Influence of Prefabrication Technology on Cost & Time Dealing With Microsoft Project

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Abstract -- This paper proposes a model for quantitatively evaluating the possible impacts arising from the application of prefabrication technology on construction. The object of this paper is to identify new technologies or methodologies in the Construction Industry that could require new training or up-skilling of the trades and semi-skilled workforce. Prefabrication has been widely regarded as a sustainable construction method in terms of its impact on environmental protection. The main focus is on to reduce the cost & time of whole project by using PEB with Microsoft Project.

Indexed Terms: Time, Cost, MSP, Prefabricated Technology, Feasibility

I. INTRODUCTION

A prefabricated building, informally a prefab, is a building that is manufactured and constructed using prefabrication. It consists of factory-made components or units that are transported and assembled on-site to form the complete building. Buildings have been built in one place and reassembled in another throughout history. This was especially true for mobile activities, or for new settlements. Prefabricated construction methods are presenting a range of techniques to improve the building construction, quality and how to reduce the negative impact of building production on the environment. In this paper the replacement of non-structural component with prefabrication element is proposed. The cost benefit analysis will be studied including prefabrication element in conventional building.

II. FUNDAMENTALS OF PREFABRICATION

2.1 Modularization:

Modularization is defined as the off-site construction of whole system prior to its transportation to the site of construction. The modules may often be required to be broken down into smaller sizes for ease of transportation. Modularization usually involves more than one trade.

2.2 Prefabrication:

This usually involves a single skill or trade and is generally defined as a production process, which normally takes place at a specialized factory where different materials are combined to form the component of an end-product. As long as the component is manufactured at a factory and is not a whole system, it is regarded as prefabricated.

2.3 Preassembly:

By definition, preassembly is the combination of various materials and prefabricated components at a separate facility before installation as a single unit. This installation is carried out similar to the process of modularization in which the manufactured components are assembled close to the site, followed by on-site installment. Commonly regarded as a combination of modularization and Prefabrication, preassembly usually involves works form various crafts and parts of different systems.

2.4 Industrialization:

This term refers to an inclusion of all three aforementioned categories of offsite construction. Industrialization is based on the concept of manufacturing and is defined as the procurement of

technology, equipment and facilities in order to increase productivity reduce manual labour and improve production qualities.

2.5 About Software:

It is primarily a visualization tool, which has improved the ability to exchange complex ideas among project participants. It has become easy to generate and reuse the information for construction projects. This is a 'CIEPM' (Computer Integrated Enterprise Project Management)concept which allows the meaningful extraction of project management data, information and knowledge from the participants beyond their imagination.

III. FACTORS AFFECTING THE COST OF BUILDING WORK- AN OVERVIEW

The issue of the cost of construction work is one that is rarely far from the minds of construction clients, design teams, constructors and, of course, quantity surveyors. The cost of constructing a building project is a primary concern for the vast majority of construction clients. Indeed one of the most common initial questions a client has is what is it going to cost me? Often followed closely by „can we do it any cheaper? "Providing answers to such questions is a key objective of quantity surveyors, whose task it is to predict the likely cost of building work and to manage the evolving project design to ensure that the client's approved budget is not exceeded.

1. The Client's Priorities
2. Quality Considerations
3. Cost Considerations
4. Time Considerations
5. The Choice of Architect
6. Choice of Materials
7. The Nature of the Site Location
8. Physical Site Conditions
9. Resource Availability
10. Environmental Considerations
11. Market Conditions

Table 1: Detail Quantity Estimation of Conventional Building (from Case study)

