Dr. B.R. Ambedkar University

Rohini Campus

Arc 24511 – thesis Project

For Partial fulfillment of the requirement for the award of the degree of

BACHELOR OF ARCHITECTURE

BY

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The matter embodied in this project is a record of my own work. If, in future, it is found that the above statement is false, then I have no objection in withdrawal of Bachelor of Architecture Degree awarded to me by the Institute.

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1. DESIGN BRIEF

This report outlines the design brief for the proposed campus of Dr. B.R. Ambedkar University in Sector-3, Rohini, Delhi. The proposal is commissioned by the Public Works Department (PWD), Government of NCT of Delhi. The document details the project's scope, objectives, site characteristics, proposed spaces, and planning framework to ensure an inclusive, sustainable, and high-performance educational environment.

1.1 Proposing Agency

Public Works Department (PWD), Government of NCT of Delhi.

1.2 Project Overview

The new campus of Dr. B.R. Ambedkar University, Delhi, is envisioned as a state-of-the-art academic facility that fosters interdisciplinary education, social justice, and sustainability. Located in an urban setting at Sector-3, Rohini, the campus will address the educational needs of over 3,500 full-time students, along with adequate provision for faculty and administrative staff. The design prioritizes energy efficiency, ecological sensitivity, and social inclusion.

1.3 Project Intent

The main intent of the project includes:

- Establishing a modern, world-class academic campus.
- Promoting interdisciplinary learning and innovation.
- Designing energy-efficient and GRIHA 5-Star compliant infrastructure.
- Strengthening community outreach and connectivity.
- Supporting holistic student development and faculty engagement.

1.4 Site Details

- Location: Sector-3, Rohini, Delhi-110085
- Total Site Area: 18 Acres (approx. 72,843 sq.m)
- Permissible FAR: 2.25
- Maximum Built-up Area Permitted: 1,60,875 sq.m
- Proposed Built-up Area (Phase I): 1,67,680 sq.m
- Surroundings: Institutional and residential zone with urban road access
- Land Use: Institutional (70%) and Residential (30%)
- Site Character: Rectangular, urban setting with topography

1.5 About the project

The upcoming Rohini Campus of Dr. B. R. Ambedkar University Delhi (AUD) is strategically located in Sector 3, Rohini, and spans across 18 acres. Designed to accommodate up to 3,500 full-time students, the campus will include hostel facilities for 900 students as well as 132 residential units for faculty and staff.

This integrated campus aims to foster a vibrant academic and cultural environment, equipped with a range of world-class infrastructure including:

- Auditorium, convention centre, seminar, and conference halls
- Library and student centre
- Indoor and outdoor sports facilities
- Health centre, guest house, and cafeterias
- Display and performance spaces
- Convenience/utility centre and crèche

The academic framework of the campus will house seven interdisciplinary schools:

- School of Undergraduate Studies
- School of Liberal Studies
- School of Development Studies
- School of Law, Governance & Citizenship
- School of Business, Public Policy & Social Entrepreneurship
- School of Education Studies
- School of Human Studies and Culture & Creative Expressions

In addition to the schools, the campus will host several specialized research and innovation centres, including:

- Centre for Research Methods
- Centre for Community Knowledge
- Centre for Future Studies
- Centre for South Asian Studies
- Centre for Psycho-Clinical Research
- Centre for Early Childhood Education & Development
- Centre for Development Practice
- Centre for Publishing
- Centre for Women's Studies
- University Centre for Innovation & Incubation of Entrepreneurship

1.6 Campus Capacity

The proposed campus is designed to accommodate:
• 3,500 full-time students
• 250 faculty members
• 248 administrative and support staff

1.7 Detailed List of Proposed Spaces

Institutional and Administrative Facilities are proposed to be built in the campus in three categories i.e. Central facilities at Campus level, Cluster level facilities and School level facilities.

1.7.1 Central Facilities

The Central Facilities are shared spaces designed for the entire campus community and include the Library & IT Complex, Auditorium/Convention Centre, Media Labs, Exhibition Centre, Student Centre, Cafeteria, Sports Centre, and the Administrative Block. These facilities will be

used by all Schools and Centres of the university and are expected to function 24 hours a day, 7 days a week. Due to their significance and continuous usage, their placement within the campus must be carefully planned to ensure accessibility and convenience for all users.

Sr. No.	Infrastructure	Facilities	Proposed Area (sq.m.)
i)	Administrative Block	To house offices of the VC, PVC, Registrar, CoF, Deans of Functional Divisions (Academic Services, Student Services, AES, Planning, Research, International Partnerships) and other related offices – 50% of the total staff strength (50% of 230)	3500
ii)	Library and IT Complex	Will provide book-storage facilities, reading spaces with computer terminals and offices for library services and staff – 2 lakh books	10500
iii)	Auditorium Complex	To house an auditorium (500 persons), Committee / meeting / Seminar rooms of 50 (2 nos.)/150 (2 nos.) persons capacity	4000
iv)	Student Centre	To provide space for student related activities, reading rooms, Placement office, recreation rooms, indoor sports and lockers etc. (350 students)	1000
v)	Exhibition Centre	For exhibitions	500
vi)	Cafeteria	Canteen facilities for 350 Students/ Staff/ Visitors	2000
vii)	Convenience/ Utility Centre	Shopping Centre, Food Courts, Bank, ATM, Post Office, Book & Stationery stores, etc.	750
viii)	Faculty Centre/Club	Meeting halls for informal gatherings, dining rooms, indoor sports facilities, etc. – 100 persons capacity	500
ix)	Health Centre	With OPD facilities and 6 beds for emergencies	250
x)	Covered Parking Block	Near the entrance with sitting space for drivers	100
xi)	University Crèche	Capacity for 50 children	250
xii)	Maintenance Office	For day-to-day maintenance of the entire campus. Will house electric sub-station; AC plant, lifts, civil, electrical, horticulture, plumbing, water supply, firefighting and other services.	2000
xiii)	Sports Centre	The Sports Centre will have Indoor/Outdoor sports facilities	1000
xiv)	Basement Parking and Service Area	Parking and service area	31680

Table 1 : Central Facilities at Campus Level

1.7.2 Cluster level facilities

The Schools and Centres of the university serve as the core spaces for teaching, learning, and research activities. To promote academic synergy and optimize spatial efficiency, schools with epistemic (knowledge-based) congruity will be grouped into functional clusters.

Shared Infrastructure: Schools and Centres within a cluster will share common facilities, such as seminar halls, lounges, meeting rooms, and labs.

- **Non-Exclusive Instructional Spaces:** Classrooms and instructional spaces will be centrally managed and not assigned exclusively to any individual school, promoting flexibility and efficient use.
- **Cross-School Interactions:** Clustering encourages academic intermixing between students and faculty across disciplines, fostering a multidisciplinary learning environment.
- **Optimized Space Utilization:** The cluster strategy ensures maximum use of shared resources, reducing redundancy and increasing sustainability.

The proposed development includes the following facilities:

Academic Clusters (Two blocks):
•Total Built-up Area: 47,550 sq.m
• Components: Classrooms, labs, studios, seminar halls, faculty lounges, utility areas.

Sl. No.	**Infrastructure**	**Facilities**	**Total Proposed Area (sq.m.) for 2 clusters**
i)	Classrooms	Standard sizes of 30/60/120 students capacity (60% of the students strength)	10000
ii)	Computer Labs./ IT / Research Rooms	To house Project staff, Research Fellows, PhD students, Classrooms, etc. 20% capacity of total students strength in modules of 50 persons each	5500
iii)	Committee Rooms	2 rooms of 75 capacity each with audio-visual and other conference facilities in each cluster	800
iv)	Faculty Rooms	Similar facilities in all faculty rooms i) 100% rooms for Regular & Visiting Faculty ii) 10% extra capacity for transit faculty from other AUD campus and from local institutes	5000
v)	Faculty / Staff Lounge	Sitting and retiring spaces, changing rooms and pantry, etc. for 50 persons in each cluster	500
vi)	Staff Rooms	Servicing common facilities in the cluster – 25% of total staff strength	800
vii)	Utility Rooms	Photocopying/printing/scanning/pantry services for faculty and staff	800
viii)	Student Common	Reading rooms with computer terminals; recreation room	800
ix)	Security Office, Maintenance, Staff Offices	For round the clock security and maintenance	800

xii)	Workshops/ Studios and Laboratories	Workshops, Studios and Laboratories (Some of these spaces might require specialized consultants with respect to design and operational needs of these studios)	22500
		TOTAL AREA	47550

Table 2 : Facilities at Cluster Level

- Faculty: Student Ratio (1:15)
- Admin Staff is 1/2 of total faculty strength
- Project staff is 8 per centre + 1/4th per faculty

Clusters	**Schools and Centres**	**Number of Students**	**Number of Faculty**	**Admin Staff**	**Project Staff**
R1.1	School of Undergraduate Studies (SUS)	1000	65	32	30
R1.2	School of Liberal Studies (SLS)	660	44	22	8
R1.3	Centre for Law and Governance	140	9	4	8
R1.4	Community Outreach Programme (COP)		3	2	8
R1.5	Centre for Publishing		3	2	8
Subtotal R1	Sub-total	1800	124	62	54
R2.1	School of Business Public Policy and Social Entrepreneurship (SBPPSE)	565	38	19	32
R2.2	School of Educational Studies (SES)	510	34	17	
R2.3	School of Human Studies (SHS)	580	39	19	
R2.4	School of Culture and Creative Expressions (SCCE)	20	2	1	
R2.5	ACIIE		3	2	8
R2.6	CPCR		3	2	8
R2.7	CECED		3	2	8
R2.8	Centre for Women Studies		3	2	8
Subtotal R2	Sub-total	1675	125	56	36
Total (R1+R2)	Total	3475	249	126	122

Table 3: Cluster-wise Staff & Student Allocation

1.7.3 School/ Centre level facilities

Every School will have a Dean/Director's complex, Documentation Centre and Stores etc.

Sl. No.	Infrastructure	Facilities	Proposed Area (sq.m.)
i)	Dean/Director Office Complex	Dean's / Director's office, Visitors' lounge, Office for Dean's / Director's staff, Meeting room for 10 persons, Common facilities like pantry, bathrooms, etc	550
ii)	Documentation Centre	Photocopying, Project work	300
iii)	Store	Supplies and Stationary	150

Table 4 : Dean/Director Office and Support Facilities

1.8 Residential Zoning

The "Residential Zone" of the Rohini Campus will cover approximately "25% of the total plot area". It has been carefully planned to accommodate:

- Student Hostels (for both girls and boys, with a mix of single and double occupancy),
- Faculty Hostels, and
- Residential units for faculty and staff.

The housing layout is envisioned to promote a non-hierarchical and inclusive community, encouraging intermixing of faculty and staff residences with shared community resources.

1.8.1 Common Facilities Proposed within the Residential Zone:

- Community Centre
- Guest House
- Faculty Transit Accommodation
- Convenience Centre
- Maintenance Office
- Electrical Substation

1.8.2 Breakdown of Residential Typologies:

- Faculty Housing – 50% of the total residential capacity
- Staff Housing – 30% of the total residential capacity
- Student Hostels – 25% of the total residential capacity

Gender Ratio: Girls: Boys =2: 1
Programme Ratio: Postgraduate (PG): Undergraduate (UG) = 1: 1
PG Students – Single occupancy rooms
UG Students – Double occupancy rooms

Refer Table 5a and 5b for detailed area allocation and housing layouts.

SI. No.	**Faculty & Staff**	**Students Hostel – 600 Rooms**			
	Houses (2/3/4/5/6 Type)	**UG (D) Girls**	**PG (S) Girls**	**UG (D) Boys**	**PG (S) Boys**
Rohini	35/35/30/10/2	200	200	100	100
Total	112	200	200	100	100

Table 5 : Facilities at Residential Colony and Hostels

SI. No.	Infrastructure	Facilities
i)	Community Centre	With a multi-purpose Hall, indoor games, and kitchen facilities, etc. (1500 sqm)
ii)	Guest House	A 10-room Guest House (750 sqm)
iii)	Faculty Transit Accommodation	A 20-room facility for Faculty with double room sets, attached to the Guest House using common facilities (1500 sqm)
iv)	Convenience Centre	Shops, Bank, ATMs, Post Office, etc. (500 sqm)

Table 6 : Common Facilities

1.9 Regulations and Development Controls

The total area of the Rohini plot of AUD is 7.3 hectares (73,000 sqm) According to the prevalent by-laws in Delhi, the plot area is earmarked as:

- Area reserved for Institutional use 70%
- Area reserved for Residential use 30%

Current FAR: 2.25

Total built up area permissible at the Rohini plot: 1, 60,875 sqm

Almost 85% of the permissible built-up area will be broadly utilized as under:

- Institutional Areas 90,000 sqm
- Residential Areas 46,000 sqm
- Basement, Parking, and service area 31,680 sqm (built-up area not included in FAR)

Total Area (Phase I) 1,67,680 sqm

Total built-up area for which Comprehensive Planning must be done by the consultant is

1,67,680 Sqm.

1.10 Site Details

Introduction

- The **site of the new AUD campus** is in Rohini DDA Phase-I Scheme, Delhi, being developed by the **Delhi Development Authority (DDA)**.
- The **total plot area** is **7.3 hectares**.
- The site is free from all encumbrances, with **no overhead power lines** or other obstructions.

1.10.1 Features and Details of the Site

(i) Location and Connectivity

The site is in the western part of Delhi, within an already developed urban neighborhood. It is well connected through:

- The site is well connected to - Outer Ring road – 0.6 km
- Metro station – Rohini East - 2.4 km , Rohini West - 3.1 km , Pitampura - 3.1 km
- New Delhi Railway Station – 15 km
- IGI International Airport - 19.6km
- Bus stands nearby are Pushpanjali Enclave Bus Stand, Kali Mandir Bus Stand, Naharpur Village Bus Stand, Rohini Sector -7 Bus Stand.

(ii) Infrastructure

- External roads, sewerage, and storm water drainage are already in place in Rohini.
- All internal services of the AUD campus will be connected to existing DDA-laid infrastructure.

(iii) Site Context – Sector-3, Rohini

- The AUD plot in Sector-3 measures 7.3 hectares.
- A 13.5-metre-wide public road runs almost centrally through the site, dividing it into two parts.
- This road will remain public and accessible to the neighboring population and maintenance agencies.

