Comparison of Brick less Method and Conventional Method of Construction

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***Abstract*- - In today's world, due to rapid urbanization, shortage of skilled labour, increase in housing demand and shortage of houses has led the construction industry to look for alternative methods of construction which saves time and money, need less amount of labour and are easily available for all. The construction of residential housing accounts for 75% of the total construction in India since the construction industry is the 2nd largest industry after agriculture. Construction industry accounts for 8% of India's GDP. In this project, we have compared various parameters between Aluminium Formwork (brick-less) Method and Conventional Method such as carpet area, wall thickness, estimation, quantity and rate analysis by performing calculations on construction of an apartment from Uppernest Mulund (E), Mumbai, Maharashtra, India.**

Index Terms- aluminium formwork technique, conventional technique, brickless construction, mass housing, economic construction, high-rise building, wall thickness, comparison of alu-form

I. INTRODUCTION

In India there is an increase in housing demand and a shortage of housing. Every person desires a housing unit but not everyone can afford one. There is an increasing demand for structures that are sustainable and meet the safety, security and environmental considerations.

The use of various types of formworks like Aluminium Formwork, Plaswall and Plastic/Moladi are the brickless techniques of construction which can overcome the parametric drawbacks of conventional method of construction, like wall thickness and carpet area.

The above mentioned parameters affect the quantity of materials like concrete, steel, formwork, plaster, etc. and their individual costs which directly affect the total cost of the project.

II. LITERATURE REVIEW

Mr. D. M. Wijesekara (2012), studied the cost effective and speedy construction in high-rise buildings using aluminium panel formworks and thereby concluded that the brick-less technique of Alu-form construction is most affordable for mass housing and there is less waste disposal and the formwork system can be used again for another project. A very high quality concrete surface can be obtained by using this method and hence, this too, reduces the cost.

Wahid Ferdous, Yu Bai, Tuan Duc Ngo, Allan Manalo, Priyan Mendis (2019), studied the safety features and time management for modular construction for brick-less techniques and concluded that it offers faster and safer manufacturing, better predictability to completion time, superior quality, less workers on site, less wastage of resources and more environmental friendly solution than the conventional method by critically reviewing the recent development, performances, challenges and future opportunities of brick-less construction.

Huang, Chen and Sun (2004), employed computer process simulation techniques in their research for the study of different form reuse schemes to use gang-forming systems in building constructions.

Taha and Price (1991), developed a package which produces design details schedule of quantities, cost comparison between purchased and hired proprietary formwork and a cost estimate. A conceptual model for implementing stiffness method in formwork design was also proposed by them in 1997.

Kui Hu, Yujing Chen, Falak Naz, Changnv Zeng, Shihao Cao (2019), studied and concluded the quality of recycled aggregates from construction and demolition waste (CDW) is strictly related to the content of porous and low-strength phases and is

specifically related to the high content of brick particles.

Abel Pinto, Isabelle L. Nunes, Rita A. Ribeiro (2011), studied the construction safety efforts that are implied by simply allocating more resources to safety management will improve safety on site and concluded that the construction industry has many occupational risks and poor working conditions and implemented their study for the safety programs to achieve adequate safety levels using Occupational Risk Assessment (ORA).

III. OBJECTIVES

1. To prove that Alu-form, Plaswall and Plastic Formwork are most-effective for mass housing.
2. To calculate wall thickness and carpet area (m2) of Aluminium Formwork Technique.
3. To analyze and compare safety, quality, cost and time of Aluminium Formwork and Conventional Method.

IV. SCOPE OF STUDY

1. In a building constructed using Aluminium formwork, wall thickness is less than the Conventional method. Hence, quantity of material and their corresponding cost is less.
2. Total carpet area is more in Brick-less technique than the Conventional method as the wall thickness is less.
3. Aluminium formwork can prove to be cost effective after at least 50 repetitions.
4. Since the total structure is made of concrete, it offers better reliability, safety, strength and longer life.
5. Total estimated cost of the structure is less than conventional method especially for high rise structures.

V. METHODOLOGY

1. Materials required.
2. Quantity estimation.
3. Rate analysis of materials.
4. Wall thickness and Volume.
5. Carpet area calculation.
6. Time and Cost optimization.