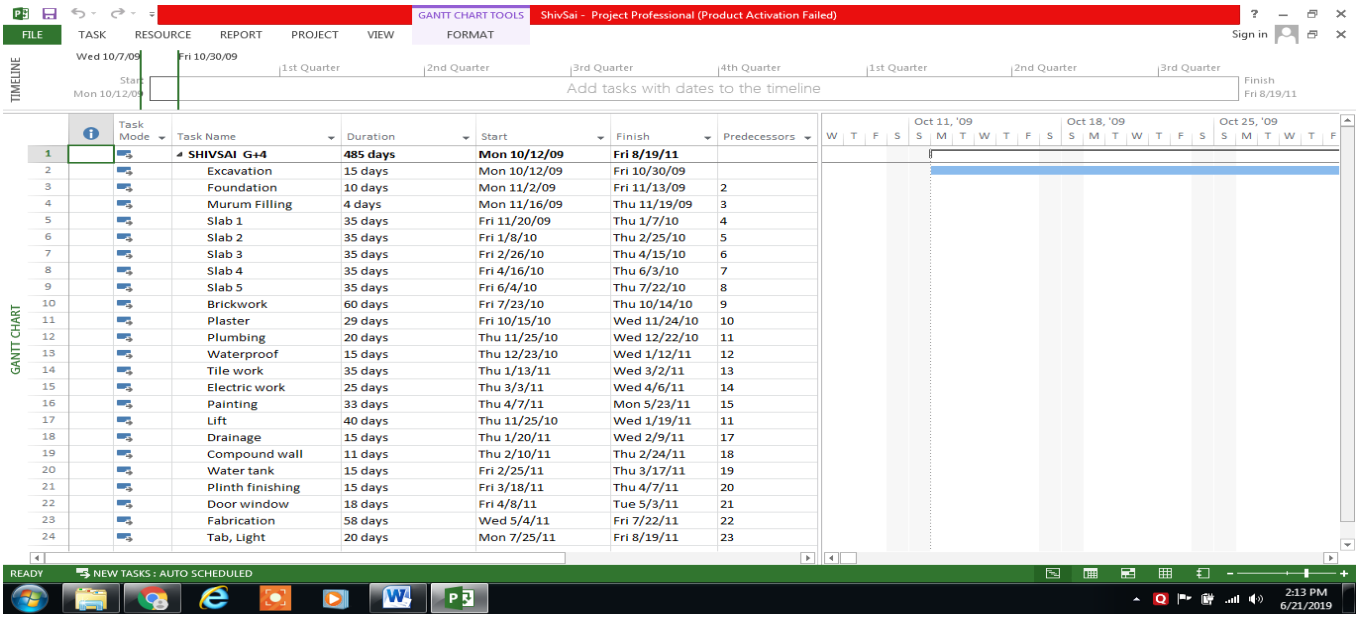
Sr. No.	Description	Quantity in cum	Cement in bag	sand in brass	Aggregate in brass
I	**PCC (M10) 1:03:06**	18	63	3	6
II	**Footing (M20) 1:1.5:3**	122	996	18	37
III.	**Plinth beam**	3.459	28	1	1
IV.	**Columns**				
1	Footing to plinth column	230	1879	35	69
2	Plinth to first column	67	555	10	20
3	First to second column	67	555	10	20
4	Second to third column	67	555	10	20
5	Third to fourth column	67	555	10	20
6	Fourth to fifth column	67	555	10	20
7	Terrace to O.H.W.T.	2.1	18	1	1
V.	**Beam**				
1	1sr	31	182	7	7
2	2^{nd}	31	182	7	7
3	3rd	31	182	7	7
4	4rth	31	182	7	7
5	5^{th}	31	182	7	7

6	O.H.W.T	9	75	2	3
VI.	**Slab**				
1	1st	54	442	8	16
2	2nd	54	442	8	16
3	3rd	54	442	8	16
4	4rth	54	442	8	16
5	5th	54	442	8	16

