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Planning and scheduling for multi-story building using M.S project

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ABSTRACT

Every one of us is a manager of projects of our own life. From an employee to financial analyst, from banker to doctor, from engineer to administrator, from a teacher to a student, we all work on different tasks with deadlines. For managing the events or activity, there is computer-based software which is particularly design for the planning and secluding. Software like M.S Excel, M.S Project, and Primavera. This thesis is carried out for the planning and scheduling of the M.S project. To know that this type of software is easy and efficient than manual methods. This software is basically based on manual methods but it is less time-consuming and precise than manual methods. In this thesis construction, site planning and scheduling should be generated. The site name is Indraprastha greens it is a multistorey building project of 10 blocks of 7 story. Each story has 4 flats, there are two types of flats each flat has 5 blocks. The project is constructed by a DEEP GROUP OF COMPANYS. In this thesis, E-block is select for the research of planning and scheduling in the Microsoft Project. From excavation to finishing work schedule should be generated in the Microsoft project and notify the critical path. Resource allocation of every work and material should be provided. The cost of the work and material should be calculated in the M.S project. From this thesis, the positive outcome of the planning and scheduling should specify. This thesis is actually researching and notifying the proper planning and secluding for the management of the project with Microsoft project and it will notify the duration, deadline, cost, and material.

Keywords: Planning, Scheduling, Organizing, Cost, Material, and Quantity

1. INTRODUCTION

Project Management is the Application of knowledge, skills and Techniques to project activities to meet project requirements. It is a strategic ability to do something successfully for organizations, enabling them to patch the project results to Organizational goals and thus, better compete in their markets. It can be also defined as the process and activity of planning, organizing, inspiring, and controlling resources, procedures and protocols to achieve specific goals in scientific or daily problems. A project is a temporary aim designed to produce a special product, service or result with a defined starting and end, undertaken to meet eccentric goals and objectives, typically to bring about beneficial change or added value. The temporary nature of projects stands in contrast with business as usual, which are recurring, permanent, or semi-permanent functional activities to produce products or services.

1.1 About Microsoft project

Microsoft Project is a project management software program developed and sold by Microsoft, which is designed to assist a project manager in developing a plan, assigning resources to tasks, tracking progress, managing the budget, and analysing workloads. Project creates budgets based on assignment work and resource cost. As resources are assigned to the task and the program calculates the cost equal to the work times the rate, which rolls up to the task level and then to any summary tasks level and finally to the project level.

1.2 Objectives

- 1) To reduce the total duration.
- 2) To ease of work for the Labour.
- 3) Planning and scheduling of residential building.
- 4) To prepare a realistic schedule and set baseline.
- 5) To prepare the graph of the planning and scheduling.

1.3 Scope

Project scope is the part of project planning that involves determining and documenting a list of specific project goals, deliverable, tasks, costs and deadlines. These deliverables are derived from a project's requirements. In construction, delay could be defined as the time over run either beyond completion. Date specified in a contract, or beyond the date that the parties agreed upon for delivery of a project.

2. LITERATURE REVIEW

Vittal Anantatmula, Planning Techniques for Academic Advising and Learning, (2010), Journal of Engineering Research and Applications www.ijera.com ISSN: 2248-9622, Vol. 4, Issue 6(Version 5)

Description: - Found out that Similar to a traditional project, managing an academic degree is related to the triple constraints of time, cost, and scope. It is concluded that by applying project management concepts, tools, and techniques, undergraduate degree program advising and planning can be improved after comparing the planning aspects of a conventional business project with the planning of an academic degree.

R. Prabhakar and G. Ravichandran, Optimal planning and scheduling in multi-storied building, (2014), Journal of Mechanical and Civil Engineering (IOSR)

Description: - Analysed that; Construction planning is an important part of the overall management process. The planning and management include organizing the work, executing the work, correlating plan and progress information and controlling the work, the three inter-related factors of time, money and quality need to be managed in a proper way. Completion of many of the projects nowadays is not in estimated duration.

Hoang, Nhat Minh Shrestha, Swastik, Project management software and its utilities (2014), Lahti University of Applied Sciences Degree Programme in Business Information Technology

Description: - Hinted that the main function of a software is to offer help, and enhance the quality of output with less effort than manual ways. A project has disparate requirements and the aim of the adopted software is to fulfil those requirements effectively in terms of time and cost. In addition, the issues of scheduling, tracking and physical element must be considered while adopting the project management software.

