

PLANNING, SCHEDULING, AND ESTIMATION OF G+2 RESIDENTIAL BUILDING USING AUTOCAD AND PRIMAVERA

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ABSTRACT

Planning, Scheduling and estimation are essential for the successful completion of any construction project. This study presents the “planning, scheduling, and estimation of a G+2 residential building using AutoCAD and Primavera P6”. AutoCAD was used to prepare the building drawings such as floor Plans, Elevations, and structural layouts which formed the basis for quantity take-off and cost estimation. The quantities of materials and labour were calculated to prepare an approximate project estimate and Bill of Quantities (BOQ). Primavera P6 was then used to organize construction activities, assign durations, develop the project schedule, and identify the critical path. This helpful in effective time management, resource planning, and monitoring of project progress. The study shows that the integration of AutoCAD and Primavera improves accuracy, coordination, and efficiency in residential building construction. It also helps in completing the project within the planned time and estimated cost.

Keywords: G+2 residential building, planning, scheduling, estimation, AutoCAD, Primavera P6.

1. INTRODUCTION

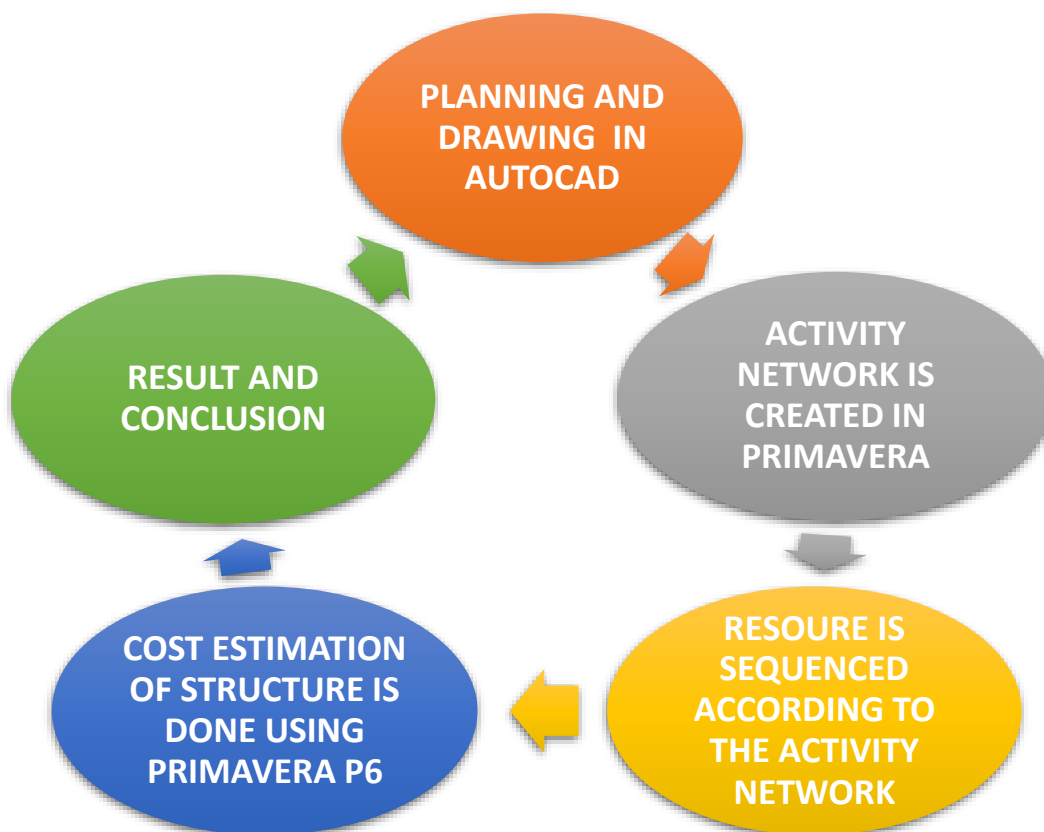
Planning, Scheduling, and estimation are important aspects of any construction project to ensure proper time management, cost control, and smooth execution of work. In residential construction, a G+2 building requires systematic coordination of activities from design to completion. Proper planning helps in calculating the required materials, labour, and cost. With this help of modern software tools like AutoCAD and Primavera P6, construction projects can be managed more effectively. AutoCAD is used to prepare building drawings, while Primavera P6 is used to schedule activities and monitor project progress. This study focuses on the planning, scheduling and estimation of a G+2 building using these tools to improve accuracy and project management efficiency. Tall buildings throughout the world are becoming popular day by day. With the technology and computers, the basic aim has been to construct safer buildings keeping in view the overall economics of the project.

