

Comparative Analysis of Conventional Formwork and Mivan Formwork based on Duration and Cost

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Abstract – In India, development industry is one of the most significant piece of the nation as far as economy and advancement of the nation. With developing populace, there is urgent need in the development of framework industry and furthermore advancement of new strategies in development industry. In this way utilization of advance assembling strategies over the old traditional systems is significant parameter for the improvement of the nation.

This venture portrays the need of mivan innovation in development industry. Mivan is another innovation contrasted with traditional methods which helps in fruitful culmination of the undertaking inside recommended time and furthermore cost sparing. Right now is accomplished for cost and time between ordinary formwork and mivan formwork by utilizing Microsoft Project.

Key Words: AutoCAD, Microsoft Project (MSP), Mivan Technology.

1. INTRODUCTION

The advancement made by the development business of any nation could be considered as the indication of improvement of that nation. Development is significant piece of Indian economy and it has helped in the improvement of nation. The conventional method of development for singular houses would be absolutely lacking for mass lodging development industry considering the fast pace of development. Further, such developments are inclined to low quality control even if there should arise an occurrence of contractual workers with generous assets also knowledge. "Attempts to pursue collective staying, it is important for also including creative innovations that are able to do quick rate development and can convey great quality and sturdy structure in financially savvy way". This innovation is one of the ongoing development advances up and coming at the more prominent speed for the fruitful consummation different development venture across Indian development industry, particularly mass lodging venture. This specific examination is fundamental since it can give the vital significant data on the structure all out cost and complete length correlation between the ordinary accessible frameworks and Mivan building framework in Indian development industry, where economy and time both assume significant job.

1.1 Formwork

"Frameworks, shapes or panels seem to be the barrels where cement is mounted, with the intention that, when solidified, it would have desired form or frame. If cement creates enough cohesion to support its strength, it can be removed."

1.2 Engineering at MIVAN

MIVAN is an aluminium formwork innovation. MIVAN framework is formwork development, cast-in-situ solid divider and floor sections cast solid gives the auxiliary framework in one constant pour. Enormous room measured structures for dividers and floors sections are raised at site. These structures are made solid and durable, created with exactness and simple to deal with. They have a large number (around 250) of iterations. The concrete is manufactured under strict quality control in RMC batch processing plants and conveyed to the transit mixing location.

Advantages of Mivan:

1. High quality system guarantees consistence of measurements.
2. On evacuation of form an excellent solid completion is created to exact resistances and verticality.
3. Total framework shapes the total solid structures.
4. Custom intended to suit venture necessities.
5. Unsurpassed development speed.
6. Panels can be used afresh up to 250 times
7. Can be raised utilizing incompetent workers.

1.3 Microsoft Project

Project is an administrative computer undertaking designed and manufactured by Microsoft to assist a company leader in setting up an plan, allocating assets, pursuing development, approaching the financial limit and dissecting the remaining burdens.

Definitions of assets (laboratory, infrastructure and components) can be shared among undertakings using a can resource pool. Every asset can have its individual schedule, which characterizes what days and time is asset present. Asset rates are utilized to figure asset task costs. The execution of the planned work dependent on the asset accessibility as characterized in the asset schedules. All assets can be characterized in Work, Material and Cost.

Features of Microsoft Project

- Scheduling strategy utilizing system models
- Reduction in the Total Duration of the Project
- Ease of work for Labour
- Reduction in the general Cost of the Project.

1.4 AutoCAD

- AutoCAD is an enterprise PC that helped to design and layout software. AutoCAD was first published in December 1982, made and promoted by Autodesk.
- It is used for different applications like making plots for structures, Bridges to give a few models. AutoCAD is 2D and 3D PC upheld drafting programming application.

AutoCAD features

- **Storage and availability:** Software development documents use less extra space to hold truly drafted paper sketches, as considered extra space required. In addition, paper delineations require care and protection from misery or trouble heavy rainfall, explosions or other tragedies, and over duration they may get hurt.
- **3D View:** AutoCAD showed that higher 3d images with shades, equipment as well as textures associated with different surfaces which make them understood and less challenging for the customer to image the completed result.
- **Revisions and alterations:** The Processor supported plan has developed in mechanical assemblies that license any number of adjustments and changes in a viable and quick manner.
- **Speed:** Users would save time and effort. Basic changes can be made with headings such as duplicate, replicate, expand, tilt and magnitude and a lot of logically other bearings.
- **Accuracy:** AutoCAD facilitates you to create with fragmentary measurements and, in addition, to define the consistency of every percentage of numerical positions, thereby providing accuracy in all estimations.

