

Cost and Time estimation for Conventional, Aluminium & Tunnel Formwork

¹Prof. Ashish P. Waghmare, ² Renuka S. Hangarge

¹ Prof & PG Co-ordinator, Dept. Of Civil Engineering, Dr. D Y Patil SOET, Lohgaon, Pune 412105

² Student M.E., (C&M) Civil Department, Dr. D Y Patil SOET, Lohgaon, Pune 412105

Abstract - Due to increase in inhabitants, people started to construct the dwelling buildings. At the early days buildings were constructed using conventional type form work system where wooden planks, runners, poles were used for the form work. With the development of technology, man tend to use plywood in its place of planks, steel jacks for support instead of wooden poles. The below study is carried out to compare different Formwork systems on the basis of Time & Cost.

Key Words: Conventional Formwork, Tunnel Formwork, Aluminium Formwork, Construction Cost, time

1. INTRODUCTION

The expenditure on formwork is occupying a major part in the total cost of construction. Therefore the selection and proper planning the system of form work will reduce the cost of construction, time of construction, the wastages and labour requirement which reduces the total cost of construction.

Formwork systems are among the key factors determining the success of a construction project in terms of speed, quality, cost and safety of the works. Construction industry is seen to be able to play a bigger role into a sustainable society by offering sustainable construction. Formwork system is one of the important construction methods in building construction

2. DATA COLLECTION

Photograph at Tunnel Formwork site during the construction.



Conventional Building during construction is as below



Aluminium Formwork during construction is as below



Case study1: Residential building with G+12 floors (Aluminium Formwork is used)

Case study2: Residential building with G+12 floors (Conventional Formwork is used)

Case Study3: Residential building with G+12 floors (Tunnel Formwork is used)

Case study 1 & 2 are of same site & each case study contains four buildings of G+12 floors.

Table 3.1: Al-Formwork 1st Building cost

| Item | Amount |
|-------------------|--------------------|
| Concrete Quantity | 16625986.2 |
| Steel Quantity | 26773524 |
| Formwork Quantity | 18449026.2 |
| Gypsum | 8674220.16 |
| Labour Rate | |
| Concrete rate | 4835298 |
| Steel | 8924508 |
| Shuttering | 9056794.68 |
| Deshuttering | 402524.208 |
| Gypsum | 4486665.6 |
| Total | 94228547.05 |

Table 3.2: Conventional Formwork 1st Building cost

| Item | Amount |
|-------------------|--------------------|
| Concrete Quantity | 11552673.19 |
| Steel Quantity | 19178505 |
| Formwork Quantity | 2375319.8 |
| Brickwork | 12199804.2 |
| Internal Plaster | 8674220.16 |
| External Plaster | 1380380.4 |
| Labour Charges | |
| Concrete casting | 2938492.8 |
| Steel | 6392835 |
| Shuttering | 7125959.4 |
| Deshuttering | 244318.608 |
| Brickwork | 4267870.64 |
| Internal Plaster | 4539043.328 |
| External Plaster | 1060860.82 |
| | 81930283.34 |

3 .DATA ANALYSIS

Total Cost of four Conventional formwork building = 327721133.4 Rs

Total Cost of four Al-Formwork building = 321567109.6 Rs

Total Difference = 6154023.768 Rs

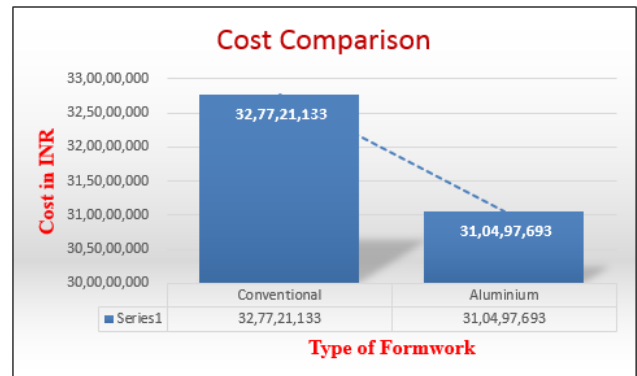
This is the cost with 48 repetitions of Aluminium Formwork.