Table 2: Material Summary Steel for Proposed Residential Building

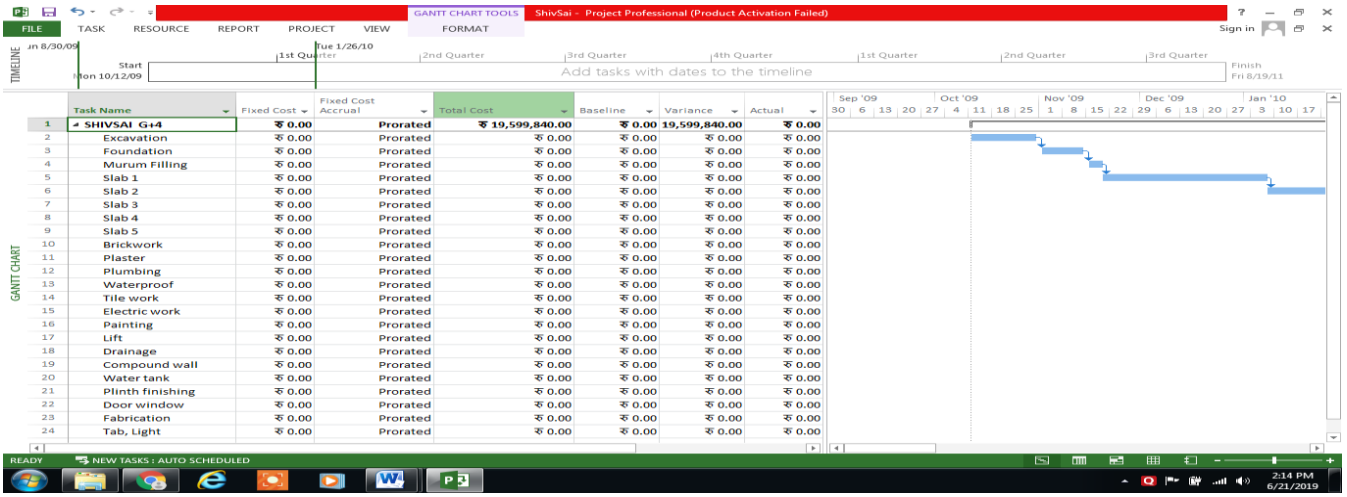
Sr. No.	Description	Unit	6 mm	8 mm	10 mm	12 mm	16 mm	20 mm	25 mm	Total Quantity
I	**Footing**	kg	-	-	2899.2	853.08	-	-	-	3752.34
II	**Column quantity**									
1	Footing to plinth level	Kg	-	-	2110.5	67.85	-	-	-	2178.35
2	Plinth to first column	Kg	-	31.06	102	221	977	-	-	1331.06
3	First to second column	Kg	-	31.06	102	221	977	-	-	1331.06
4	Second to third column	Kg	-	31.06	102	221	977	-	-	1331.06
5	Third to fourth	Kg	-	31.06	102	221	977	-	-	1331.06
6	Fourth to fifth column	Kg	-	31.06	102	221	977	-	-	1331.06
7	Terrace to O.H.W.T.	Kg	-	31.06	102	221	977	-	-	1331.0
III	**Plinth beam**	Kg	-	554.9	-	-	-	-	-	554.9
IV	**Slab quantity**									
1	1st floor	Kg	79	126	40	-	-	-	-	245
2	2nd floor	Kg	79	126	40	-	-	-	-	245
3	3rd floor	Kg	79	126	40	-	-	-	-	245
4	4rth floor	Kg	79	126	40	-	-	-	-	245
5	5th floor	Kg	79	126	40	-	-	-	-	245
6	O.H.W.T	Kg	-	-	-	-	-	-	-	
V	**Beam Quantity**									
1	1st floor	Kg	797.1	1503	40.15	-	-	-	-	2340.3
2	2nd floor	Kg	-	-	-	-	-	-	-	-
3	3rd floor	Kg	-	-	-	-	-	-	-	-
4	4rth floor	Kg	-	-	-	-	-	-	-	-
5	Terrace floor	Kg	-	-	-	-	-	-	-	-
VI	Staircase quantity	Kg	-	838.31	-	-	-	-	-	838.3
VII	**Lift wall**									
1	up to plinth level	Kg	-	244.02	113.09	121.86	-	-	-	478.8
2	Plinth level to fourth level	Kg	-	1478.3	499.9	538.2	-	-	-	2516.5

