

Comparative Study of Mivan Formwork with Tunnel Form System for High Rise Building

Mayur Sanjay Lodha¹, Kiran Anil Tambe²

^{1,2}Final Year Student of MBA In Project And Construction Management, Department of Project and construction management, MIT Art Design And Technology University, Pune, Maharashtra, India.

Abstract - Real estate construction industry has a reputation of not being very technologically sophisticated, generally lagging in innovation, construction techniques & management. But now a day's lot of research is carried out in this sector, advanced TUNNEL form-work & ALUFORM system are good examples of this innovation. The high rise building construction consists 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 consists of 20-25% of total cost of project. So that using advanced formwork system helps in cost saving as reduction in slab cycle time. This study is done for comparative analysis of tunnel formwork system and aluminum formwork used for high rise building construction. This paper aims at studying advanced tunnel formwork system in high rise building, to compare this system with MIVAN system and to find best formwork in terms of economy and rapid construction.

Key Words: Formwork, High Rise Building, Tunnel Formwork, Cost, economy, Aluform.

1. 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. Formwork constitutes 30% of the cost and 60% of the time in concrete construction. Quality of concrete finish and soundness of concrete depends very much on the formwork system. Formwork should be properly designed, fabricated, and erected to receive fresh concrete. If formwork is not done properly the desired shape of concrete is not possible. When concrete is compacted, it exerts pressure and the formwork must be strong and stable to take this pressure. The form should be leak proof to retain the concrete & slurry.

Advanced Tunnel formwork identified to be suitable for Indian conditions for mass construction, where quality and speed can be achieved at high level. The speed of construction by this system will surpass speed of most of the other construction systems. The labour in coordination with heavy machineries (eg. tower crane) handles this method effectively to speed up the construction, to assure quality control and durability. Adoption of this system reduces overall cost of the structure. This paper mainly focuses on advanced tunnel

formwork systems, its components, working cycle and its benefits based on speed and economy.

1.1 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 to accelerate the concrete. The cycle time for tunnel formwork system is 1-3 days only, The tunnel formwork system is very useful for repetitive room design.

1.2 ALUMINIUM FORMWORK SYSTEM

Aluminium formwork also known as MIVAN technology. MIVAN system is formwork construction, cast-in situ concrete wall and floor slabs cast monolithically provides the structural system in one continuous pour. Large room sized forms for walls and floor 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).

2. OBJECTIVES

Objective of this paper is to introduce Indian construction industry to advanced TUNNEL formwork systems which is rapid and if used effectively ultimately economical based on,

- Components
- Working cycle
- Economy.
- Benefits and disadvantages.

2.1 Objective

- 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.
- 4] study Components, Working cycle, Economy, Benefits and disadvantages of Both Tunnel form and aluform Technique.

3. METHODOLOGY-

Formwork planning process is divided in 3 stages.

Stage 1: Information, data collection and examination of limiting conditions.

Stage 2: Analysis of system & choice of system based on information collected

Stage 3: Use of system in construction.

3.1 Slab cycle of ALUFORM system.

3.1.1 Aluminum formwork system / ALUFORM system

The System is fast, simple, adaptable and very cost effective.

Aluform is advanced form work system in which cast in place concrete structured building can be constructed. The system is fast (7-10 days slab cycle), simple to use easily adaptable and very cost effective as number of reuses are more i.e. about 150-200. As we can construct all building components such as slabs, beams, columns, walls, stairs, window hoods etc.

3.2 Slab cycle of TUNNEL FORM system.

The tunnel formwork is room sized steel formwork by which monolithic structures i.e. RCC walls and slabs are constructed in continuous pour. Thermal curing technique is used to accelerate curing of concrete for which tunnel forms are heated by means of hot air blows. This system is economical only for large number of identical units and for tall structures or skyscrapers. The sequence of construction involves placing of reinforcement followed by electrical and sanitary conduits fittings along with tunnel forms.