A high-rise building, apartment, office, apartment block, or block of flats, is a tall building or structure used for residential and or office use. Due to an increasingly competitive environment, construction companies are forced to be more efficient and achieve competitive operational advantage. Companies are always looking for improvements in equipment features, communication tools, efficient management techniques, and training human resources. Construction companies are also narrowing their focus, becoming specialists in certain types of construction projects. This specialization requires more focused project planning and controlling techniques that prove to be better for certain types of projects while providing specialized construction services.

The benefits of effective planning scheduling and control of construction projects are reduced construction time and reduced cost overruns. Planning is the process of identifying all the activities necessary to complete the project. Scheduling is the process of determining the sequential order of the planned activities, assigning realistic durations to each activity and determining the start and finish dates of each activity. The process of converting a general or outline plan of a project into a time based graphic presentation gives information on available resources and time constraints. Construction planning is necessary for a runner to schedule also defining work tasks determining general sequence of construction methods assigning responsibility.

2. METHODOLOGY

The methodology for this study involves the planning, Scheduling and estimation of a G+2 residential building using AutoCAD and Primavera P6. Initially, the building details and requirements were prepared in AutoCAD. The Drawings were used to calculate the quantities of various construction items such as concrete, brickwork, steel, plastering, flooring, and finishing works. Based on the calculated quantities, an approximate cost estimate and Bill of Quantities (BOQ) were prepared. After estimation, all the construction activities involved in the project were identified and arranged in a proper sequence. These activities were the entered into primavera P6, where durations and logical relationships were assigned to develop the project schedule. The schedule was analysed to determine the total project duration and critical path. This methodology helped in understanding the role of software tools in improving construction planning, time, management, and cost estimation.



3. GENERAL DETAILS OF THE BUILDING:

Type of building	:	R.C. Frame building
Number of floors	:	G+2
Location of building	:	Visakhapatnam
Total height of the building	:	10m from ground level
Total number of columns	:	36
Depth of foundation	:	2m below ground level
Type of footing	:	Isolated footing
Plinth level	:	0.45m above ground level
Size of beams	:	0.22m x 0.304m
Size of columns	:	0.22m x 0.22m
Thickness of slab	:	0.15m
Type of walls	:	Ordinary clay brick walls
Wall thickness	:	6"(outer wall) and 4"(inner wall)
Type of Staircase	:	Dog legged Staircase
Front setbacks	:	2.01m
Rear setbacks	:	1.25m
Left side setbacks	:	1.25m
Right side setbacks	:	1.25m
Width of road	:	12.19m (40'-0")
Grade of concrete	:	M20
Grade of Steel	:	Fe500

4. FIGURES AND TABLES

Table no – 1: Dimensions of each room according to building Bye-laws.

S no	Room Description	From	To
1.	Drawing or Living Room	4200mm X 4800mm	5400mm X 7200mm
2.	Bedroom	3000mm X 3600mm	4200mm X 4800mm
3.	Guest Room	3000mm X 3600mm	-----
4.	Verandah (width)	1800mm	3000mm
5.	Office Room	3000mm X 3600mm	-----
6.	Dining Room	3600mm X 4200mm	4200mm X 4800mm
7.	Kitchen	2500mm X 3900mm	3000mm X 3600mm
8.	Store Room	2500mm X 2500mm	3000mm X 3000mm
9.	Bath & WC (combined)	1800mm X 1800mm	1800mm X 2500mm
10.	Bathroom (separate)	1200mm X 1800mm	-----
11.	WC (separate)	1200mm X 1200mm	-----

Table no – 2: The space left from plot boundary to the building.

