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Flexible Scheduling in Construction Industry by Using Primavera and Histogram

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ABSTRACT: The purpose of this project is to optimize the resources by using the methods “Resource allocation, Resource leveling, time cost trade off”. Resource allocation is used to assign available resources in an economic way. Resource allocation is the scheduling of activities and the resources required by those activities while taking into construction both the resource availability and the project time. Resource leveling aims to minimize the period variation in resource loading. Resource leveling involves redistribution and imbalance of allocated work. Resource leveling techniques were developing to enhance the shape of the resource histogram by reducing its variations. Time cost trade of is project duration can be reduced by assigning more resources to project activity. Doing this however increases project cost. The critical path method is used for scheduling a set of project activities. The analysis of resources also done by using primavera software.

KEYWORDS: Resource allocation, Resource leveling, Time cost trade off, primavera.

I. INTRODUCTION

Critical Path Method is widely used in construction projects during planning and control phases. CPM relies on fixed durations and relationships among activities determine the Critical Path (CP) and consequently determine the total project duration. Although CPM Provides a logical, time-based schedule for the projects.

Controlling project cost expenditure is indeed a complex task. Direct cost are directly attributable to the object and it is financially feasible to do so. In construction, the costs of materials, labor, equipment etc. Indirect cost of materials, labor, equipment etc., and all directly involved efforts or expenses for the cost object are direct cost.

Resource histogram is a tool that is often used by the project work for construction field. The resource histogram is specially a bar chart that is used for the purposes of displaying the specific amounts of time that a particular resource is scheduled to be worked on over a time period.

Resource leveling as a technique in which start and finished dates are adjusted based on resource constraints with the goal of balancing demand for resources with the available supply. Resource leveling is the process of resolving these conflicts. It can also be used to balance the workload of resources over the course of the project, usually at the expense of time, cost, scope. Resource leveling is done by using primavera and histogram.

The objective of this project is to develop the better schedules for construction project. The one of the aims to reach while constructing a resource feasible project schedule. Time minimize the total duration of the project. The use of resources is leveling.

II. LITERATURE REVIEW

The study about resource allocation, resource leveling, time and cost optimization is carried out from many literatures. These are the resources are optimized by using primavera and histogram. The critical path method is done for manually and primavera software used. The project duration is reduced for using the critical path method. The many construction project the primavera software is used and this was clearly explained by the author Bhanthiri thirumalesha in paper “Resource Optimization in Construction of a Residential Apartment Using Primavera P-6

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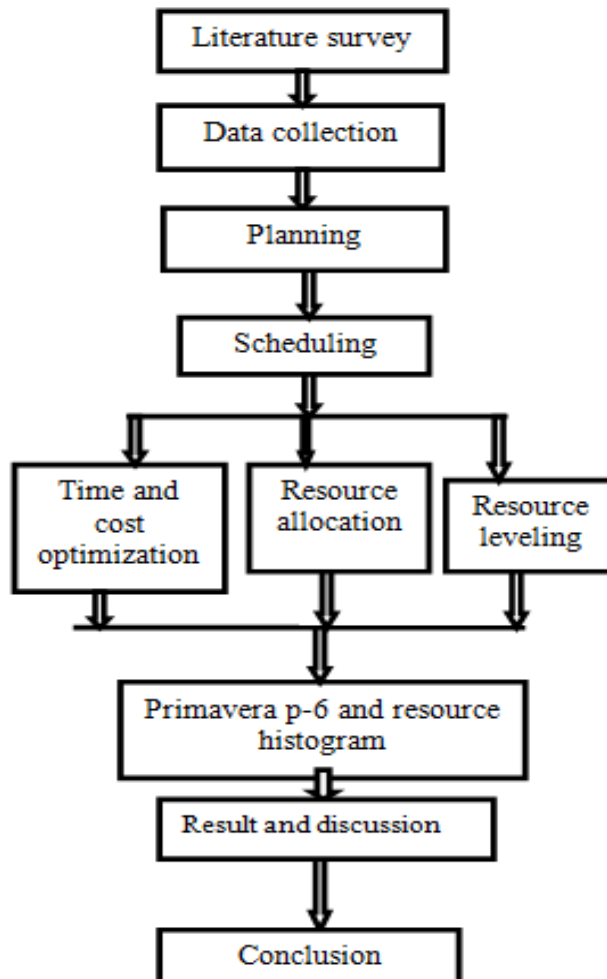
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Software”. The resource optimization is clearly studied and the method is used the resource optimization and resource leveling. Then clearly studied about the resource leveling using histogram by using crashing method for level the resources. From the various literature review is clearly stated the PRIMAVERA software used for reduce the time, cost and resources.