4. CASESTUDY

For project work two different sites were studied, Rohan Builders India Pvt Ltd is using advanced TUNNEL formwork system (1-3 days slab cycle) and marathon Reality's , nexazone , panvel (Slab cycle of 8-14 days).

Case Study 1	Case study2
RohanAbhilasha,wagholi	Nexazone, panvel
Residential	Residential
Tunnel Formwork System	Aluminium Formwork System
MESA Imalat	Marathon Reality

4.1 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	170
4	Maintenance cost		15
5	Storage cost		4
6	Cycle time	24hours	14 days
7	Size of panel	1 to 4 m	650*2400
8	Weight of panel	2-4 tonne	9.25kg/sq.m
9	Salvage value		40% of cost
10	Number of repetitions	500nos	110Nos
11	De-shuttering time	10hrs	22 hrs
12	Additional Equipment requirement	Tower crane & boom placer	Staff and material
13	Manpower	55-60nos /slab	3labour/day/sq.m
15	Durability	High	High
16	Finishing	Paint finish	Fine
17	% wastage	0	0%
18	Accuracy	+ -3mm	+ -5mm
19	Curing method	Thermal curing	Curing compound
20	Casting System	RCC monolithic	RccFramed

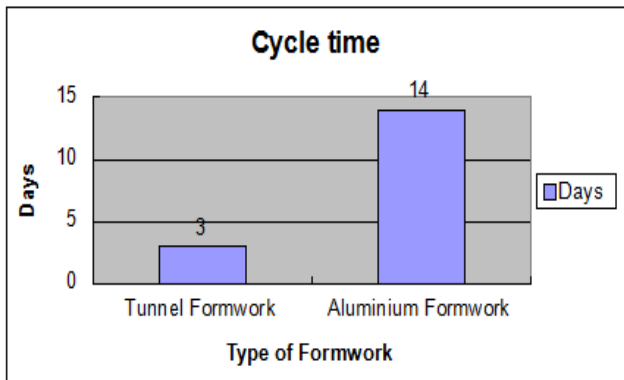
4.2 Initial Cost/m2

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

4.3 Cycle Time (days)

Type	Days
Tunnel Formwork	3 days
Aluminium Formwork	14 days

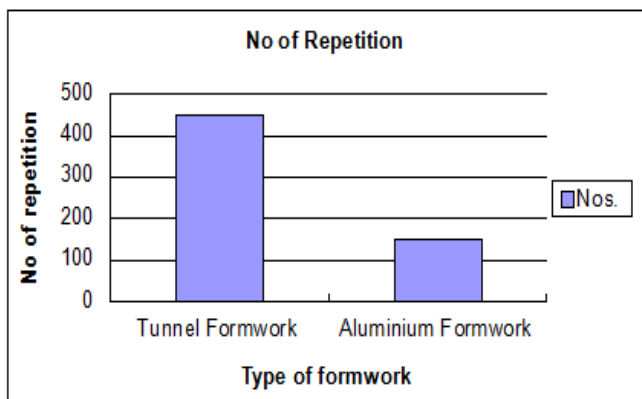
Fig 1- Cycle time required for formwork



4.4 Cost Analysis for Numbers of repetitions

Type	Nos.
Tunnel Formwork	450
Aluminium Formwork	150

Fig 2- No of Repetition with each formwork



5. CONCLUSIONS

From Data analysis and study of both formwork system it is concluded

1] initial cost/sq.m for tunnel formwork is high But as the numbers of repetitions increases tunnel formwork system is best suitable after 450 nos repetitions. So that Aluminium formwork can be used for 150 repetitions.

2] Heavy machinery and on site management are critical factors in implementing tunnel formwork. Also high cash flow management is essential to carry out work properly.

3] Coordination problem cause remarkable delay in schedule. Also after studying the tunnel formwork system.

4] it can be concluded that, though initial investment and per day operational cost in TUNNEL formwork is more, due to more reuses and reduced slab cycle time TUNNEL formwork works out ultimately economical.

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