WIDTH OF THE ROAD	ROAD SIDE MARGIN
9.0 m or less	3.0 m
9 m to 12 m	4,5 m
12 m to 18 m	6.0 m
18 m to 30 m	7.5 m
30 m to 60 m	9.0 m
More than 60 m	12.0 m

Figure – 1: Building Bye-Laws.

CHAPTER - VIII
DEVELOPMENT CODES
(Provisions for Non-High Rise Development)

57. Permissible Setbacks & Height for All Types of Non-High Rise Buildings

(1) The height of buildings permissible in a given site/plot shall be subject to restrictions in the areas notified as **(a) Sites in Old /Existing Built up areas/Congested areas/Settlement/Gram Khantam and (b) Areas Prohibited for High Rise Buildings** given in the Annexures.

(2) The minimum setbacks and permissible height as per **Table – 17** and other conditions stipulated below shall be followed.

TABLE – 17
Minimum Setbacks and Height Permissible

Sl. No.	Plot Size (in Sqm) Above - Up to	Parking provision	Height (in m) Permissible Up to	Building Line or Minimum Front Setback to be left (in m)					Minimum setbacks on remaining sides (in m)
				Abutting Road Width					
				Up to 12 m	Above 12m & up to 18m	Above 18m & up to 24 m	Above 24m & up to 30m	Above 30m	
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
1	Less than 50		7	1.5	1.5	3	3	3	-
2	50-100	-	7	1.5	1.5	3	3	3	-
			10	1.5	1.5	3	3	3	0.5
3	100 - 200	Stilt floor	10	1.5	1.5	3	3	3	1.0
4	200 - 300	Stilt floor	7	2	3	3	4	5	1.0
			10	2	3	3	5	6	1.5
5	300 - 400	Stilt floor	7	3	4	5	6	7.5	1.5
			12	3	4	5	6	7.5	2.0
6	400 - 500	Stilt floor	7	3	4	5	6	7.5	2.0
			12	3	4	5	6	7.5	2.5
7	+ 500 - 750	Stilt floor	7	3	4	5	6	7.5	2.5
			12	3	4	5	6	7.5	3.0
			15	3	4	5	6	7.5	3.5
8	750 - 1000	Stilt + One Cellar floor	7	3	4	5	6	7.5	3.0
			12	3	4	5	6	7.5	3.5
			15	3	4	5	6	7.5	4.0
9	1000 - 1500	Stilt + 2 Cellar	7	3	4	5	6	7.5	3.5
			12	3	4	5	6	7.5	4.0
			15	3	4	5	6	7.5	5.0
10	1500 - 2500	Stilt + 2 Cellar floors	18**	3	4	5	6	7.5	6.0
			7	3	4	5	6	7.5	4.0
			15	3	4	5	6	7.5	5.0
11	Above 2500	Stilt + 2 or more Cellar floors	18**	3	4	5	6	7.5	6.0
			7	3	4	5	6	7.5	5.0
			15	3	4	5	6	7.5	6.0
			18**	3	4	5	6	7.5	7.0

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Figure – 2: Proposed plan of building.