Minh Shrestha Optimal planning and scheduling in multi-storied building, (2014), International Journal of Innovative Research in Science, Engineering and Technology (IJIRSET)

Description: - Develop the quality of output with less effort than manual ways. A project has disparate requirements and the aim of the adopted software is to fulfil those requirements effectively in terms of time and cost. In addition, the issues of scheduling, tracking and physical element must be considered while adopting the project management software.

J. Jayalakshmi, Planning and Scheduling of High-Rise Building Using Primavera, (2014), International Journal of Engineering Research and Applications (IJERA) SSN: 2248-9622, Vol. 4, Issue 6(Version 5)

Description: - This study compared time performance of the conventional method of construction for high-rise residential and Industrial Building System (IBS) method by overall construction period. The scheduling was developed using Primavera project planning software. The positive changes include creating a healthy working environment among those involved directly in the construction industry.

Rhuta Joshi and Prof. V.Z. Patil, Resource Scheduling of Construction Project, (2015), International Journal of Science and Research (IJSR) ISSN: 2319-7064

Description: - Analysed the project management technique by scheduling various construction activities, allocation of resources and resource levelling using Microsoft Project 2013 for residential building.

Wallance Agyei, Project Planning and Scheduling using PERT and CPM techniques with linear programming, (2015), International journal of scientific & technology research volume 4, ISSN 08

Description: - The study was aimed at finding the difference between the cost and minimum expected time that will be required to complete the project. Both CPM and PERT techniques were used for analysis and from the result it was concluded that schedule proposed by bus provides much shorter completion time as compared to the actual time taken by the process.

E. Suresh Kumar and S. Krishnamoorthy, Scheduling and Financial Analysis of a High-Rise Building, (2015), Journal of Mechanical and Civil Engineering e-ISSN: 2278-1684, p-ISSN: 2320-334X, Volume 12, Issue 6 Ver. I

Description: - In their study they focused on the scheduling using MSP and earns value analysis for an apartment building. Thereby time required for the process of cost overrun is avoided. Project schedule is considered as core of the project plan, and the purpose of the project schedule is to show the organization how the work will be performed to uncover the mistakes.

Maruthi S, Project schedule and resource allocated done using MSP, (2015), International Journal of Engineering & Technology (IJET)

Description: - Carried out studies in two phases at first phase the project schedule and resource allocated done using MSP software and at second phase, optimization has been carried out by modifying the man power requirement for various tasks to remove any sudden variations in demand of manpower. And concluded manpower resource has been optimized by modifying the particular activities duration and by modifying predecessors without affecting the project duration. Management skills and technique reduce the time by 23.2% and cost by 3.14%.

3. METHODOLOGY

This thesis is carried out for the planning and scheduling of the construction site. The site name is indraprasth greens it is multistorey building project of 10 blocks of 7 storey. The project is constructed by **DEEP GROUP OF COMPANYS**. In this thesis E-block is select for the research of planning and scheduling in Microsoft Project. From excavation to finishing work schedule should be generated in Microsoft project and notify the critical path. Resource allocation of ever work and material should be provided. Cost of the work and material should be calculated in M.S project.

3.1 Data collection

Activity name	Start date	End date
Block-E		
Clearing of plot	3/7/2020	4/7/2020
planning	3/7/2020	4/7/2020
Marking of excavation	4/7/2020	4/7/2020
Excavation	4/7/2020	8/7/2020
Concrete work		
Basement		
p.c.c	8/7/2020	9/7/2020
Footing, column and lift padi	9/7/2020	21/7/2020
Slab, beam, starter and stair	16/7/2020	31/7/2020
Ground floor		
column and lift padi	25/7/2020	4/8/2020
Slab, beam, starter and stair	1/8/2020	15/8/2020
1st floor		
column and lift padi	8/8/2020	20/8/2020
Slab, beam, starter and stair	15/8/2020	29/8/2020
2nd floor		
column and lift padi	23/8/2020	3/9/2020
Slab, beam, starter and stair	29/8/2020	13/9/2020
3rd floor		
column and lift padi	6/9/2020	19/9/2020
Slab, beam, starter and stair	13/9/2020	27/9/2020
4th floor		
column and lift padi	22/9/2020	3/10/2020
Masonry work		
Ground floor	5/12/2020	17/12/2020
1 st floor	12/12/2020	27/12/2020
2 nd floor	22/12/2020	7/1/2021
3 rd floor	2/1/2021	18/1/2021
4 th floor	12/1/2021	31/1/2021
5 th floor	26/1/2021	12/2/2021
6 th floor	6/2/2021	22/2/2021
7 th floor	17/2/2021	6/3/2021

