iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 14 **Issue:** IV **Month of publication:** April 2026

DOI: https://doi.org/10.22214/ijraset.2026.79950

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 14 Issue IV Apr 2026- Available at www.ijraset.com

Construction Methodology of a Commercial Complex

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Abstract: ***The construction of a commercial complex requires a systematic approach to ensure structural stability, quality construction, and efficient cost management. This project, titiled"Construction Methodology ofa Commercial Complex",focuses on planning, design, and estimation using AutoCAD as the Principle drafting tool. The study begins with an overview of commercial complexes, their functional requirements governing their design. Planning aspects such as to ensure the efficient layout of commercial units, service areas, parking, and circulation network for the most effective use of land and functional efficiency. The design phase involves the preparation of detailed G+5 floor layouts, with a focus on thoughtful spatial coordination, clear dimensional indications, and systematic arrangement of architectural components like openings, vertical circulation elements, and service provisions. Using AutoCAD, accurate two-dimensional documentation modeling of the designs can be undertaken to enable interpretation, spatial and aesthetic analysis. The estimation forquantity surveying techniques like Bill of Quantities preparation and abstract cost estimation based on design outputs. This helps in accurate assessment of the material requirement and establishes a link between design parameters and cost planning. As a whole, the study reflects an integration of planning principles, architectural drafting and estimation techniques. The study offers a structured framework for inclined understanding and execution of development of a commercial shopping complex.***

Keywords: Commercial complex, AutoCAD, Estimation

I. INTRODUCTION

A commercial complex is a group of related retail stores and necessary facilities planned to provide maximum convenience to the customer and maximum visibility to the merchandise. It integrates shopping, dining, offices, entertainment areas and different service areas into a single development. Most commercial complexes have foodcourts, restaurant, theatre, gaming zone, on these complexes serve.The project has different levels, centralized amenities and modern infrastructure for the economic and social needs. The focus of the building design is on looks,comfort and accessibility for which they are made in a way to allow vibrant and lively character of a city. Commercial complex is not just a space for buying and selling. Commercial complexes are becoming more popular as family hangout zones and tourist attraction sites due to their ambience,style and convenience. Essentially, a commercial complex can be called a privately owned public space.While, it was designed to make money for investors,it also provides leisure activities and shopping possibilities for the public. It embodies a contemporary interpretation of an old-age market place that fosters trades while encouraging society.Overall, the quality of a commercial space is critical for user satisfaction, which makes it imperative to optimize architectural design and spatial planning for enhanced functionality and user experience.

II. UNITS

SI. No.	Description of item	Measurement type	SI Units	CGS Units
1.	Earthwork excavation	volume	m^3	cm^3
2.	Plain cement concrete (PCC)	volume	m^3	cm^3
3.	Reinforced cement concrete (RCC)	volume	m^3	cm^3
4.	Brick work (modular)	volume	m^3	cm^3
5.	Cement (OPC 53 grade)	weight	Kg/bags	g
6.	Fine aggregate(river sand)	volume	m^3	cm^3
7.	Coarse aggregate (20mm,10mm)	volume	m^3	cm^3

8.	Steel reinforcement	weight	Kg/tone (t)	g
9.	Formwork/shuttering	area	m^2	cm^2
10.	Flooring	area	m^2	cm^2
11.	Plastering	area	m^2	cm^2
12.	Painting	area	m^2	cm^2
13.	Doors and windows	Area/number	m^2/Nos.	cm^2
14.	Waterproofing	Area/volume	m^2	cm^2
15.	Road/pavement works	Area/volume	m^2/m^3	cm^2/cm^3
16.	Electrical conduits	length	m	cm
17.	Plumbing pipes	length	m	cm
18.	Water supply (tank capacity	volume	m^3/ (l)	cm^3
19.	Cost/rate	currency	₹/m^3,₹/m^2,₹/kg	₹/cm^3,₹/cm^2
20.	Vitrified tiles (600*600)	area	m^2	cm^2
21.	Anti-skid tiles (300*300)	area	m^2	cm^2
22.	External plaster sand	volume	m^3	cm^3
23.	Lifts(passenger)	number	nos	nos
24.	Escalators	number	nos	nos
25.	Admixtures(plasticizer)	weight	kg	g