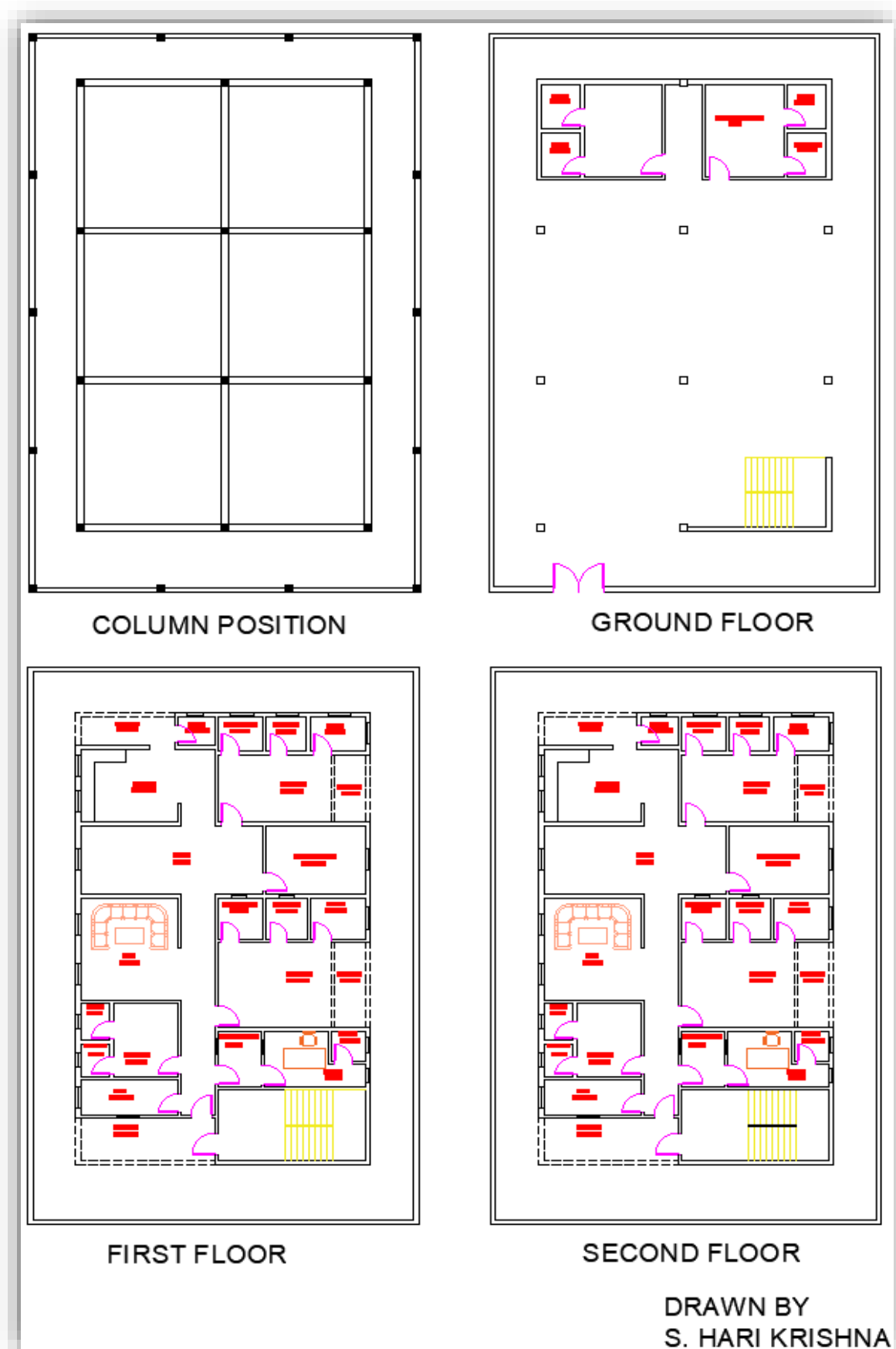
