

Comparative Analysis of Tunnel Formwork System and Aluminum Formwork System for High Rise Buildings

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Abstract— The high rise building construction consist of number of repetitive activities and also have 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 consist of 20-25% of total cost of project[2]. 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 aluminum formwork used for high rise building construction.

Keywords— Formwork, High Rise Building, Tunnel Formwork, Cost

I. INTRODUCTION

The high rise building involves high cost investment which is increased day by day as delay in execution is occurred 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. According to the National building code of India, a tall building is one with four floors or more or a high-rise building is one 15 meters or more in height. . The formwork used in construction project contain 20-25% cost of project[2], 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 gain its own strength. The Formwork selection for high rise building is depend upon the cost , time and finishing quality. High rise building construction consist of many type of repetitive activity. For repetitive work and high rise building construction Tunnel formwork system and aluminum formwork system is developed.

II. TUNNEL FORMWORK SYSTEM

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, The tunnel formwork system is very useful for repetitive room design.

Operational cycle

The 24 Hour cycle defines the works to be done each day. To establish this cycle, the overall structure is divided into a number of more or less similar construction phases,

corresponding to a day's work. The necessary manpower and equipment are then determined according to the size of these phases. To reach maximum efficiency, the phases done every day are similar.

The cycle is divided into the following activities:

- 1) Initial striking operations
- 2) Movement of forms
- 3) Final preparation
- 4) Pouring

III. ALUMINIUM FORMWORK SYSTEM

Aluminium formwork also known as MIVAN technology.. MIVAN system is formwork construction, cast – in situ concrete wall and floor slabs cast monolithic provides the structural system in one continuous pour. Large room sized forms for walls and floors slabs are erected at site. These forms are made strong and sturdy, fabricated with accuracy and easy to handle. They afford large number of repetitions (around 250).

Operational cycle time

Sr.no	Activity
1	Wall Shuttering
2	Slab Shuttering
3	Prob Install
4	Slab level
5	Leveling
6	Line and plumb
7	Wall reinforcement
8	Slab Reinforcement
9	Electrical fitting
10	Casting of slab
11	De shuttering wall
12	De shuttering slab

IV. OBJECTIVES

- 1] Collection of primary and secondary data
- 2] Comparison of Tunnel formwork system and aluminum formwork system used for high rise building construction on time cost quality and its characteristics parameters.
- 3] Techno-Economical analysis of both formwork system

V. METHODOLOGY

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

Case study Details

Case Study 1	Case study2
RohanAbhilasha,wagholi	PanchshilHighrise,Wagholi
Residential	Residential
Tunnel Formwork System	Aluminium Formwork System
MESA Imalat Hi TekInsat	Tricon Infra Buildtechpvt .Ltd.

VI. DATA COLLECTION

A] Data Collected from Interview

From Case study 1 Rohan Builders:

Sr.No	Parameters	
1	Cost	
	Initial Investment	High
	Avg cost/m2	25000/m2
	Labour Cost/m2	200/m2
2	Numbers of repetitions	500
3	Cycle time	3days
4	Deshuttering time	10hrs
5	Manpower requirments	55-60Nos/slab area
6	Accuracy	+ - 3mm
7	Durability	High
8	Wastage of material	0%
9	Additional Equipment Requirements	Tower crane, Concrete Spreader
10	Curing method	Thermal curing
11	Finishing	Paint Finish

From Case Study 2 Tricon Infra Buildtech

Sr.No	Description	
1	Initial Investment(for Project)	High
2	Average cost/sq.m	8500
3	Labour cost / sq.m	165
4	Maintenance cost	10
5	Storage cost	02
6	Cycle time	12days
7	Size of panel	600*2050
8	Weight of panel	8.50kg/sq.m
9	Salvage value	50% of cost
10	Number of repetitions	110Nos
11	De-shuttering time	24hrs
12	Additional Equipment requirement	Staff and material
13	Manpower requirement	3labour/day/sq.m
15	Durability	High
16	Finishing	Fine
17	Percentage of wastage	0%
18	Accuracy	+5mm
19	Curing method	Curing compound