With proper use and handling these can be used up to 120 repetitions. So, out of 120 only 48 repetitions are used. Hence cost savings for remaining life of Aluminium Formwork is = $(120-48) \times \text{Initial Investment in Formwork} / 120 = 1,10,69,415.3 \text{ Rs.}$

Currently cost of Al-Formwork building = $321567109.6 - 11069415.3 = 31,04,97,693.4 \text{ Rs.}$

Cost of Conventional Formwork Building = 327721133.4 Rs.

Graph:1 Cost Comparison of Conventional v/s Aluminium Formwork



Cost of Conventional Formwork for 81439 m² Skin area construction = 32,77,21,133.4 Rs.

Currently cost of Al-Formwork for 134174.736 m² Skin area construction = 31,04,97,693.4 Rs.

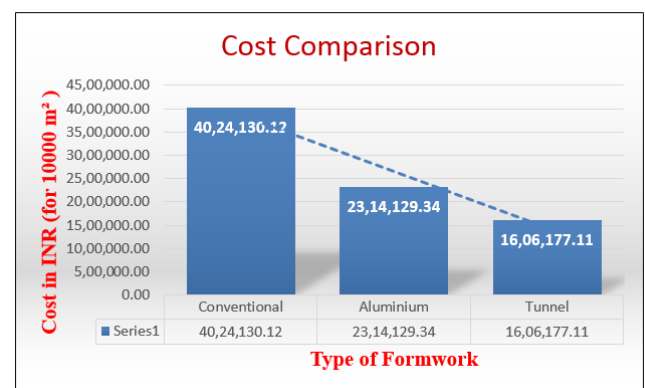
Cost of Tunnel Formwork for 81721 m² Skin area construction = 13,12,58,400 Rs.

Cost for 10000 m² Skin area construction for Conventional FW = 40,24,130.12 Rs.

Cost for 10000 m² Skin area construction for Aluminium FW = 23,14,129.34 Rs.

Cost for 10000 m² Skin area construction for Tunnel FW = 16,06,177.11 Rs.

Graph:2 Cost Comparison for Conventional, Aluminium & Tunnel Formwork

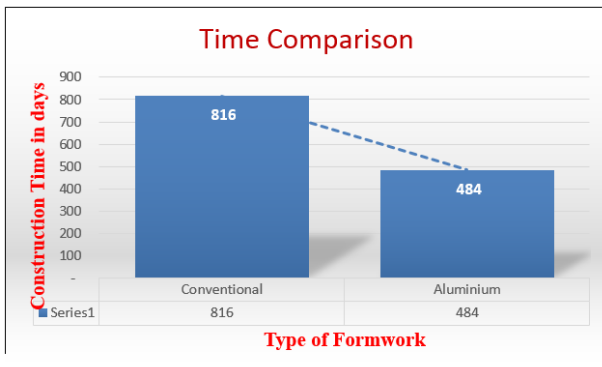


Total Days required for Conventional Formwork Building construction = **816**

Total Days required for Aluminium Formwork Building construction = **484**

Total Days difference = 332 Days

Graph:3 Time Comparison of Conventional v/s Aluminium Formwork



Time for Conventional Formwork for 81439 m² Skin area construction = **816 Days**.

Time for Al-Formwork for 134174.736 m² Skin area construction= **484 Days**

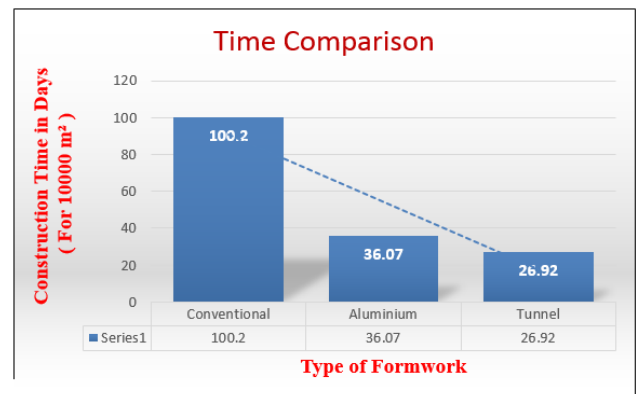
Time for Tunnel Formwork for 81721 m² Skin area construction = **220 Days**