III. METHODOLOGY

The proposed commercial shoppingcomplex will be constructed using a systematic and integrated approach for planning, designing, analyzing, andestimation for functional efficiency andstructural adequacy. Over Site area of 300ft x 200 ft (91.44 m× 60.96 m) with basement G+5storeyed structure for retail circulation, parking and service facilities.The first phase of site evaluation isunderstanding the accessibility, infrastructure around it, soil quality andfeasibility.Zoning strategies are adopted tozone the commercial area, circulation area, parking area, and service area for the optimum use of soil.Afterwards, the Design engineers perform the Design Autodesk through a software called AutoCAD,where a 2D plan isprepared.In the basement, parking and other utility serviceshave been provided with clearly defined entry and exit ramps to avoidvehicularcongestion. Ventilation, light, andcirculation systems receive sufficientattention to facilitate comfort and safety ofuser. Moreover, the planning of thesuperstructure should involve the orderlyarrangement of retail units, corridors,etc.as well as vertical circulation elements like staircases.The structural elements, like doors, windows and ventilators, of the building will be incorporated with proper dimensions and positioning for durability, access and ease of environment.Moreover, designspecifications follow standard buildingcodes and bylawsincluding safety and serviceability.

During the estimation stage, detailed take-off of quantities and cost estimation is prepared based on standard engineering procedures. The SI units from the design drawings are used to compute thequantities by considering their dimensional parameters namely length, breadth and height. A detailed Bill ofQuantities (BOQ)will be prepared including material, labor transport, and overhead cost. Analysis of rates is done for every item so as to achieve the unit cost of that item. Materialestimation comprises finding quantity ofcement, steel, fine aggregate and coarseaggregate based on standard mix ratios and construction requirements. Accuracy and reliability are enhanced by using advanced estimation techniques and standard data references. To sum up, the approachstrikes a balance between planning, design accuracy, and cost-effectiveness to deliver a commercial shopping complex that is both sustainable and functional.

IV. FIGURES AND TABLES

Table1: Standard Design Parameters for Vertical Transportation Systems as per NBC 2016 and relevant IS Codes

System	Parameters	Standard Values	Usage/Remarks

Elevator	Capacity(Persons)	10 – 26 Persons	Based on building size
	Load	680 – 1768 kg	Corresponds to capacity
	Door Width	900 – 1200 mm	Wider for high traffic
	Application	Small to high-traffic malls	Passenger Movement
Escalator	Step Width	600 / 800 / 1000 mm	Depends on user volume
	Inclination Angle	30˚- 35˚	Standard safe angle
	Vertical Rise	Up to 6 – 7 m	Floor-to-Floor movement
	Horizontal length	6 – 10 m	Based on Rise
	Step Height (rise)	200 – 210 mm	Fixed Dimension
	Step Depth (tread)	400 mm	Comfortable Stepping
	Speed	0.3 – 0.6 m/s	Safe Passenger Movement
	Capacity	4000 – 9000 persons/hour	High Crowd Handling
Stairs	Width of Stair	0.9 – 1.5 m	Based on Occupancy
	Tread (Depth)	250 – 300 mm	Comfortable Walking
	Riser (Height)	150 – 180 mm	Standard Design
	Steps per Flight	10 – 12 steps	Avoid Fatigue
	Hand Rail height	800 – 900 mm	Safety Requirement
	Slope (Angle)	25˚- 40˚	Comfortable Inclination

Table 2: Ground Floor Specifications

SI.	Floor/Space Name	No's	Length (ft)	Width (ft)	Area (sq ft)
GROUND FLOOR – Retail / Fashion					
1	Sarees Room /Main Hall)	1	150.00	110.00	16,500
2	Trends Showroom	1	100.00	90.00	9,000
3	Max Fashion	1	80.00	75.00	6,000
4	Cosmetics Section	1	50.00	50.00	2,500
5	Watches Section	1	50.00	50.00	2,500
6	Gift Store	1	50.00	50.00	2,500
7	Reception & Bill Counters	3	48.00	26.00	3,744
8	Toilets (Gents + Ladies)	4	20.00	20.00	1,600
9	Trail Rooms	8	10.00	8.00	640
10	Lift Lobbies	2	15.00	10.00	300
11	Escalators Openings	2	25.00	10.00	500
12	Stairs	2	15.00	8.00	240
13	Ventilors / Services	4	5.00	5.00	100
SUB TOTAL – GROUND FLOOR					46,124sq ft