IV. SCHEDULING OF CONVENTIONAL BUILDING BY USING MSP



	Task Mode	Task Name	Duration	Start	Finish	Predecessors
1		SHIVSAI G+4	485 days	Mon 10/12/09	Fri 8/19/11	
2		Excavation	15 days	Mon 10/12/09	Fri 10/30/09	
3		Foundation	10 days	Mon 11/2/09	Fri 11/13/09	2
4		Murum Filling	4 days	Mon 11/16/09	Thu 11/19/09	3
5		Slab 1	35 days	Fri 11/20/09	Thu 1/7/10	4
6		Slab 2	35 days	Fri 1/8/10	Thu 2/25/10	5
7		Slab 3	35 days	Fri 2/26/10	Thu 4/15/10	6
8		Slab 4	35 days	Fri 4/16/10	Thu 6/3/10	7
9		Slab 5	35 days	Fri 6/4/10	Thu 7/22/10	8
10		Brickwork	60 days	Fri 7/23/10	Thu 10/14/10	9
11		Plaster	29 days	Fri 10/15/10	Wed 11/24/10	10
12		Plumbing	20 days	Thu 11/25/10	Wed 12/22/10	11
13		Waterproof	15 days	Thu 12/23/10	Wed 1/12/11	12
14		Tile work	35 days	Thu 1/13/11	Wed 3/2/11	13
15		Electric work	25 days	Thu 3/3/11	Wed 4/6/11	14
16		Painting	33 days	Thu 4/7/11	Mon 5/23/11	15
17		Lift	40 days	Thu 11/25/10	Wed 1/19/11	11
18		Drainage	15 days	Thu 1/20/11	Wed 2/9/11	17
19		Compound wall	11 days	Thu 2/10/11	Thu 2/24/11	18
20		Water tank	15 days	Fri 2/25/11	Thu 3/17/11	19
21		Plinth finishing	15 days	Fri 3/18/11	Thu 4/7/11	20
22		Door window	18 days	Fri 4/8/11	Tue 5/3/11	21
23		Fabrication	58 days	Wed 5/4/11	Fri 7/22/11	22
24		Tab, Light	20 days	Mon 7/25/11	Fri 8/19/11	23