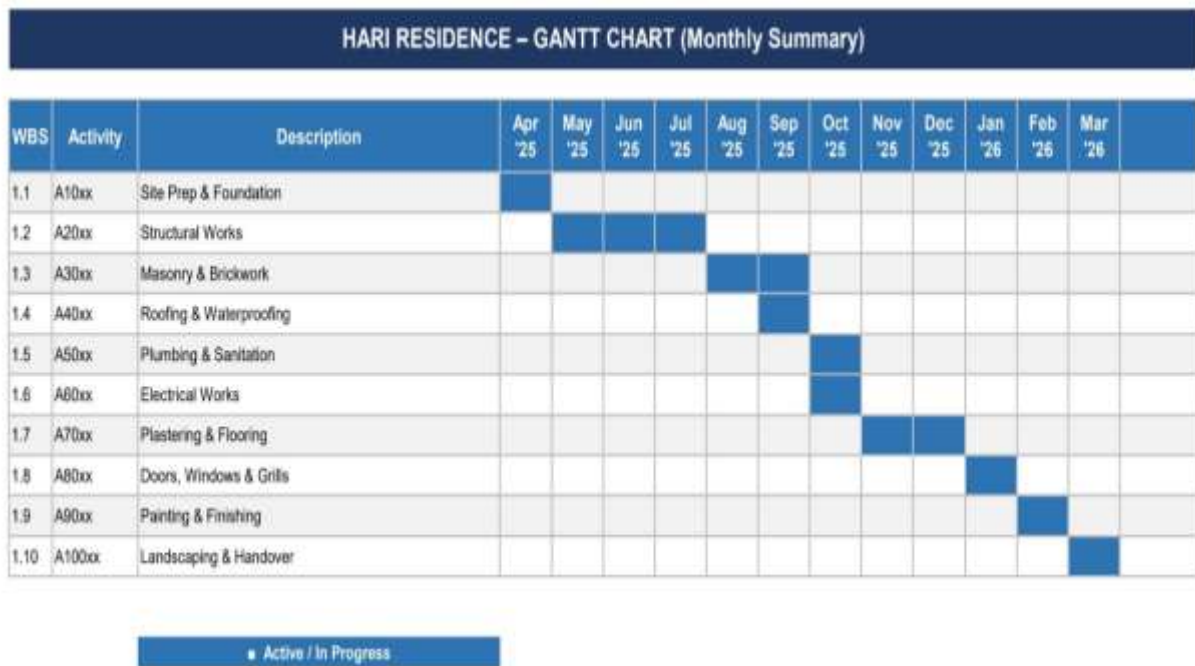


