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Planning, Designing and Detailed Estimate of G + 1 Frame Structure

Tejashree Kiran Shinde[1], Darshan Ramakant Thakare[2], Pradnya Vishwas Pawar[3], Rudraksha Krushna Borse[4], Sakshee Dipak Sandanshiv[5], Nimesh Dilip Chaudhari[6], Prof. S. Y. Sonawane[7], Prof. N. R. Borase[8]
[1, 2, 3, 4, 5, 6]*UG Student of Civil Engineering Department, Gangamai College of Engineering, Nagaon*
[7]*Assistant Professor, Civil Engineering Department, Gangamai College of Engineering, Nagaon*
[8]*Head, Civil Engineering Department, Gangamai College of Engineering, Nagaon*

Abstract: ***The layout planning is a part of urban development it includes planning of residential houses, commercial complexes, service roads, primary health centres, school & other amenities sewerage system for whole layout (includes treatment, sewer line, storm water drains), water distribution system. This project includes design & estimation of residential building in plot of layout planned. Designing involves identifying the loads which act upon a structure and the forces and stresses which arise within that structure due to those loads, perform analysis to get moments and shear forces on different elements of the structure and then design the structure for ultimate loads and moments. The various loads can like self-weight of the structures, other dead loads, live loads, moving (wheel) loads, wind load, earthquake load, load from temperature change is determined for the structure. Estimation includes finding the quantities of materials required for the construction of the structure and requirements of labour etc., finally determining the overall cost of the structure before execution of work***
Keywords: building planning, designing, estimation, factors affecting cost

I. INTRODUCTION

It is important to understand how the load transfer mechanism works in a building to ensure the structure remains stable and safe under various loading conditions. The load transfer mechanism involves the path that different types of loads (such as dead, live, wind, seismic, and snow loads) follow from the points of application through the building structure and down to the foundation. Proper load transfer is crucial to the overall stability and safety of a building. Structural engineers use advanced modeling and analysis techniques to predict how loads will flow through a building and ensure that the design provides a clear and efficient load path. This ensures that the building can withstand expected loads without excessive deformation or failure.

A. Roof and Upper Floors

1) *Loads:* On the roof and upper floors, the building will experience loads such as dead loads (weight of the structure itself and any permanent fixtures), live loads (weight of people, furniture, and movable objects), wind loads, snow loads, and in some regions, seismic loads.
2) *Transfer:* These loads are transferred from the roof and upper floors to the primary structural elements, such as beams and columns.

B. Beams

1) *Load Reception:* Beams receive loads from the roof and floors and distribute them along their length.
2) *Transfer:* The loads are then transferred from the beams to columns or load-bearing walls.

C. Columns

1) *Vertical Load Path:* Columns carry the loads received from beams and upper floors downward in a vertical path towards the foundation.
2) *Lateral Loads:* Columns also resist lateral loads from wind and seismic forces, helping to stabilize the structure.

D. Load-Bearing Walls

1) *Load Distribution:* Load-bearing walls act similarly to columns, carrying vertical loads down to the foundation and providing resistance against lateral loads.

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E. Slabs

1) *Load Transfer:* Floor and roof slabs distribute loads uniformly to beams and columns. The direction of slab spans can also influence how loads are transferred.

F. Foundation

1) *Load Reception:* Foundations receive the loads transferred down through the structural elements and distribute them into the ground.
2) *Types:* The type of foundation (shallow or deep) depends on the building's size, the nature of the loads, and the soil conditions.

G. Soil

1) *Load Distribution:* The foundation transmits loads into the soil. The soil supports the loads, and its bearing capacity must be considered during the design phase.

II. OBJECTIVE

The objectives of this project are

1) To learn designing various R.C.C. components and to prepare detailed estimate of building.
2) To know about the drawings required for sanctioning.
3) To know why designing is done from top to bottom of building.