1.5 Objectives

1. To think about the expense of working by utilizing traditional formwork procedure and by utilizing MIVAN formwork strategy.
2. To look at the Duration of working by utilizing customary formwork method and by utilizing MIVAN formwork procedure.
3. To complete which formwork is best for development Sub Subsection

2. GENERAL METHODOLOGY

The amount of columns, beams, walls and slabs have been determined utilizing exceed expectations sheet. With the assistance of Microsoft venture programming the period and cost is determined. What's more, further end is made on which formwork is cost productive, fast development, better completed quality, low support. Subsequently to decide the significance of choice of formwork.

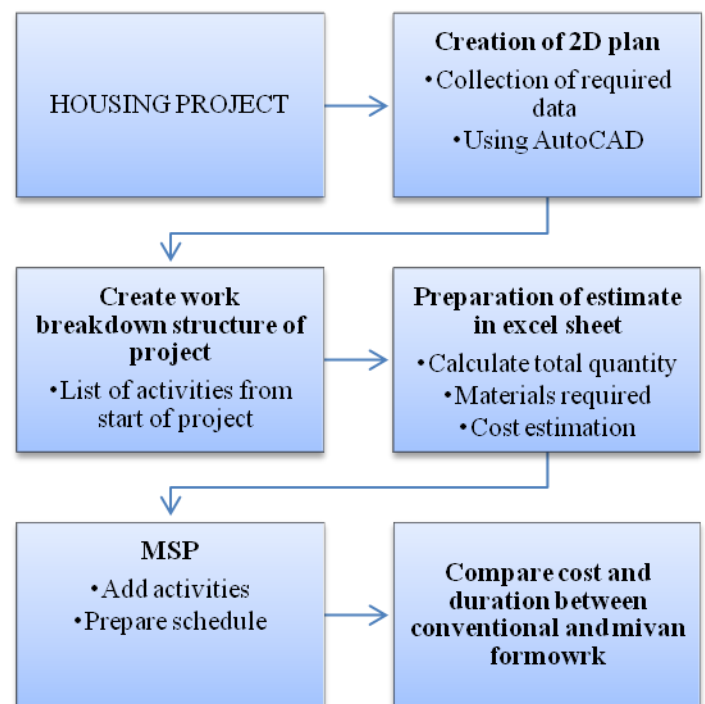


Fig -1: Flow Chart for General Methodology

Details about case study

1. Built up Area = 351 sqft
2. Story consists of:
 - 1Living Room
 - 1 Bedroom
 - 1 Toilet
 - 1 kitchen

2.1 Creation of 2D plan utilizing CAD

- The initial step is the production of the plan of the venture. For both traditional formwork and for mivan formwork building.

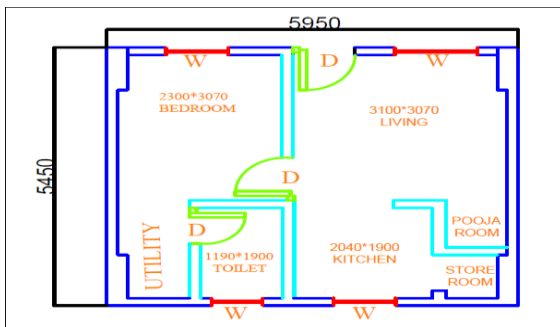


Fig 2: Plan of a house

2.2 Build a work breakdown structure

- The term Work Breakdown Structure is in short generally called as WBS. It is a procedure of collection various components of the undertaking with worried to explicit item.

