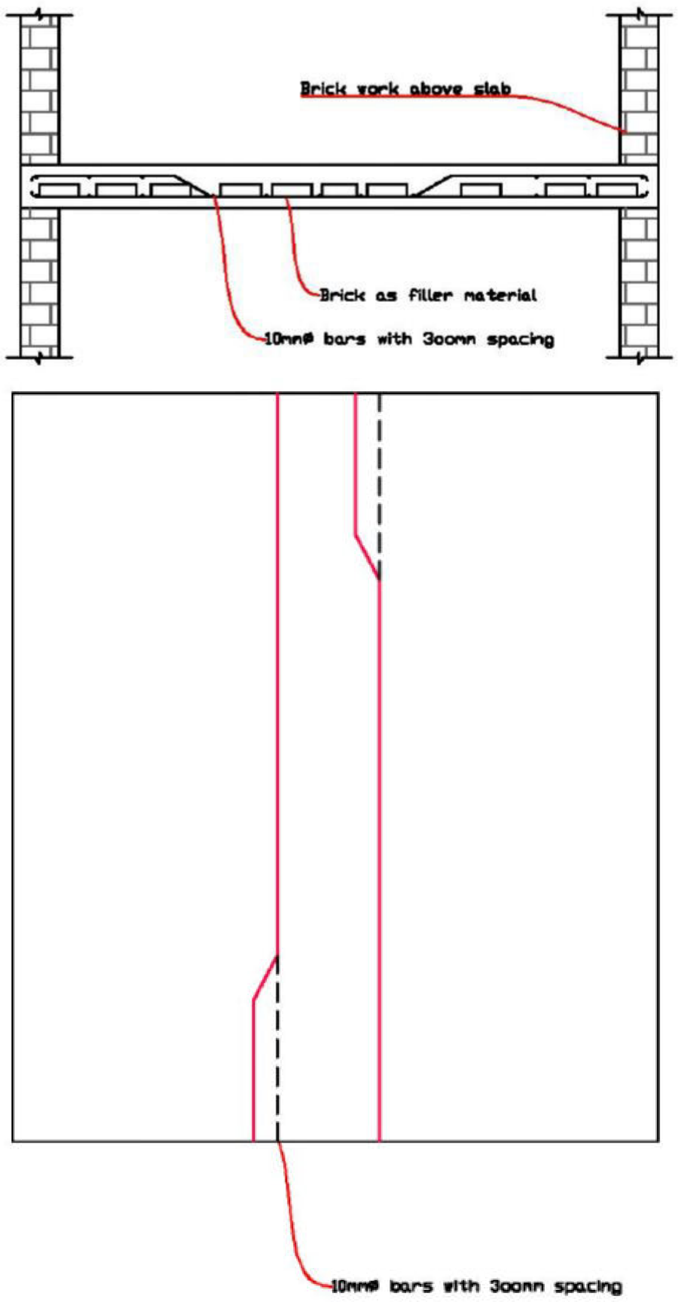

Fig.4 sectional details of filler slab

5. CONCLUSION

The following things are concluded in this paper,

- If slabs are constructed using filler slab technology 35% to 40% of total cost can be saved
- It is possible to save 5% to 15% of concrete cost excluding cost of filler material. If filler material is added 20% of total cost is saved.
- In case if filler material is found to be a waste material, it saves nearly about 20% of cost of casting a roof slab.

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REFERENCES

1. Balasubramani N, Vedhajanani B, Perumal K and Raman P, Application of RCC Filler slab Floors and Roofs Int. J. of Recent Engineering Research and Development, Vol. 02, (2017) 223-226
2. Ayush Srivastava, Filler-Slab as a Continuous T-Beam Slab, International Journal for Scientific Research & Development, Vol. 2, (2015)
3. Amit D Chougule, Manoj H. Mota, and Ushadevi S Patil, To Study the Filler Slab As Alternative Construction Technology-A Review, Journal Of Information, Knowledge And Research In Civil Engineering, Vol. 3 (2015)
4. S.Sundari and S.Sukumar, Study On Filler Slab Using Self Compacting Concrete with Terracotta Pots as Filler, International Journal of Advanced Engineering Technology, Vol. VII, (2016), 961-966

BIOGRAPHIES

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