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COMPARATIVE ANALYSIS OF ALLUFORMWORK AND CONVENTIONAL FORMWORK IN PUNE REGION

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Abstract – The formwork is paying an important role in construction industries so the selection of formwork is too much important, so many option available in market but before selecting any kind of formwork initially think about the type of project, budget of project, what quality required, in which time period we have to complete project, is that formwork is being safety, feasibility of form work. Because wrong selection of form work become difficult to complete the project on time and set quality also hampering budget.

Alluformwork system identified to be sustainable for Indian condition for mass housing construction where quality and speed can be maintained at reasonably high level. Formwork system are among the key factor determine the success of construction project in terms of speed, quality, cost and safety of the works the rapid advancement in the field of formwork along with the innovation in concrete as a change more efficient construction is possible these day the alluformwork system saves cost, time and improves the quality of construction alluformwork is successfully used in japan, Singapore, Malaysia, and middle east of the construction of apartment and buildings, both low and high-rise. Allufoemwork system is very cost effective.

Key Words: Alluformwork, conventional formwork, time, cost, quality, safety, Activities.

1.INTRODUCTION

As everyone knows the formwork is temporary structure which is used for to support the concrete until and unless it get become set. Also formwork is use to attain required strength and shape which we want. There are multiple option available in market but everyone have some criteria

According to our need we have to select. Definitely costing is vary according to material or technology of formwork for example wooden form is cheaper than alluformwork or steel formwork.

Now a day competition is increases so according to everyone try to complete our project in fix time period with better quality and costing of project is in budget or pocket friendly so that better product can serve to client so that they will happy

As we know everyone get attracted to latest technology so that everyone want to do our project in latest technology so that client can attract easily.

Some project have time limit have no effect of cost in that case they divert in to latest technology for reduce construction time period.

1.1 Aim

To increases or divert the mentality of people in alluformwork instead of that conventional formwork and its awareness

To show how we can optimize the construction cost, time, multiple activity by using alluformwork.

1.2 Objective

Study different type form work on residential structure.

To study advance technique of form work like alluformwork.

Comparative study of cost benefit analysis of alluformwork.

1.3 Need of form work study

Modern civilization getting support in construction of buildings for making our life easy. Since its start modern technology plays an important role in construction industries. Those having ability to plan / design and construct building digitally has significantly increases speed and efficiency to reduce construction cost at the same time

Additionally, the material that are used in construction industries are stronger, more flexible and durable, allowing for more sustainable structure that are safer and more environmentally friendly. With better quality. Professional concrete construction means using formwork and the task of creating this article and modern project should be so experienced.

1.4 Scope of Project

Scope of the project will be limited to alluformwork in residential project in pune area.

On the basis of project can calculate how much will be the

building, formwork, initial investment cost of the project by using alluformwork.

2. Alluformwork

AlluFormwork System is a construction system for forming cast in place concrete structure of a building. It is also a system for scheduling and controlling the work of other construction trades such as steel reinforcement, concrete placement and mechanical and electrical conduits. The System is fast, simple, adaptable and very cost effective. It is unique because it forms all of the concrete in a building including walls, floor slabs, columns, beams, stairs, window hoods, balconies and various decorative features in exact accordance with the architects' design. The dimensional accuracy of the concreted work also results in consistent fittings of doors and windows. The smooth–off form finish of the concrete eliminates the need for costly plastering. AlluFormwork System provides AlluFormwork 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. Unlike other construction systems, Formwork Systems of aluminum forms can be erected by unskilled labour and without the need for hoisting cranes. The largest panel weight not more than 25 kgs which means it can be handled by a single worker.

2.1 Advantages And Disadvantages of Alluformwork.

Advantages of Alluformwork.

Speed tof construction is high as the slab to slab cycle is less

Construction cost is become optimizes.

More safety during construction

Repetition of material is more

Light weight of shuttering material so easy to handle.

Less skilled labour required

Quality work can achieve with less afford

Number of construction activities reduces

High earthquake resistance structure

High scrap value of material

Monolithic structure

Disadvantages of Alluformwork.

Initial investment is high

Preplanning required

Repetitive construction required

Much more accessories has to be carried out during construction

Changes of structure not allow once construction start

More time required for making material in plant

2.2 Accessories of Alluformwork

Wall panel – available in standard sizes ie. 600x2400mm and remaining panel is design as per room sizes having weight 24kg.

Rocker – rocker is fix at the bottom of wall panel as shown in image with the help of pin and wedges. Rocker plays important role for leveling and alignment of wall as his bottom edge is sharp. Its standard height is 50 mm and length is as per panel width.