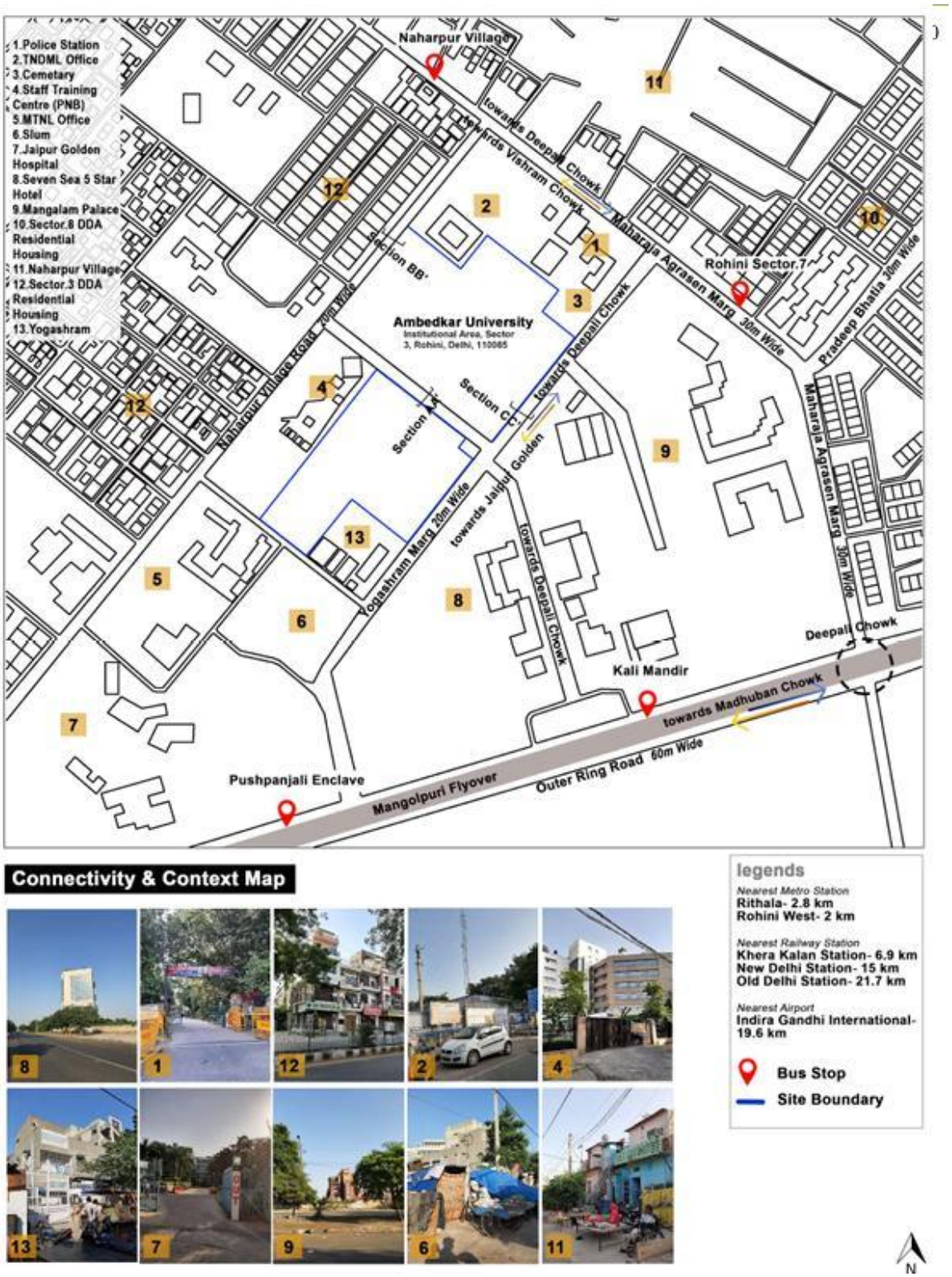


Figure 1 Site Location Map with context and connectivity

Site Plan and Dimensions:

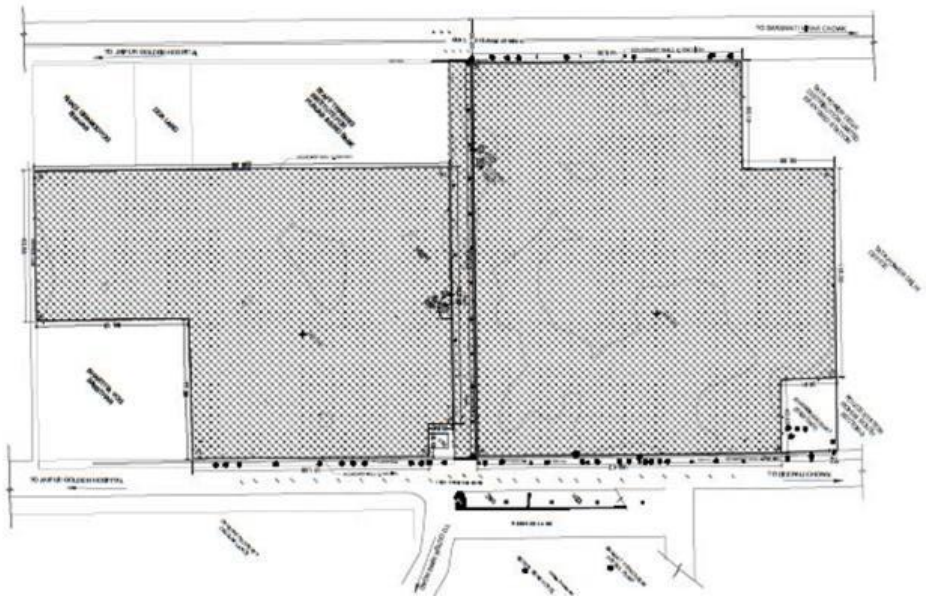


Figure 2 Site drawing given in tender

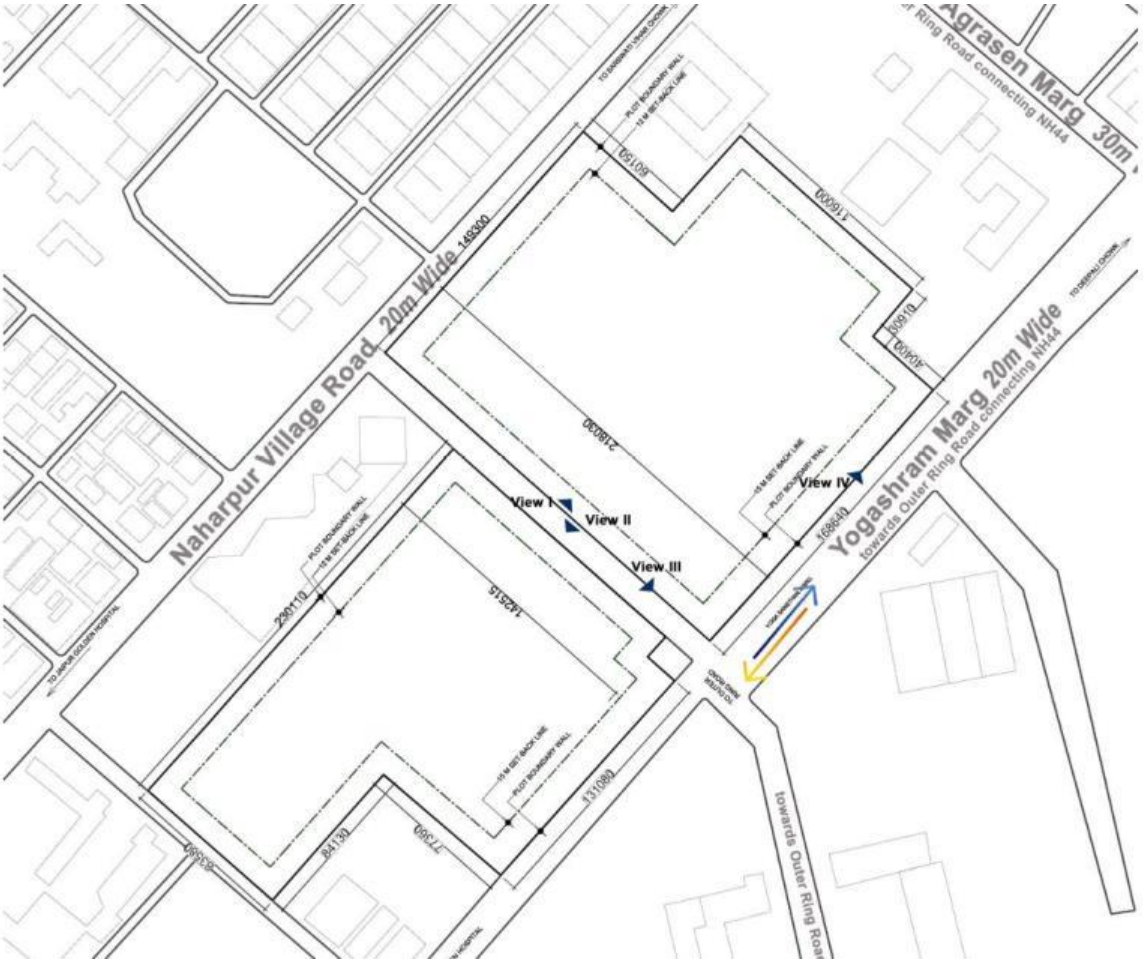


Figure 3 Site with dimensions

2. Literature Survey

A **literature survey** is a critical foundation for any architectural design project, especially for a complex institutional campus. It helps gather and review existing knowledge, standards, regulations, and case studies relevant to campus planning. By referring to sources like the National Building Code (NBC), Neufert, TSS, and GRIHA guidelines, it ensures the design meets functional, safety, and sustainability requirements. The survey also aids in understanding space standards, user needs, and contextual factors, allowing designers to make informed and justified decisions. Ultimately, it strengthens the overall design approach by aligning it with best practices, ensuring compliance with byelaws, and encouraging innovation through the identification of design opportunities.

Etymology

The term **"Institutional Campus"** is composed of two historically significant words: *"institutional"* and *"campus"*, both of which carry rich cultural and architectural connotations.

- The word **"institution"** originates from the **Latin term** *"institutio"*, meaning *"instruction, arrangement, or foundation"*. Its root verb *"instituere"* translates to *"to set up, establish, or educate"*. Over time, this evolved to refer to organized bodies or entities established for public service, particularly in domains such as **education, healthcare, research, justice, or governance**. The adjective **"institutional"** thus pertains to anything relating to such organizations and their structured systems.
- The word **"campus"** stems from the **Latin** word *"campus"*, literally meaning *"open field"* or *"flat expanse"*. The modern usage of the term began in the **18th century**, particularly in North America, where it was first employed to describe the **grounds of a university**. With time, the term came to represent the **entire physical layout** of any educational or research establishment, encompassing not only open land but also its buildings and infrastructure.

When combined, the phrase **"institutional campus"** refers to a **comprehensively planned and integrated physical environment** that houses and supports the various functions of an institution—be it educational, administrative, cultural, or scientific.

An **institutional campus** is much more than a collection of buildings; it is a **self-contained ecosystem** that enables and enhances the core functions of an institution. It is characterized by its **zoned planning**, **holistic integration** of built and unbuilt spaces, and its capacity to create a **sense of identity and community**.

Such a campus typically includes:

- **Academic Buildings** – classrooms, laboratories, studios, libraries, and seminar spaces
- **Administrative Areas** – offices for staff and faculty, management blocks, and service facilities
- **Residential Facilities** – hostels, faculty/staff quarters, and guest houses
- **Common Amenities** – canteens, health centers, auditoriums, amphitheatres, prayer halls

- **Recreational and Sports Facilities** – indoor and outdoor sports complexes, activity zones
- **Circulation and Connectivity** – internal roads, pedestrian paths, cycle tracks, transport nodes
- **Landscaped Open Spaces** – courtyards, gardens, parks, water features, and buffer green zones

Key Features and Characteristics

- **Zoning and Spatial Hierarchy**
  A successful institutional campus demonstrates **functional zoning** that separates and organizes areas based on use—academic, residential, administrative, and recreational—while ensuring ease of navigation and harmony.
- **Community and Cultural Identity**
  The architectural language of the campus often reflects the **vision, values, and identity** of the institution it houses. It becomes a **cultural landmark**, a space of collective memory and shared aspirations.
- **Sustainability and Ecological Integration**
  Modern institutional campuses increasingly follow **green building practices** (such as GRIHA or LEED standards). They include solar panels, rainwater harvesting, waste management systems, climate-responsive architecture, and landscape ecology to promote environmental responsibility.
- **Inclusive and Interactive Spaces**
  The design encourages **interdisciplinary interaction**, collaborative learning, and informal engagement through plazas, cafes, and open forums. These spaces support mental well-being and a vibrant academic life.
- **Adaptability and Growth-Oriented Planning**
  A well-designed campus accommodates **future expansion**, technological integration, and evolving pedagogical models. Its master plan often includes **phased development**, with provisions for new buildings or modules.
- **Transport and Accessibility**
  The campus is designed to be **easily accessible** via public transportation, internal shuttle systems, and barrier-free routes. Accessibility extends to persons with disabilities, ensuring universal design principles are respected.

Role and Significance in Architectural Planning

The institutional campus, in architectural terms, is a **microcosm of a well-functioning urban entity**. It embodies the principles of urban planning, sustainability, cultural symbolism, and human-centric design.

It is a space where the **built environment supports intellectual and social activity**, where architecture becomes a silent yet powerful enabler of knowledge, dialogue, and progress. Unlike commercial or residential campuses, institutional campuses have a **civic and public essence** — they are places of **collective purpose**, **long-term vision**, and **socio-cultural development**.

2.1 Historic Background of Institutional Campuses

Institutional campuses have evolved through centuries as centers of learning, governance, religion, health, and culture. Their development reflects the socio-political priorities and intellectual progress of each era.

- **Ancient Times**: The earliest forms of institutional campuses were religious or philosophical centers. In India, the **Takshashila** and **Nalanda Universities** (circa 5th century BCE) were sprawling residential learning campuses with lecture halls, libraries, and student hostels, functioning like modern-day academic campuses.
- **Medieval Period**: During this era, especially in Europe and parts of Asia, campuses were often associated with religious institutions. **Monastic complexes** and **madrasas** were established, combining education, residence, and spiritual life in a single walled compound.
- **Renaissance & Enlightenment**: Education began to diversify into secular domains such as art, science, and law. The rise of **autonomous universities** in cities like Bologna, Oxford, and Paris formalized the concept of a dedicated academic campus as a hub of research, thought, and social influence.
- **Colonial Era**: Colonizing powers introduced institutional campuses for administration, missionary work, and European-style education. In India, colleges like **Presidency College** and **Madras University** featured colonial architectural layouts and lush courtyards.
- **Post-Independence**: Institutional campuses evolved into symbols of nation-building. In India, iconic campuses like **IITs**, **IIMs**, and **JNU** were created with careful master planning—incorporating education, residence, culture, and recreation.
- **Contemporary Period**: Modern institutional campuses have become **multifunctional**, **sustainable**, and **inclusive**—integrating smart infrastructure, green building practices, and hybrid functions (academic + commercial + residential). Today's campuses serve not just as centers of knowledge, but also as **urban ecosystems**.