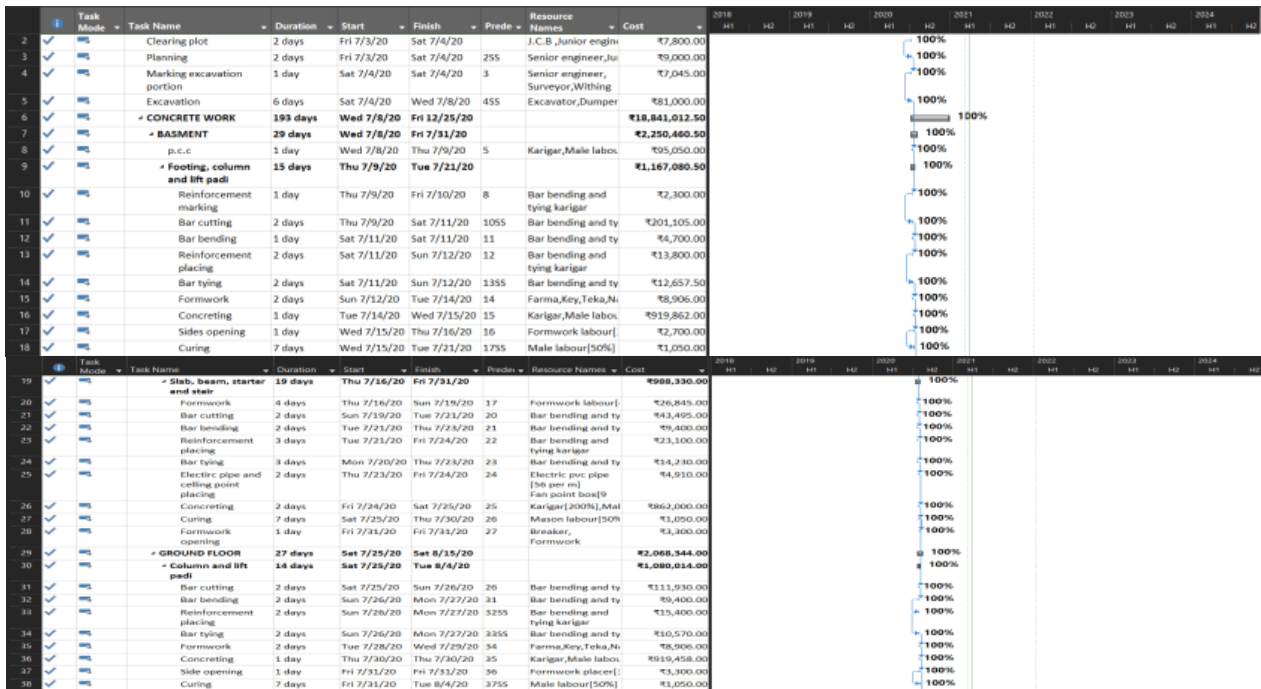
3.2 Data analysis

Activity name	Start date	End date
E-block		
Clearing of plot	3/7/2020	4/7/2020
planning	3/7/2020	4/7/2020
Marking of excavation	4/7/2020	4/7/2020
Excavation	4/7/2020	8/7/2020
Concrete work		
Basement		
p.c.c	8/7/2020	9/7/2020
Footing, column and lift padi		
Reinforcement marking	9/7/2020	10/7/2020
Bar cutting	9/7/2020	11/7/2020
Bar bending	11/7/2020	11/7/2020
Reinforcement placing	11/7/2020	12/7/2020
Bar tying	11/7/2020	12/7/2020
Formwork	12/7/2020	14/7/2020

