Comparative Analysis of Aluminium And Tunnel Formwork System For High Rise Building

Mr Vijay D.Waghmode[1], Mr Ashish Waghmare[2]
[1]Dept of Civil Engineering
[2]Professor, Dept of Civil Engineering
[1, 2] Dr DyPatilSoet, SPPU University Pune, Maharashtra, India

Abstract- *Winds of change are blowing across every industry in India but the construction industry is still reluctant to utilize the advanced techniques that can enhance the productivity and efficiency of the construction industry. In recent years construction industry is witnessing increased demand in multi-storey construction and repetitive modular structures are becoming an integral part of it. These structures require detailed planning in order to save cost and time. As formwork accounts for about 25- 40% of the total project cost and almost 60% of the time in concrete construction, we need to pay attention to the development in formwork techniques and replace conventional formwork with new formwork techniques like tunnel or aluminium formwork.For any successful project there should be proper planning, detailed thinking, and good management. Along with that construction methodology & technology is also very important nowadays. In construction one of the important factors is formwork. The cost of formworks is much higher than we consider it in project cost; it is around 20-25% of the project cost. The quality of construction mostly depends on the formwork used. Now a day to cast RCC load bearing structure in a monolithic way, advance formwork technologies like Tunnel formwork, Aluminium formwork and Doka formwork is used. It includes the walls, beams and the slab to be cast monolithically. In this topic focusing on the benefits and limitations of tunnel formwork in contrast to conventional formwork thus changing the mindset of local construction industries that are still dependent on conventional formwork techniques.*

One of the most important factors in determine the success of a construction project in terms of speed, quality cost and safety of work is the formwork used in the project as it accounts about 40% of the total project cost of the structure. When considering a construction project both the client and contractor want to finish the job early as the client wants to use the building for the intended purpose as soon as possible. The contractor wants to finish the construction as soon as possible to gain a higher profit. The most efficient way to speed up the work in high-rise building construction is by achieving a very short floor cycle. The floor cycle of a building mainly depend on the formwork type as it is the main time factor of a building project. The aim of this paper is to present about the existing formwork types in Maharashtra and to show each one will affect the project duration, project cost and

The quality of the work. This topic aimed at studying the Tunnel Formwork and Aluminium Formwork and compare on basis of time & cost parameter.

Keywords- Formwork,Quality,Cost, Duration, etc.

I. INTRODUCTION

In Indian economy construction industry is one of the significant factors. The population of India is second largest in the world. As the population growth rate is higher the need for housing is also higher. So that land requirement is higher day by day which result in lack of land area for house and result in introducing of high rise building house. The high rise building can be defined as the seven stories or more. The high rise building involves high cost investment which is increased day by day as delay in execution is occurred. The current condition of defining successful construction project include the completion of the project within cost, time, at the proper performance or specification and with minimum construction work injury. Formwork systems are key factors in determining the success of a building construction project in terms of cost, speed, quality and safety of work. Selecting poor quality of formwork systems in aiming to minimize the cost of project will directly affect the speed and quality of construction. The quality of the concrete is depends on the quality of formwork materials and workmanship that affects the cost and speed of construction. The formwork used in construction project contains 40% cost of project, so that selection of best suitable formwork for high rise building will result in successful completion of project. The formwork can be defined as the temporary structure which is used to support the fresh concrete until it gains its own strength. There are different types of formwork are used now days in Indian construction industry. Theformwork are made up of wooden, steel, aluminium or prefabricated forms.

The formwork selection for high rise building is depending upon the cost, time and finishing quality. High rise building construction consists of many type of repetitive activities. For repetitive work in high rise building construction tunnel formwork system and aluminium formwork system is developed. The tunnel formwork is room formwork in which RCC slab and walls are casted in continuous pour. Then by using hot air blows thermal curing is used for accelerate the concrete. The cycle time for tunnel formwork system is 1-3days only, which result in speedy construction and cost saving. The tunnel formwork system is very useful for repetitive room design. Aluminium formwork system provides aluminium formwork for RCC load bearing or RCC framed multi-storied buildings and enables the walls and slabs to be poured in the same operation. These increases efficiency and also produces an extraordinarily strong structure with excellent concrete finish. Due to the fine tolerance achieved in the machined metal formwork components, consistent concrete shapes and finishes are obtained floor after floor. This allows plumbing and electrical fittings to be prefabricated with the certain knowledge that there will be an exact fit when assembled.

1.2 PROBLEM STATEMENT

The high rises building construction consists of number of repetitive activities and also has same identical floors. The increase in duration of construction greatly affects the construction cost. Selection of best formwork system gives best result in cost saving. Formwork consists of 20-25% of total cost of project. So that used advanced formwork system helps in cost saving as reduction slab cycle time. This study is done for comparative analysis of tunnel formwork system and aluminium formwork used for high rise building construction.

1.3 SCOPE OF PROJECT

The increase in duration of construction greatly affects the construction cost. Building formwork consists of 20-25% of total cost of project. So that used advanced formwork system helps in cost saving as reduction slab cycle time. This study limited to comparative study of tunnel formwork and aluminium formwork.