2.2 Types of Institutional Campuses

Category	Type of Institutional Campus	Primary Function	Example
Educational	University Campus	Higher education and research	JNU, Delhi University, Oxford University
	College Campus	Undergraduate and professional education	St. Xavier's College, Miranda House
	Technical/Engineering Campus	Technical, engineering, and scientific studies	IITs, NITs, IIITs
	School Campus	Primary and secondary education	DPS, Kendriya Vidyalaya
Administrative	Government Complex Campus	Governance and administration	Central Secretariat, Vidhana Soudha

Healthcare	Medical College + Hospital Campus	Medical education and healthcare delivery	AIIMS Delhi, PGIMER Chandigarh
Judicial	Judicial Complex	Legal education and justice system	Supreme Court Complex, Delhi High Court
Cultural	Museum and Archive Campus	Cultural heritage preservation and exhibition	National Museum, IGNCA
Religious	Monastery / Temple Complex	Religious learning and spiritual practice	Nalanda, Hemis Monastery, Vatican City
Scientific / R&D	Research and Innovation Campus	Advanced research, labs, and innovation hubs	ISRO Campus, BARC, IISc
Corporate / Hybrid	Institutional-Corporate Hybrid Campus	Education + Incubation + Industry tie-ups	Infosys Campus (Mysore), Amity University
Sustainable / Smart	Eco-Institutional Campus	Sustainability-focused, GRIHA/LEED rated	IIT Gandhinagar, TERI Gram Campus

Table 7 Type of institution

2.3 Users of an Institutional Campus

User Group	Description	Key Needs / Functions
Students	Primary users in educational campuses (school, college, university, etc.)	Classrooms, libraries, hostels, canteens, recreation areas, sports, healthcare, transport
Faculty / Teaching Staff	Professors, lecturers, instructors, and tutors	Offices, staff rooms, seminar halls, research labs, lounges, residential quarters
Administrative Staff	People managing operations, admissions, accounts, HR, etc.	Administrative blocks, record rooms, staff canteens, meeting areas
Non-Teaching Staff	Support staff like peons, security, cleaners, maintenance crew	Maintenance areas, restrooms, service entries, staff housing
Researchers	Postgraduate students, PhDs, scientists working in labs or departments	Research labs, archives, testing zones, collaborative spaces
Visitors	Parents, alumni, guest lecturers, examiners, consultants	Waiting lounges, reception areas, guest houses, exhibition halls
Vendors / Service Providers	Canteen workers, shopkeepers, delivery personnel, maintenance contractors	Commercial kiosks, service corridors, access to utilities, waste management areas
Healthcare Personnel	Doctors, nurses, medical support staff (for institutions with hospitals or clinics)	Medical blocks, emergency areas, staff resting rooms
Library and Archival Staff	Librarians, archivists, and technical support staff	Reading zones, cataloguing areas, digital media rooms
Transport and Security Staff	Drivers, guards, surveillance teams	Parking zones, checkposts, security cabins, surveillance rooms
Residential	Families of staff/faculty and	Staff quarters, hostels, recreational

Community	residential students	areas, internal transport
Event Participants	Attendees of workshops, seminars, fests, or public outreach	Auditoriums, multipurpose halls, open-air spaces, parking facilities
External Stakeholders	Accrediting bodies, government authorities, donors, sponsors	Meeting/conference rooms, display areas, formal lounges

Table 8 User of an institution

2.4 Components of the Project

These are the major physical and functional components that make up the institutional campus:

1. Academic and Research Facilities

- Schools (7 interdisciplinary schools)
- Research and innovation centres (10+ specialized centres)
- Classrooms, lecture halls, seminar rooms, studios
- Laboratories and workshops
- Faculty rooms and lounges
- Student commons and reading areas

2. Central Facilities

- Library & IT complex
- Auditorium and convention centre
- Media labs, exhibition centre
- Student centre
- Cafeteria and food courts
- Health centre and crèche
- Administrative block
- Maintenance and service facilities

3. Cluster-Level Facilities

- Shared classrooms and labs
- Committee rooms and seminar halls
- Staff rooms, lounges, utility spaces
- Security and maintenance hubs
- Studios, workshops, project rooms

4. School/Centre-Level Facilities

- Dean/Director's office complex
- Documentation centres
- Stores and supplies rooms

5. Residential Facilities

- Student hostels (PG & UG, single/double occupancy)

- Faculty and staff housing (various typologies)
- Transit accommodation and guest house
- Residential community facilities (community centre, convenience stores)

6. Sports and Recreation

- Indoor and outdoor sports complexes
- Recreation zones in academic and residential areas

7. Mobility & Infrastructure

- Circulation routes (pedestrian, vehicular, service)
- Parking (surface, basement)
- Entry/exit nodes and security posts
- Substations, HVAC, firefighting, and utility networks

2.5 Major Design Considerations for an Institutional Campus

1. Zoning and Spatial Organization

A coherent zoning strategy forms the backbone of the campus master plan.

- **Academic, residential, administrative, and recreational zones** must be logically arranged to minimize conflicts and maximize connectivity.
- Academic clusters should be **grouped based on functional and interdisciplinary relationships**, promoting collaboration among schools and centres.
- Spatial hierarchy should distinguish between **public, semi-public, and private zones** to control movement and ensure safety.

2. Accessibility and Universal Design

- Design must serve all users—including those with disabilities—with dignity and ease.
- Ensure **barrier-free access** to all areas through ramps, lifts, tactile paths, and signage as per the **National Building Code (NBC)** and **Universal Design principles**.
- Proximity to public transportation (metro stations, bus stops) should be supported with **safe pedestrian approaches**, drop-off points, and bicycle lanes.
- Residential zones should be **safe and walkable**, especially for female and differently-abled students.

3. Sustainable and Climate-Responsive Design

- Sustainability must be integrated at the conceptual, architectural, and infrastructural levels.
- Design should aim for **5-Star GRIHA compliance**, incorporating:
- **Passive solar design**: North-south building orientation, sun-shading devices, insulation
- **Ventilation**: Cross-ventilation in classrooms, courtyards, and hostels
- **Energy efficiency**: Use of LED lighting, solar PVs, efficient HVAC systems
- **Water efficiency**: Rainwater harvesting, dual plumbing, low-flow fixtures
- **Waste management**: Segregation at source, composting, recycling areas

4. User-Centric Planning

The campus must accommodate a diverse and dynamic user base.

- Students (UG, PG, Research Scholars), faculty (regular, visiting), staff (admin, technical), researchers, and visitors all have unique needs.
- **Flexible and modular classrooms** should cater to various teaching styles (lectures, discussions, workshops).
- Hostel design must consider **gender ratio**, **occupancy types**, and **privacy needs**, with recreation areas, study zones, and common kitchens.
- **Community spaces** such as student centres, cafés, reading lounges, and plazas should encourage informal learning and social engagement.

5. Safety, Security, and Wellbeing

- Ensuring the physical and emotional safety of users is non-negotiable.
- Install **CCTV cameras**, security checkpoints, and street lighting across the campus.
- Emergency exits, fire stairs, extinguishers, and sprinklers must be in accordance with **NBC fire safety codes**.
- **Health centres**, mental health support, and first-aid posts should be centrally located and accessible 24/7.
- Zoning should discourage isolated areas; encourage **visual connectivity and passive surveillance** in all built and unbuilt spaces.

6. Circulation

Types of Circulation

- **Pedestrian Circulation**: Walkways, shaded paths, ramps, corridors.
- **Vehicular Circulation**: Entry/exit roads, internal loop roads, drop-off zones.
- **Service Circulation**: Dedicated routes for deliveries, waste collection, maintenance.
- **Emergency Circulation**: 6m wide access roads for fire and ambulance routes.
- **Vertical Circulation**: Staircases, elevators, ramps within buildings.
- **Cycle Circulation**: Bicycle lanes, parking stands, green mobility tracks.

2.6 Public/User Movement Patterns Inside an Institutional Campus

1. Student Movement Pattern

- **From Entrance to Academic Blocks**:
  - Entry through main gate → walkways/cycle paths → academic clusters.
  - High volume during morning and class changeover times.
- **Intra-campus Movement**:
  - Academic blocks ↔ Library, IT Centre, Seminar Rooms.
  - Academic blocks ↔ Cafeteria, Student Centre, Sports Complex.
- **Residential to Academic**:

- Hostel → pedestrian/cycle track → classrooms/labs.
- **Peak times**: 8:00–10:00 AM, 1:00–2:00 PM (lunch), 5:00–6:00 PM.

2. Faculty Movement Pattern

- **From Entry to Parking/Faculty Housing**:
- Entry → vehicle parking or faculty residences.
- **Academic Circulation**:
- Faculty lounge ↔ Classrooms ↔ Seminar rooms ↔ Meeting rooms.
- **Shared Facilities**:
- Access to admin block, canteen, faculty club, and sports centre.

3. Administrative Staff Movement

- **Entry → Administrative Block** directly.

- Internal flow: Admin block ↔ Registrar office ↔ VC/PVC/Deans' offices.
- Occasional access to meeting rooms, service areas, and document centers.

4. Visitors/Guests Flow

- **Entry → Security Checkpoint/Reception**.
- Directed flow to:
- VC/Registrar offices (for official visitors).
- Guest house (accommodation).
- Auditorium/exhibition/gallery (for public events).
- Temporary access to student or faculty areas (supervised or with pass).

5. Researcher/Project Staff Flow

- **Entry → Cluster Zones/Research Labs**.
- Access to:
- Library, labs, seminar halls, data centres.
- Flow between academic cluster and innovation centre/university incubation unit.

6. Service & Maintenance Flow

- **Separate service entry** (rear or side of campus).
- Movement to:
- Maintenance office, utility block, HVAC area, crèche, kitchen.
- **Non-intersecting with student/faculty zones** during peak hours.

7. Health/Emergency Movement

- **From any point → Health Centre/First Aid**.
- Ambulance access through **dedicated emergency route**.

- Staff movement between health centre and residential/admin areas.

8. Recreational and Informal Movement

- Students/faculty move:
  - Academic block ↔ Cafeteria ↔ Library ↔ Amphitheatre ↔ Sports fields.
- Encourages **casual interaction**, learning beyond classroom.
- Flow often **spreads across green courts and open plazas**.

9. Event-Based Public Movement

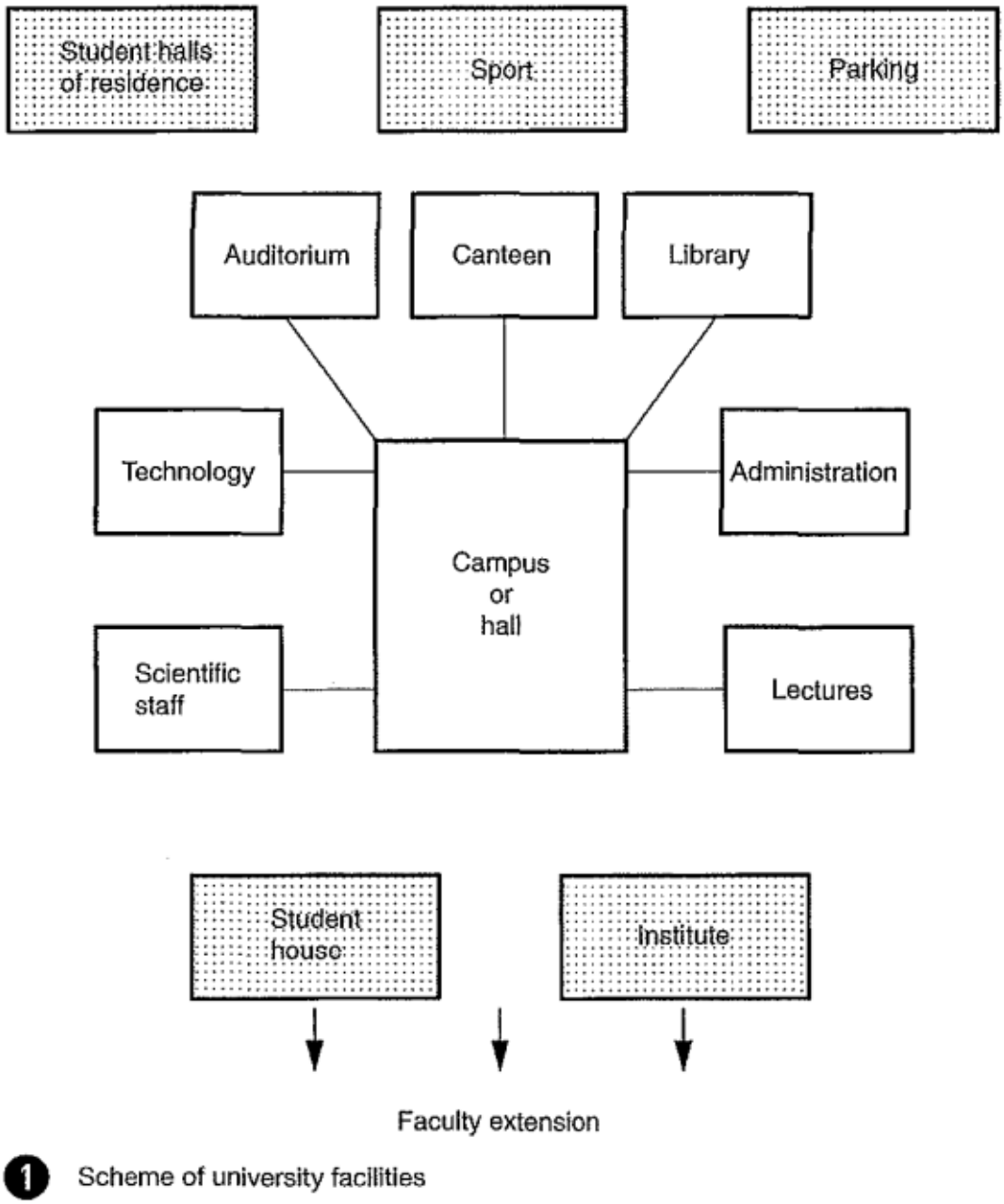
- **Guests, participants, or public** flow to:
  - Auditorium, Convention Centre, Exhibition Halls.
- Designated **visitor parking**, **pre-function areas**, and **controlled access** zones.

2.7 Lecture Theatres:

Central university facilities include: great hall, event hall, administration, deanery and student union. Also prominent are libraries, canteens, sports facilities, car parks and student residences (~ p. 167}.

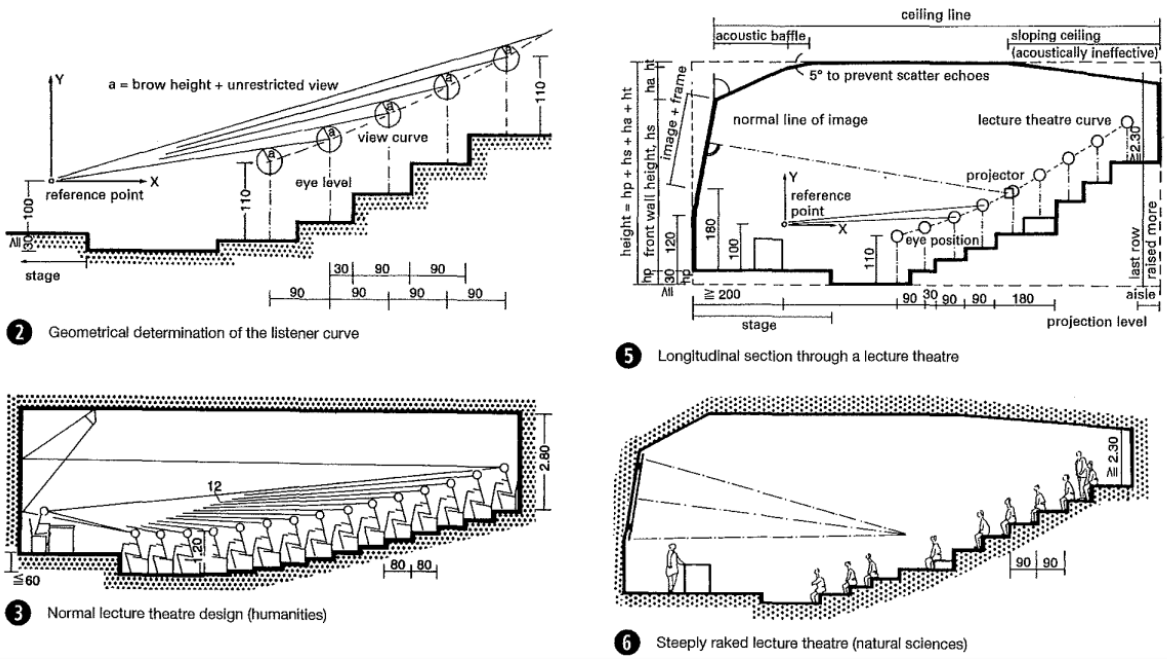
Basic space requirements for all subjects Lecture theatre for basic and special lectures, seminar and tutorial rooms (partially with PC workplaces) for detailed instruction of the course material, specialised libraries, rooms for scientific assistants, conference and examination rooms.