Concreting	14/7/2020	15/7/2020
Side openings	15/7/2020	16/7/2020
Curing	15/7/2020	21/7/2020
Slab, beam, starter and stair		
Formwork	16/7/2020	9/7/2020
Bar cutting	19/7/2020	21/7/2020
Bar bending	21/7/2020	23/7/2020
Reinforcement placing	21/7/2020	24/7/2020
Bar tying	21/7/2020	24/7/2020
Electric pipe and ceiling point placing	24/7/2020	25/7/2020
Concrete	25/7/2020	25/7/2020
Curing	25/7/2020	30/7/2020
Formwork opening	7/31/2020	31/7/2020
Masonry work		
Ground floor		
Masonry up to lintel	5/12/2020	6/12/2020
Lintel formwork	7/12/2020	7/12/2020
Lintel bar cutting, bending and placing	8/12/2020	8/12/2020

4. RESULT AND DISCUSSION

4.1 Planning and scheduling of indraprasth greens using M.S project



4.2 Work overview



Fig. 4.2.1: Work overview

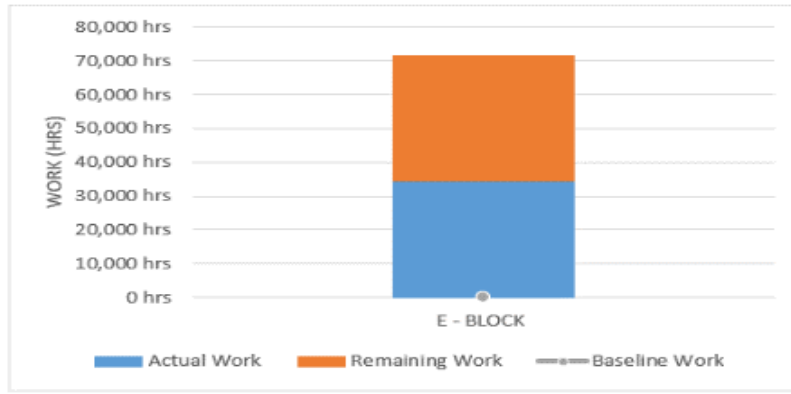


Fig. 4.2.2: Work hours bar graph

4.3 Resource allocation and cost calculation

	i	Resource Name	Type	Initials	Std. Rate	Work	Cost
1		J.C.B	Work	J	₹300.00/hr	16 hrs	₹4,800.00
2		Excavator	Work	E	₹500.00/hr	48 hrs	₹24,000.00
3		Dumpers	Work	D	₹200.00/hr	240 hrs	₹48,000.00
4		Compactor	Cost	C			₹0.00
5		Bar cutter	Cost	B			₹0.00
6		Bar bending machine	Cost	B			₹0.00
7		Mixer	Cost	M			₹0.00
8		Silo	Cost	S			₹0.00
9		Concrete pump	Cost	C			₹0.00
10		Material lift	Cost	M			₹0.00
11		Vibrator	Cost	V			₹0.00
12		Breaker	Cost	B			₹0.00
13		Cutter	Cost	C			₹0.00
14		Core cutting machin	Work	C	₹200.00/hr	112 hrs	₹22,400.00
15		Drill machine	Cost	D			₹0.00
16		Reinforcement labour	Work	R	₹800.00/day	4,240 hrs	₹424,000.00
17		Formwork labour	Work	F	₹600.00/day	1,864 hrs	₹139,800.00
18		Karigar	Work	K	₹800.00/day	384 hrs	₹38,400.00
19		Bar bending and tying karigar	Work	B	₹800.00/day	2,184 hrs	₹218,400.00
20		Formwork placer	Work	F	₹600.00/day	1,760 hrs	₹132,000.00
21		Male labour	Work	M	₹300.00/day	2,140 hrs	₹80,250.00
22		Mason	Work	M	₹800.00/day	12,224 hrs	₹1,222,400.00
23		Mason labour	Work	M	₹300.00/day	16,724 hrs	₹627,150.00
24		Plumber	Work	P	₹1,000.00/day	2,072 hrs	₹259,000.00
25		Electrician	Work	E	₹1,200.00/day	3,144 hrs	₹471,600.00
26		Painter	Work	P	₹600.00/day	2,864 hrs	₹214,800.00
27		Alumminium worker	Work	A	₹1,200.00/day	288 hrs	₹43,200.00

