Study of Prefabricated Shuttering Material for Casting Column with Slab & Beam

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***Abstract*: Indian construction industry started adopting and innovating new techniques for fast construction. As the population is increasing for that fulfilling the need, speedy construction is the necessity of time. Formwork plays an important role in construction of the buildings. In any building construction RCC work plays important role in completion of project on time and maximum cost of the project. As we all know for RCC work we are using timber, MS shuttering, aluminum shuttering, tunnel formwork. But all shuttering material has its own pros and cons so by considering all factors here is a Study of Prefabricated G.I. & M.S. frame with wooden sheets Shuttering material for casting column with slab & beam. As we are casting columns with slab & beam it reduces time. And joints will be monolithic and gets smoother finish at junctions.**

***Index Terms*: Prefabricated, conventional construction, shuttering design, innovation, maintenance, performance**

I. INTRODUCTION

Now a days every builder and customer wants building completes in lesser time, in any building construction RCC takes more time and every activity is obviously dependent on RCC as in traditional construction practice we are casting columns first then we are casting slab and beams it takes more time and cost both and casting columns with slab & beam is not possible in wooden formwork. As the title of this paper suggest Prefabricated Shuttering material for casting column with slab & beam the shuttering material is basically made up of G.I. and M.S. frame in which beam bottoms frame and slab panels frame are fabricated in G.I. and beam side frame and column side frame are fabricated in M.S. and plywood is fixed in frame with rivet and filled outer gap by black silicon. Its initial cost is more than wooden formwork, but it has more repetitions and takes less time in construction. It will prepare offsite and brought to site for direct application

II. LITERATURE REVIEW

1. Sumit Ghangus "A Comparative Study of Aluminum Form Work with other Conventional Form Work" (2018)
A commonly used timber and MS shuttering is very heavy and is difficult to use for work at large level, where the Aluminum Shuttering is light in weight and can be used in industry for construction of Structural members of the building including the walls. This Aluminum shuttering is commonly known by the name Mivan shuttering in industry. The Mivan shuttering is revolutionary in construction industry in many phases like this reduces the time of construction, material consumption, construction cost, increases spaces in buildings and most importantly increases the durability of Structure. The study on these factors is done and compared in such a way that how both shuttering differs each other, also which among the both is efficient in terms of time, cost & strength.

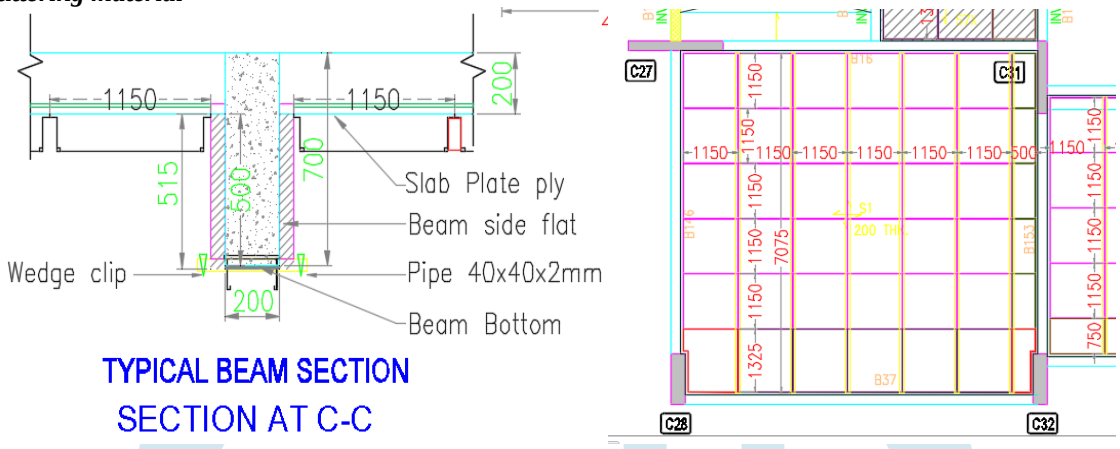
2. Miss. Renuka Hangarge, Mr. Ashish Waghmare, Mr. Shridhar Patil, "Comparison of Conventional, Aluminium and Tunnel Formwork" (2017)
Construction industry is having biggest role in economy of India. In recent times, if we look at the global economy and growth of population in India, land acquisition has become more difficult. To fulfill the need of shelter of this growing population and increasing industrialization, speedy construction is the necessity of time. Same time, due to inadequacy of land Vertical growth is preferable than Horizontal one. Formwork plays an important role in construction of the buildings. It constitutes 20% cost and 60% time of the total construction. This project does the comparison of the Conventional Formwork, Tunnel Formwork and Aluminum Formwork systems.

3. Bhagyashri Wani "Analysis of New Formwork Technology Adopted on A Construction Site in Pune" (2017)
To fulfil the housing and infrastructure requirements of increasing population, in last few decades Indian construction industry has grown in large amount. With the introduction of multinational companies in Indian construction sector, accuracy and speed of work has increased. Now-a-days to cope up with the demand is becoming crucial. Conventional construction methods are economical but they are unable to give required quality work and speed. Hence, in today's date there is a need to think on latest construction technology. Formwork is an important part of construction which takes almost 30-35% of total cost of construction. The various new technologies of formwork systems are introduced which helps to increase the overall economy, high quality construction and speed of construction. In this paper, analysis of new formwork technology implemented on site is done and it is proven that how it is more useful than the previous method of formwork technology.