Space requirements for specific subjects: Humanities: lecture theatre with seating raked (rising) at a low pitch ~ 3. No particular requirements for blackboards or projection. Technical and artistic subjects: e.g. architecture, art, music: drawing, studio, workshop, practice and meeting rooms of all types. Technical and natural science subjects: e.g. physics, mechanical engineering, electrical engineering: drawing rooms, laboratories, workshops. Natural science and medical theory subjects: e.g. chemistry, biology, anatomy, physiology, health care, pathology: laboratories with associated practical rooms, scientific workshops, animal keeping and experiment rooms. Medical demonstration ('anatomy') theatres with steeply raked seating ~ 4. Natural science lecture theatres with experiment benches and steeply raked seating ~ 6). (Neufert)



1 Scheme of university facilities

Figure 4 Layout



2 Geometrical determination of the listener curve

5 Longitudinal section through a lecture theatre

3 Normal lecture theatre design (humanities)

6 Steeply raked lecture theatre (natural sciences)

4 Lecture theatre for demonstrations on a bench (medicine)

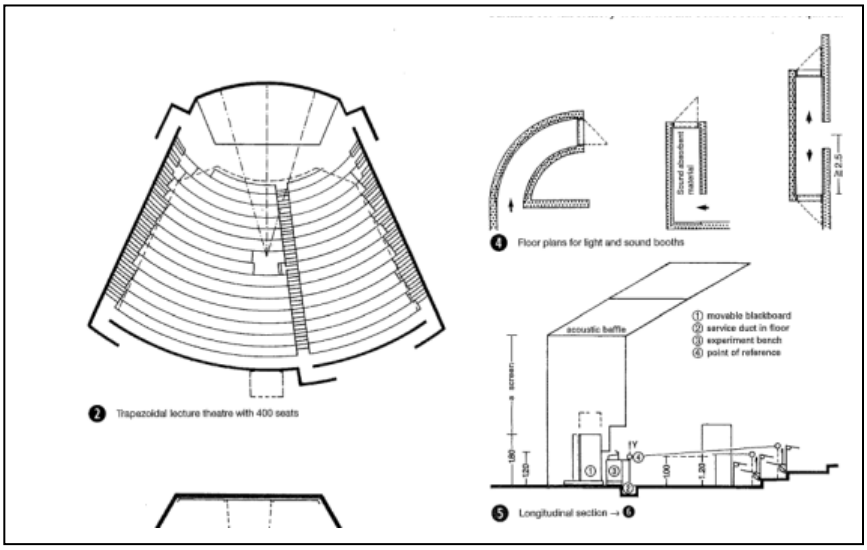
7 Steps in life drawing class with seated area of 0.65 m² per student (technical artistic subjects)

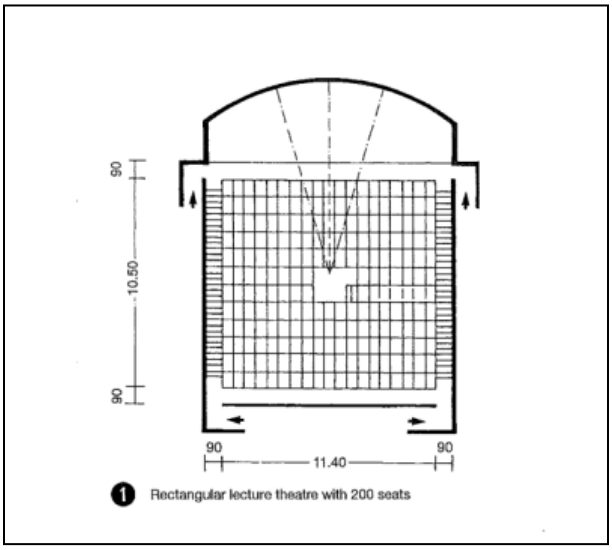
Figure 5 Seating Dimensions of lecture hall

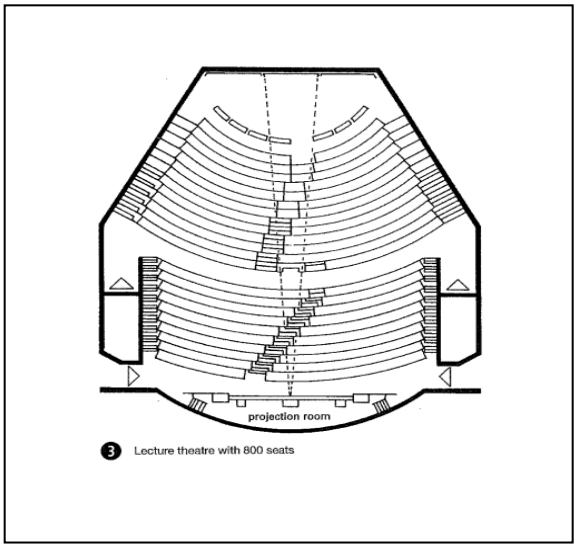
Larger lecture theatres for central lectures are preferably accommodated in auditorium buildings, and smaller lecture theatres for specialist lectures in institute or seminar buildings. Access to the lecture theatre is best separated from the research facilities, with the shortest possible route from outside to the back of the lecture theatre (in the case of raked seating, entrances behind the uppermost row, or in larger lecture theatres also at the side at middle height (3)

Lecturers enter the lecture theatre at the front, from the preparation room, and experimental apparatus can be rolled into the theatre. Common lecture theatre sizes are 100, 150, 200, 300, 400, 600, 800 seats. Lecture theatres with up to 200 seats, ceiling height approx. 3.5 m can be integrated into an institute building; larger theatres should ideally have their own building. Experiment benches should be

easily changeable, on wheels and suitable for laboratory work. Media connections are required. (Neufert)







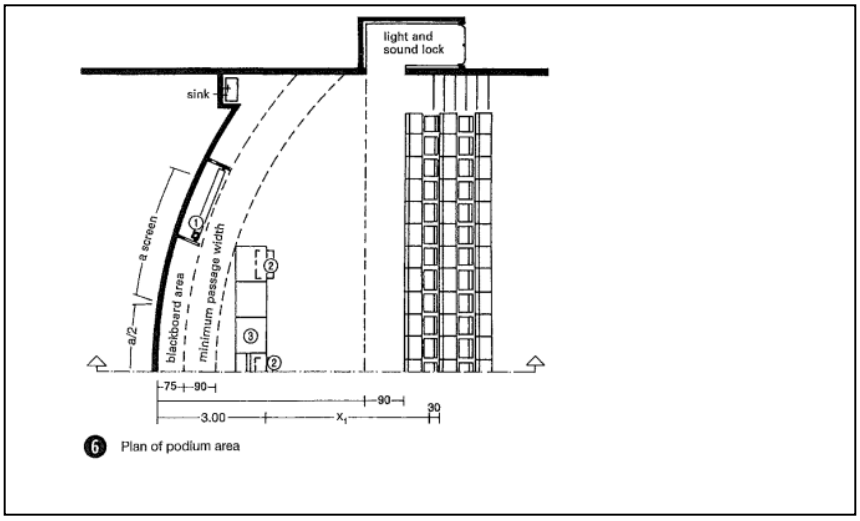
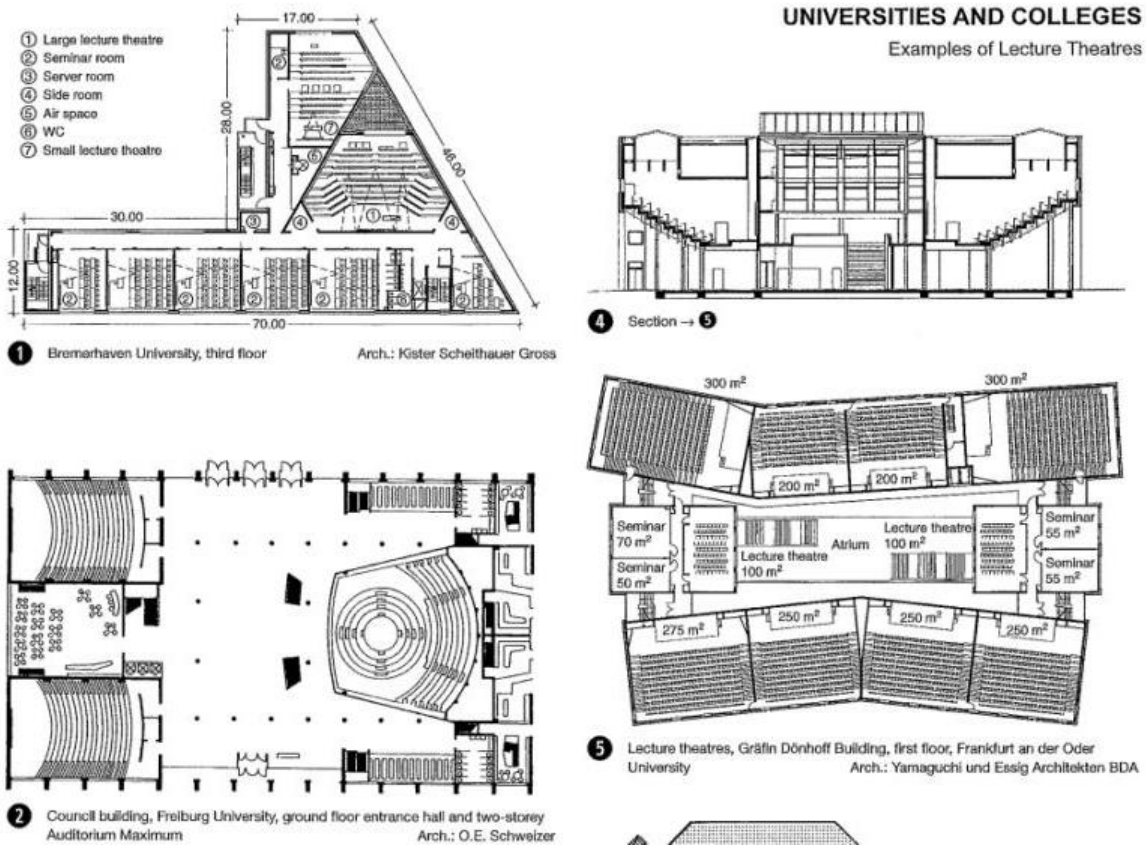


Figure 6 Different shapes of lecture hall



① Bremerhaven University, third floor Arch.: Kister Scheithauer Gross

② Council building, Freiburg University, ground floor entrance hall and two-storey Auditorium Maximum Arch.: O.E. Schweizer

⑤ Lecture theatres, Gräfin Dönhoff Building, first floor, Frankfurt an der Oder University Arch.: Yamaguchi und Essig Architekten BDA

Figure 7 Example of Lecture Theater

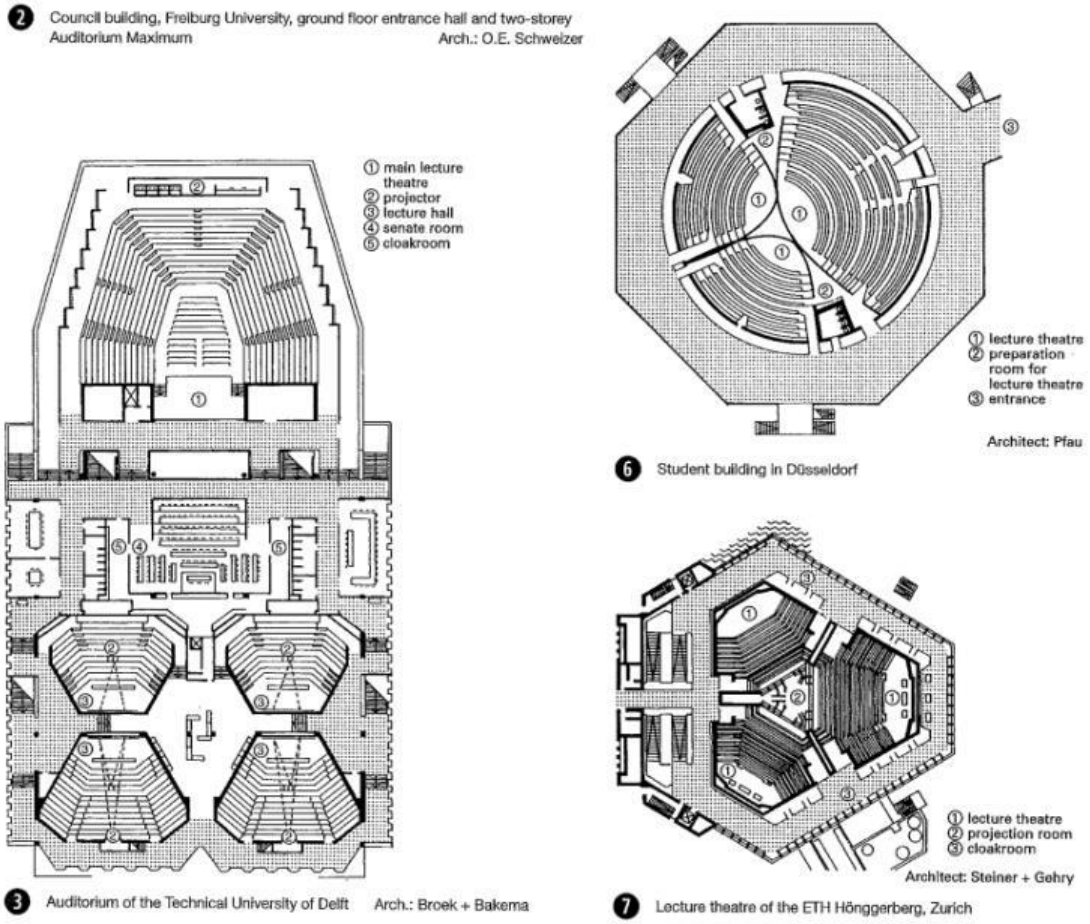


Figure 8 Examples of lecture theatre

2.1.7 Seating and Projection

Lecture theatre seating

Combined units with tip-up or slewing seat, backrest and desk (with shelf or hook for case or bag), mostly fixed mounting ~ 1 - 3. Arrangement is according to subject, number of students and type of tuition: from light (slide shows, electro-acoustic facilities) to heavy. Some lecture theatres (surgery, internal medicine, physics) have raked (rising) rows of seating ~ 1. The space requirement per student depends on type of seating, desk depth and floor pitch. Per student (including all walking areas in larger lecture theatres in a cramped situation), the space requirement is 1.10 m2, in smaller lecture theatres and in a normal situation 0.80-0.95 m2

• Projection, boards, acoustics, lighting: Projection screens and black-/whiteboards can be designed as segmented surfaces, or fixed to a straight back wall. Wall boards in many sections, mostly vertically sliding, manual or mechanical, can be dropped down below the projection area. Wheeled boards or screens are also possible. Speech should reach the listener as uniformly as

possible, with no disturbing echo. Suspended ceilings will aid reflection and absorption. Rear walls should be clad with sound-absorbing material, other walls flat. Light intensity in windowless lecture theatres: 600 lx.