4.4 Resources overview

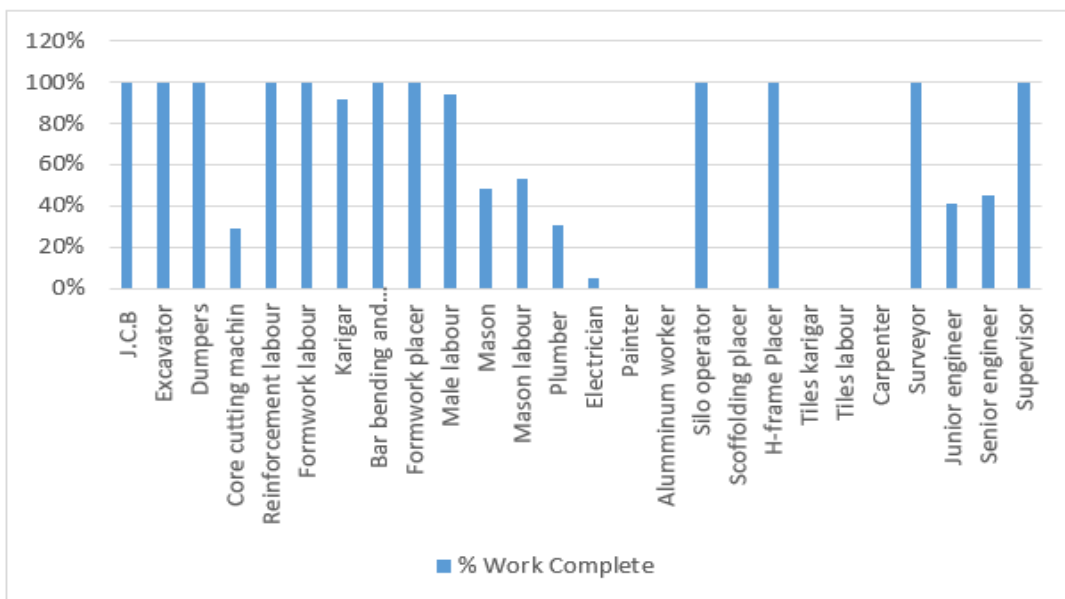


Fig. 4.4.1: Work completion bar graph

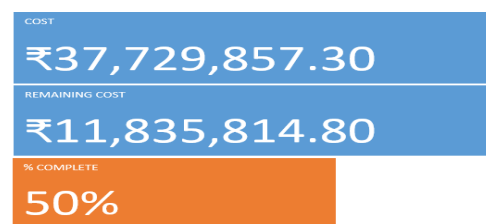
Name	Start	Finish	Remaining Work
J.C.B	Fri 7/3/20	Sat 7/4/20	0 hrs
Excavator	Sat 7/4/20	Wed 7/8/20	0 hrs
Dumpers	Sat 7/4/20	Wed 7/8/20	0 hrs
Core cutting machin	Sun 3/14/21	Sat 5/1/21	80 hrs
Reinforcement labour	Thu 7/9/20	Thu 2/25/21	0 hrs
Formwork labour	Sun 7/12/20	Wed 2/24/21	0 hrs
Karigar	Wed 7/8/20	Thu 7/8/21	32 hrs
Bar bending and tying karigar	Thu 7/9/20	Thu 2/25/21	0 hrs
Formwork placer	Sun 7/12/20	Wed 2/24/21	0 hrs
Male labour	Wed 7/8/20	Thu 7/8/21	120 hrs
Mason	Sat 12/5/20	Tue 7/6/21	6,336 hrs
Mason labour	Sat 7/25/20	Tue 7/6/21	7,928 hrs
Plumber	Mon 3/8/21	Thu 12/23/21	1,440 hrs
Electrician	Thu 7/23/20	Sun 12/26/21	3,000 hrs
Painter	Sat 4/10/21	Sat 12/18/21	2,864 hrs
Alumminium worker	Sun 12/12/21	Sun 12/19/21	288 hrs
Silo operator	Tue 7/14/20	Fri 2/26/21	0 hrs
Scaffolding placer	Thu 4/8/21	Mon 5/3/21	256 hrs
H-frame Placer	Mon 3/1/21	Wed 4/7/21	0 hrs
Tiles karigar	Thu 7/8/21	Thu 11/18/21	3,096 hrs
Tiles labour	Thu 7/8/21	Thu 11/18/21	4,200 hrs
Carpenter	Sun 12/12/21	Wed 1/12/22	1,200 hrs
Surveyor	Sat 7/4/20	Sat 7/4/20	0 hrs
Junior engineer	Fri 7/3/20	Wed 1/12/22	4,960 hrs
Senior engineer	Fri 7/3/20	Sun 12/26/21	1,504 hrs