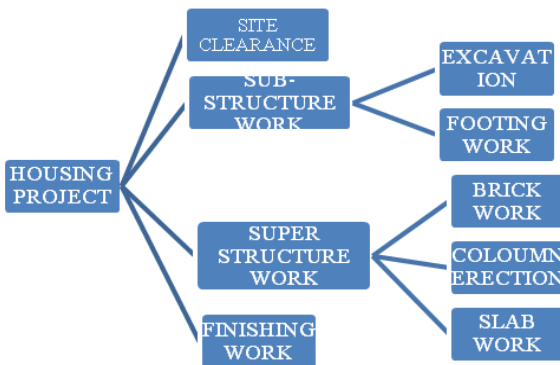


Fig 3: Work break down structure

2.3 Preparation of estimate in excel sheet

- Gauge for the task is readied utilizing excel expectations sheet for both regular formwork and furthermore for mivan framework with the assistance of CAD drawing. An absolute amount for every part is discovered and complete rate is processed utilizing plan rate book for both regular framework and furthermore for mivan framework.

2.4 Preparation of the plan of job tasks Breakdown structure

- Schedule involves cleanup of construction sites, plinth bar or tie pillar, roofing and cementing section work, and so forth. The procedure of identification of the work breakdown structure includes a different method for different construction projects [Vinayakumar S. P. et al 2019]

ID	Task Mode	Task Name	Resource Names	Duration	Start	March 2020	01	04	07	10
1		PROJECT MSP		36.5 days	Sun 08-03-20					
2		CLEARING GRASS	CLEARING SITE[0 ha]	0 days	Sun 08-03-20					
3		EARTHWORK AND EXCAVATION	EARTHWORK EXCAVATION[13.5 CUM]	2 days	Mon 09-03-20					
4		TRANSPORTING THE EXCAVATED MATERIAL	TRANSPORTATION[13.75 CUM]	2 days	Mon 09-03-20					
5		LAYING P.C.C.	P.C.C.[1.13 CUM]	1 day	Wed 11-03-20					
6		BACKFILLING	BACKFILLING[13.75 CUM]	3 days	Thu 12-03-20					
7		Centering	CENTERING SHUTTERING[249.16 SQM]	9 days	Thu 12-03-20					
8		Staircase		2 days	Wed 13-03-20					
9		Columns		2 days	Thu 12-03-20					
10		Slab & Beams & Shear Wall		3 days	Fri 20-03-20					
11		Reinforcement	STEEL QUANTITY[4.59 M.T.]	8 days	Thu 12-03-20					
12		Staircase		2 days	Thu 12-03-20					
13		Columns		2 days	Fri 13-03-20					
14		Slab & Beams & Shear Wall		3 days	Thu 19-03-20					
15		R.C.Concrete M25	CEMENT CONCRETE[37.98 CUM]	9 days	Thu 12-03-20					
16		Staircase		1 day	Tue 24-03-20					
17		Columns		1 day	Thu 12-03-20					
18		Slab & Beams & Shear Wall		1 day	Tue 24-03-20					
19		Teakwood Frame	TEAKWOOD FRAME[11.38 CUM]	1 day	Tue 14-04-20					
20		Teakwood Shutter	TEAKWOOD SHUTTER[1.89 SQM]	1 day	Wed 15-04-20					
21		M.S.Gill for W & V	M.S.GRILL WORKS[13 SQM]	1 day	Thu 16-04-20					
22		19mm Granite Door frame	GRANITE DOOR FRAME[2.97 SQM]	1 day	Fri 17-04-20					
23		Plumbing Work		2 days	Wed 25-03-20					
24		Electrical Work		2 days	Wed 25-03-20					