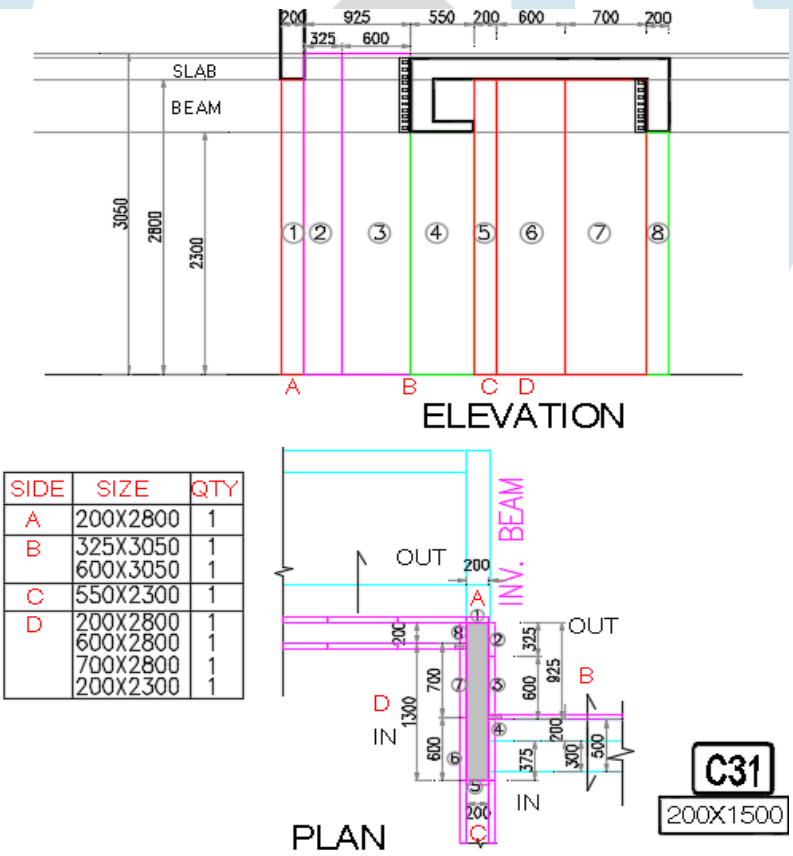
III. DETAILS

Shuttering material is basically made up of G.I. and M.S. frame in which beam bottoms frame and slab panels frame are fabricated in G.I. and beam side frame and column side frame are fabricated in M.S. and plywood is fixed in frame with rivet and filled outer gap by black silicon and all frames are fix to each other by nut bolt , U clamp, edge clip and wedges. supporting system is cup lock system only U jack replace by slab panel head

Design of shuttering material-



Slab shuttering panel arrangement



SIDE	SIZE	QTY
A	200X2800	1
B	325X3050 600X3050	1 1
C	550X2300	1
D	200X2800 600X2800 700X2800 200X2300	1 1 1 1

Column shuttering design

Fig No. 1: Design of shuttering material

Processes involved-

1. Design

First detail drawings of shuttering material are prepare as per RCC design, sizes of components and also considers how to execute it on site

2. Manufacturing of shuttering material

- As per given drawing fabrication department fabricate the frames of shuttering plates for beam side, beam bottom, column side, lift wall and slab panels.
- There is an element called corner which is placed all beam corners it will be fabricated in M.S.
- After fabrication of frames slotting (making holes) work is done as per design where the clips and wedges will fix.
- For identification of frames colouring done and size and respective code will be written on it.
- Next step is to cut the plywood in size of frame and fix it in frame by rivet.
- After that the final step is to fill the gap between frame and plywood by black silicon.
- After preparing main component fixing elements need to prepare
- There are following fixing materials

- Stopper
- Wedges
- Beam bottom head
- Slab panel head
- U clamp
- Edge clip

3. Delivered to site

Delivered to site by truck from factory to site on the project timeline. Delivery of all components are carefully planned according to the schedule of the project because if any component not delivered in required number then work may get delay.

4. Execution process

In this shuttering material columns are casted with slab & beam so shuttering procedure and checking is slightly change than conventional shuttering

Step 1: After completing column reinforcement column shuttering complete as per design and check level and plumb.
Step 2: Placing beam bottom on column shuttering and fixing beam sides on beam bottom by wedges, stoppers and waller
Step 3: Scaffolding will be completed as per slab panel support require and place horizontal rectangular tubes on slab panel head and then placing slab panels.
Step 4: After completing shuttering again plumb of column and beam should be checked
Step 5: Then after completing reinforcement and electrical work fix MS starter at place and final checking of slab done before concreting
Step 6: After final check we can cast columns with slab and beam according to concrete grade

ADVANTAGES

- Time saves of casting columns Separately.
- We are casting starter of column with slab so it also reduces time.
- If execute properly can cast each slab in 10 days
- Initial cost may look high but ultimately it reduces the project cost.
- Monolithic concrete of column and slab
- Quality of work will improve
- More repetition than wooden formwork
- Less costly than latest shuttering material like aluform

CONCLUSION

As the requirement of fast track construction we should evolve from old methods and techniques we need to thinks how we can reduce the construction time so as we all know RCC is taking major time in construction and as discussed in this paper prefabricated shuttering material for casting columns with slab & beam would be a game changer for moderate costing projects. By using this shuttering material, we can increase quality of work because as we are casting columns with slab & beams so whole concrete will be monolithic, ultimately, we can reduce time, cost and increase quality.

REFERENCES

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