Kicker – kicker is play an important role to hold the outer panel in its position with better stability. Fix it on top of outer panel with help of kicker nut and bolt. As its length is depend upon the outer periphery of building and height of kicker is 200mm

Internal corner (I.C.) – as per name this accessories is used to hold internal panel at corner portion height is vary as per height of slab.

External corner (E.C.) – as per name this used to hold external panel at corner portion as its height vary for as per height

Wall top extra panel (W.X and W.E.)- Slab to slab height is vary building to building in that case internal and external side above standard panel fix wall top extra panel to match height of wall

Pull and push jack- pull and push jack used for making wall alignment properly also help to hold wall panel on his location. Having threaded portion as shown in image which is connected to cylinder while rotating its clock wise or anticlockwise panel moves inner side or outer side

Turn bukhal and wire rope – is used for wall panel plumb. At time of panel setting some time panel have to pull inside for plumb in that time turn bukhal plays important role to make panel in plumb

Waller bracket used for restrict bulging of panel as well as help in alignment of wall

Wall tie – wall tie is used to hold inner panel and outer panel as per wall thickness. After casting we have to remove it and reused

Special panel- except that standard panel somewhere need to use special panel. Generally used in staircase and elevation portion

Tie rod with wing nut and solder- solder are fix to align the kicker in required manner. And gives better stability to kicker. Restrict bulging of kicker while concreting

Deck panel – deck panel is used to cover slab bottom and its standard size is 600X900 mm and closing panel is according to room sizes

Slab level (S.L.)- is used to connect deck panel to wall panel and its length is according to room length

Prop Head (D.P.) –double pole is used to connect middle beam which is used to fix deck panel. Double pole is help supporting to deck which is fix above pro

Middle beam- middle beam is used to connect and support to deck panel at at interval of standard size of deck panel.

Lower slab level (L.S.)- lower slap level is used at sunk portion to give proper shape to sunk area also used above the internal loft

Pin and wedged. – pin and wedges are plays and important role to connect all accessories and panel with each other and give rigidity to connection which is very easy to fix and remove.

Slab cut out – slab cut out which is place deck of slab and in that portion concrete will not allowed. This cut out used for access of material after material shifting it close with concrete.

Beam joint (J.B.) - Beam joint used to joint deck beam with **prop head or D.P**. with the help of long pin and wedges.

3. Conventional formwork

The formwork is built on site with the help of timber and plywood . It is easy to produce but time-consuming for larger structures, and the plywood facing has a relatively short lifespan. It is still used extensively where the labour costs are lower than the costs for procuring reusable formwork. It is also the most flexible type of formwork, so even where other systems are in use, complicated sections may use it.

This is usually consist of standard framed ply fix together with help silver wood patti. This is provided to resisting horizontal force of wet concrete. Play wood can use both faces after remaking for increases repetition of ply

3.1 Advantages and Disadvantages of Conventional.

Advantages of Alluformwork.

Easy availability of material

Initial costing less

Any changes can possible during construction

Less accessories has to be carried out during construction

Easy to de-shuttering after concrete hardening

It is easy to replace any damage part

Timber have good thermal insulation

It is easy to understand for construction

Disadvantages of Conventional formwork

Dry timber absorb water from concrete

Heavy weight difficult to handle

Limitation on number of repetition

Less scrap value

Skilled labour required

Finishing can't get easily

Multiple joint are in construction

3.2 Accessories of Conventional formwork

Props- Props are available in various sizes according slab or beam bottom we can select.basicaly it use for supporting to slab or beam bottom until and unless concrete itself take load.

Shikanja- Shikanja is used to hold or improve joint strength at beam bottom level or column junction level. Its length may according to our demand

Tie rod and wing nut- Tie rod and wing nut used to fix or tight column weller in greater accuracy manner also its used in beam whenever the beam depth and length is larger in that case tie rod and wind nut is provided to avoid bulging of beam

Silver wood - Silver wood basically wood strip available in different sizes as per our demand. Basically it is used to getting support to ply while making ply shuttering as per required sizes in that case provided silver wood frame help to support and give shape properly to ply as per requirement.

Chabi- chabi is wooden batten available in different sizes as per our requirement wooden chabi ganaraly used to support beam bottom fix over prop head , also used to support column fix with help of shikanja and somewhere can used to

slab bottom.