ID	Task Mode	Task Name	Resource Names	Duration	Start	March 2020	01	04	07	10
25		Wall Putty	WALL PUTTY[113.24 SQM]	1 day	Mon 20-04-20					
26		Nahni trap	CI NAHANI TRAP[1 NOS]	0.25 days	Mon 09-03-20					
27		FIXING KITCHEN KATTA	KITCHEN KATTA[1 NOS]	1 day	Tue 21-04-20					
28		Vitrified glazed tiles	VITRIFIED GLAZED TILES[63.44 SQM]	2 days	Tue 24-03-20					
29		Polished Cadappa flooring	POLISHED CADAPPA SLAB[8.8 SQM]	1 day	Wed 21-04-20					
30		Nosing for Caddappa	NOISING FOR GRANITE[37.88 R.M.]	1 day	Wed 22-04-20					
31		S.S.Railing	S.S.RAILING[3.37 SQM]	1 day	Thu 23-04-20					
32		Flush doors shutters	FLUSH DOOR SHUTTER[1.89 SQM]	2 days	Wed 15-04-20					
33		P.V.C. DOORS	P.V.C. SHUTTER[1.58 SQM]	1 day	Fri 24-04-20					
34		Aluminium windows and ventilators	ALUMINIUM DOORS & VENTILATOR[5.13 SQM]	1 day	Fri 24-04-20					
35		Wall mounted sink cock	WALL MOUNTED SINK[1 NOS]	1 day	Mon 27-04-20					
36		Water closet european type	WATER CLOSET EUROPEAN TYPE[1 NOS]	1 day	Mon 27-04-20					
37		Wall Mixer/Diverter	WALL MIXER/DIVERTER[1 NOS]	1 day	Mon 27-04-20					
38		Health fauset	HEALTH FAUSET[1 NOS]	1 day	Mon 27-04-20					
39		Pillar cock for basin	PILLAR COCK[1 NOS]	1 day	Mon 27-04-20					
40		Wash hand basin	WASH BASIN[1 NOS]	1 day	Mon 27-04-20					
41		Kitchen Sink	KITCHEN SINK[1 NOS]	1 day	Mon 27-04-20					
42		SS Jagwar/Grohe BIB taps	SS JAGUAR/GROHE BIB TAPS[1 NOS]	1 day	Mon 27-04-20					
43		SS Rose Shower	SS ROSE SHOWER[1 NOS]	1 day	Mon 27-04-20					
44		Internal Emulsion Paint(Ceiling)	PRIMER AND INTERIOR PAINTING CEILING[24.94 SQM]	1 day	Thu 26-03-20					
45		Internal Emulsion Paint(walls)	PRIMER AND INTERIOR PAINTING[96.95 SQM]	2 days	Mon 30-03-20					
46		Apex Exterior Paint	EXTERNAL PAINTING[110.69 SQM]	2 days	Wed 01-04-20					
47		Enamel paint	ENAMEL PAINT[5.74 SQM]	2 days	Fri 03-04-20					

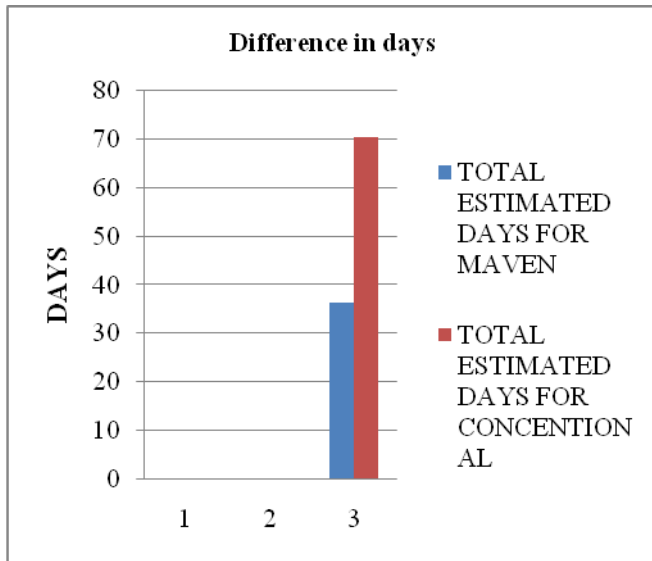
Fig 4: Preparation of Plan for MIVAN Formwork in MSP Applications