III. PLANNING AND DESIGNING OF STRUCTURE

For designing a building top – down designing is preferred. The "top-down design," involves planning the structural elements and overall building layout starting from the roof or upper levels down to the foundation. This approach is used for a variety of reasons in civil engineering:

1) Understanding the load distribution
2) Safety by focusing on the top levels first
3) Structural Continuity
4) Coordination with MEP Systems
5) Compatibility with Architectural Design
6) Roof and Upper-Level Design
7) Compliance with Building Codes
8) Foundation Design
9) Construction Phasing
10) Efficiency

In general, designing from the top down allows for a holistic view of the building's structure and systems, ensuring that all components work together seamlessly and safely.

As a civil engineer, preparing an estimate for a building project before starting construction is an essential step in the planning and execution process. An accurate and comprehensive estimate serves multiple purposes:

1) Budgeting- It includes planning about cost and funding for the structure
2) Project Planning- It includes Scheduling and Resource Allocation.
3) Cost Management- Cost of any structure can be controlled by Monitoring and Control.
4) Contract Negotiation- There are various factors like bidding and Contract Drafting can be used for negotiation of the contract of building.
5) Risk Management- Risks during the planning and construction phase can be mitigated by Contingency Planning and Risk Identification.
6) Design and Scope Evaluation- This provides an opportunity to optimize the design for cost efficiency without compromising quality. Estimating the cost of different design options allows for evaluating the feasibility and cost-effectiveness of various design choices.
7) Client Communication- Providing the client with a detailed estimate ensures clear communication regarding the expected costs of the project. Clients can make informed decisions about design choices and project scope based on the estimated costs.

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8) Compliance- In some cases, accurate cost estimates may be required by local regulations or funding agencies to ensure compliance with budgets and project guidelines.

In summary, preparing an estimate before starting construction is a crucial step that provides a roadmap for the project, ensuring it proceeds smoothly, stays within budget, and meets client and regulatory expectations.

For constructing any building it is necessary to obtain technical sanction and building permission for the same. For obtaining technical sanction (also known as building approval or construction permit) is a critical step in starting a construction project. The process involves submitting a set of documents to the local building authority for review and approval to ensure compliance with local building codes, regulations, and zoning laws. The specific requirements may vary depending on the jurisdiction, but generally, the following documents are needed for technical sanction:

1) Architectural Plans
2) Structural Plans
3) Services Plans
4) Compliance Reports
5) Land Title and Ownership Documents
6) Zoning and Land Use Clearance
7) No-Objection Certificates (NOCs)
8) Project Specifications
9) Cost Estimate and Budge
10) Application Forms
11) Contractor's License and Details
12) Other Supporting Documents

Once all the required documents are compiled and submitted, the building authority reviews the application to ensure compliance with applicable laws and regulations. If approved, a technical sanction or construction permit is issued, allowing the project to proceed. It's important to ensure all documents are accurate and complete to avoid delays in the approval process.