Fig. 4.4.2: Work hour remaining table

4.5 Cost overview

COST OVERVIEW

FRI 7/3/20 - WED 1/12/22



COST STATUS

Cost status for top level tasks.

Name	Actual Cost	Remaining Cost	Baseline Cost	Cost	Cost Variance
E - BLOCK	₹25,894,042.50	₹11,835,814.80	₹0.00	₹37,729,857.30	₹37,729,857.30

Fig. 4.5.1: Cost overview

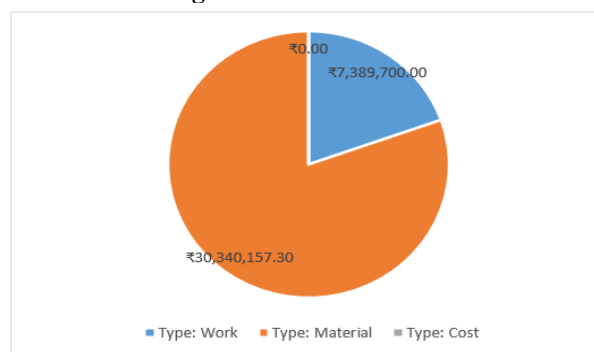


Fig. 4.5.2: Specification of resource amount

4.6 Particular change can decrease duration and cost

1. First change in concrete work 7th floor

169	✓	4 7TH FLOOR	31 days	Wed 11/11/20	Fri 12/25/20			₹2,112,144.00
170	✓	Column and lift padi	19 days	Wed 11/11/20	Tue 12/15/20			₹1,123,814.00
171	✓	Bar cutting	5 days	Wed 11/11/20	Sat 12/5/20	168	Bar bending and ty	₹135,630.00
172	✓	Bar bending	2 days	Sat 12/5/20	Sun 12/6/20	171	Bar bending and ty	₹9,400.00
173	✓	Reinforcement placing	4 days	Sat 12/5/20	Sun 12/6/20	172SS	Bar bending and tying karigar	₹30,800.00
174	✓	Bar tying	3 days	Sat 12/5/20	Sun 12/6/20	173SS	Bar bending and ty	₹15,270.00
175	✓	Formwork	2 days	Sun 12/6/20	Mon 12/7/20	174	Farma,Key,Teka,Ni	₹8,906.00
176	✓	Concreting	1 day	Tue 12/8/20	Tue 12/8/20	175	Karigar,Male labour	₹919,458.00
177	✓	Sides opening	1 day	Wed 12/9/20	Wed 12/9/20	176	Formwork placer[:	₹3,300.00
178	✓	Curing	7 days	Thu 12/10/20	Tue 12/15/20	177	Male labour[50%]	₹1,050.00

In 7th floor concrete work, the duration is 19 days and its cost is 1,123,814. The duration is 4 days more than the other floors column and lift padi activity and the cost also 43,800 more than the other floors column and lift padi activity. Due to of Diwali festivals required workers were not come back that's why the duration was increase and in increase in duration increase the cost. There are 2 bar tying, bending and cutting person and 4 labour or helper of the bar worker. After increase 4 bar tying, bending and cutting person and 8 labour or helper of bar worker duration were be decrease and the duration were decrease the cost were also decrease. 4 days of duration were decrease and 43,800 Rs were also be decrease.