Table 3: First Floor Specifications

SI.	Floor/Space Name	No's	Length (ft)	Width (ft)	Area (sq ft)
FIRST FLOOR - Ladies / Ethnic					
1	Kids Wear	1	80.00	60.00	4,800
2	Lounge Wear	1	70.00	60.00	4,200
3	Leggings & Cosmetics	1	70.00	55.00	3,850
4	Jewellery Section	1	60.00	50.00	3,000
5	Party Wear / Sarees	1	90.00	80.00	7,200
6	Formal / Cotton / Kurti Sets	1	120.00	60.00	7,200
7	Reception / Cash Counters	4	20.00	15.00	1,200
8	Trail Rooms	6	10.00	8.00	480
9	Lift Lobbies	2	15.00	10.00	300
10	Escalators	2	25.00	10.00	500
11	Stairs	2	15.00	8.00	240
12	Watch Room / Accessories	1	43.00	78.00	3,354
13	Toilets	4	20.00	20.00	1,600
14	Doors (total)	25	4.00	8.00	800
SUB TOTAL – FIRST FLOOR					38,724 sq ft

Table 4: Second Floor Specifications

SI.	Floor/Space Name	No's	Length (ft)	Width (ft)	Area (sq ft)
SECOND FLOOR – Gents Wear					
1	Hoodies / T-Shirts / Pants	1	150.00	100.00	15,000
2	Ethnic Wear / Suits	1	100.00	80.00	8,000
3	Shoes Section	1	70.00	60.00	4,200
4	Watches & Accessories	1	80.00	50.00	4,000
5	Storage Area	2	42.00	20.00	1,680
6	Wardrobe Display	1	42.00	20.00	840
7	Bill Counters	2	20.00	10.00	400
8	Lift Lobbies	2	15.00	10.00	300
9	Escalators	2	25.00	10.00	500
10	Stairs	2	15.00	8.00	240
11	Toilets	4	20.00	15.00	1,200
SUB TOTAL – SECOND FLOOR					36,360 sq ft

Table 5: Third Floor Specifications

SI.	Floor/Space Name	No's	Length (ft)	Width (ft)	Area (sq ft)
THIRD FLOOR – Entertainment Zone					
1	Trampoline Area	1	80.00	60.00	4,800
2	Horror Zone	1	100.00	60.00	6,000
3	Mirror Zone	1	80.00	80.00	6,400
4	VR Games Zone	1	100.00	80.00	8,000
5	Bowling Alley (4 lanes)	1	120.00	50.00	6,000
6	Archery Zone	1	60.00	40.00	2,400
7	Kids Play Area	1	80.00	50.00	4,000
8	Ticket Counter (main)	2	25.00	20.00	1,000
9	Rest Rooms / Staff Room	2	30.00	20.00	1,200
10	Private Rooms 1-6	6	22.00	20.00	2,640
11	Toilets (4 blocks)	4	20.00	20.00	1,600
12	Lift Lobbies	2	15.00	10.00	300
13	Escalators	2	25.00	10.00	500
14	Stairs	2	15.00	8.00	240
15	Doors	48	4.00	8.00	1,536
SUB TOTAL – THIRD FLOOR					46,616 sq ft

Table 6: Fourth Floor Specifications

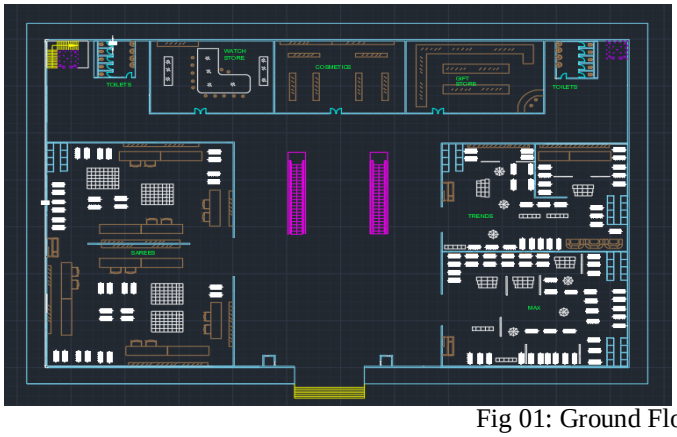
SI.	Floor/Space Name	No's	Length(ft)	Width (ft)	Area (sq ft)
FOURTH FLOOR – Food Court					
1	Pani Puri / Chaat Stall	1	30.00	25.00	750
2	Fast Food Counter	1	50.00	30.00	1,500
3	Biryani Restaurant	1	60.00	40.00	2,400
4	KFC / Chicken Rolls	1	60.00	40.00	2,400
5	Pizza Section	1	80.00	50.00	4,000
6	Ice Cream / Cafe	1	50.00	35.00	1,750
7	Milkshakes Counter	1	40.00	30.00	1,200
8	Birthday Party Room	1	70.00	50.00	3,500
9	Central Seating Area	1	180.00	120.00	21,600