ID	Task Mode	Task Name	Resource Names	Duration	Start	Finish	Predecessors
1		PROJECT MSP		70.5 days	Sun 08-03-20	Mon 15-06-20	
2		CLEARING GRASS	CLEARING SITE[0 ha]	0 days	Sun 08-03-20	Sun 08-03-20	
3		EARTHWORK AND EXCAVATION	EARTHWORK EXCAVATION[36.45 CUM]	2 days	Mon 09-03-20	Tue 10-03-20	2
4		TRANSPORTING THE EXCAVATED MATERIAL	TRANSPORTATION[36.45 CUM]	3 days	Mon 09-03-20	Thu 12-03-20	355+0.5 days
5		LAYING P.C.C.	P.C.C.[2.03 CUM]	2 days	Thu 12-03-20	Mon 16-03-20	4
6		BACKFILLING	BACKFILLING[53.86 CUM]	3 days	Mon 16-03-20	Thu 19-03-20	5
7		Centering	CENTERING SHUTTERING[158.05 SQM]	18 days	Mon 16-03-20	Thu 09-04-20	
8		Staircase		5 days	Thu 26-03-20	Thu 30-03-20	395+2 days
9		Columns		6 days	Mon 16-03-20	Tue 24-03-20	555+1 day
10		Slab & Beams		8 days	Mon 30-03-20	Thu 09-04-20	855+2 days
11		Reinforcement	STEEL QUANTITY[2.7 M.T.]	19 days	Thu 12-03-20	Wed 08-04-20	
12		Staircase		5 days	Thu 26-03-20	Thu 02-04-20	855
13		Columns		6 days	Thu 12-03-20	Fri 20-03-20	555
14		Slab & Beams		9 days	Thu 26-03-20	Wed 08-04-20	855
15		R.C.Concrete M25	CEMENT CONCRETE[22.25 CUM]	24 days	Fri 13-03-20	Thu 16-04-20	
16		Staircase		4 days	Wed 08-04-20	Tue 14-04-20	14
17		Columns		9 days	Fri 13-03-20	Thu 26-03-20	555+1 day
18		Slab & Beams		6 days	Wed 08-04-20	Thu 16-04-20	14
19		Teakwood Frame	TEAKWOOD FRAME[11.38 CUM]	1 day	Wed 06-05-20	Thu 07-05-20	1855+14 days
20		Teakwood Shutter	TEAKWOOD SHUTTER[1.89 SQM]	1 day	Mon 01-06-20	Tue 02-06-20	32
21		AAC blocks	A.A.C CONCRETE BLOCK[119.23 SQM]	4 days	Wed 06-05-20	Tue 12-05-20	1855+14 days
22		M.S.Gill for W & V	M.S.GRILL WORKS[13 SQM]	2 days	Fri 08-05-20	Tue 12-05-20	2155+2 days
23		Int. plaster(12mm 1-5)	INTERIOR PLASTERING[96.95 SQM]	3 days	Mon 11-05-20	Thu 14-05-20	2155+2 days
24		Int Plaster(Ceiling 1-4)	INTERIOR PLASTERING CEILING[24.94 SQM]	4 days	Tue 12-05-20	Mon 18-05-20	2355+1 day