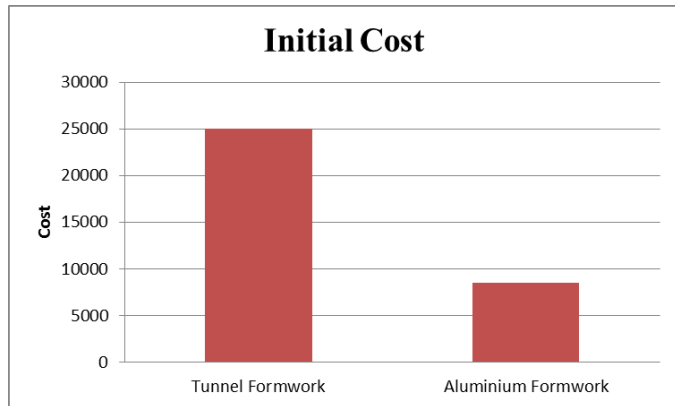
VII. DATA ANALYSIS

General Comparative statement

Sr.No	Description	Tunnel formwork	Aluminium Formwork
1	Initial Investment(for Project)	High	High
2	Average cost/sq.m	25000rs	8500rs
3	Labour cost / sq.m	175-200/slab area	165
4	Maintenance cost		10
5	Storage cost		02
6	Cycle time	24hours	12days
7	Size of panel	1 to 4 m	600*2050
8	Weight of panel	2-4 tonne	8.50kg/sq.m
9	Salvage value		50% of cost
10	Number of repetitions	500nos	110Nos
11	De-shuttering time	10hrs	24hrs
12	Additional Equipment requirement	Tower crane & boom placer	Staff and material
13	Manpower requirement	55-60nos /slab	3labour/day/sq.m
14	Permissible fresh concrete pressure	NA	NA
15	Durability	High	High
16	Finishing	Paint finish	Fine
17	Percentage of wastage	0	0%
18	Accuracy	+3mm	+5mm
19	Curing method	Thermal curing	Curing compound
20	Casting System	RCC monolithic	RccFramed

Initial Cost/m²

Type	Unit	Rate
Tunnel Formwork	Sq. mt	25000 Rs
Aluminium Formwork	Sq. mt	8500 Rs



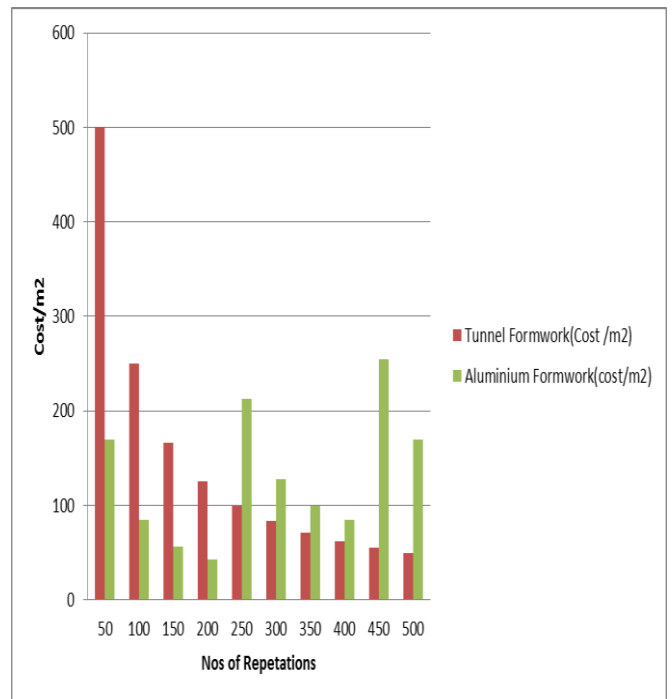
Cycle Time (days)

Type	Days
Tunnel Formwork	3 days
Aluminium Formwork	14 days

Numbers of repetitions

Type	Nos.
Tunnel Formwork	500
Aluminium Formwork	200

Cost Analysis for Numbers of repetitions



VIII. CONCLUSION

From Data analysis and study of both formwork system it is concluded that initial cost/sq.m for tunnel formwork is high But as the numbers of repetitions increases tunnel formwork system is best suitable after 500 nos repetitions. So that Aluminium formwork can be used for 200 repetitions.

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