Figure – 3: Project scheduling in primavera.

HARI RESIDENCE – ACTIVITY LIST (Primavera P6 Format)									
Act ID	WBS	Activity Name	OD (Days)	Start	Finish	BL Start	BL Finish	Resource	Budget (₹)
A1000	1.1.1	Site Clearing & Layout Marking	5	01-Apr-25	05-Apr-25	01-Apr-25	05-Apr-25	Labour + Surveyor	₹30,000
A1010	1.1.2	Soil Excavation for Foundation	10	06-Apr-25	15-Apr-25	06-Apr-25	15-Apr-25	JCB + Labour	₹60,000
A1020	1.1.3	PCC Bed Concrete (14.4)	4	16-Apr-25	19-Apr-25	16-Apr-25	19-Apr-25	Concrete Gang	₹35,000
A1030	1.1.3	Anti-Termite Chemical Treatment	1	20-Apr-25	20-Apr-25	20-Apr-25	20-Apr-25	Specialist	₹25,000
A1040	1.1.4	Footing Reinforcement & Shuttering	5	21-Apr-25	25-Apr-25	21-Apr-25	25-Apr-25	Steel Fixer+Carp.	₹120,000
A1050	1.1.4	Foundation Concrete (M20)	5	26-Apr-25	30-Apr-25	26-Apr-25	30-Apr-25	Concrete Gang	₹180,000
A2000	1.2.1	GF Column Reinforcement	10	01-May-25	10-May-25	01-May-25	10-May-25	Steel Fixer	₹60,000
A2010	1.2.1	GF Column Shuttering & Concrete	10	11-May-25	20-May-25	11-May-25	20-May-25	Carpenter+Conc.	₹90,000
A2020	1.2.1	Plinth Beam Reinforcement & Concrete	11	21-May-25	31-May-25	21-May-25	31-May-25	Structural Gang	₹180,000
A2030	1.2.2	Plinth Filling – Murrum & Compaction	10	01-Jun-25	10-Jun-25	01-Jun-25	10-Jun-25	Labour + Roller	₹80,000
A2040	1.2.2	Ground Floor PCC Slab	5	11-Jun-25	15-Jun-25	11-Jun-25	15-Jun-25	Concrete Gang	₹140,000
A2050	1.2.3	FF Column & Beam Reinforcement	15	16-Jun-25	30-Jun-25	16-Jun-25	30-Jun-25	Steel Fixer	₹220,000
A2060	1.2.3	FF Column & Beam Shuttering/Concrete	15	01-Jul-25	15-Jul-25	01-Jul-25	15-Jul-25	Carpenter+Conc.	₹260,000
A2070	1.2.4	Roof Slab Reinforcement	8	16-Jul-25	23-Jul-25	16-Jul-25	23-Jul-25	Steel Fixer	₹140,000
A2080	1.2.4	Roof Slab Shuttering & Concrete	8	24-Jul-25	31-Jul-25	24-Jul-25	31-Jul-25	Carpenter+Conc.	₹160,000
A3000	1.3.1	GF External Brick Wall (9')	20	01-Aug-25	20-Aug-25	01-Aug-25	20-Aug-25	Mason	₹145,000
A3010	1.3.1	GF Internal Brick Wall (4.5')	20	01-Aug-25	20-Aug-25	01-Aug-25	20-Aug-25	Mason	₹125,000
A3020	1.3.2	FF External Brick Wall (9')	26	21-Aug-25	15-Sep-25	21-Aug-25	15-Sep-25	Mason	₹145,000
A3030	1.3.2	FF Internal Brick Wall (4.5')	26	21-Aug-25	15-Sep-25	21-Aug-25	15-Sep-25	Mason	₹125,000
A4000	1.4.1	Terrace Waterproofing – Dr. Fall / Sika Top	10	16-Sep-25	25-Sep-25	16-Sep-25	25-Sep-25	Waterproof. Cont.	₹200,000
A4010	1.4.2	Sunshade RCC (Over Windows)	3	26-Sep-25	28-Sep-25	26-Sep-25	28-Sep-25	Civil Contractor	₹60,000
A4020	1.4.2	Parapet Wall (RCC / Brick)	2	29-Sep-25	30-Sep-25	29-Sep-25	30-Sep-25	Civil Contractor	₹60,000
A5000	1.5.1	Underground Drainage Piping	5	01-Oct-25	05-Oct-25	01-Oct-25	05-Oct-25	Plumber	₹60,000
A5010	1.5.1	Sump Construction (10,000 L)	5	06-Oct-25	10-Oct-25	06-Oct-25	10-Oct-25	Civil+Plumber	₹40,000
A5020	1.5.2	Plumbing Rough-in GF	8	11-Oct-25	18-Oct-25	11-Oct-25	18-Oct-25	Plumber	₹60,000
A5030	1.5.2	Plumbing Rough-in FF	7	19-Oct-25	25-Oct-25	19-Oct-25	25-Oct-25	Plumber	₹50,000
A5040	1.5.3	Bathroom & Kitchen Fixtures	6	26-Oct-25	31-Oct-25	26-Oct-25	31-Oct-25	Plumber	₹60,000
A6000	1.6.1	Conduit Laying (Both Floors)	12	01-Oct-25	12-Oct-25	01-Oct-25	12-Oct-25	Electrician	₹70,000
A6010	1.6.1	Internal Wiring & Switches	8	13-Oct-25	20-Oct-25	13-Oct-25	20-Oct-25	Electrician	₹60,000