IV. DETAILED PLANNING, DESIGNING AND ESTIMATION OF G+1 FRAME STRUCTURE

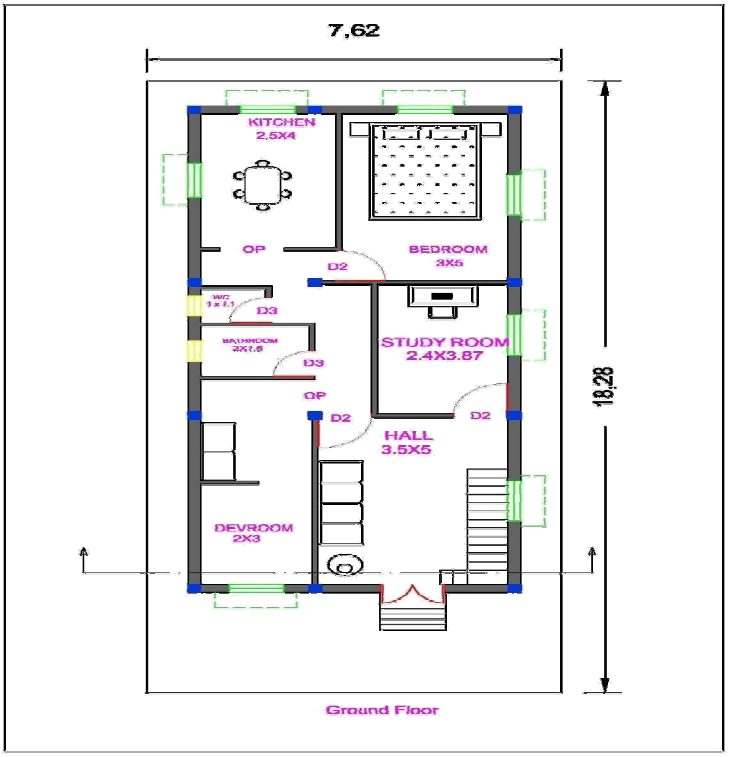


Fig. No. 1 Ground Floor plan for proposed residential building