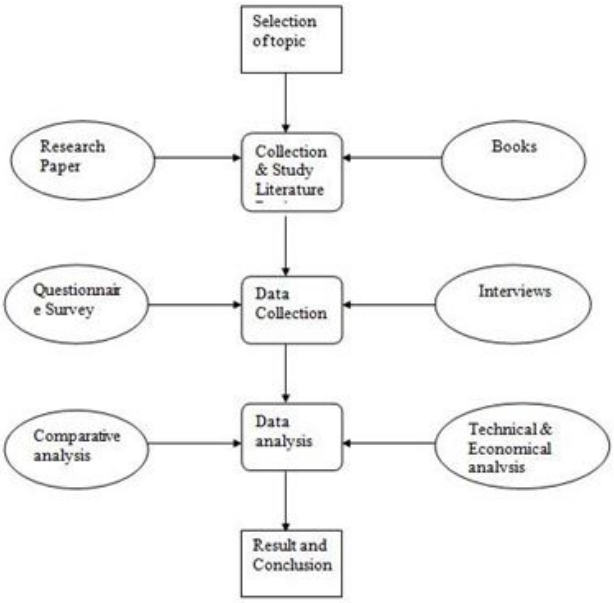
1.4 OBJECTIVE OF STUDY

1. Comparative analysis of tunnel formwork system and aluminium formwork system used for high rise building construction on Basis of Initial Cost, Maintenance Cost.
2. Comparative analysis of tunnel formwork system and aluminium formwork system used for high rise building construction building on basis of De-shuttering time, Cycle time, Duration.
3. Comparative analysis of tunnel formwork system and aluminium formwork system used for high rise building construction building on basis of No. of repetitions, Scrap value,

II. METHODOLOGY

For collection of data related to objectives following step by step procedure is designed. The methodology involved the field research. For data collection questionnaire is designed as per the objectives and then field visit and interviews with project manager, site engineer data is collected .And data analysis is done

Flow chart



2.1CASE STUDY DETAILS

For data collection questionnaires' was prepared on the basis of objectives of the project. Then for questionaries' survey and data collection two different sites visit were studied, Rohan Builders India Pvt Ltd. is using Tunnel Formwork System and Tricon Infra Build tech Pvt Ltd using aluminium system.

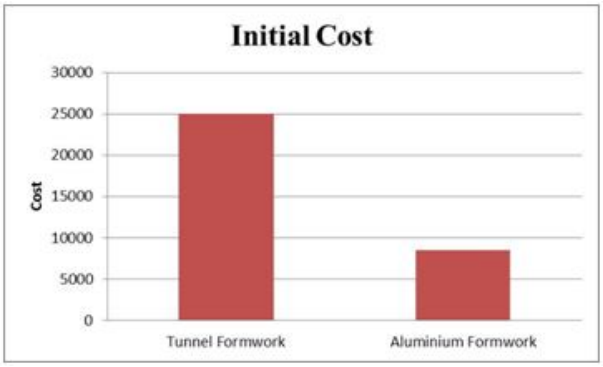
Sr.no	Details	Case Study 1	Case study2
1	Name of Project	Rohan Abhilasha,wagholi	PanchshilTower,Wagholi
2	Type of Project	Residential	Residential
3	Type Of Formwork	Tunnel Formwork System	Aluminum Formwork System
4	Name Of Formwork Consultant	MESA Imalat Hi TekInsalt	Tricon Infra Buildtechpvt Ltd.
5	No of floors	2 parking+12 fllors	3parking+32Floors
6	Height of building	42m	106m
7	Built up area	13568m2	38704m2

2.3 DATA ANALYSIS

The data collected from site visit and interviews is a need to analyse and presented in the proper format. This will be helpful in a further study. The characteristics, economic and technical and time of tunnel and aluminium formwork are analyzed in this chapter. The results obtained are analysed and presented on a graph. The data cost comparison with respect to numbers of repetitions, cash flow analysis and one slab cycle time & technical analysis is done in this chapter.

1. Comparisonof Initial Cost.

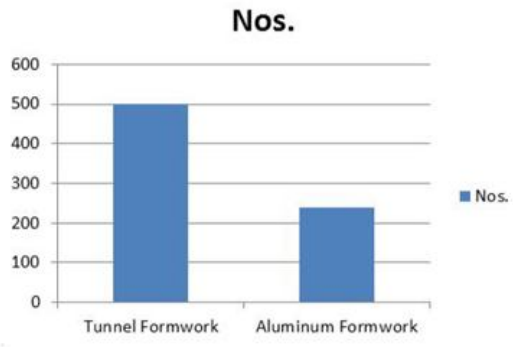
Type	Unit	Rate
Tunnel Formwork	Sq. mt	25000 INR
Aluminum Formwork	Sq. mt	8500 INR



From above graph it is concluded that the initial cost per square meter for tunnel formwork is 66% is higher than aluminum formwork.