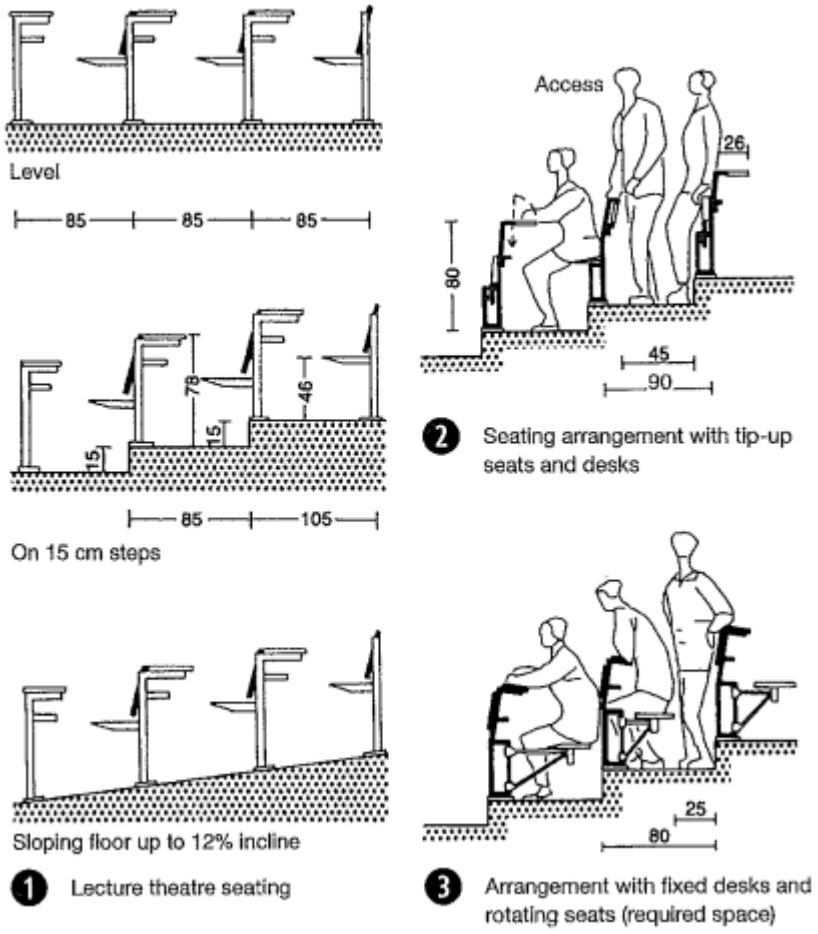
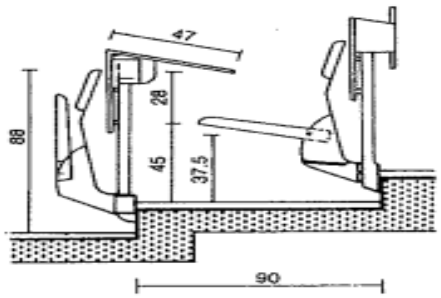
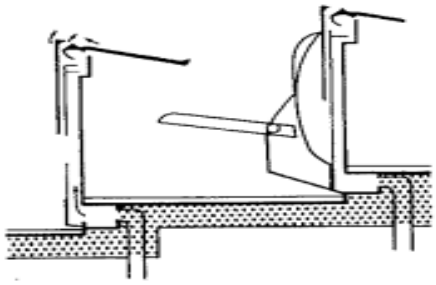


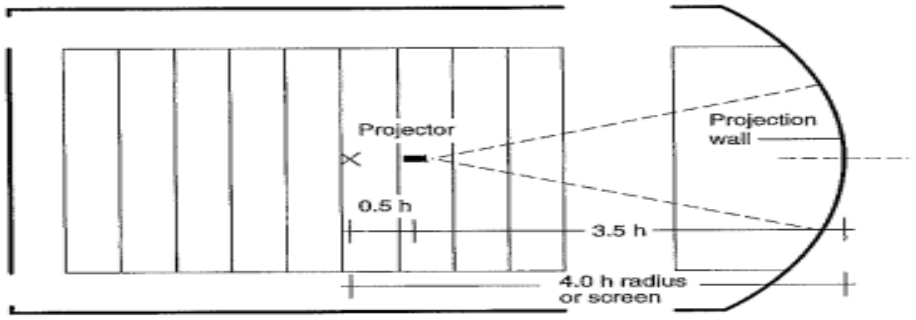
Figure 9 Seating dimensions of Lecture Theater



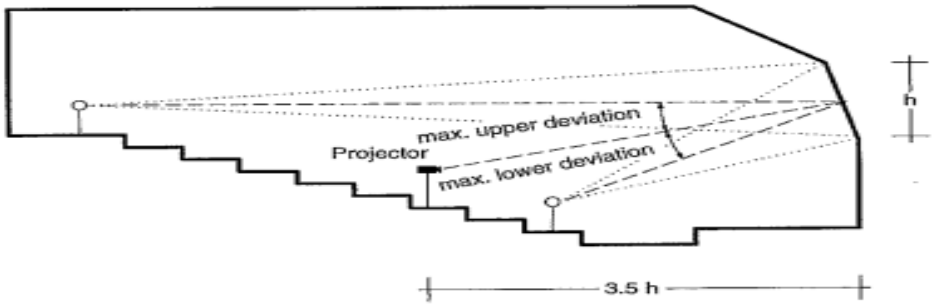
4 Lecture theatre seating /desk ventilation



5 Desk ventilation / air flow

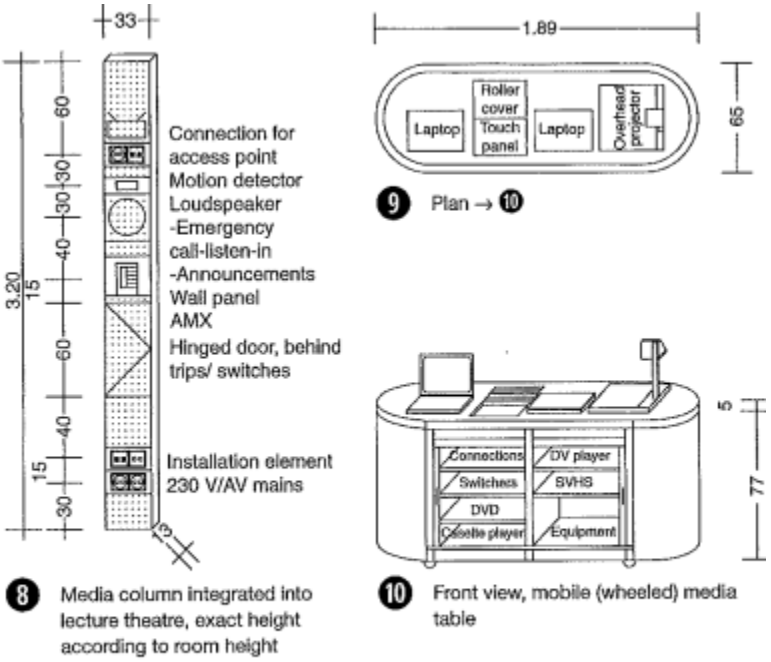


6 Layout of projectors, plan



7 Layout of projectors, section, showing distribution of the angle of inclined view to places above and below the projectors

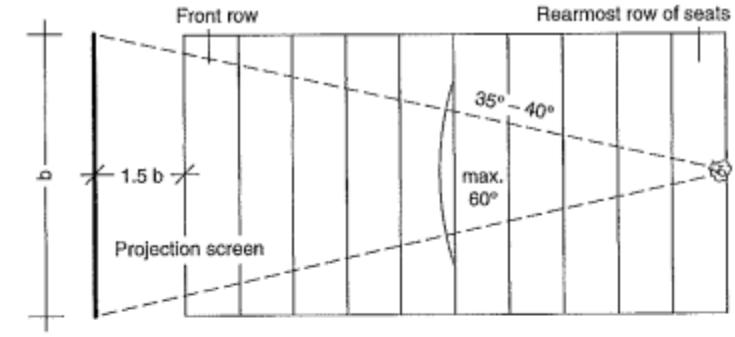
Figure 10 Projector Position



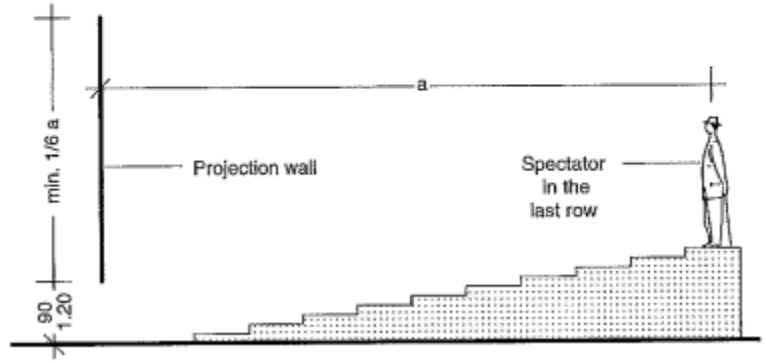
8 Media column integrated into lecture theatre, exact height according to room height

9 Plan → 10

10 Front view, mobile (wheeled) media table



11 Projection wall width dependent on length of lecture theatre, plan



12 Projection wall width dependent on length of lecture theatre, section

Figure 11 media details dimensions

2.8 Seminar and Service Rooms:

The design of lecture theatres and seminar rooms has to comply with the places of assembly regulations. It should also be ensured that wheelchair users have sufficient space in lecture theatres in line with standards.

Service rooms for lecture theatres.

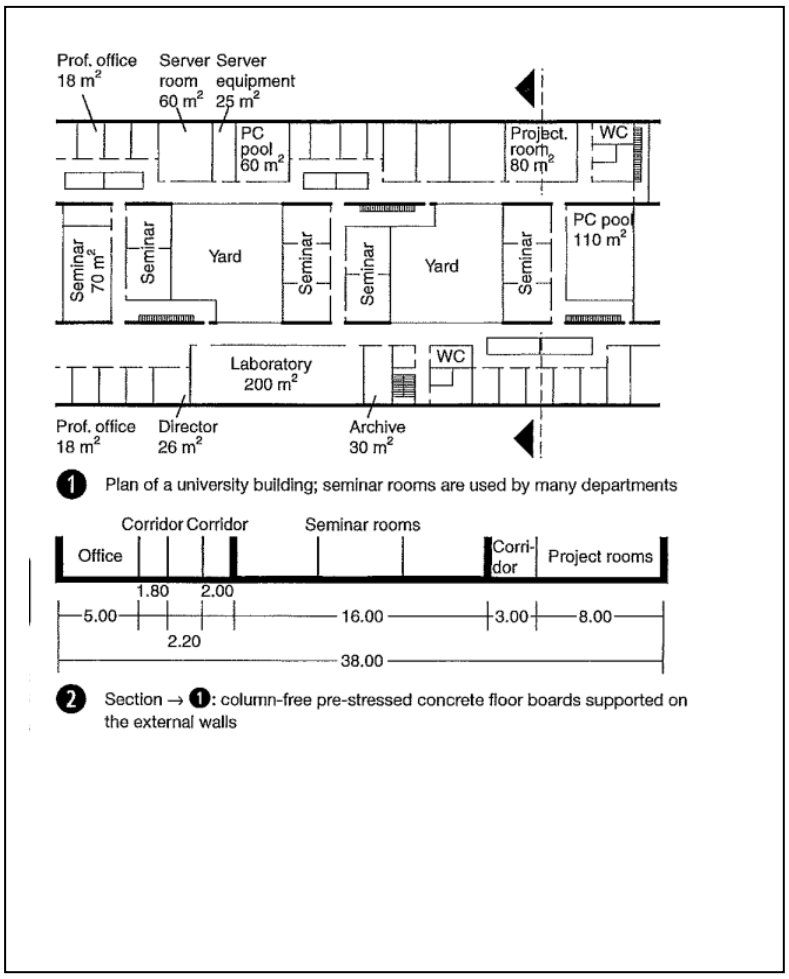
Every lecture theatre should have a directly accessible side room. This has no fixed function and can be used as a storage room. Sufficient preparation area should be provided next to all lecture theatres featuring experiments, positioned at the same level and with a short route to the podium. Guideline for the min. size: for rectangular plan lecture theatre, approx. 0.2-0.25 m2 /seat.

trapezoidal plan 0.15-0.18 m2/seat; natural science and pre-clinical subjects 0.2-0.3 m2/seat. Areas for storage and staff rooms are necessary for the proper operation of a lecture theatre building: a room for technical staff to maintain the facilities; for cleaning staff; storeroom for replacement parts, light bulbs, fluorescent tubes, black-/whiteboard, clothing etc. Min. size per room 15 m2; space required for all side rooms min. 50-60 m2.

- Computer room The size of the computer room is related to the number and size of the computer desks, which depends on the size of the displays.
- General tuition rooms Seminar rooms, usual sizes: 20, 40, 50, 60 seats; mobile double tables, width 1.20 m, depth 0.60 m, space required per student 1.90-2.00 m. Variable arrangement of the tables for tutorial and group work. If there is free ventilation from only one external wall, the depth of the room should not exceed 2.5 x clear ceiling height.

- Offices for scientific personnel - 5
  - professor 20-24 m2
  - scientific assistant 15 m2
  - assistant 20 m2
  - secretary 15 m2 (double occupation 20 m2)
  - Cloakroom and WC facilities
  - Rough estimate for both together: 0.15-0.16 m2/seat
  - Faculty and open-access libraries (-7 Libraries pp. 247 ff.)
  - Storage for 30 000-200 000 vols on open-access shelves.
- Book storage space -6)
  - Bookcases with 6-7 shelves, 2 m high (reaching height)
  - Distance between bookcases 1.50-1.60 m
  - Space required 1.0-1.2 m2/200 vols
- Reading places -7
  - Width 0.9-1.0 m/depth 0.8 m
  - Space required 2.4-2.5 m2 per place

Entrance control, with storage for cases/bags; catalogue, copier room



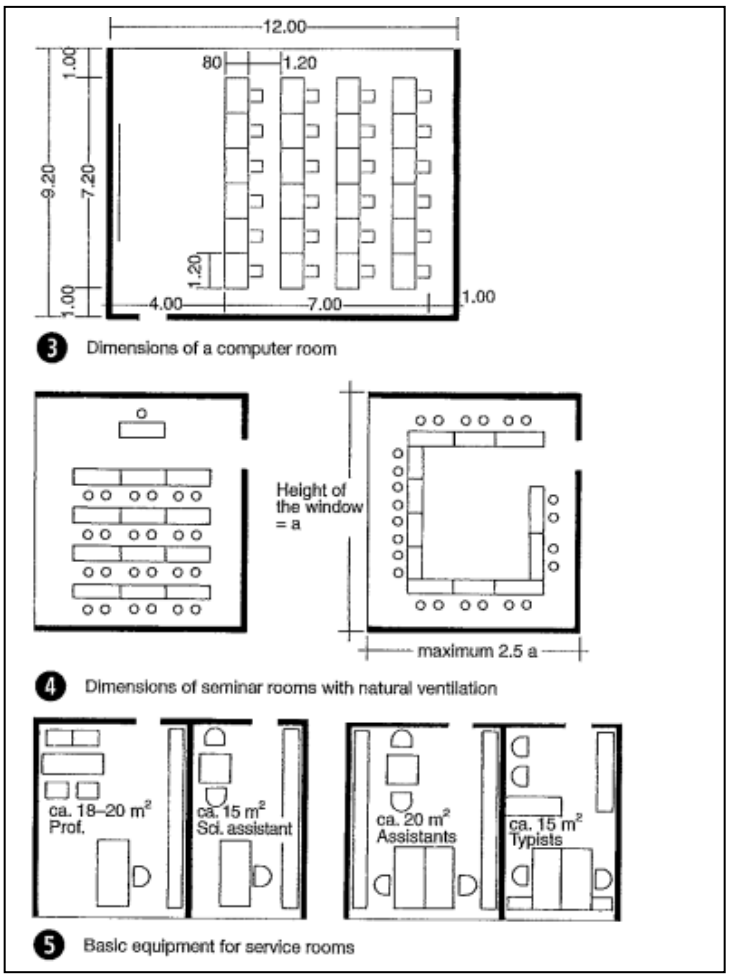


Figure 12 Dimension of seminar room

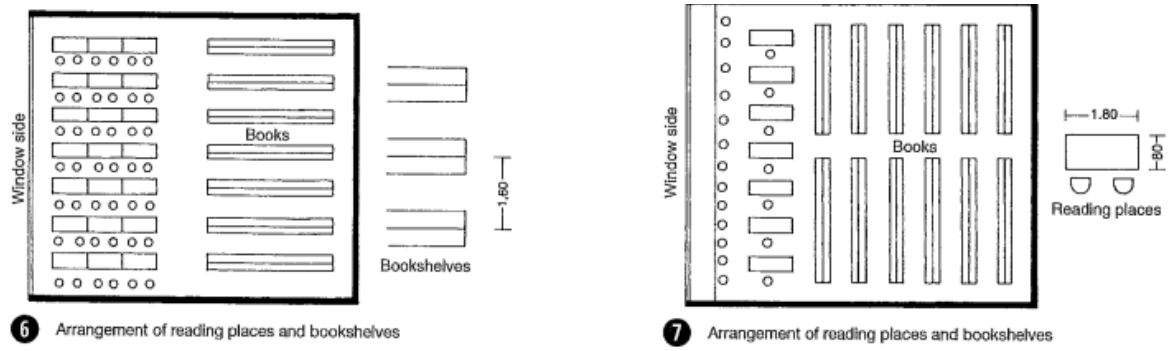


Figure 13 Arrangement of book shelves

2.9 Laboratories:

Laboratories differ according to use and subject. According to use:

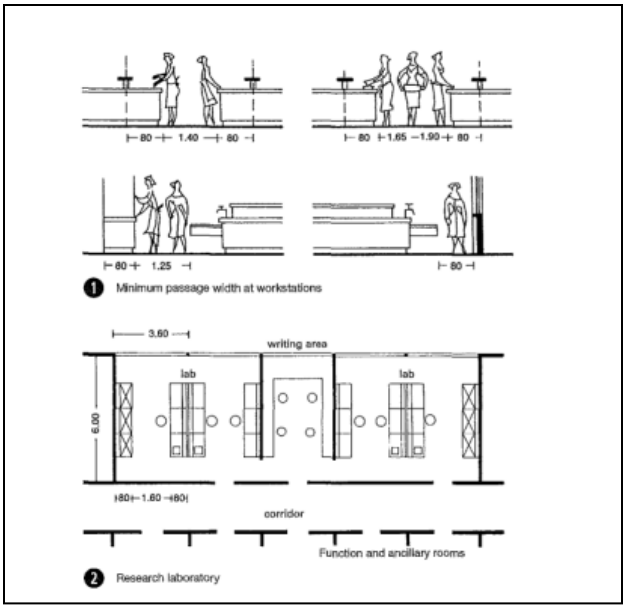
Tuition-related practical laboratories with a large number of workstations collected together and mostly with simple basic equipment - 3

Research-related laboratories, mostly in smaller rooms with special equipment and additional practical spaces like weighing and measurement rooms, centrifuge and autoclave rooms, rinsing kitchens, air-conditioned and cold storage rooms with constant temperature, photographic/dark rooms etc. -2

According to subject: Chemistry and biology laboratories have permanently installed laboratory benches. Rooms have a high rate of air exchange and frequently additional fume cupboards with air extraction - p. 204 -7 for work producing gas and smoke. Fume cupboards are often installed in their own rooms ('stink rooms').

Physics laboratories mostly have mobile benches and sophisticated electrical equipment in cable ducts in the wall or suspended from the ceiling. Low rate of air exchange -7 p. 204. There are special laboratories for specific requirements, e.g. isotope laboratories for work on radioactive substances in various safety classes.

Clean room laboratories are used for work requiring especially dust-free filtered air, e.g. in microelectronics or for particularly dangerous substances, whose release into the surrounding rooms should be prevented by special air circulation and filtering (microbiology, gene technology) -4. (Neufert)



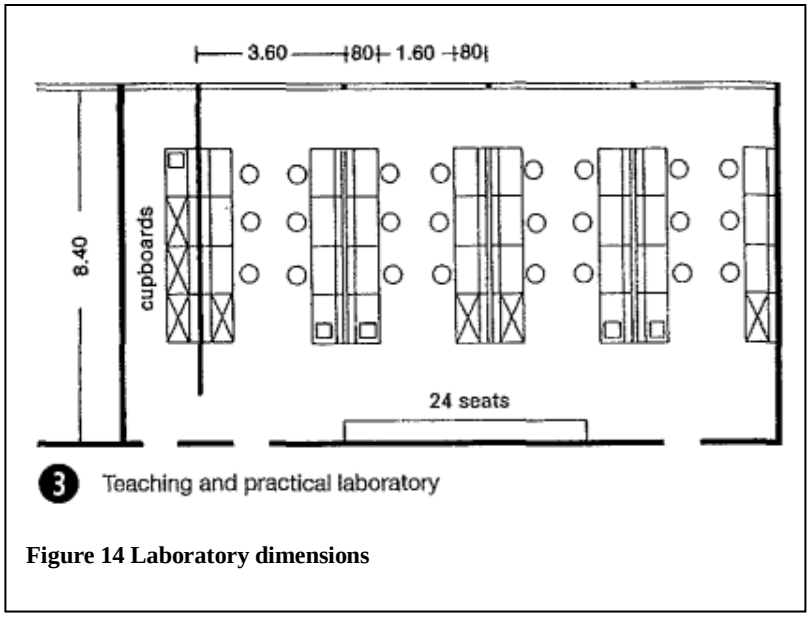


Figure 14 Laboratory dimensions

2.10 Libraries:

University libraries These are single- or two-storey buildings: single-storey systems are centrally administered (book processing and services) and mostly have at least a few separate user areas in branch or specialist libraries. Two-storey libraries include a central library and an (often larger) number of libraries for faculties, specialist areas and institutes. Stock is often freely available in reading rooms, often in self-service stacks (shelving units spaced as in closed stacks) and in closed stacks, the different forms of display being mixed in most university libraries. The ratio of stored to display and lending stock is determined by the structure of the stock, and/or the organisation type or library concept, and often also the space available in existing buildings.

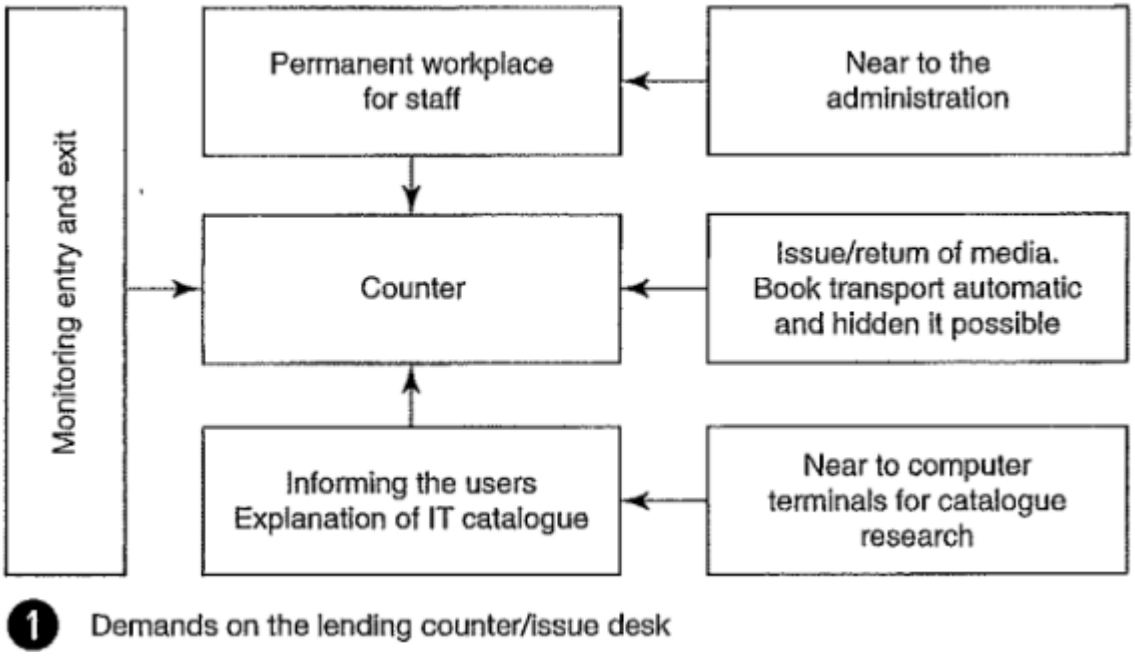
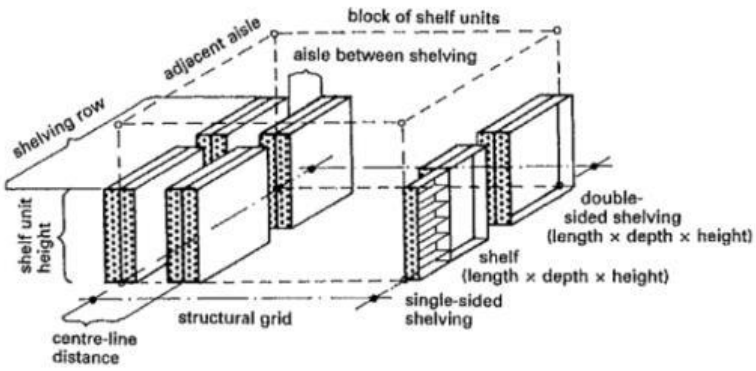
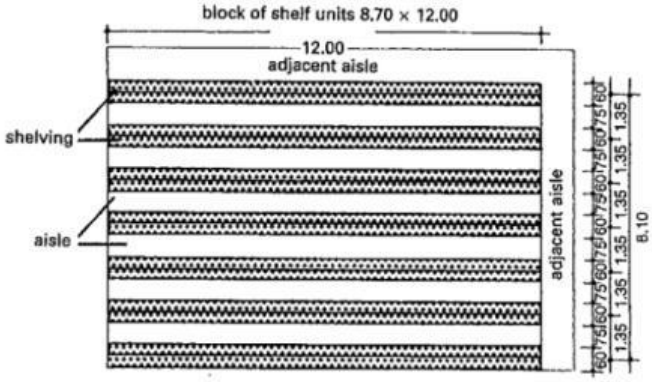


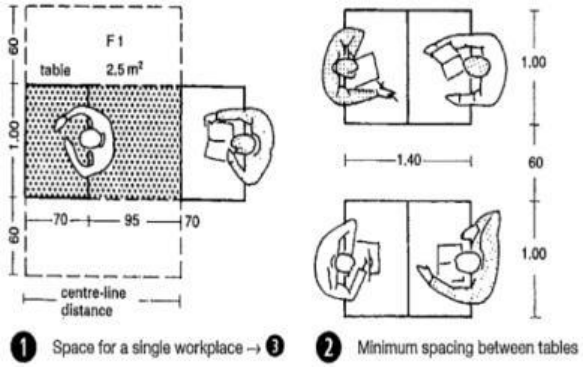
Figure 15 layout of library



1 Unscaled sketch to clarify the terms used in the calculation of areas for stock

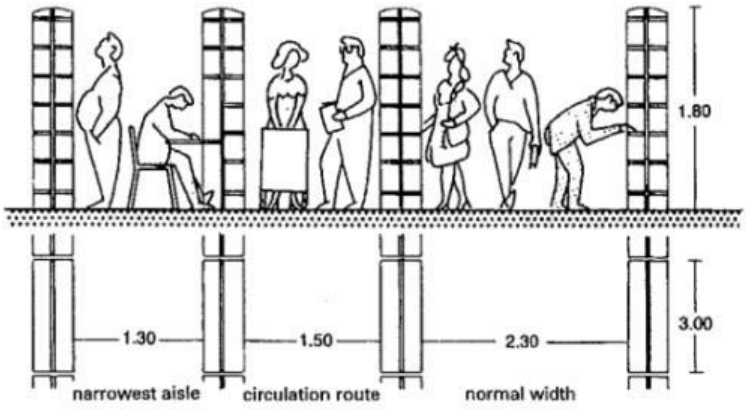


2 Floor area for bookshelves in stacks (stores), which are closed to the public

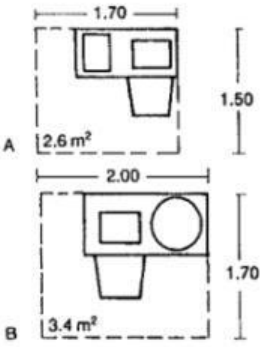


1 Space for a single workplace → 3 2 Minimum spacing between tables

Figure 16 library details



7 Minimum spacing



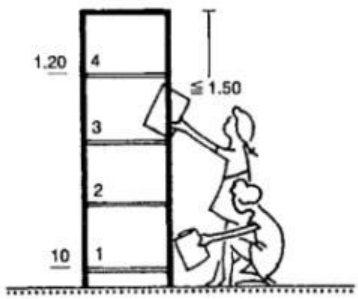
8 Microfiche reader workplace



9 Shelf unit, five shelves



10 Shelf height for schoolchildren



11 Shelf unit, four shelves – small children

2.11 Doctors practice : single / group

Single practices A practice of a single specialist must have a minimum amount of space (approx. 150 m2) and functions separated into rooms, which are differentiated and extended according to speciality. There is a general division between the patient and the staff areas. At the entrance, there is a waiting area with cloakroom and WC, and the doctor's area with consultation room is placed near the waiting area. The treatment room and laboratory are next door. An extension of the consultation and examination area for repeated treatments and a separate diagnostic zone are sensible. The number and size of the rooms are based on the particular specialist qualifications of the doctor (internist and general practitioner, surgeon, orthopaedist, gynaecologist etc.). Patient WCs, staff changing rooms with WCs and staff lounge complete the programme. Separate children's play areas can be a good idea in the waiting area (e.g. gynaecology). Waiting room: The size is in accordance with the number and frequency of visits to the treatment rooms, depending on the specialisation of the doctor. If the practice is organised to require appointments, the size of the waiting room can be reduced. Appointment planning and recording of services take place in the reception. The staff here must be able to oversee the waiting room and the entrance, and the connection to the medical area should be as short as possible. Consultation room The doctor's consultation room (12-16 m2) is a visually and acoustically enclosed room and primarily intended for the purposes of establishing case history, consultation, study of diagnostic findings, development of therapy plans and protocols

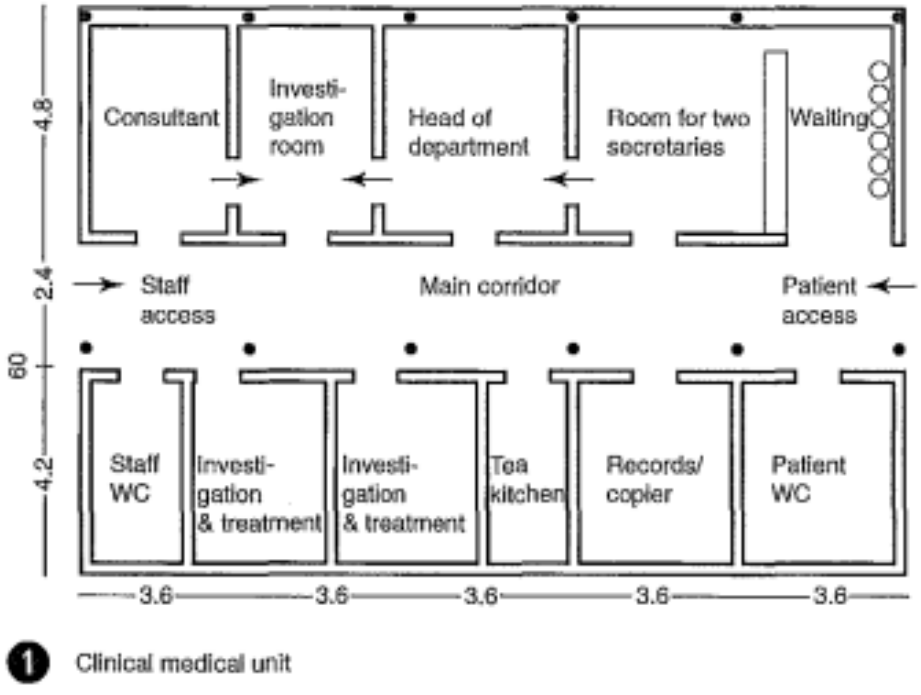
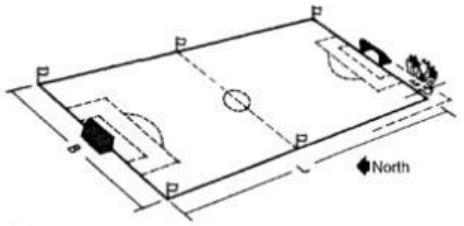