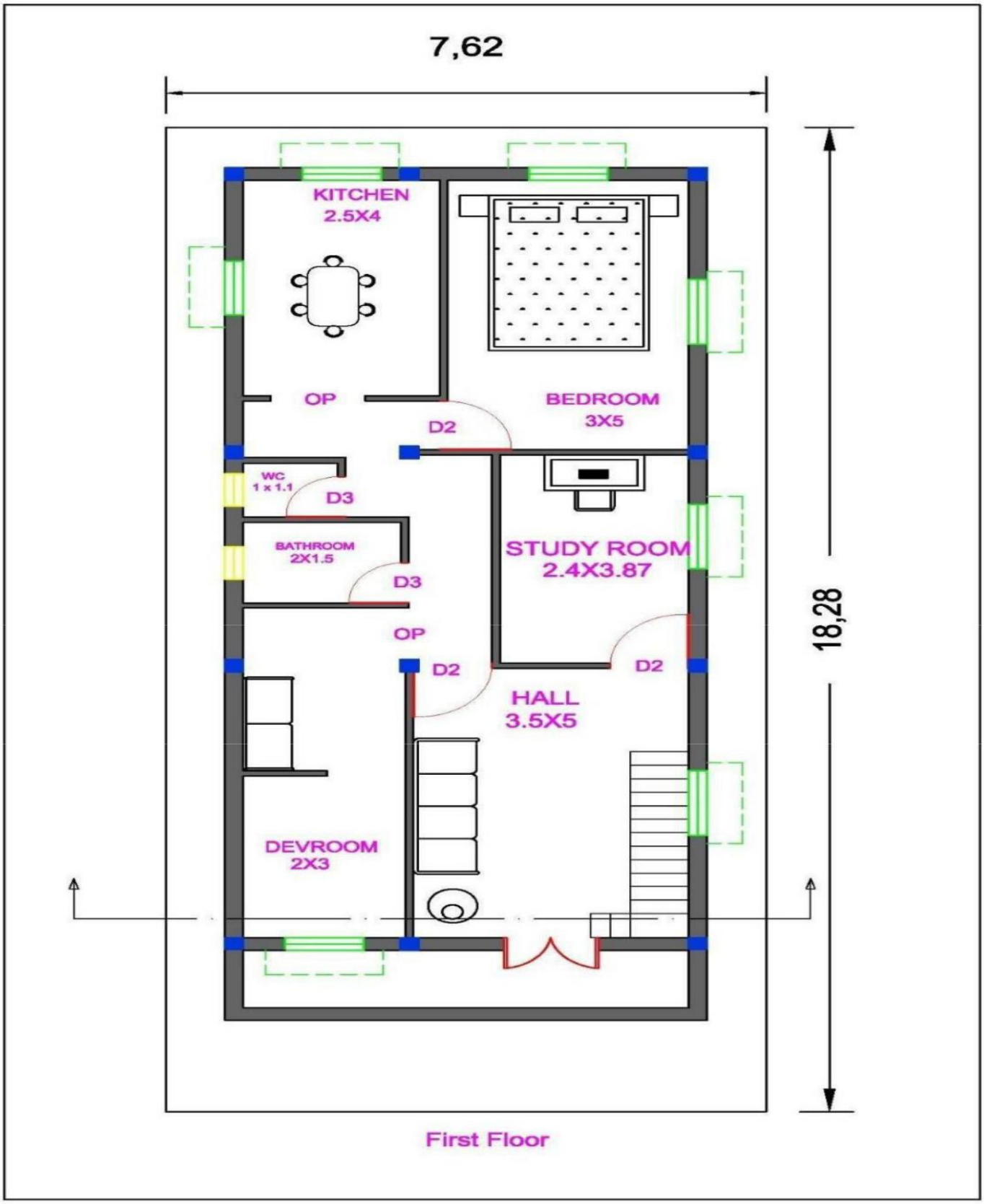


Fig. No. 2 first Floor plan for proposed residential building

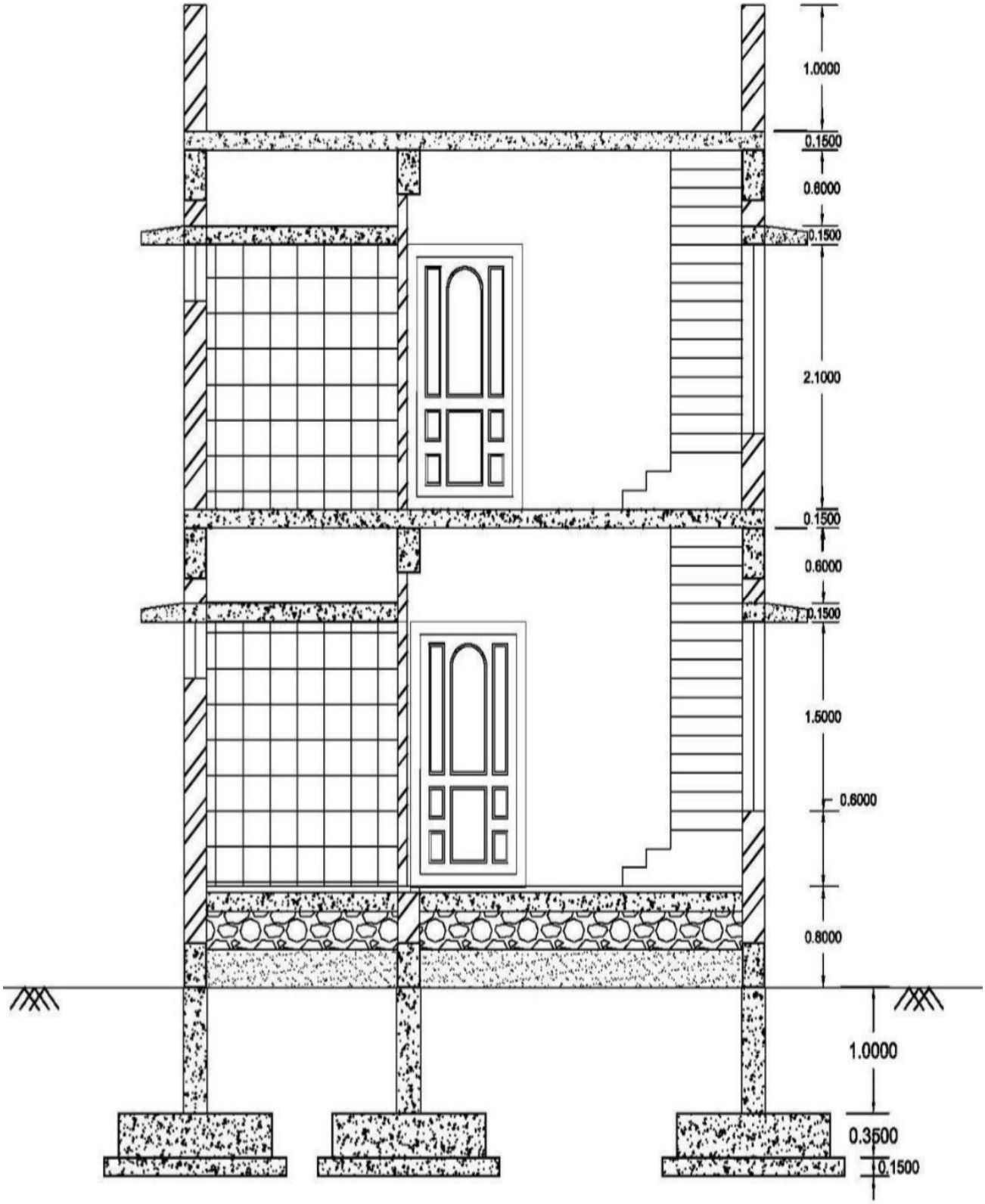