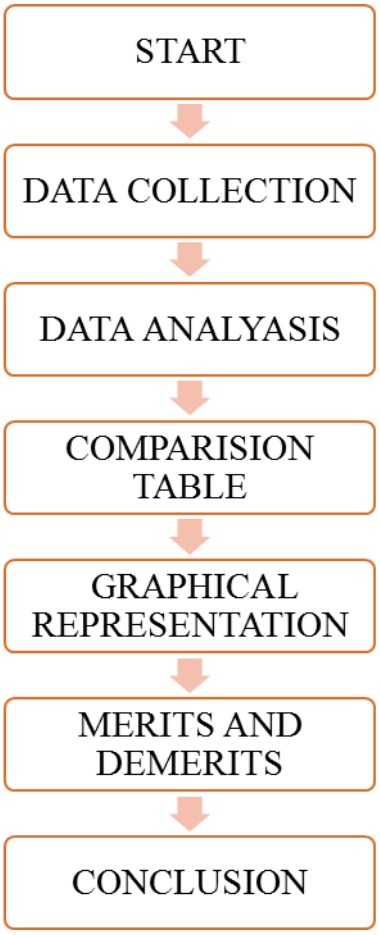
Ply- Ply which is used at construction site for shuttering material is commercial waterproof ply which majorly used everywhere. Ply plays important role in shuttering available in different thickness as per requirement thickness of ply selected.

Spanner- Spanner is available in different pattern and sizes spanner plays important role to support slab evenly. Having adjustable arrangement in length wise as per requirement can adjust exactly erection of spanner is easy and safe

Weller- Weller is used to support column with help of tie rod and wing nut or shikanja. Weller is at fix interval of column in height wise to support the column and will not allowed for bulging. Length of weller is vary as per length of column

4. Methodology

First collected the materials like literature review and latest published papers related to comparative analysis on conventional formwork and aluformwork , it many contains live and completes project case study by using aluformwork and conventional formwork.



5. Data collection

5.1Case Study on Residential Building Using Alluformwork

Builder name- Earnest and Shah Ventures, Pune

Project Name –Aayush Park –III

Building- C (P+12)

Location- Yashawant Nagar Katvi Road, Katvi, Talegaon Dabhade

Work Status- Ongoing Project

Working on Topic –

Calculating Cost of Building

Calculating Time Duration of Building for Completion

Quality of Construction

Number of Activity for Completion of Building

Scrap Value of Formwork

Safety during Work

Formwork Repetition

Calculating Cost Of Building

Total slab area = 77512.00 sq.ft.

Per Floor area =77512/13= 5962.46 sq.ft.

Construction cost Per Sq.ft. = Total amount/ Total slab area

= 41457292.01 / 77512.00

= 534.85 Rs./ Sq.ft.

Alluformwork quantities = 3000 Sq.m.

Rate of Alluformwork = 7800 Rs/Sq.m.

Alluformwork Costing = Alluformwork quantities x Rate of Alluformwork

= 3000 X 7800

= 2,34,00000.00 Rs.

Number of repetition of alluformwork =150 nos

Cost of Alluformwork per repetition = Total Material Cost / Number Of repetition

= 23400000 / 150

= 1,56,000.00 Rs.

Alluformwork Cost per sq.ft. = per repetition cost / Per Slab Area

= 156000 / 5962.46

= 26.16 Rs/Sq.ft.

Total Building Cost Per Sq.ft. = Total RCC. Cost Per Sq.ft. + Alluformwork Cost Per Sq.ft.

= 534.85 + 26.16

= 561.01 Rs./Sq.ft. (Considering 150 no's repetition and not consider scrap value)

Net Material Cost After deducting Scrap value = Cost of New alluformwork – Scrap Value of Used Material

= 2,34,00000 – 65,10,000

=1,68,90,000.0 Rs.

Cost of Alluformwork per repetition = Total Material Cost / Number Of repetition

= 1,68,90,000 / 150

= 1,12,600.00 Rs.

Alluformwork Cost per sq.ft. = per repetition cost / Per Slab Area

= 112600 / 5962.46

= 18.88 Rs/Sq.ft.

Total Building Cost Per Sq.ft. = Total RCC. Cost Per Sq.ft. + Alluformwork Cost Per Sq.ft.

= 534.85 + 18.88

= 553.73 Rs./Sq.ft. (Considering 150 no's repetition and consider scrap value)

5.2Case Study on Residential Building Using Conventional Formwork

Builder name- Veda And Shah Ventures, Pune

Project Name –Aayush Park –II

Building- C (P+12)