ID	Task Mode	Task Name	Resource Names	Duration	Start	Finish	Predecessors
25		External Plaster 20mm	EXTERNAL PLASTERING[100.76 SQM]	4 days	Mon 18-05-20	Fri 22-05-20	24
26		19mm Granite Door frame	GRANITE DOOR FRAME[2.97 SQM]	5 days	Wed 13-05-20	Wed 20-05-20	2355+2 days
27		Plumbing Work		8 days	Wed 13-05-20	Mon 25-05-20	2355+2 days
28		Electrical Work		5 days	Fri 15-05-20	Fri 22-05-20	2155+7 days
29		Wall Putty	WALL PUTTY[113.24 SQM]	4 days	Wed 20-05-20	Tue 26-05-20	26
30		Nahni trap	CI NAHANI TRAP[1 NOS]	0.25 days	Thu 14-05-20	Thu 14-05-20	23
31		FIXING KITCHEN KATTA	KITCHEN KATTA[1 NOS]	1 day	Tue 26-05-20	Wed 27-05-20	29
32		Vitrified glazed tiles	VITRIFIED GLAZED TILES[63.44 SQM]	4 days	Tue 26-05-20	Mon 01-06-20	29
33		Polished Cadappa flooring	POLISHED CADAPPA SLAB[8.8 SQM]	1 day	Tue 26-05-20	Wed 27-05-20	29
34		Nosing for Caddappa	NOISING FOR GRANITE[37.91 R.M.]	1 day	Wed 27-05-20	Thu 28-05-20	3355+1 day
35		S.S.Railing	S.S.RAILING[3.37 SQM]	2 days	Thu 28-05-20	Mon 01-06-20	34
36		Flush doors shutters	FLUSH DOOR SHUTTER[1.89 SQM]	3 days	Mon 01-06-20	Thu 04-06-20	35
37		P.V.C. DOORS	P.V.C. SHUTTER[1.58 SQM]	1 day	Mon 01-06-20	Fri 06-06-20	35
38		Aluminium windows and ventilators	ALUMINIUM DOORS & VENTILATOR[5.13 SQM]	1 day	Mon 01-06-20	Fri 06-06-20	35
39		Wall mounted sink cock	WALL MOUNTED SINK[1 NOS]	1 day	Fri 05-06-20	Mon 08-06-20	38
40		Water closet european type	WATER CLOSET EUROPEAN TYPE[1 NOS]	1 day	Fri 05-06-20	Mon 08-06-20	38
41		Wall Mixer/Diverter	WALL MIXER/DIVERTER[1 NOS]	2 days	Fri 05-06-20	Tue 09-06-20	38
42		Health fauset	HEALTH FAUSET[1 NOS]	1 day	Fri 05-06-20	Mon 08-06-20	38
43		Pillar cock for basin	PILLAR COCK[1 NOS]	1 day	Fri 05-06-20	Mon 08-06-20	38
44		Wash hand basin	WASH BASIN[1 NOS]	1 day	Fri 05-06-20	Mon 08-06-20	38
45		Kitchen Sink	KITCHEN SINK[1 NOS]	1 day	Fri 05-06-20	Mon 08-06-20	38
46		SS Jagwar/Grohe BIB taps	SS JAGUAR/GROHE BIB TAPS[1 NOS]	1 day	Fri 05-06-20	Mon 08-06-20	38
47		SS Rose Shower	SS ROSE SHOWER[1 NOS]	1 day	Fri 05-06-20	Mon 08-06-20	38
48		Internal Emulsion Paint(Ceiling)	PRIMER AND INTERIOR PAINTING CEILING[3] days	3 days	Mon 01-06-20	Thu 04-06-20	32
49		Internal Emulsion Paint(walls)	PRIMER AND INTERIOR PAINTING[96.95 SQM]	3 days	Mon 02-06-20	Fri 05-06-20	32
50		Apex Exterior Paint	EXTERNAL PAINTING[110.69 SQM]	3 days	Fri 05-06-20	Wed 10-06-20	49

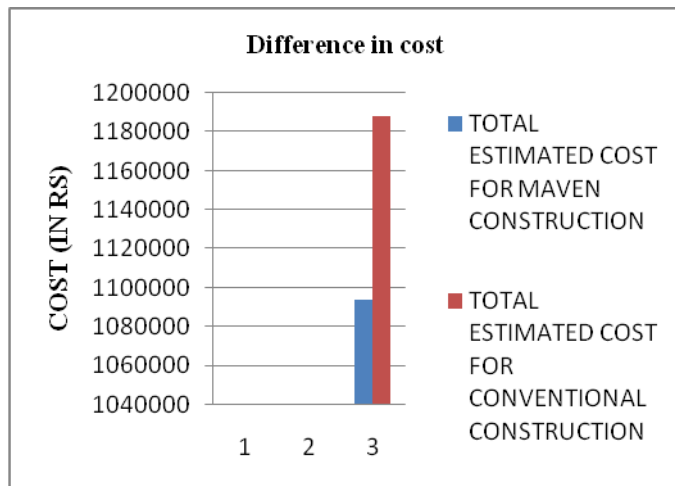
Fig 5: Preparation of Plan for Conventional Formwork in MSP Applications

3. RESULTS AND DISCUSSIONS



Graph 1: Comparison of duration

Comparison of duration, using mivan formwork the total duration required for finishing a single unit of house is 36.5 days and using conventional techniques the total duration required for completion of a single unit of house is 70.5 days. So the total time saving is 34 days.



Graph 2: Comparison of cost

Utilizing the mivan innovation the all out expense for a solitary unit of house is Rs.1, 093,474 and by utilizing regular systems the all out expense is Rs.1, 188,324. So the all out cost sparing is Rs.91850.