Fig. No. 3 Section for proposed residential building

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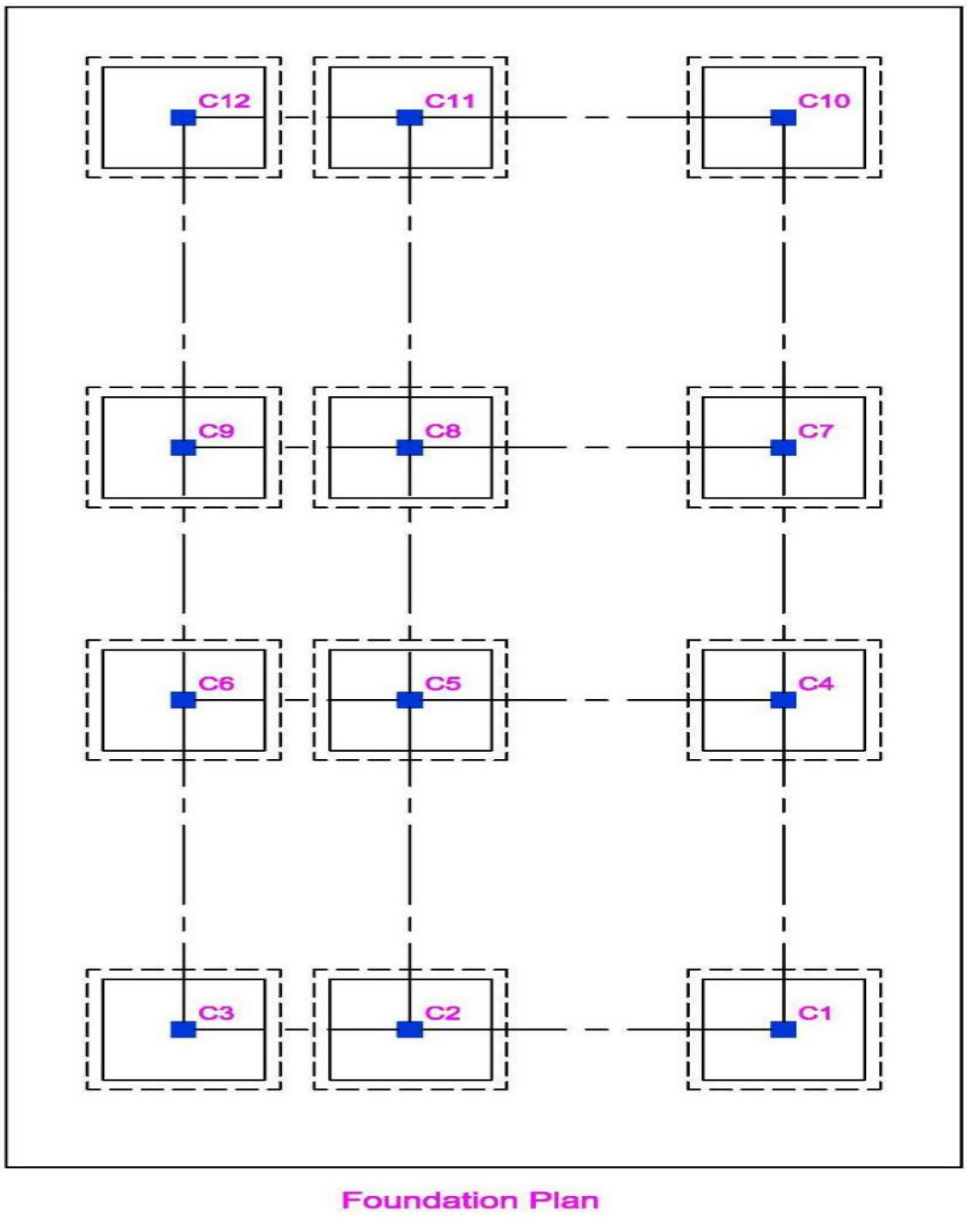