10	Juice / Wash Area	2	25.00	20.00	1,000
11	Toilets (Gents + Ladies)	4	20.00	20.00	1,600
12	Lift Lobbies	2	15.00	10.00	300
13	Escalators	2	25.00	10.00	500
14	Stairs	2	15.00	8.00	240
15	Doors	33	4.00	8.00	1,056
SUB TOTAL – FOURTH FLOOR					43,796 sq ft

Table7: Fifth Floor Specifications

SI.	Floor/Space Name	No's	Length(ft)	Width (ft)	Area (sq ft)
FIFTH FLOOR – Cinema / Multiplex					
1	Screen 1 (Auditorium)	1	150.00	80.00	12,000
2	Screen 2 (Auditorium)	1	150.00	80.00	12,000
3	Projection Rooms	2	20.00	15.00	600
4	Lobby / Common Area	1	180.00	50.00	9,000
5	Ticket Counters	4	10.00	8.00	320
6	Food Kiosks	4	15.00	10.00	600
7	Toilets (multiple)	20	6.00	5.00	600
8	Storage / Staff Rooms	2	20.00	15.00	600
9	Lift Lobbies	2	15.00	10.00	300
10	Escalators	2	25.00	10.00	500
11	Stairs	2	15.00	8.00	240
SUB TOTAL – FIFTH FLOOR					36,760 sq ft

No. of Seats / Capacity for – Screen 1: 800
Screen 2: 800



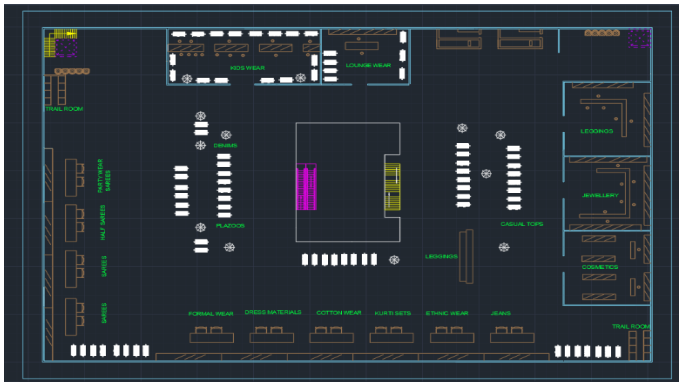
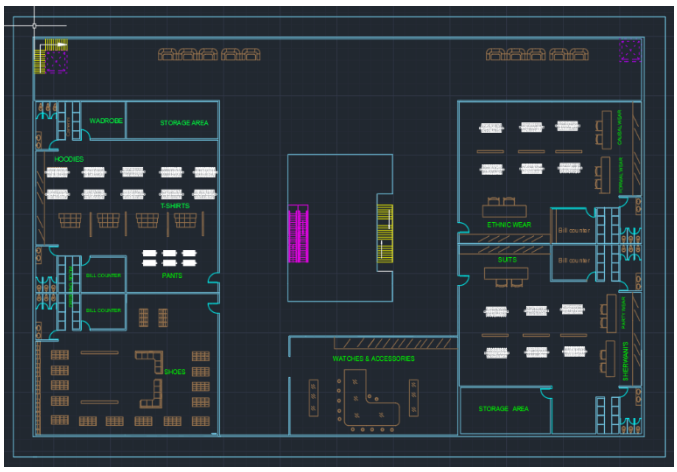