III. METHODOLOGY



DATA COLLECTION:

The data of twin house residential building construction was collected. Project activities are done by using critical path method and primavera software.

Id	Activity	Duration	Predecessor
1	Site clearance	2	-
2	Marking	1	1
3	Earth work excavation for foundation	1	2
4	Concrete work in foundation	5	3

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5	Damp proof course	2	4
6	Sand filling for foundation	2	4
7	Brick work	4	5,6
8	Lintel	2	7
9	Brick work	4	8
10	Centering	4	9
11	Reinforcement laying	4	10
12	Concreting	1	11
13	Curing	7	11
14	Deshuttering	2	12,13
15	Ground floor stair construction	2	13
16	First floor brick work	7	15
17	Lintel	3	14,16
18	Brick work	5	16
19	First floor centering	4	18,17
20	First floor reinforcement laying	5	19
21	Concreting	1	20
22	Curing	7	21
23	Deshuttering	3	22,21
24	First floor stair construction	2	23
25	Plastering	20	24
26	White wash one coat	10	25
27	Color wash two coat	18	25
28	Doors & Window installation	6	26,27
29	Electrical wiring installation	5	28
30	Plumping work	4	29
31	Sanitary fitting	4	30
32	Flooring	7	30
33	Interior design	6	31,32
34	Boundary wall and gate	7	33

RESOURCES USED FOR TWIN HOUSE:

Resource Id	Resource Name	Maximum Availability	Cost
EE	Engineer	1	1000/day
Su	Supervisor	1	900/day

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La	Labour	5	800/day
He	Helper	7	600/day
CM	Concrete mixer	-	1000/day
Ex	Excavator	-	1000/day

RESIDENTIAL BUILDING ESTIMATED AMOUNT:

1. AMOUNT CALCULATION FOR GROUND FLOOR:

Total = Rs. 1147954.70

Add 8% for water supply and sanitary works = Rs.91836.38

Add 8% for electrification works = Rs. 91836.38

Total = Rs. 1331627.53

Add 2% for contingencies = Rs. 26632.55

Add 3% for work charge establishment = Rs. 39948.82

Grand total for ground floor = Rs. 1398208.9

2. AMOUNT CALCULATION FOR FIRST FLOOR

Total = Rs. 997470.40

Add 8% for water supply and sanitary works = Rs. 79797.63

Add 8% for electrification works = Rs. 79797.63

Total = Rs. 1157065.69

Add 2% for contingencies = Rs. 23141.31

Add 3% for work charge establishment = Rs. 34711.97

Grand total for first floor = Rs. 1214918.97

TOTAL AMOUNT CALCULATION:

Total (GF+FF) = Rs. 2613127.87

FROM THE GIVEN DATA THE RESOURCES USED:

Cement (450 bags) = Rs. 180000

Fine aggregate (242.735 cu.m) = Rs. 776755

Coarse aggregate (125.56 cu.m) = Rs.401792

Bricks (108577 nos) =Rs. 651462

Steels (11664 kg) = Rs. 886464

Total working days = 167

No of labours used = 873

TOTALLY ESTIMATED COST = Rs. 5609600.87

CRITICAL PATH METHOD:

From the above collected data's the network diagram is drawn and from that critical path is determined. The schedule time 167 days. The maximum time required to complete the twin house building is 140 days.

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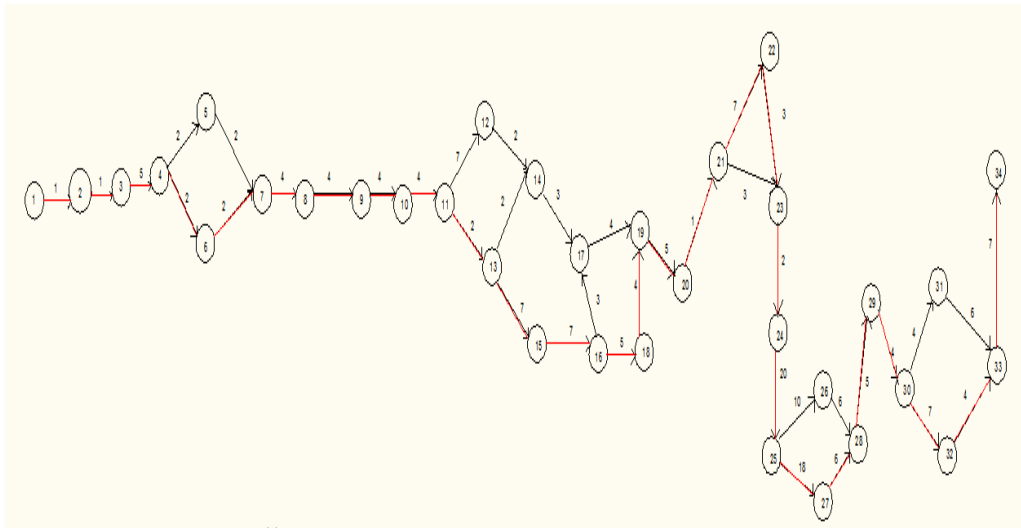