Fig. No. 4 Foundation plan for proposed residential building

Table No. 1 Schedule of opening

SCHEDULE OF OPENING			
SR. NO.	UNIT	DIMENSION	NO.
1	DOOR (D1)	1.2 x 2.1	1
2	DOOR (D2)	1 x 2.1	3
3	DOOR (D3)	0.75 x 2.1	2
4	WINDOW (W1)	1.2 x 1.5	3
5	WINDOW (W2)	1 x 1.2	4
6	VENTILATOR	0.6 x 0.45	2

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Table No. 2 Area statement

AREA STATEMENT	
Built up Area	88.92sq.m.
Total Built up Area	177.84 sq.m.
Plot Area	139.29 sq.m.
Total Carpet Area	57.78 sq.m.
F.S.I.	1.27

Table No. 3 Schedule of slabs

Sr no.	Slab ID	D (mm)	Wd (kN/m)	Reinforcement	
				Shorter Span R/F	Longer Span R/F
1)	S1 and S5	150	11.625	8mm # 140mm c/c	8mm # 270mm c/c
2)	S2 and S6	100	9.75	8mm # 250mm c/c	6mm # 180mm c/c
3)	S4	100	9.75	8mm # 270mm c/c	6mm # 300mm c/c
4)	S3	130	10.87	8mm # 180mm c/c	8mm # 160mm c/c
5)	S7	150	9.75	8mm # 260mm c/c	6mm # 120mm c/c

TABLE NO. 3 SCHEDULE OF BEAM

Sr no.	Beam ID	Cross section	Design load(Wd) KN/m		Reinforcement	
				Bottom	Top	Shear
1)	B1 = B13	230x400	20.43	3-8#	2-6#	6mm @ 200mm c/c
2)	B6 = B17	230x400	13.2	2-10#, 1-16#	2-6#	6mm @ 200mm c/c
3)	B8	230x350	11.88	2-10#, 1-12#	2-6#	6mm @ 200mm c/c
4)	B9, B7	230x350	9.51	2-10#, 1-8#	2-6#	6mm @ 200mm c/c
5)	B2, B11	230x350	29.175	2-16#, 1-10#	2-6#	6mm @ 200mm c/c
6)	B3, B15	230x350	25.94	2-12#, 1-8#	2-6#	6mm @ 200mm c/c
7)	B10	230x400	26.08	2-16#, 1-8#	2-6#	6mm @ 200mm c/c
8)	B5, B16	230x200	5.86	2-18#	2-6#	6mm @ 200mm c/c
9)	B4, B14	230x350	6.72	2-8#	2-6#	6mm @ 200mm c/c
10)	B12	230x350	15.86	1-10#, 2-12#	2-6#	6mm @ 200mm c/c

The cost of the above proposed building is found after preparing the detailed estimate and rate analysis.