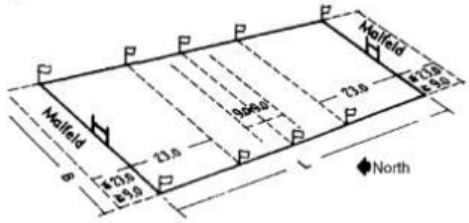
Figure 17 Dispensary layout

SPORTS FACILITIES

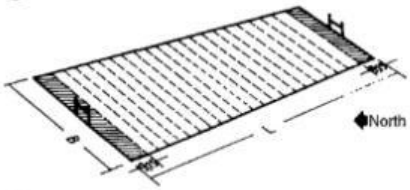
Playing Areas



1 Football



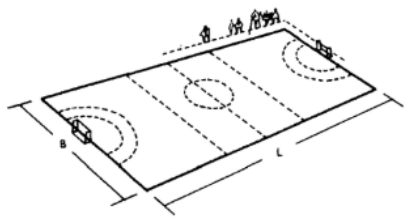
2 Rugby (German)



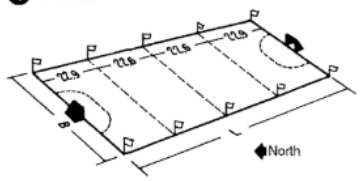
3 American football, goals 5.50 × 3.05 m

Sport	Competitive sport				Leisure sport				Net	Goal / basket (m)
	Playing area dimensions (m)	Free space around sides (m)	Free space around ends (m)	Total area (m)	Playing area dimensions (m)	Free space around sides (m)	Free space around ends (m)	Total area (m)	Height (m)	W = width H = height
Football	45–90 × 90–120	1	2	46–91 × 92–122	68 × 105	1	2	69 × 107	—	W = 7.32 H = 2.44
Football, FIFA requirements	45–90 × 90–120	2	3.5	47–92 × 93.5–123.5	68 × 105	2	3.5	70 × 108.5	—	W = 7.32 H = 2.44
Rugby	68.4 × 100	2	12–23	70.4 × 123	68.4 × 100	2	12–23	70.4 × 123	—	W = 5.60 H = 3.00
Handball	55–65 × 90–110	1	2	56–66 × 92–112	60 × 90	1	2	61 × 92	—	W = 3.00 H = 2.00
Indoor handball	18–22 × 38–44	1	2	19–23 × 40–46	20 × 40	1	2	21 × 42	—	W = 3.00 H = 2.00
Hockey (field hockey)	—	—	—	—	55 × 91.4	2	4	57 × 95.4	—	W = 3.66 H = 2.14
Netball	25 × 60	1	2	26 × 62	25 × 60	1	2	26 × 62	—	net H = 2.50
Softball/ rounders	25 × 50–70	10	10	35 × 60–80	—	—	—	—	—	pole H = 1.50
Indoor cycle polo	9–11 × 12–14	0.5	0.5–1	9.5–11.5 × 13–15	—	—	—	—	—	W = 2.00 H = 2.00
Volleyball	9 × 18	2	3	11 × 21	9 × 18	2	3	11 × 21	2.43	—
Prellball	8 × 16	2	4	10 × 20	8 × 16	2	4	10 × 20	—	—
Schleuderball	—	—	—	—	15 × 100	8	30	23 × 130	—	—
Fistball	—	—	—	—	20 × 50	6	8	26 × 58	2.00	—
Basketball	15 × 28	1	1	—	—	—	—	—	—	3.05
Streetball	13–15 × 24–28	1 2	1 2	14–16 × 26–30	—	—	—	—	—	3.05

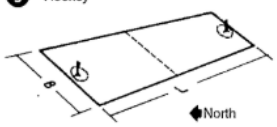
Figure 18 sport facilities dimensions



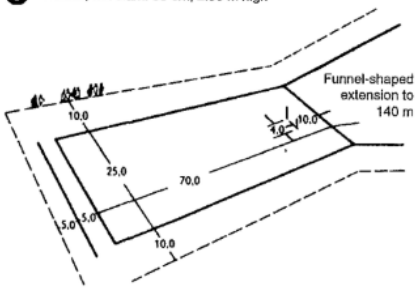
4 Handball



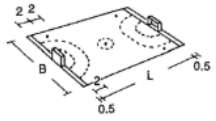
5 Hockey



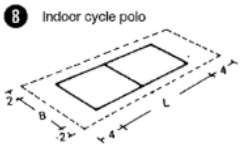
6 Netball, net diam. 55 cm, 2.50 m high



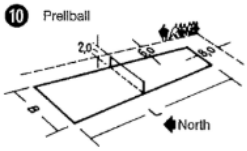
7 Softball/rounders



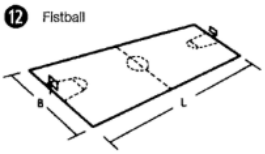
8 Indoor cycle polo



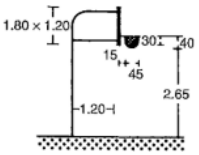
10 Prellball



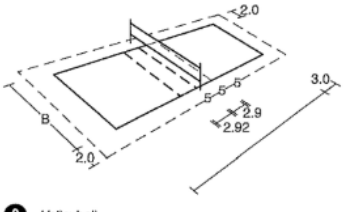
12 Fistball



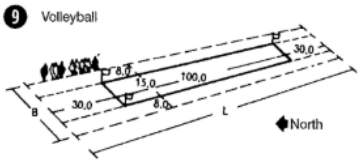
13 Basketball → 14



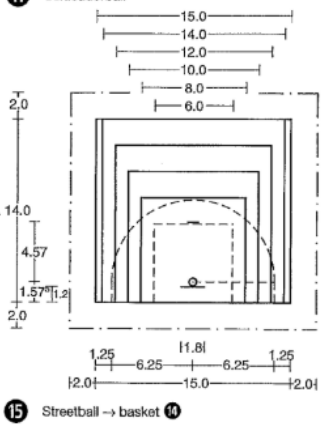
14 Basketball basket → 13 + 15



9 Volleyball



11 Schleuderball



15 Streetball → basket 14

Playing area size (m)						
Game	max.		min.		Standard dimensions[1)]	
	L	W	L	W	L	W
❶ School football	70	40	40	20	44	22
❷ Indoor football	50	25	40	20	44	22
❸ Indoor handball	—	—	—	—	44	22
❹ Indoor hockey	40	20	36	18	44	22
❺ Indoor netball	60	25	64	27	—	—
❻ Cycle polo on grass	—	—	—	—	60	40
❼ Horseshoe throwing	15	3	12	3	—	—
❽ Croquet	—	—	—	—	20	4
❾ Fencing piste	24	2	13	1.80	—	—
❿ Boccia	—	—	—	—	24	3
⓫ Shuffleboard	—	—	—	—	17	3
⓬ Tennikoit	12.20	5.50	—	—	18.20	11.50
⓭ Baseball	—	—	—	—	18.29	18.29
[1)] including safety margin						

2.13 Lift Enclosure/Lift:

General requirements shall be as follows:

- Walls of lift enclosures shall have a fire rating of two hours. Lift shafts shall have a vent at the top of area not less than 0.2 2 sq m
- Lift motor room shall be located preferably on top of the shaft and separated from the shaft by the floor of the room.
- Landing door in lift enclosures shall have a fire resistance of not less than one hour. The number of lifts in one lift bank shall not exceed four.
- A wall of two hours fire rating shall separate individual shafts in a bank
- Lift car door shall have a fire resistance rating of 1 hour

For buildings 15.0 m and above in height, collapsible gates shall not be permitted for lifts and solid doors with fire resistance of at least one hour shall be provided

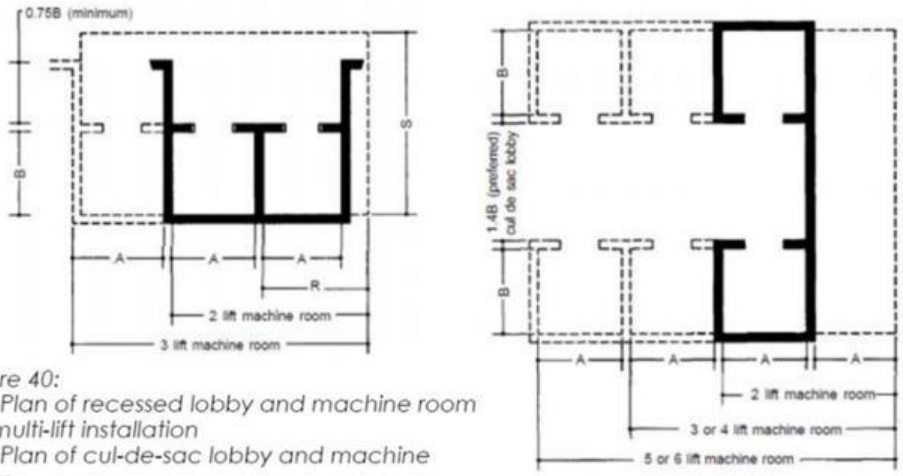


Figure 40:
(a.) Plan of recessed lobby and machine room for multi-lift installation
(b.) Plan of cul-de-sac lobby and machine room

Figure 19 lift dimensions

- **Selecting the size of an elevator:**

Type	Capacity/ load	Shaft size	Car size	Door	Pit
	persons/kg	mm	mm	mm	mm
General purpose passenger traffic (speed : 1m/s)	13/1000	2400*2300	1600*1400	1100	1800
	16/1250	2600*2300	1950*1400	1100	1900
	21/1600	2600*2600	1950*1750	1100	1900
Intensive passenger electric traction (speed : 2.5 m/s)	13/1000	2400*2300	1600*1400	1100	2800
	16/1250	2600*2300	1950*1400	1100	2800
	21/1600	2600*2600	1950*1750	1100	2800
General-purpose goods lifts, electric traction (speed : 0.5/0.63/1 m/s)	13/1000	2100*2100	1400*1800	1400	1500
Heavy-duty goods, electric traction	26/2000	2600*2900	1700*2000	1700	1500-1800
	26/2000	2900*2500	2000*2100	1800	1500-1800

Figure 20 lift dimension table

2.14 Ramps:

- These are used to allow wheeled vehicles such as trolleys, wheelchairs and buggies to change levels.
- A ramp when provided should not have a slope greater than 1 in 20 or maximum af I in 12 for short distance up to 9000 mm.

- Each ramp shall have at least 1800 mm of straight clearance at the bottom
- At least one entrance usable by individuals in wheelchairs shall be on a level that would make the elevators accessible.
- Width of a ramp: It is determined according to type and intensity of use. One-way travel requires a minimum width of 900 mm clear, whereas two-way travel needs 1500 mm. Where turns occur at landings adequate space for manoeuvring wheel chairs must be provided.

Internal staircase:

All assembly buildings having area more than 500 m on each floor shall have a minimum of two staircases.

- The minimum width for a staircase in an institutional building shall be 2000mm. The formula for most staircases of twice the rise plus the going lies between 600 and 630mm will give a suitable relationship.
- The rise should not exceed 190 mm, and the going should not be less than 250 mm.
- The top of the handrail should be between 900 and 1000 mm above the pitch line.
- The minimum headroom in a passage under the landing of a staircase and under the staircase shall be 2.2 m. (bye laws delhi)

4.17.2 Minimum width

The minimum width of staircase shall be as follows:

A	Residential buildings (dwellings) NOTE — For row housing with 2 storeys, the min. width of shall be 0.75	1.0 m
B	Residential hotel buildings	1.5 m
C	Assembly buildings like auditoria, theatres and cinemas	2.0 m
D	Educational building	1.5 m
E	Institutional buildings	2.0 m
F	All other buildings	1.5 m

Figure 21 width of staircase

Capacity of Exits

The capacity of exits (staircase, ramps and doorways) indicating the number of persons could be safety evacuated through a unit exit width of 50 cm shall be as given below:

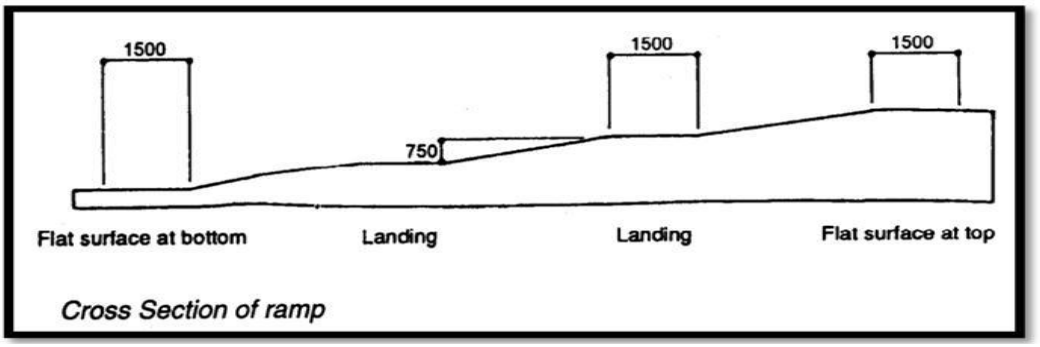
Table 4.3 Occupants per unit Exit width

Sl. No.	Group of Occupancy	Number of Occupants		
		Stairways	Ramps	Doors
1	Residential	25	50	75
2	Educational	25	50	75
3	Institutional	25	50	75
4	Assembly	40	50	60
5	Business	50	60	75
6	Mercantile	50	60	75
7	Industrial	50	60	75
8	Storage	50	60	75
9	Hazardous	25	30	40

Figure 22 Capacity of exit

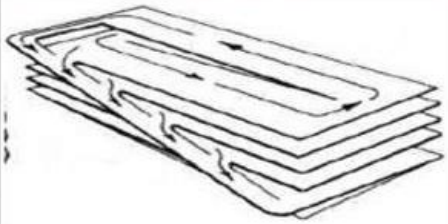
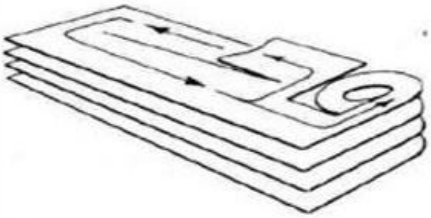
2.15 VEHICULAR RAMPS

- Ramps of slope of not more than 1 in 10 may be substituted for and shall comply with all the applicable requirements of all required stairways as to enclosure capacity and limiting dimensions. Larger slopes shall be provided for special uses but in no case greater than 1 in 8. For all slopes exceeding 1 in 10 and where the use is such as to involve danger of slipping, the ramp shall be surfaced with approved non-slipping material
- The minimum width of the ramps in the Hospitals shall be 2.4 m. and in the basement using car parking shall be 6.0 m
- Handrails shall be provided on both sides of the ramp.
- Ramp shall lead directly to outside open space at ground level or courtyards of safe place.
- For building above 24.0 m in height, access to ramps from any floor of the building shall be through smoke fire check door.
- In case of nursing homes, hospitals, etc. area exceeding 300 sq m at each floor one of the exit facilities shall be a ramp of not less than 2.4 m. in width.
- Prevent the installation of steep ramps.
- Prevent the installation of steep ramps.
- Make sure the grade of a ramp is a moderate rise of 10 mm to each 120 mm of travel.
- Provide a flat surface 1500 mm or more in length at the top and bottom of the ramp for a wheelchair to pause and prevent it from going out of control.



