International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 09 Issue: 06 | June 2022 www.irjet.net p-ISSN: 2395-0072

RENOVATION OF OLD LIME STONE PORTICO SLAB AT ST THOMAS MOUNT WITH FILLER BLOCK SLAB SYSTEM

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Abstract - This abstract summaries the renovation of old portico slab built before 300 years with lime stone mortar by British government .The structure Saved with out demolishing the lime stone pillars And new weight less slab replaced with filler block slab Technology

Key Words **- FILLER BLOCK SLAB ,IS 456 , DESIGN OF SLAB**

1. INTRODUCTION

Concrete being the highest consumed material on earth is produced and used at a large scale in the construction industry. Many innovative techniques and economical methods are being proposed and filler slab technology is one such innovative and cost-effective technology where a dead load of the slab is reduced by replacing the concrete. Concrete is good in withstanding compressive forces and steel is good in withstanding tensile forces. The main aim behind the use of filler-slab technology is to condense a substantial portion of concrete below the neutral axis since all concrete in the tension zone does not add to the tensile properties. This concrete is replaced with lightweight, inert and inexpensive filler without neglecting the quality and structural strength of the structure

1.1 APPLICATION

At st Thomas mount a 300 years old building built by Robert clive which has a single floor area of 8000 sq ft plan shown in **fig 1** .It has heritage of an old British gothic architecture .Now cantonment

Office is functioning in this building .The portico slab of the building has done at that time by lime mortar based terrace roof .The wooden rafters and purlins got damaged due to natural forces. The cantonment board and the local administrative authority decided to renovate the portico slab without disturbing its view and elevation.

1.2 Technical support and Approch

The cantonment board approach Dr.A.r.Santhakumar

Dean civil eng .Annauniversity (rtd)and his technical team to investigate and Rehabilitate the portico slab.

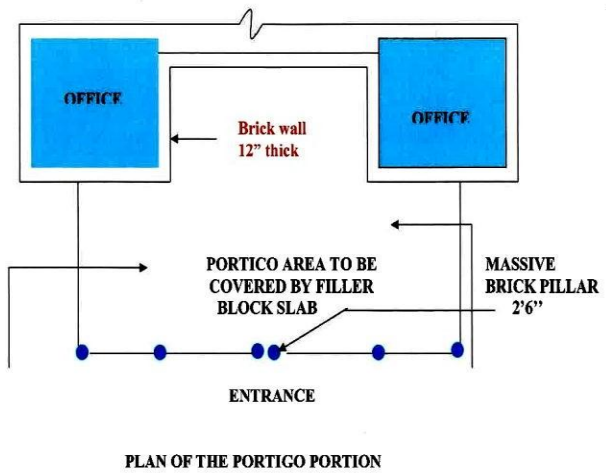

Figure 1

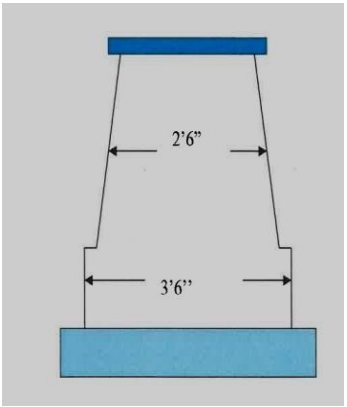

Figure 2 PILLAR DIAGRAM

The pillar compressive strength has evaluated by Rebound hammer test

2.1 THE TASKS BEHIND RENOVATION

1. The dead load and live load of the roof slab does not affect the massive pillars .
2. The axial load from the beam of the roof slab is to match safely to the existing pillars.
3. The new roof slab should cover entire portico area .