Location- Behind Dy Patil collage varale, Talegaon Dabhade

Work Status- Completed Project

Working on Topic –

Calculating Cost Of Building

ACTIVITY	ITEMS	QTY.	UNIT	RATE	AMOUNT
R.C.C.	LABOUR	77512.00	SQ.FT.	140.00	10851680.00
	REINFORCEMENT	315866.50	KG	40.81	12890511.87
	M10 SITE MIX CONCRETE	40.79	Cu.m.	1997.42	81470.77
	M25 RMC CONCRETE	106.08	Cu.m.	2826.00	299786.32
	M30 RMC CONCRETE	218.04	Cu.m.	3939.75	859015.21
	M40 RMC CONCRETE	98.25	Cu.m.	4730.00	464725.36
	M30 RMC - SELF COMPACTING CONCRETE	1882.03	Cu.m.	4571.00	8602772.11
	M35 RMC - SELF COMPACTING CONCRETE	754.74	Cu.m.	4636.00	3498952.45
	M40 RMC - SELF COMPACTING CONCRETE	781.68	Cu.m.	5000.00	3908377.93
BLOCK WORK	N.A.				
INTERNAL FINISHES	N.A.				
EXTERNAL PLASTER	N.A.				
			Total Amount		41457292.01

Calculating Time Duration of Building for Completion

Quality of Construction

Number of Activity for Completion Of Building

Scrap Value of Formwork

Safety during Work

Formwork Repetition

1. Calculating Cost Of Building

ACTIVITY	**ITEMS**	**QTY.**	**UNIT**	**RATE**	**AMOUNT**
R.C.C.	**RCC. LABOUR**	84430.00	SQ.FT.	165.00	13930950.00
	MATERIAL COST				
	REINFORCEMENT	210861.60	KG	40.81	8605261.90
	M10 SITE MIX CONCRETE	99.00	CU.M.	1997.42	197744.91
	M20 SITE MIX CONCRETE	90.20	CU.M.	2542.20	229306.04

	M25 SITE MIX CONCRETE	291.68	CU. M.	2826.77	824513.16
	M30 SITE MIX CONCRETE	210.78	CU. M.	2942.40	620198.78
	M35 SITE MIX CONCRETE	264.70	CU. M.	3091.41	818297.20
	M25 RMC CONCRETE WITH PUMPING	408.08	CU. M.	3914.00	1597225.12
	M30 RMC CONCRETE	207.51	CU. M.	3939.75	817537.52
	M30 RMC CONCRETE WITH PUMPING	589.78	CU. M.	4094.25	2414706.77
	M35 RMC CONCRETE WITH PUMPING	666.76	CU. M.	4253.90	2836330.36
BLOCK WORK	**BLOCKWORK LABOUR**	80204.00	SQ.FT.	22.80	1828651.20
	MATERIAL COST				
	100MM AAC BLOCKWORK	280.00	CU. M.	4100.10	1148028.00
	125MM AAC BLOCKWORK	858.88	CU. M.	4265.70	3663703.09
	BLOCKWORK IN PARKING AREA	28.13	CU. M.	5644.64	158755.61
INTERNAL FINISHES	ROUGH PLASTER (M)	161617.55	SQ.FT.	5.23	845610.52
	NEERU PLASTER (M)	25056.00	SQ.FT.	7.10	177990.28
	INTERNAL PLASTER LABOUR	80204.00	SQ.FT.	23.94	1920083.76
	ROUGH PLASTER FOR PARKING AREA (L+M)	1076.45	SQ.FT.	16.70	17977.33
	POP IN CEILING (L+M)	43165.97	SQ.FT.	19.38	836556.59
	POP ON WALL (L+M)	128905.00	SQ.FT.	17.10	2204275.50
	POP IN CEILING FOR MAIN ENTRANCE LOOBY/SCOIETY ROOM (L+M)	489.00	SQ.FT.	19.38	9476.82
	POP ON WALL FOR MAIN ENTRANCE LOOBY/SCOIETY ROOM (L+M)	1076.45	SQ.FT.	17.10	18407.30
	PUTTY PLASTER IN CEILING (L+M)	19461.78	SQ.FT.	9.13	177712.63
EXTERNAL PLASTER	EXTERNAL PLASTER (M)	121098.00	SQ.FT.	10.62	1285697.47
	EXTERNAL PLASTER LABOUR ON BUILT UP AREA	80204.00	SQ.FT.	38.76	3108707.04
	EXTERNAL PLASTER LABOUR FOR PARKING AREA	10043.00	SQ.FT.	28.62	287400.53
			Total amount		**50581105.41**

Total slab area = 84430.00 sq.ft.

Per Floor area =84430/13= 6494.61 sq.ft.

Construction cost Per Sq.ft. = Total amount/ Total slab area

= 50581105.41 / 84430.00

= 599.08 Rs./ Sq.ft.

Ply formwork quantities = 9741.92 Sq.ft.