Time for 10000 m² Skin area construction for Conventional FW= **100.2 Days**

Time for 10000 m² Skin area construction for Aluminium FW= **36.07 Days**

Time for 10000 m² Skin area construction for Tunnel FW= **26.92 Days**

Graph:4 Time Comparison for Conventional, Aluminium & Tunnel Formwork



4. CONCLUSIONS

Following Table gives the idea about the cost & time taken by Conventional, Aluminium & Tunnel Formwork system for construction of 10,000 m² of skin area.

| Item | Conventional Formwork | Aluminium Formwork | Tunnel formwork |
|---|-----------------------|--------------------|-----------------|
| Cost for construction of 10,000 m ² of Concrete area in INR | 40,24,130.12 | 23,14,129.34 | 16,06,177.11 |
| Time for construction of 10,000 m ² of Concrete area in Days | 100.2 | 36.07 | 26.92 |

- From the results obtained we can conclude that, Aluminium formwork is Cost effective in comparison with Conventional Formwork.
- Aluminium formwork is better for use in the constructions, where Time effective formwork is necessary, than Conventional Formwork.
- Tunnel Formwork is the most time & cost effective formwork among Conventional, Aluminium & Tunnel Formwork.
- Also, the duration of the project can be reduced largely with the use of Tunnel formwork where 1-4 days cycle is possible. So this is the fastest formwork system compared to conventional & Aluminium formwork.
- Time saving is equal to money saving. So, even though initial investment is large, Tunnel Formwork can be suggested for faster construction.
- If the number of repetitions are more for residential buildings, then Aluminium formwork is suggested as it saves the time & cost of finishing & shuttering.

REFERENCES

[1] Miss. Patil Dhanashri Suryakant¹, Prof. Desai D B² 1 (Student, Civil Department, Dr. J. Magdum College Of Engineering Jaysingpur, Maharashtra) 2 (HOD, Department Of Civil Engg, Dr. J. Magdum College Of Engineering Jaysingpur, Maharashtra)

“Emerging Trends in Formwork - Cost Analysis & Effectiveness of Mivan Formwork over the Conventional Formwork”

[2] NINJAL M PAREKH¹, 2BHUPENDRA M MARVADI,³UMANG PATEL “COMPARATIVE STUDIES OF CONSTRUCTION TECHNIQUES”

(CONVENTIONAL TECHNIQUE VS ALUMINIUM FORMWORK TECHNIQUES)

¹ Student, M.E. Infrastructure Engineering, Dept. of Civil Engineering, L.D.R.P. Institute of Technology and Research, Gandhinagar-382015, Gujarat. ^{2,3} Assistant Professor, Dept. of Civil Engineering, L.D.R.P. Institute of Technology and Research, Gandhinagar-382015, Gujarat.

[4] Prathul U¹, 2Leeladhar Pammar¹ PG student, 2 Assistant Professor¹, 2Department of Civil Engineering, NMAMIT, Nitte

“Analysis of Productivity by Comparing Mivan and Conventional Formwork”

[5] Sandip.P.Pawar¹, P.M.Atterde² 1P.G. Student Dept. of civil Engineering SSGBCOET Bhusawal Maharashtra 2Guide, dept. of civil Engineering SSGBCOET Bhusawal Maharashtra

“COMPARATIVE ANALYSIS OF FORMWORK IN MULTISTORY BUILDING”

IJRET: International Journal of Research in Engineering and Technology eISSN: 2319-1163 | pISSN: 2321-7308 Volume: 03 Special Issue: 09 | NCETCE-2014 | June-2014, Available @ <http://www.ijret.org> 22

[6] Tejas D. Aradhya¹, Emeritus M. R. Apte²

“STUDY OF ADVANCED TUNNEL FORMWORK SYSTEM IN HIGH RISE BUILDING”

IJRET: International Journal of Research in Engineering and Technology eISSN: 2319-1163 | pISSN: 2321-7308

[7] The Canadian Society for Civil Engineering 5th International/11th Construction Specialty Conference, At Vancouver

“Role of Formwork Systems in High-Rise Construction”

July 2015 DOI:0.13140/RG.2.3386.6083 Conference: ICSC15:

BIOGRAPHIES



Prof. Ashish P. Waghmare,
Prof & PG Co-ordinator,
Dept. Of Civil Engineering,
Dr. D Y Patil SOET, Lohgaon, Pune 412105



Renuka S. Hangarge,
Student M.E., (C&M)
Civil Department,
Dr. D Y Patil SOET, Lohgaon, Pune 412105