Table No. 4 cost of building

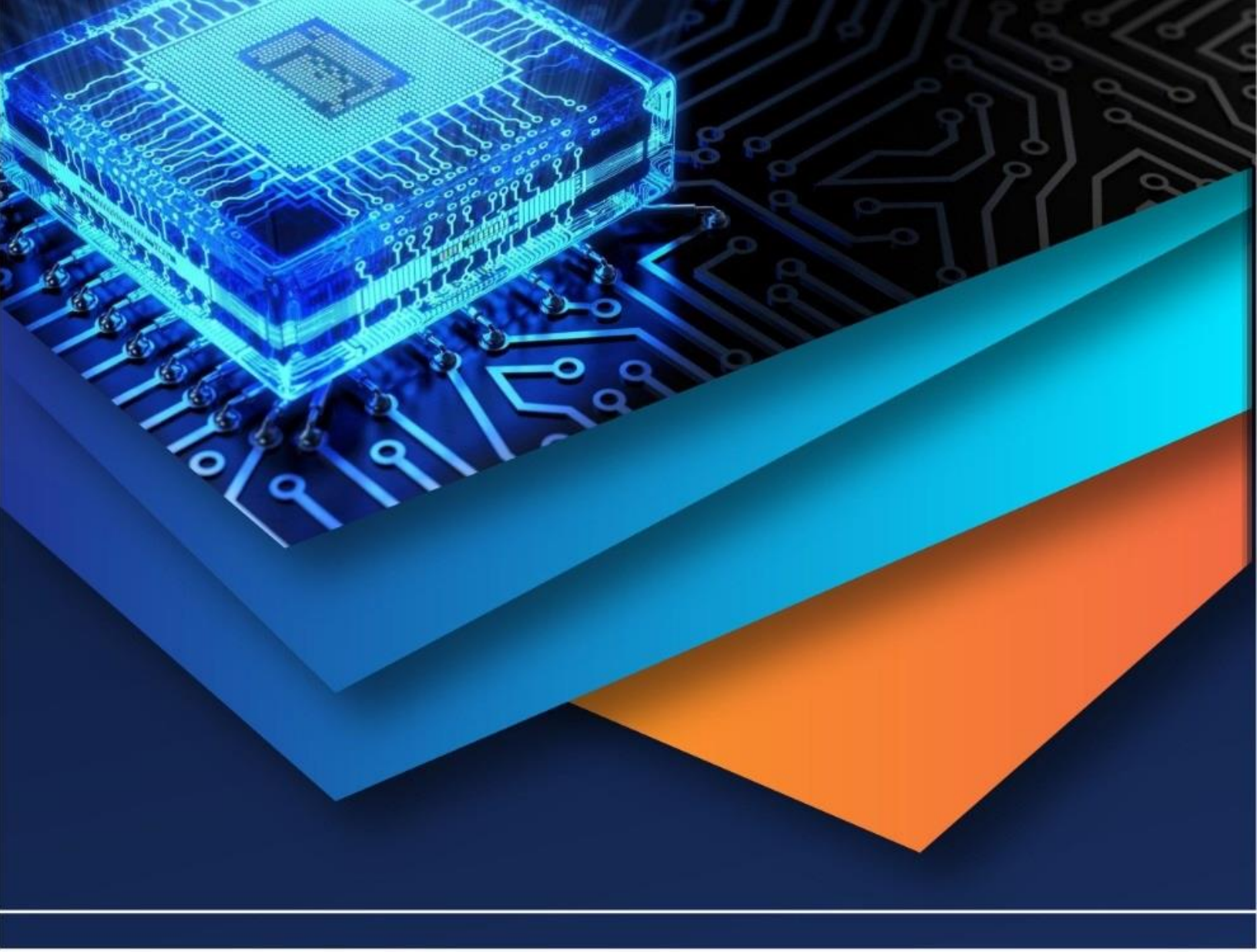
Cost of Ground floor	10,30,981
Cost of First floor	7,23,112
Cost of Building	17,54,093
Add 3% additional items contingencies on additional items	52,623
Add 5% work charge establishment on additional items	1,40,328
Total cost of Building	**19,47,044 Rs**

V. CONCLUSION

By doing this project, we came to know about the drawings required for sanctioning. We understood the rules which are considered at the time of planning and principles of planning such as roominess, circulation, privacy, etc. We also understood the various load considered while designing such as dead load, live load, floor finish. By doing estimate, we came to know about mode of measurement, rules for deduction, schedule of opening, rate of material, measurement sheet and abstract sheet.

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