2. Second change in masonry work 4th floor

218	✓	4 4TH FLOOR	24 days	Tue 1/12/21	Sun 1/31/21			₹816,780.00
219	✓	Masonry upto lintel	8 days	Tue 1/12/21	Tue 1/19/21	216	Brick [46,460 per n	₹406,250.00
220	✓	Lintle formwork	1 day	Tue 1/19/21	Wed 1/20/21	219	Farma,Formwork l	₹4,500.00
221	✓	Lintle bar cutting and bending	1 day	Wed 1/20/21	Thu 1/21/21	220	Bar bending and tying karigar	₹19,530.00
222	✓	Lintel concreting	1 day	Thu 1/21/21	Fri 1/22/21	221	Aggregate 4 mm[6	₹168,900.00
223	✓	Masonry lintel to beam bottom	6 days	Fri 1/22/21	Tue 1/26/21	222	Brick [24, 380 per nos],Ceme	₹216,550.00
224	✓	Curing	7 days	Tue 1/26/21	Sun 1/31/21	223	Male labour[50%]	₹1,050.00

In 4th floor masonry work the lintel activity has 3 days more than the other floor activity and cost is increase by 32,700. Due to of material comes late for that the days is increase and the cost is also increased. If the material comes on the time duration will decrease to 3 days and cost also decrease to 32,700.

3. Third change in outer plaster work

Task Mode	Task Name	Duration	Start	Finish	Prede	Resource Names	Cost
247	OUTER PLASTER WORK	30 days	Mon 3/1/21	Thu 4/8/21			₹401,400.00
248	EAST	6 days	Mon 3/1/21	Sat 3/6/21			₹77,400.00
249	H-frame scaffolding part 1	2 days	Mon 3/1/21	Tue 3/2/21	245	H-frame, H-frame	₹10,200.00
250	Part 1 plaster	1 day	Wed 3/3/21	Wed 3/3/21	249	Cement p.p.c[37 p	₹28,500.00
251	H-frame scaffolding part 2	2 days	Thu 3/4/21	Fri 3/5/21	250	H-frame, H-frame	₹10,200.00
252	Part 2 plaster	1 day	Sat 3/6/21	Sat 3/6/21	251	Cement p.p.c[37 p	₹28,500.00
253	WEST	6 days	Sat 3/6/21	Wed 3/10/21			₹77,400.00
254	H-frame scaffolding part 1	2 days	Sat 3/6/21	Sun 3/7/21	252	H-frame, H-frame	₹10,200.00
255	Part 1 plaster	1 day	Sun 3/7/21	Sun 3/7/21	254	Cement p.p.c[37 p	₹28,500.00
256	H-frame scaffolding part 2	2 days	Sun 3/7/21	Tue 3/9/21	255	H-frame, H-frame	₹10,200.00
257	Part 2 plaster	1 day	Tue 3/9/21	Wed 3/10/21	256	Cement p.p.c[37 p	₹28,500.00
258	NORTH	9 days	Wed 3/10/21	Fri 3/19/21			₹123,300.00
259	H-frame scaffolding part 1	2 days	Wed 3/10/21	Fri 3/12/21	257	H-frame, H-frame	₹10,200.00
260	Part 1 plaster	1 day	Fri 3/12/21	Sun 3/14/21	259	Cement p.p.c[42 p	₹30,900.00
261	H-frame scaffolding part 2	2 days	Sun 3/14/21	Mon 3/15/21	260	H-frame, H-frame	₹10,200.00
262	Part 2 plaster	1 day	Mon 3/15/21	Tue 3/16/21	261	Cement p.p.c[42 p	₹30,900.00
263	H-frame scaffolding part 3	2 days	Tue 3/16/21	Thu 3/18/21	262	H-frame, H-frame	₹10,200.00
264	Part 3 plaster	1 day	Thu 3/18/21	Fri 3/19/21	263	Cement p.p.c[42 p	₹30,900.00

In outer plaster work there are 48 nos of H-frame for scaffolding so after one part plaster completed then 1 day duration to remove and place to another part. So, if the H-frame are 96 nos it will minimize the 4 days duration.

5. CONCLUSION

- First change: - If bar tying, bending and cutting person increase from 2 person to 4 person and labour or helper increase from 4 person to 8 person it will decrease the duration by 4 days and cost by 43,800.

- Second change: - If the material (brick) come on time it will decrease the duration by 3 days and decrease the cost of 32,700
- Third change: - If H-frame is 96 nos rather than 48 nos it will minimize the duration by 4 days.
- Total 11 days of duration can be minimizing after applying all three change and total duration became 654 to 643.
- Total 76,500 Rs cost can be decrease after applying the first and second change to 37,729,857 Rs to 37,653,357 Rs.

6. REFERENCES

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