2. Comparison of Repetitions.

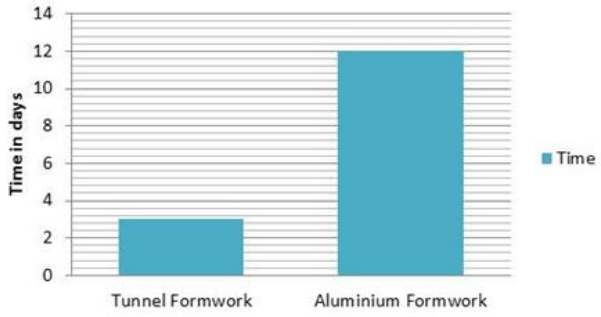
Numbers of repetitions	
Type	Nos.
Tunnel Formwork	500
Aluminum Formwork	240



From above graph it is concluded that the numbers of repetitions available for tunnel formwork is 52% is higher than aluminum formwork.

3. Comparison cycle time.

Type	Time in days
Tunnel Formwork	**3 days**
Aluminum Formwork	**12 days**



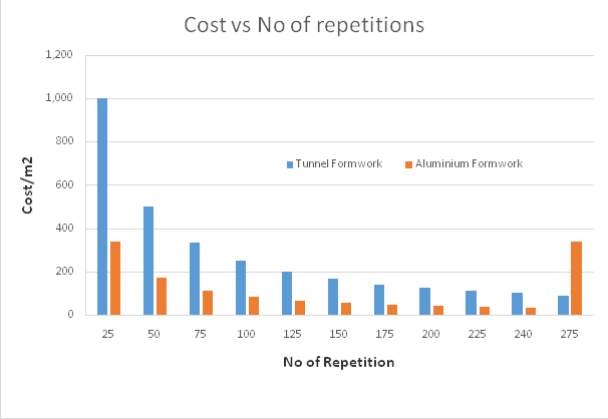
From above graph it is concluded that the 75% less time is required for tunnel formwork than aluminum formwork for one cycle time.

4. Comparison of Salvage value.

As aluminum formwork is made from aluminum which has 20% more scrap value than tunnel formwork which is made up of steel which has less scrap value.

5. Cost v/s repetition

Type	
Tunnel Formwork	30 % of initial cost
Aluminum Formwork	50 % of initial cost



From the above graph it is concluded that as the numbers of repetitions increases behind 240 repetitions tunnel formwork system is suitable as there is no need to change formwork set.

III. CONCLUSION

1. The initial cost per square meter for tunnel formwork is 66% is higher than aluminum formwork.
2. The numbers of repetitions available for tunnel formwork is 52% is higher than aluminum formwork
3. The 75% less time is required for tunnel formwork than aluminumformwork for one cycle time.
4. The 58% less time is required for tunnel formwork than aluminumformwork for de shuttering. So this will beneficial in cycle time reduction.
5. Asaluminum formwork is made from aluminum which has 20% more scrap value than tunnel formwork which is made up of steel Which has less scrap value.

REFERENCES

[1] AakankshaDilip Chaudhary (May-2017)"Study of Tunnel Formwork System & Comparative Analysis with Conventional Formwork"

[2] Aditya S. Lahar (June 2017) "Comparative Study And Analysis Between Tunnel Formwork And Conventional Formwork System"

[3] AniketS.Kadam, Akshay T. Kokare, Sanket B. Samukhrao, Sanman N. Sawant And Pritee Mistry(April 201) " Cost Comparison & Effectiveness of Mivan Formwork over the Conventional Formwork"

[4] ArbazKazi and FauwazParkar (Dec 2015) " Comparative study and decision making for formwork technique to be adopted on construction site in Mumbai" International journal of research in engineering and technology, volume 04 issue 12

[5] Hisham A. Abou Ibrahim and Farook R. Hamzeh (April 2016) "Role of Formwork system in High Rise building construction" The masterbuilder.co.in april 2016

[6] K .Loganathan and K.E.Viswanathan (April 2016) "A study on Cost, Duration and Quality analysis of different formworks in high rise building" International journal of scientific and engineering research ,volume 7 issue 4

[7] Minjal M Parekh, Bhupendra M Marvadi And Umang Patel (November 2014)" Comparative Studies Of Conventional Technique VS Aluminium Formwork Techniques"

[8] R. Thiyagarajan, V.Panneerselvam and K. Nagamani (December 2017)" Aluminium Formwork System Using In Highrise Buildings Construction"

[9] Sandip P. Pawar and P.M.Atterde (June 2014) "Comparative analysis of formwork in multistory building" International journal of research in engineering and technology, volume 3 issue 09

[10] ShankarBimal Banerjee, PawanDilipBarhate and VipulPradipJaiswal (March 2015) " Mivan Technology"

[11] Tejas D. Aradhye and Emeritus M.R.Apte (May 2016) "Study of Advanced tunnel formwork system in high rise building" International journal of research in engineering and technology, volume 05, issue 05