4. CONCLUSIONS

Various structures for mould include a broad variety of good layout plans that can be selected to fulfill the requirements of a particular innovation. Regular precast for strong creation typically comprised of personalized arrangements requiring talented specialists. This kind of formwork often

included poor protection and gave moderate speed to growth and large amounts of waste – inefficient and unsustainable. Existing formwork systems, that are usually separated, are meant for acceleration and competence. These are programmed to provide improved precision and minimal squandering in production, and to improve much of excellently-being and safety highlights operated in.

It is finished up from the above information examination that mivan development require less time and cost to finish development. Right now is no prerequisite of putting dividers, aluminium formwork will give better surface completion. Henceforth it is far superior to traditional brickwork development.

REFERENCES

- [1] Vinayakumar Petimani S, Vishwanath Awati, Rashmi J.V [2019], "Monitoring of Construction Project by 4D Application of GIS", International Research Journal of Engineering and Technology (IRJET), Volume: 08 Issue: 02, ISSN: 2277-3878:
- [2] Prof. Ashish P. Waghmare, Renuka S. Hangarge [2017], "Cost and Time estimation for Conventional, Aluminium & Tunnel Formwork", International Research Journal of Engineering and Technology (IRJET), Volume: 04 Issue: 07, ISSN: 2395-0056:
- [3] Manik Moholkar1, Prof. Dr. Vidya Nitin Patil2 [2019], "Productivity Analysis of Building Construction Using Mivan Formwork", IJIRT, Volume 6 Issue 1, ISSN: 2349-6002:
- [4] Sathiyapriya Venkidusamy, Dr.P.S.Kothai, S.Khaviya [2018], "A Study of Value Engineering Practices in Wall Construction of a Residential Building", International Journal of Intellectual Advancements and Research in Engineering Computations, Volume-6, Issue-2, ISSN:2348-2079:
- [5] Kushal Patil, Ajitkumar Jadhav, Nikhil Shingate [2015], "Mivan Technology", International Journal of Engineering and Technical Research (IJETR), Volume-3, Issue-6, ISSN: 2321-0869:
- [6] K.Loganathan, K.E.Viswanathan [2016], "a study report on cost, duration and quality analysis of different formworks in high-rise building", International Journal of Scientific & Engineering Research, Volume 7, Issue 4, ISSN 2229-5518:
- [7] Aaqib Majid Khan, Chitranjan Kumar [2015], "Impact of Mivan Formwork over Conventional Formwork", International Journal of Science and Research (IJSR) ISSN: 2319-7064:
- [8] Karnataka Public Works Department (KPWD), schedule of rates book.
- [9] Akshay Kapoor, Shubham Upadhyay, Devendra Pratap Chauhan, Anshul Dohare [2018], "comparison between conventional brickwork construction vs mivan construction", International Journal of advance Research in Science and Engineering, Volume 7, Issue 10, ISSN : 2319-8354:

- [10] Yadav P.D, Associate Prof. Konnur B.A [2018], "Review Paper on Conventional and Mivan Formwork used for Construction", International Journal of advance Research in Science and Engineering, Volume 7, Issue 4, ISSN : 2319-8354:
- [11] Swapnali M. Karke¹, M.B. Kumathekar, "Comparison of the use of Traditional and Modern Formwork Systems", Civil Engineering Systems and Sustainable Innovations, ISBN: 978-93-83083-78-7:
- [12] P.P. Pattanshetti, H.B. Patil, "MIVAN TECHNOLOGY", Civil Engineering Department, Bhivrabai Sawant College of Engineering, Kennedy Road, Pune 411001, University of Pune, India.
- [13] Vijay Anil Sonawane, Harshita Ambre [2019], "Comparative Analysis of Aluminium Formwork Building and Conventional Formwork Building based on Duration by using Line of Balance (LOB) Technique", International Research Journal of Engineering and Technology (IRJET), Volume 6, Issue 5 ISSN: 2395-0056:
- [14] Prof. Ashish P. Waghmare, Renuka S. Hangarge [2017], "Cost and Time estimation for Conventional, Aluminium & Tunnel Formwork", International Research Journal of Engineering and Technology (IRJET), Volume 4, Issue 7, ISSN: 2395-0056:

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