VI. CALCULATIONS AND RESULTS

The following calculations are done based on our case study of a high-rise residential construction project called Uppernest in Mulund (E), Mumbai:

1. Materials required:

ALUMINIUM FORMWORK	CONVENTIONAL METHOD
M25 Concrete	M25 Concrete
Aluminium Formwork	Wooden Formwork
Steel	Steel
--------	Brick Masonry
--------	Plaster

2. Quantity Estimation:

MATERIALS	ALUMINIUM FORMWORK	CONVENTIONAL METHOD
M25 Concrete	4.576 m^3	1.414 m^3
Formwork	332.44 ft^2	332.44 ft^2
Steel	830 kgs	830 kgs
Labour	6 nos.	12 nos.
Brick Masonry	----	5.5 m^3
Plaster	----	33.96 m^2

3. Rate Analysis:

MATERIALS	ALUMINIUM FORMWORK	CONVENTIONAL METHOD
M25 Concrete	Rs. 17,846/-	Rs. 7,111.4/-
Formwork	Rs. 17,28,688/-	Rs. 13,280/-
Steel	Rs. 37,350/-	Rs. 37,350/-
Labour	Rs. 1,500/-	Rs. 3,600/-
Brick Masonry	----	Rs. 18,975/-
Plaster	----	Rs. 6792/-
Total Cost	Rs. 17,85,384/-	Rs. 87,108.4/-

4. Scrap Values of Various Formworks:

Sr. No.	Formworks	% Scrap
1.	Plywood	15%
2.	Steel	30%
3.	Aluminium	50%

Here, we can see that Aluminium Formwork offers maximum Scrap Value.

5. Cost Comparison of Formwork Repetitions:

Techniques	50 times	100 times	150 times	160 times
Alu-form	4563488	7398288	10233088	10800048
Conventio	435542	8710840	1306626	1393734

nal	0		0	4
Percentage	-4%	15%	21%	22%

6. Graphical Representation of Cost Comparison:

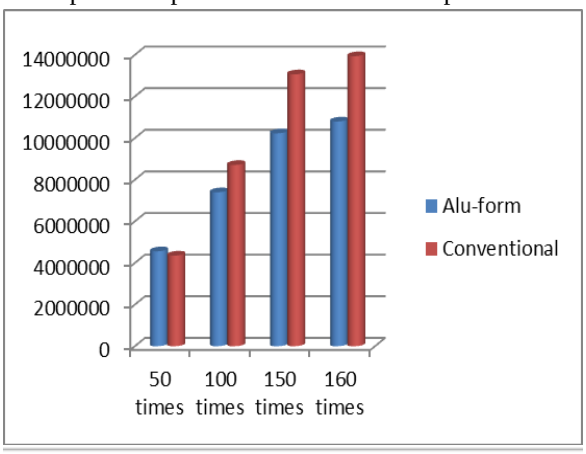

Fig. 2BHK Standard Unit Plan

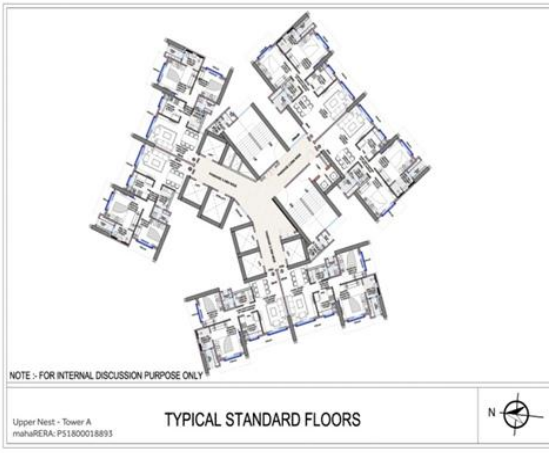

Fig. Typical Standard Floors

VII. CONCLUSION

From the above calculations based on our CASE STUDY of Uppernest Mulund (E), Mumbai, we can conclude that Alu-form technique is initially expensive than Conventional Method. But Alu-form technique is a very fast and speedy method as it can complete a project that requires 3 years by Conventional Method, in just 1 year.

Plus, due to its fast construction, the overhead costs like electricity charges, water charges, government taxes, labour costs, wastage costs, wear and tear due to weather changes, etc are saved by using Alu-form techniques.

Also, after 100 repetitions, Alu-form technique can prove to be extremely economic and cost-effective as compared to conventional method of construction as Aluminium formwork panels can be used for upto 250 repetitions.

Hence, Aluminium formwork technique shall be used for high rise building constructions, typically for buildings which have same structural plans for apartments on each floor.

It should also be used to decrease the housing demand for the increasing population while providing low cost housing units for all.

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