Fig:1 Network Diagram

critical path:

1-2-3-4-6-7-8-9-10-11-13-15-16-17-19-20-21-22-23-24-25-26-27-28-29-30-32-33-34=
1+1+5+2+2+4+4+4+1+2+7+7+5+4+5+1+7+3+2+20+18+6+5++4+6+7+7 = **140**

PROJECT DURATION ACTIVITIES (CPM):

Learning the primavera software and understand the procedure which helps to know the project completion scheduling period. After collecting the data planning the all resources used for project and finishing time. Then the calendar in my project is 8 hours per day working hours for the labours. Sunday is holiday and government holidays.

Activity ID	Activity Description	Orig Dur	Rem Dur	%	Early Start	Early Finish	2019																		
							JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN											
A110	SITE CLEARANCE	2	2	0	01JUN18	04JUN18	4	16	16	23	30	6	13	20	27	3	10	17	24	31	7	14	21	28	
A111	marking	1	1	0	05JUN18	05JUN18																			
A121	EARTH WORK EXCAVATION FOR	1	1	0	06JUN18	06JUN18																			
A131	CONCRETE WORK IN	5	5	0	07JUN18	13JUN18																			
A141	DAMP PROOF COURSE	2	2	0	14JUN18	15JUN18																			
A151	SAND FILLING FOR FOUNDATION	2	2	0	15JUN18	16JUN18																			
A161	BRICK WORK	4	4	0	18JUN18	23JUN18																			
A171	LINTEL	2	2	0	25JUN18	26JUN18																			
A181	BRICK WORK	4	4	0	27JUN18	02JUL18																			
A191	CENT FILING	4	4	0	03JUL18	06JUL18																			
A1103	REINFORCEMENT LAYING	4	4	0	10JUL18	13JUL18																			
A1111	CONCRETING	1	1	0	16JUL18	16JUL18																			
A1121	CURING	7	7	0	17JUL18	25JUL18																			
A1131	DESHTUTERING	2	2	0	28JUL18	27JUL18																			
A1141	GROUND FLOOR STAIR	2	2	0	30JUL18	31JUL18																			
A1151	FIRST FLOOR BRICK WORK	7	7	0	01AUG18	08AUG18																			
A1161	LINTEL	3	3	0	10AUG18	14AUG18																			
A1171	BRICK WORK	5	5	0	15AUG18	21AUG18																			
A1181	FIRST FLOOR CENTERING	4	4	0	22AUG18	27AUG18																			
A1191	FIRST FLOOR REINFORCEMENT	5	5	0	27AUG18	31AUG18																			
A1201	CONCRETING	1	1	0	03SEP18	03SEP18																			
A1211	CURING	7	7	0	03SEP18	11SEP18																			
A1221	DESHTUTERING	3	3	0	11SEP18	13SEP18																			
A1231	FIRST FLOOR STAIR	2	2	0	14SEP18	17SEP18																			
A1241	PLASTERING	20	20	0	18SEP18	15OCT18																			
A1251	WHITE WASH ONE COAT	10	10	0	18OCT18	28OCT18																			
A1261	COLOUR WASH TWO COAT	16	16	0	30OCT18	24NOV18																			
A1271	DOORS AND WINDOWS	6	6	0	22NOV18	28NOV18																			
A1281	ELECTRICAL WIRING	5	5	0	29NOV18	05DEC18																			
A1291	PLUMBING WORK	4	4	0	05DEC18	10DEC18																			
A1301	SANITARY FITTINGS	4	4	0	10DEC18	13DEC18																			
A1311	FLOORING	7	7	0	14DEC18	24DEC18																			
A1321	INTERIOR DESIGN	6	6	0	20DEC18	03JAN19																			
A1331	BOUNDARY WALL AND GATES	7	7	0	04JAN19	14JAN19																			

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IV. CONCLUSION

The critical path and the building estimated total amount were determined from the above data. Then which amount of resources used for this building is calculated. Total estimated building cost is Rs. 5609600.87. The twin house building constructed schedule duration is 167 days. The critical path method and primavera is done by the duration is reduced 140 days. The project will be done by 140 days.

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