V. COSTING OF CONVENTIONAL BUILDING BY USING MSP

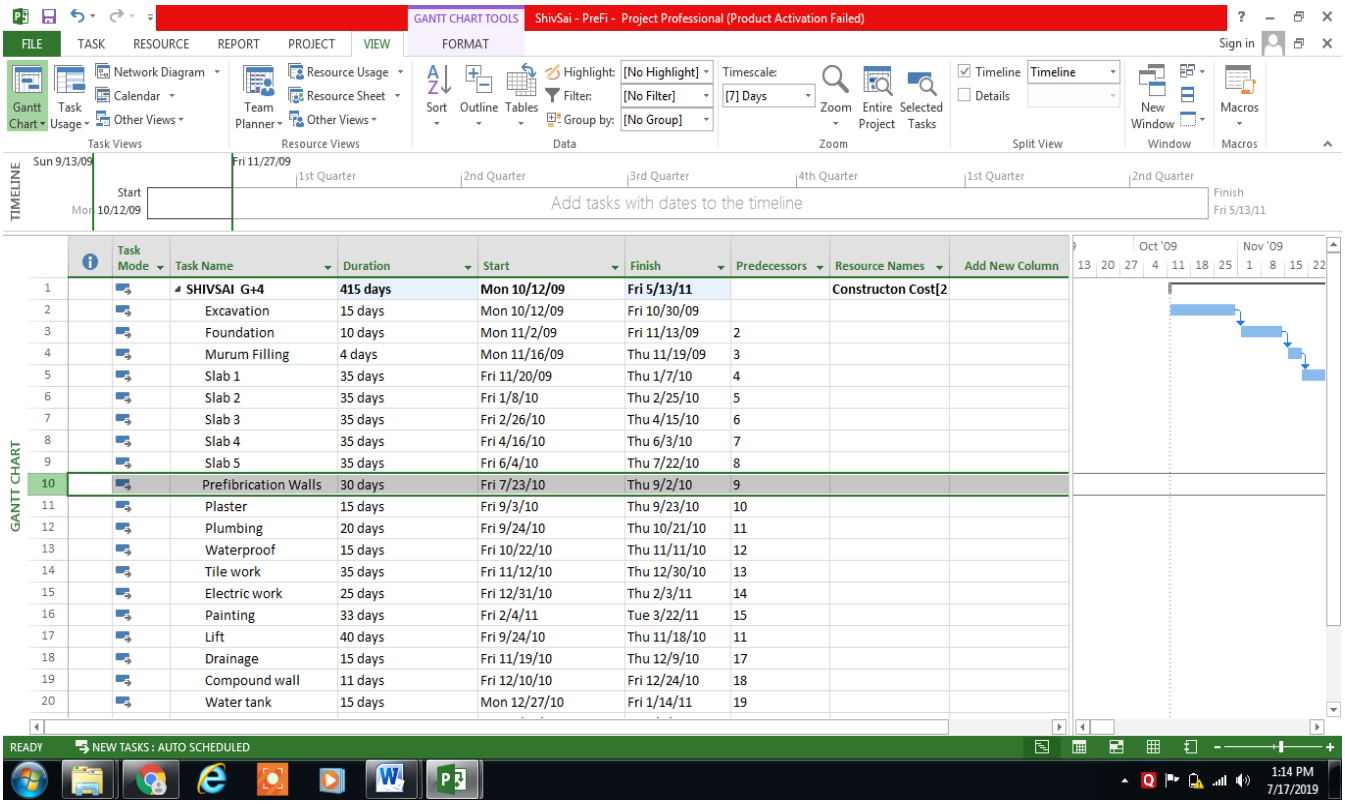


	Task Name	Fixed Cost	Fixed Cost Accrual	Total Cost	Baseline	Variance	Actual
1	SHIVSAI G+4	₹ 0.00	Prorated	₹ 19,599,840.00	₹ 0.00	19,599,840.00	₹ 0.00
2	Excavation	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
3	Foundation	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
4	Murum Filling	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
5	Slab 1	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
6	Slab 2	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
7	Slab 3	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
8	Slab 4	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
9	Slab 5	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
10	Brickwork	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
11	Plaster	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
12	Plumbing	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
13	Waterproof	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
14	Tile work	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
15	Electric work	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
16	Painting	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
17	Lift	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
18	Drainage	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
19	Compound wall	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
20	Water tank	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
21	Plinth finishing	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
22	Door window	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
23	Fabrication	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
24	Tab, Light	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00

Concluder Remark for Conventional Building by using MSP:

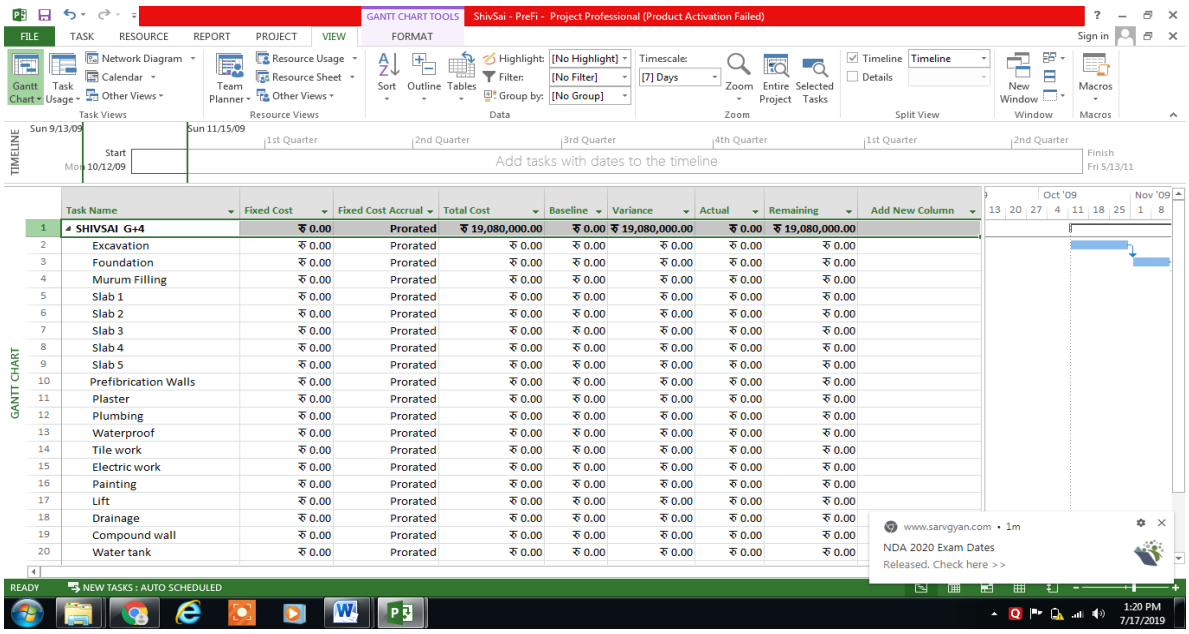
From the above Scheduling Sheet (WBS) & Costing Sheet, Required time for Conventional Building is found 485 days having total required cost is found to be Rs. 19599840