A6020	1.6.2	DB Board, MCB & Earthing	11	21-Oct-25	31-Oct-25	21-Oct-25	31-Oct-25	Electrician	₹120,000
A7000	1.7.1	Internal Ceiling Plaster	15	01-Nov-25	15-Nov-25	01-Nov-25	15-Nov-25	Plastering Gang	₹90,000
A7010	1.7.1	Internal Wall Plaster (GF & FF)	15	16-Nov-25	30-Nov-25	16-Nov-25	30-Nov-25	Plastering Gang	₹90,000
A7020	1.7.2	External Plaster & Texture	15	01-Dec-25	15-Dec-25	01-Dec-25	15-Dec-25	Plastering Gang	₹100,000
A7030	1.7.3	Whitified Tile Flooring (GF)	8	16-Dec-25	23-Dec-25	16-Dec-25	23-Dec-25	Tile Contractor	₹90,000
A7040	1.7.3	Whitified Tile Flooring (FF)	8	24-Dec-25	31-Dec-25	24-Dec-25	31-Dec-25	Tile Contractor	₹80,000
A8000	1.8.1	Door Frame Installation	8	01-Jan-26	08-Jan-26	01-Jan-26	08-Jan-26	Carpenter	₹70,000
A8010	1.8.1	Door Shutters Fixing	7	09-Jan-26	15-Jan-26	09-Jan-26	15-Jan-26	Carpenter	₹60,000
A8020	1.8.2	UPVC Windows Supply & Fix	10	16-Jan-26	25-Jan-26	16-Jan-26	25-Jan-26	UPVC Vendor	₹60,000
A8030	1.8.3	MS Staircase Railing	4	26-Jan-26	29-Jan-26	26-Jan-26	29-Jan-26	Fabricator	₹25,000
A8040	1.8.3	Window Grills & Safety Grills	2	30-Jan-26	31-Jan-26	30-Jan-26	31-Jan-26	Fabricator	₹15,000
A9000	1.9.1	Wall Putty & Primer (Interior)	10	01-Feb-26	10-Feb-26	01-Feb-26	10-Feb-26	Painter	₹60,000
A9010	1.9.2	Interior Emulsion (2 Coats)	10	11-Feb-26	20-Feb-26	11-Feb-26	20-Feb-26	Painter	₹110,000
A9020	1.9.3	Exterior Texture Paint (2 Coats)	8	21-Feb-26	28-Feb-26	21-Feb-26	28-Feb-26	Painter	₹60,000
A10000	1.10.1	Compound Wall Construction	15	01-Mar-26	15-Mar-26	01-Mar-26	15-Mar-26	Civil Contractor	₹70,000
A10010	1.10.1	Gate Fabrication & Erection	5	16-Mar-26	20-Mar-26	16-Mar-26	20-Mar-26	Fabricator	₹20,000
A10020	1.10.2	Final Site Cleaning	5	21-Mar-26	25-Mar-26	21-Mar-26	25-Mar-26	Labour	₹15,000
A10030	1.10.2	Snag List Rectification	5	26-Mar-26	30-Mar-26	26-Mar-26	30-Mar-26	All Trades	₹10,000
A10040	1.10.3	As-Built Drawing Preparation	1	31-Mar-26	31-Mar-26	31-Mar-26	31-Mar-26	Project Manager	₹12,000
A10050	1.10.3	Formal Handover to Client	1	31-Mar-26	31-Mar-26	31-Mar-26	31-Mar-26	Project Manager	₹8,000

Figure – 4: Gantt charts.



5. CONCLUSION

Planning and scheduling helps to forecast and understand the progress of a construction project and it also keeps a track on the risks arising during the process. The methodology to implement construction management of a building can be explained with respect to planning, scheduling, resource allocation and levelling. Proper resource optimization is feasible during levelling of resources based on the required conditions and constraints. Primavera serves as an effective tool for generating Gantt chart for planning and scheduling a real time Multi-storey construction project. With the help of Primavera, we can effectively:

1. Link all the activities involved in the construction of the project.
2. Determine the total duration required for the project construction.
3. Determine the Critical Path for the project schedule.
4. Keep a track of the scheduled and the on-site construction.

Assign the resources in a way that helps in reducing the time duration and cost of the project works out to Rs. 47, 46,500 makes it economical. The project has been completed in an efficient manner with the understanding of proper scheduling using Primavera P6 software.

6. REFERENCE

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