Fig 01: Ground Floor PlanFig 02: First Floor Plan



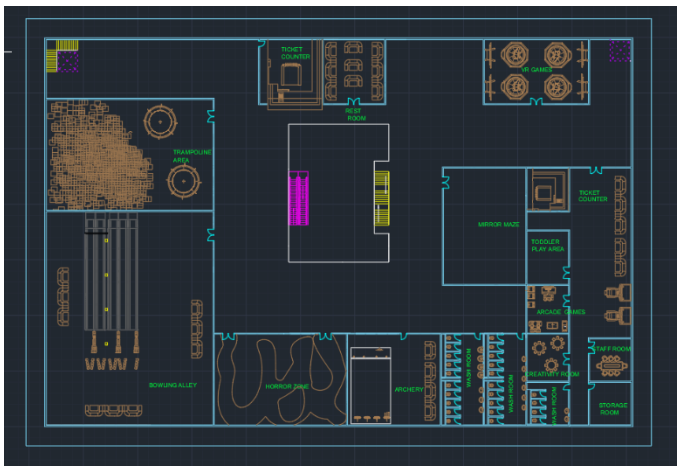
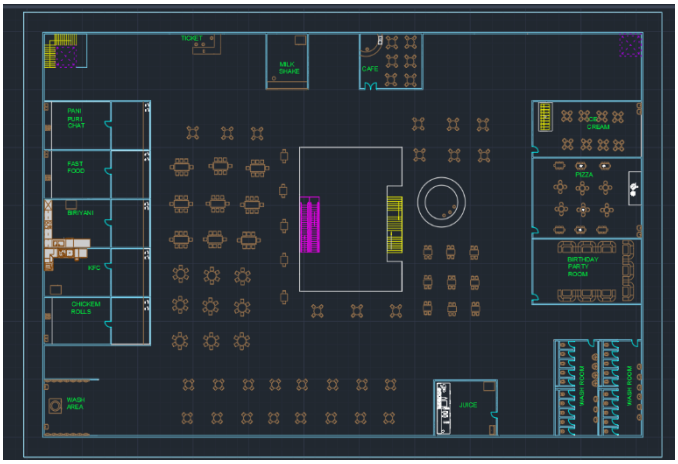


Fig 03: Second Floor PlanFig 04: Third Floor Plan



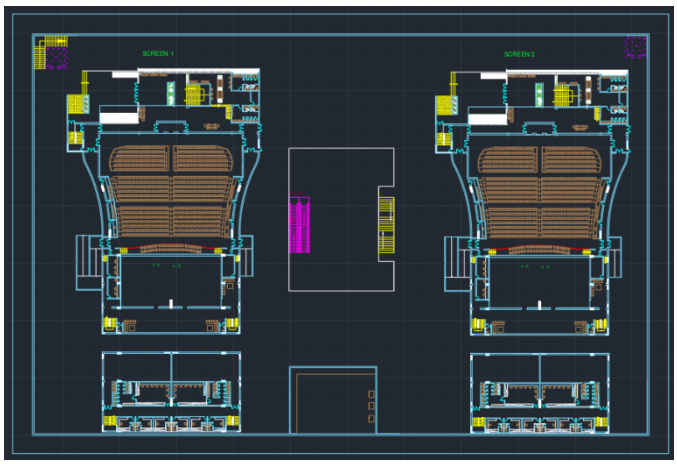


Fig 05: Fourth Floor Plan

Fig 06: Fifth Floor Plan

GRAND ABSTRACT ESTIMATE — COMMERCIAL COMPLEX (300 ft × 200 ft × 6 FLOORS)					
Total BUA: 360,000 sq ft (33,444 sq m) | Rates: 2023-24 Market Base | Location: AP					
Note: Indicative estimate only. Detailed tender BOQ required for actual procurement.					
Sl.	Description of Work	Qty	Unit	Rate (₹)	Amount (₹)
◆ CIVIL WORKS					
1	Earthwork — excavation, backfill & disposal	—	LS	—	₹5,34,160
2	PCC M10 bed concrete	459	cu.m	₹4,800	₹22,03,200
3	RCC M25 — Footings	3,528	cu.m	₹7,500	₹2,64,60,000
4	RCC M25 — Plinth beams	380	cu.m	₹8,000	₹30,40,000
5	RCC M30 — Columns (294/fl × 6 floors)	2,940	cu.m	₹8,500	₹2,49,90,000
6	RCC M25 — Beams (main + secondary)	2,200	cu.m	₹8,000	₹1,76,00,000
7	RCC M25 — Slabs all 6 floors + roof	3,350	cu.m	₹7,800	₹2,61,30,000
8	RCC M25 — Staircases & landings	80	cu.m	₹9,000	₹7,20,000
9	RCC M30 — Shear walls / lift cores	300	cu.m	₹9,000	₹27,00,000
10	Fe500 TMT steel reinforcement (263 MT)	263	MT	₹82,000	₹2,15,66,000