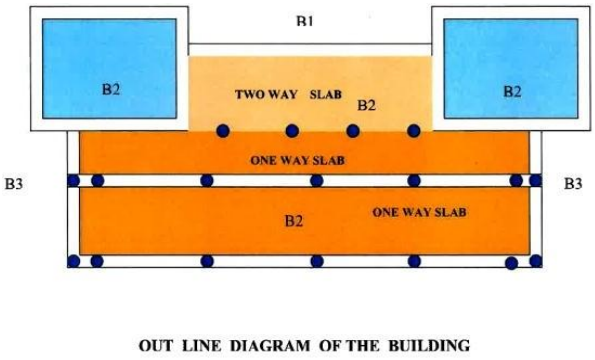

Figure 3 OUT LINE DIAGRAM B1 ,B2, B3 ARE BEAMS

3.1 Design

Clear span =3.5 m

Width of support =200 mm

Live load =4 kn/m^2

Floor finish =1 kn m^2

Assuming depth of slab d =span /25=3500/25=140 mm

Assuming clear cover of 20 mm and using 10mm dia bars

Effective depth d =140 mm

Over all depth =165 mm

Effective span

a.clear span+effective depth =3.5+0.14 =3.64 m

b.center to center of supports =3.5+0.20=3.70 m

loads

volume of two Mangalore tiles in two lines so 8 Mangalore tiles

=(0.3x.0.5x0.06)x8=0.072 m^3

Normal concrete volume =1x0.14 m^3 =0.14 m^3

Concrete volume reduction due to filler block slab =0.14-0.072 =0.072 m^3

So new self weight of slab=0.072 x25=1.8 kn /m

Filler block slab weight=2x8kg=16kg=16x9.81=156.96 N

=0.156 kn/m

Live load =2.5 kn /m

Floor finish =1.00kn/m

Total load = 5.456kn/m

Ultimate moments and shear force

Mu =0.125 WuL^2

=0.125X1.5X5.45 X3.64^{2}X5.45= 13.539kn-m

Vu=0.5WuL=0.5 5.45 X3.64 = 9.919 KN

Limiting moment of resistance

Mu limit =0.138 fck bd^2

=0.138x(20x10^{3}x140^2) =54kn-m

Mu<Mu lim

So section is under reinforced

Main reinforcements

Mu =0.87fyAstxd{1-($A_{St\,fy}$/bd/fck)

13.539(x10^6 =0.87415xAstx140{1-(415Ast/1000x140x20)

Solving Ast=123.62 mm^2

Sv =(1000ast/Ast) =1000x78.5 /123.62=635.01mm

But as per code we should provide minimum reinforcement
So provided 10 mm dia at 20 cm c/c

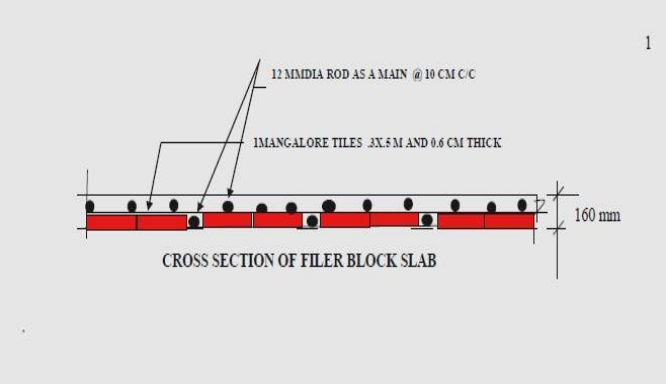

Fig 4 cross section of slab at elevation

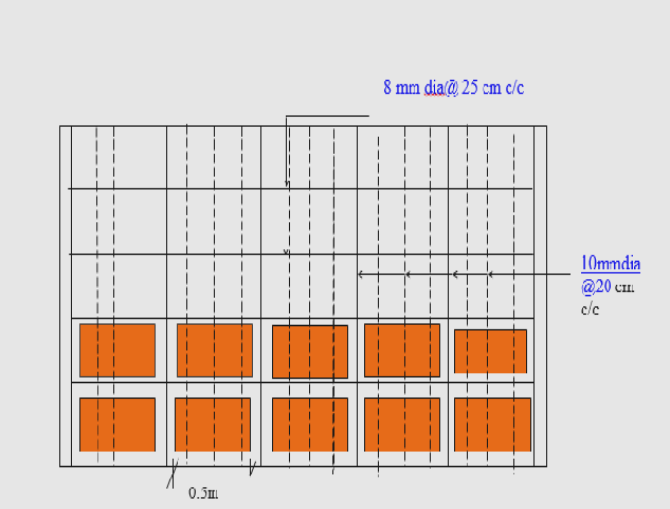

Fig .5 Cross section at top of slab

3.2 Construction out come photos

FIG 6 .AFTER THE CONSTRUCTION COMPLETION

FIG 7 .AFTER THE CONSTRUCTION COMPLETION

4. CONCLUSIONS

The correct problem identified as a heavy dead load Of old masonry replaced by a filler block slab technology made it as weight reduced roof and saved the old ethical building views .

This new innovative method can be recommended for any type of structure Economic point of view, 30% of concrete is saving in filler slab technique. In filler slab technique 30%cost is saving, which is greatly effect on economy

In manufacture of cement, f ller slab technique saves 30% of carbon emission which proves eco-friendly.

5. MATERIAL SELECTION FOR FILLER MATERIALS

The following points should be considered for filler material selection:

- Filler material should be inert in nature. It should not react with concrete or steel in RCC slab constructed.
- Filler materials water absorption should be checked for as it will soak the hydration water from concrete.
- Filler material should be light in weight, so that overall weight of the slab reduces and also the deadload onto the foundations is reduced.
- Filler material should be low cost so that it cost is much lesser then the cost of the concrete it replaces. This is very important to achieve economy.
- Filler material should be of a size and cross-section, which can be accommodated within the spacing of the reinforcement and also thickness wise could be accommodated within the cross section of the slab.

Filler material texture should match with the desired ceiling finish requirements so as not to provide an ugly ceiling pattern

6. ACKNOWLEDGEMENT

Thank full remembering Mr. Laurie Baker

As beautiful, cost-effective and strategically masterful individualistic housing lined the coast, each house resonated with the specific needs of its inhabitants, and didn't pander to the preferences of the architect. And keeping with this style, Mr. Laurie Baker applied these principles across the 41 years he worked in India, earning the title of '*the father of low-cost housing*'.

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