Note – In conventional formwork system 165 rs/ Sq.ft. rate including Labour+ formwork

-12 mm commercial ply have 12 to 15 repetition

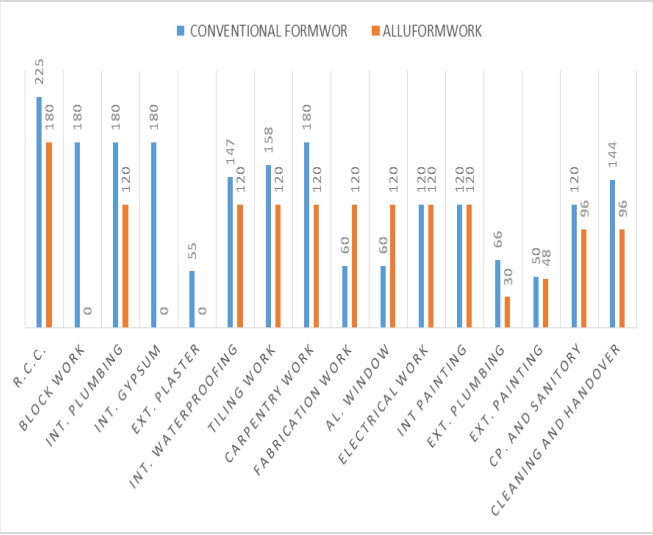
6. Result and Analysis

Comparative analysis in tabular format of alluformwork and conventional formwork in considered parameter

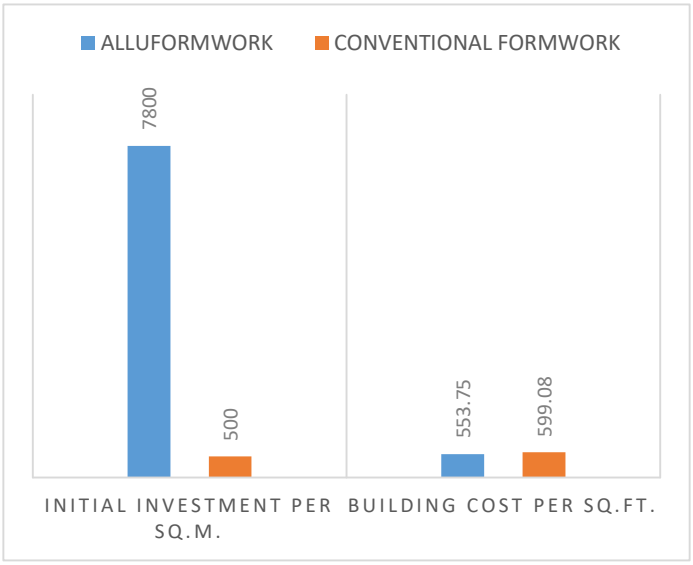
Sr.No.	Parameter	Alluformwork	Conventional formwork
1	Cost (Rs.)		
	Initial investment in formwork	7800 Rs/Sq.m.	500 Rs/Sq.m.
	Cost of building per sq.ft.	553.75 Rs/Sq.ft.	599.08 Rs/Sq.ft.
	Deshuttering time Period	3 Days	7 Days
	Time required for	10 Days	15 Days

	floor to floor cycle		
	Total time duration to complete the building	312 Days	640 Days
3	Quality		
	Quality of final product	Excellent	Good
	Strength of Formwork material	7 To 8 Tone/Sq.m.	2.5 To 5 Tone /Sq.m.
4	Number of activities involves	13 Nos	16 Nos
5	Scrap value of formwork	125 Rs/Kg	25Rs/Kg
6	Safety during work	Moderate	High
7	Formwork repetition	150 to 300 Nos	12 to 15 Nos

Comparative Analysis Table.



Comparative Bar Chart of Conventional Formwork And Alluformwork With Respect to Time and Activity



Comparative Bar Chart of Alluformwork and Conventional Formwork with Respect to Initial Investment in per sq.m. and Building Cost Per sq.ft.

7. Conclusions

On The basis of result obtained, it can be concluded that the alluformwork is better option for project having sufficient repetition of formwork also reduce cost of project as well as time

By using alluformwork instead of conventional formwork can save 45 rs/sq.ft. cost of building

As the initial invest is high of alluformwork as compare to conventional formwork.

By using alluformwork can save 50% duration of building instead of conventional formwork

Alluformwork is beneficial were time duration is restricted.

By using alluformwork structure being monolithic hence more seismic resistance.

As there is no multiple joint like column, slab, block work, plaster so the issues of cracks and leakages will be minimizes

Scrap value of alluformwork is much more than conventional formwork

Safety precaution is moderate in alluformwork as compare to other

Repetition wise alluformwork is much more than conventional formwork.

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