11	Formwork — columns, beams, slabs	—	LS	—	₹4,02,21,850
◆ MASONRY WORKS					
12	Brick masonry ext. walls 230mm — 6 floors	1,657	cu.m	₹5,200	₹86,16,400
13	Brick masonry int. partitions 115mm	306	cu.m	₹4,800	₹14,68,800
◆ PLASTERING& FLOORING					
14	Cement plastering — ext. + int. + ceiling	—	LS	—	₹75,74,050
15	Vitrified floor tiles 600×600mm — 6 floors	35,117	sq.m	₹1,200	₹4,21,40,400
16	Anti-skid tiles & terrace WP	—	LS	—	₹52,78,900
◆ DOORS, WINDOWS & SHUTTERS					
17	Aluminium doors, shopfronts, flush doors	—	LS	—	₹21,24,000
18	UPVC windows & ventilators	180	nos	₹8,500	₹15,30,000
19	Rolling shutters for shops	40	nos	₹18,000	₹7,20,000
◆ ELECTRICAL& MECHANICAL SERVICES					
20	Internal electrical (wiring, DB, fixtures)	3,60,000	sq.ft	₹85	₹3,06,00,000
21	Internal plumbing & sanitary	3,60,000	sq.ft	₹55	₹1,98,00,000
22	Fire fighting system	3,60,000	sq.ft	₹45	₹1,62,00,000
23	HVAC / Air conditioning	3,60,000	sq.ft	₹180	₹6,48,00,000
◆ LIFTS& ESCALATORS					
24	Passenger lifts (4 nos.) supply & install	4	nos	₹25,00,000	₹1,00,00,000
25	Escalators (10 nos.) supply & install	10	nos	₹35,00,000	₹3,50,00,000
◆ EXTERNAL WORKS (Provisional)					
26	Compound wall, gates & entry canopy	—	LS	—	₹5,00,000
27	External road, parking & drainage	—	LS	—	₹38,00,000
28	Landscaping & miscellaneous	—	LS	—	₹15,00,000
SUB-TOTAL (A to G)					₹41,78,17,760
Add: Contingency & Unforeseen (5%)					₹2,08,90,888
Add: Design / Consultant fees (2%)					₹83,56,355
Add: GST @ 18% on Civil + MEP works					₹7,89,67,557
GRAND TOTAL PROJECT COST					₹52,60,32,560
Cost per sq ft of BUA (360,000 sq ft)					₹1,461
Cost per sq m of BUA (33,444 sq m)					₹15,729

V. CONCLUSION

The construction technique for the commercial shopping complex is comprehensive, structured, professional, and effective in terms of planning, design, and estimation. The project site measuring 300 ft × 200 ft is optimally used by proposing a basement with G+5 floors comprising retail shops, circulation space, parking and service area. Choosing a site that is accessible and has strong infrastructure around it makes the site suitable for commercial use. Zoning of spaces in functional areas offers user convenience through easy circulation and optimum use of available land leading to improvement in efficiency of the complex. The design phase done via AutoCAD for building visualization and organization is an important part of the phase. The basement is basically for parking and utility services, with appropriate ramp slopes and circulation paths to avoid congestion. The shop organized in an efficient manner with vertical circulation, like stairs for easier use of the upper floors.

The use of building elements like doors, windows and ventilators of the right size ensure proper lighting, ventilation and safety. The aesthetics and performance of the building can also be improved through these design considerations.

The methodology of estimation is a significant part of the project with proper calculations for quantities and costs. The quantity take-off is done with the standard formula as per length, breadth and height in the SI unit. The Bill of Quantities includes a complete account of the construction activities which will be undertaken for construction work such as excavation, concrete, masonry, etc along their quantities, one carries out rate analysis by taking into account the cost of various materials, labor, transportation, overheads, etc to arrive at a realistic unit rate of each item. Also, according to the standard mix proportions, cement, steel, fine aggregate and coarse aggregates are estimated so that there is no wastage during execution.The abstract estimation signifies total project cost which is equal to the cost from the BOQ plus rate analysis. This helps in understanding the total financial requirement of the project and helps in budgetary allocation and decision making. The use of standard construction materials like OPC 53-grade cement, Fe500 steel, and graded aggregates ensure strength, durability and long-term performance of the structure. The project balances technical design with economic viability and practical implementation.