VI. SCHEDULING OF PREFABRICATED BUILDING BY USING MSP



	Task Mode	Task Name	Duration	Start	Finish	Predecessors	Resource Names
1		SHIVSAI G+4	415 days	Mon 10/12/09	Fri 5/13/11		Constructon Cost[2
2		Excavation	15 days	Mon 10/12/09	Fri 10/30/09		
3		Foundation	10 days	Mon 11/2/09	Fri 11/13/09	2	
4		Murum Filling	4 days	Mon 11/16/09	Thu 11/19/09	3	
5		Slab 1	35 days	Fri 11/20/09	Thu 1/7/10	4	
6		Slab 2	35 days	Fri 1/8/10	Thu 2/25/10	5	
7		Slab 3	35 days	Fri 2/26/10	Thu 4/15/10	6	
8		Slab 4	35 days	Fri 4/16/10	Thu 6/3/10	7	
9		Slab 5	35 days	Fri 6/4/10	Thu 7/22/10	8	
10		Prefibrication Walls	30 days	Fri 7/23/10	Thu 9/2/10	9	
11		Plaster	15 days	Fri 9/3/10	Thu 9/23/10	10	
12		Plumbing	20 days	Fri 9/24/10	Thu 10/21/10	11	
13		Waterproof	15 days	Fri 10/22/10	Thu 11/11/10	12	
14		Tile work	35 days	Fri 11/12/10	Thu 12/30/10	13	
15		Electric work	25 days	Fri 12/31/10	Thu 2/3/11	14	
16		Painting	33 days	Fri 2/4/11	Tue 3/22/11	15	
17		Lift	40 days	Fri 9/24/10	Thu 11/18/10	11	
18		Drainage	15 days	Fri 11/19/10	Thu 12/9/10	17	
19		Compound wall	11 days	Fri 12/10/10	Fri 12/24/10	18	
20		Water tank	15 days	Mon 12/27/10	Fri 1/14/11	19	

VII. COSTING OF PREFABRICATED BUILDING BY USING MSP



	Task Name	Fixed Cost	Fixed Cost Accrual	Total Cost	Baseline	Variance	Actual	Remaining
1	SHIVSAI G+4	₹ 0.00	Prorated	₹ 19,080,000.00	₹ 0.00	₹ 19,080,000.00	₹ 0.00	₹ 19,080,000.00
2	Excavation	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
3	Foundation	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
4	Murum Filling	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
5	Slab 1	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
6	Slab 2	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
7	Slab 3	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
8	Slab 4	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
9	Slab 5	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
10	Prefibrication Walls	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
11	Plaster	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
12	Plumbing	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
13	Waterproof	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
14	Tile work	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
15	Electric work	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
16	Painting	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
17	Lift	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
18	Drainage	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
19	Compound wall	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
20	Water tank	₹ 0.00	Prorated	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00

Concluder Remark for Prefabricated Building by using MSP:
From the above Scheduling Sheet (WBS) & Costing Sheet, Required time for Conventional Building is found 415 days having total required cost is found to be Rs. 19080000

VIII. COMPARISON OF CONVENTIONAL CONSTRUCTION TO PREFABRICATION CONSTRUCTION

Type	Duration	Cost (Rs)	Difference	
			Time (Days)	Cost (Rs)
Conventional Construction	485	19599840	70	519840
Prefabrication Construction	415	19080000		

IX. CONCLUSION

From the above Comparison of Conventional Construction with Prefabrication Construction, it concludes that by using Prefabrication Techniques not only reduce the time required for construction but also minimize the cost of whole project. The survey found that 92% workers reported that the use of prefabrication Preassembly and precast would reduce hazards related to material handling on site and that the reduction of scaffolding through the use of prefabricated preassernbly or precast components would lead to less falls on sites.

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