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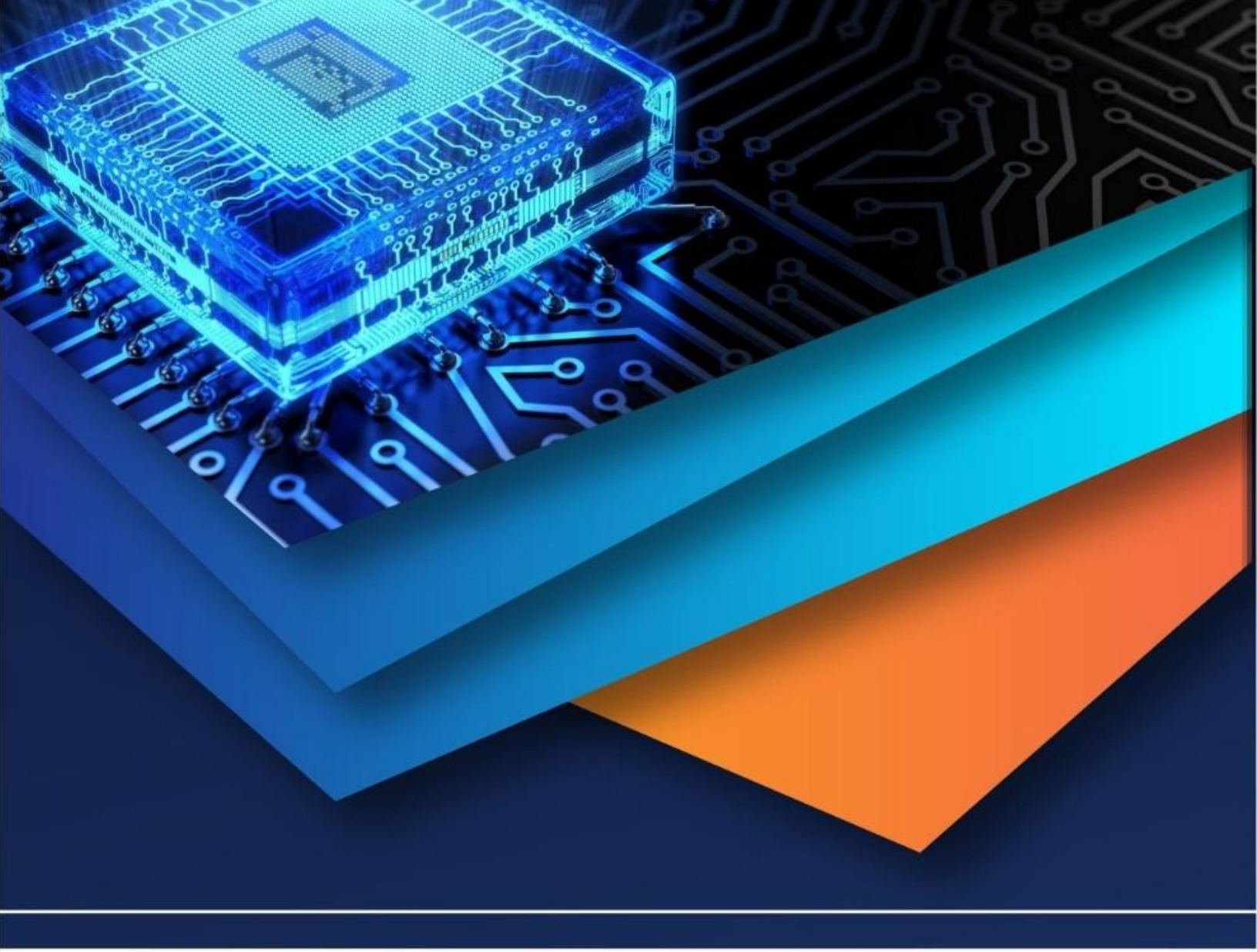

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