Cross Section of ramp

Ramp systems:

Type	Description	Layout
Clearway ramp systems	• Interfloor travel path completely separated from potentially conflicting parking–unparking movements. • Provide safest movement with least delay • Preferred for self park design	
Adjacent ramp systems	• Part or all of ramp travel is performed on access aisles • Requires less area per parking stall • Twofold use of travel paths • More susceptible to traffic movement delays	

Ramp Design:

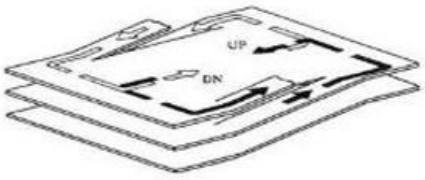
Type	Description	Layout
Opposed ramp design	• Vehicles rotate in the same direction • Up and down ramps in opposite direction • Required ramp surfaces to be opposed	
Parallel ramp design	• Up and down ramp slope in the same direction • Ramp surfaces are parallel • Vehicles must rotate in opposite direction • Cheaper to construct	

Figure 23 Types of ramp

2.16 PARKING

2.16.1 Surface parking:

DPR Rashmi Sharma 2024 Parking stalls should be built to accommodate the larger cars frequently used, although not necessarily the very largest. Parking spaces may be parallel, perpendicular, or angled (30, 45, or 60 degree) to the driving lane, or aisle as per ECS for surface car parking as per DDA is 23 m²

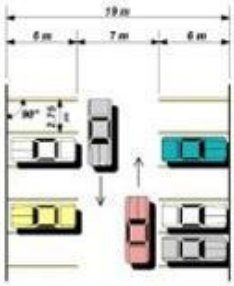
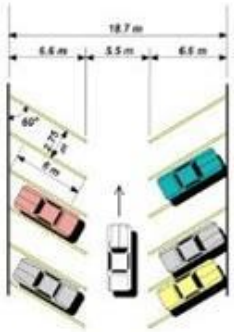
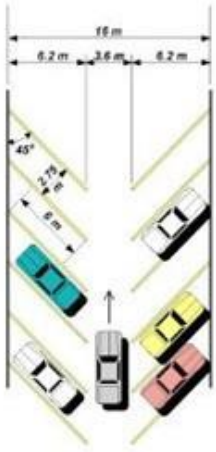
Type	Description	Layout	Advantage/Disadvantages
Perpendicular	• Effective in low turnover rate or long term parking areas. • Most efficient and economical since it accommodates the most vehicles per linear meter.		**Advantages:** • Works well with either one- or two-way aisles • Handles the most vehicles per square meter of pavement **Disadvantages:** • Requires widest area • Two-way traffic can create visibility problems
Angled - 60 degree	• This parking area configuration is ideal for a fast turnover rate or predominantly short term use. • This is often offset by difficulties of inefficient circulation patterns and one-way aisles.		**Advantages:** • Easy maneuvering in and out of parking spaces • Good visibility • Lends itself to either one-or two-way aisles **Disadvantages:** • Requires more pavement per vehicle than perpendicular configuration
Angled - 45 degree	• The 45 degree angled parking configuration displays similar benefits and limitations as the 60 degree.		**Advantages:** • Reduced width requirements for layout. • Easy maneuvering in and out of parking spaces. • Good visibility to the rear **Disadvantages:** • Doesn't work well with two-way aisles • Requires more pavement per vehicle than perpendicular parking configuration.

Figure 24 Types of parking

2.16.2 Basement parking:

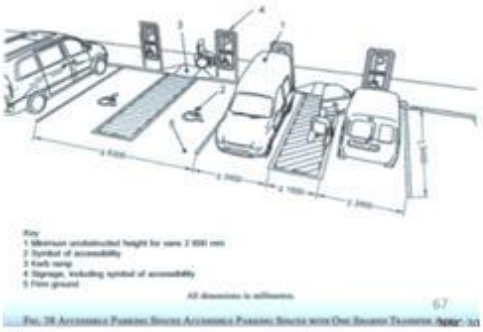
- Every basement shall be in every part at least 2.4 m in height from the floor to the underside of the roof slab or ceiling.
- Adequate ventilation shall be provided for the basement.
- The access to the basement shall be separate from the main and alternative staircase providing access and exit from higher floors.
- Area per ECS for basement car parking as per DDA is 32 m²

For car, minimum parking space to be 3m x 6m when individual parking space is required and 2.75m x 5m when common parking space is required Space for two-wheeler and bicycle to not be less than 1.25 m2 and 1.00 m2, respectively.

Table 9 Norms for Off-Street Parking Spaces

(*Clause* A-1)

Sl No.	Occupancy	One Car Parking Space for Every				
		Population Less than 50 000	Population Between 50 000 and 200 000	Population Between 200 000 and 1 000 000	Population Between 1 000 000 and 5 000 000	Population Above 5 000 000
iv)	a) Assembly halls, cinema theatres	120 seats	80 seats	25 seats	15 seats	10 seats



Designated parking for physically handicapped

The minimum size of the parking space for a car shall be 3.9m x 5.4m

If two parking spaces share a transfer are: 6.3 m

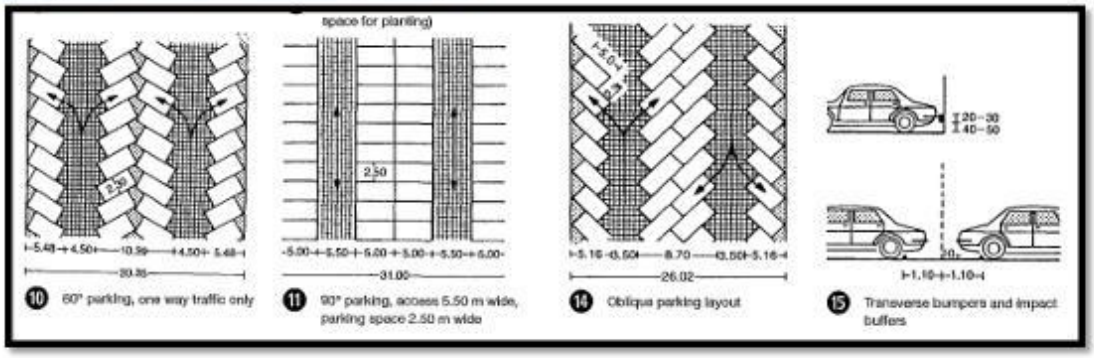
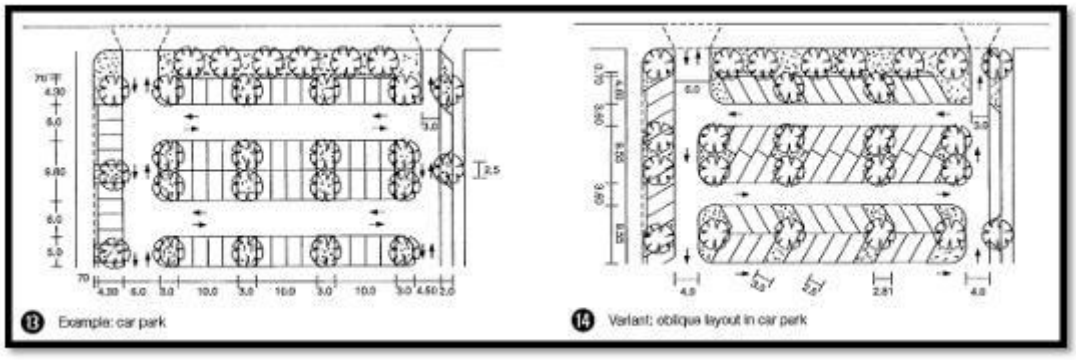
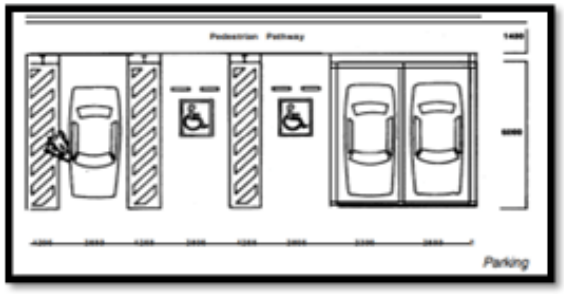


Figure 25 Basement parking

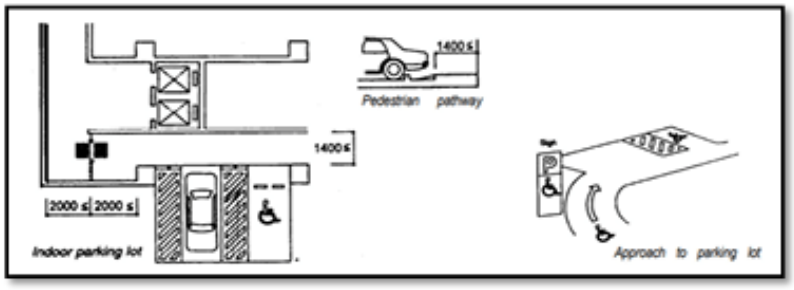


2.16.3 Parking for handicapped people



For parking of vehicles of handicapped people, the following provisions shall be made:

a) Surface parking for two care spaces shall be provided near entrance for the physically handicapped persons with maximum travel distance of 30 M from building entrance.



b) The width of parking bay shall be minimum 3.60 Meter.

c) The information stating that the space is reserved for wheel chair users shall be conspicuously displayed.

d) Guiding floor materials shall be provided or a device which guides visually impaired persons with audible signals or other devices which serves the same purpose shall be provided.

Figure 26 parking for disable people

2.17 SIGNAGE

Signage is an important part of our everyday Inco. From identifying a street name, to branding a specific store, to navigating through a museum, signage is any kind of visual graphic that displays information to a particular audience. Certain signs stand out from others based on the colours, typography, shape and graphics utilized. In addition to printed scrips, there are an increasing number of digital signs today.



Figure 27 Types of signage

2.18 NORMS

OCCUPANT LOAD

Table 4.1 Occupant Load

Sl.No.	Type of Occupancy	Occupant Load per 100 sq m. of Plinth or Covered Area
1	Residential	8.0
2	Educational	25.0
3	Institutional	6.60
4	Assembly with fixed or loose seats and dance floor without seating facilities including dining rooms	 166.6 66.6
5	Mercantile street floor and sales basement upper sale floor	 33.3 16.6
6	Business and industrial	10.0
7	Storage	3.3
8	Hazardous	10.0

* *The occupant load in dormitory portions of homes for the aged, orphanages or mental hospitals etc. where sleeping accommodation is provided shall be calculated at not less than 13.3 persons per 100 sq.m.*

** *The plinth or covered area shall include, in addition to the main assembly room or space, any occupied connecting room or space in the same storey or in the storeys above or below where entrance is common to such rooms and space and the area available for use by the occupants of the assembly place. No deduction shall be made in the plinth/covered area for corridors, closets and other sub-divisions; that area shall include all space serving the particular assembly occupancy.*

Table 9 Occupant load

SETBACK

Table 17.1: Minimum Setbacks (Other than Residential Plotted Development)

Sl. No.	Plot size (in sq.m)	Minimum Setbacks			
		Front (m)	Rear (m)	Side (m) (1)	Side (m) (2)
1	Upto 60	0	0	0	0
2	Above 60 & upto 150	3	1.5 (avg.)	-	-
3	Above150 & upto 300	4	2 (avg.)	-	-
4	Above 300 upto 500	4	3	3	-
5	Above 500 upto 2,000	6	3	3	3
6	Above 2,000 upto 10,000	9	6	6	6
7	Above 10,000	15	12	12	12

[1] Added vide S.O. 2895(E) dated 23-09-2013
[2] Added vide S.O. 678(E) dated 04-03-2014

17.0 Development Code *17—10*

Figure 28 Minimum setback

Creche/Day Care Facilities

As per factories Act, 1948 a Creche/Day care facility has to be provided for any organization/establishment employing more than 15 women for their kids upto the age of 5.

The height of the rooms shall be not less than 3.6 metres from the floor to soffit and there shall not be less than 1.86 sqm of floor area / child to be accommodated and maintaining adequate ventilation by the circulation of fresh air.
b) There is a minimum of one toilet and one wash hand basin for every 10 children over the age of two years.
c) The minimum staffing ratios for care shall be 1:4 children
d) Monitoring - There is a necessity of minimum two supervisor on continuous duty.

2.19 Water requirement and facilities:

Water requirement for the facility may be worked out and enough storage for ½ day operation is to be kept in storage. If municipal water supply is reliable, the toilet blocks may have underground sump that can store half a day's requirement and overhead tanks for another half. If municipal water supply is not available, toilet block may have its own bore well and pump with no underground sump. Alternatively a hand tube well can be used for storing water in an elevated (not overhead) tank. To minimize the wastage of water, self-closing water taps should be used. The pans must be of Pour Flush (PF) design i.e. with a steep slope. Traps should be of a 20 mm water seal. (Use of 50 mm water seal traps will require more water for flushing.) If toilet is to be linked to city sewer, a master trap has to be provided at the sewer connection. Urinals may not be fitted with urinal pots as their replacement is expensive.

*** The proposed norms are based on Guidelines on Community & Public toilets Government of Odisha Housing and Guidelines for Community Toilets, 1995; Ministry of Urban Affairs & Employment (However, they shall be further refined, once comments and suggestions are received from the State Governments after the circulation of Draft Model Building Bye-laws 2014).*

Table 4.6 Per Capita water requirement for various Occupancies/Uses

Sl. No.	Type of Occupancy	Consumption per head per day (in lt.)
1.	Residential a) In living units b) Hostels c) Hotels with lodging accommodation (per bed) d) Hotels (5 star and above)	 135 135 180 340
2.	Educational a) Day schools b) Boarding Schools	 45 135
3.	Institutional (Medical Hospitals) a) No. of beds not exceeding 100 b) No. of beds exceeding 100 c) Medical quarters and hostels	 340 450 135
4.	Assembly- Cinema theatres, auditoria, etc. (per seat accommodation)	15
5.	Government or Semi public business	45
6.	Segregated toilet facilities for Visitors in Public Buildings a) Each use of toilet (including washing hands and floors) b) Flushing urinals	 7 0.20
7.	Mercantile (Commercial) a) Restaurants (per seat) b) Other business building	 70 45
8.	Industrial a) Factories where bath-rooms are to be provided b) Factories where bath-rooms are not to be provided	 45 30
9.	Storage (including Warehouses)	30
10.	Hazardous	30
11.	Intermediate Stations (excluding mail and express stops).	45 (25)*
12.	Junction Station	70 (45)*

Figure 29 water requirement

2.20 SANITATION REQUIREMENTS FOR INSTITUTION

Table 4.11 Sanitation Requirements for Educational Occupancy

Sl. No.	Sanitary Unit	Boarding Institution		Other Educational Institution	
		For Boys	For Girls	For Boys	For Girls
1.	Water Closet (W.C.)	One for 8 boys or part thereof	One for 6 girls or part thereof	One for 40 boys or part thereof	One for 25 girls or part thereof
2.	Ablution Taps	One in each W.C.	One in each W.C.	One in each W.C.	One in each W.C.
3.	Urinals	One per every 25 pupils or part thereof	--	One per every 20 pupils or part thereof	--
4.	Wash Basins	One for every 8 pupils or part thereof	One for every 6 pupils or part thereof	One for every 60 pupils or part thereof	One for every 40 pupils or part thereof
5.	Baths	One for every 8 pupils or part thereof	One for every 6 pupils or part thereof	--	--
6.	Drinking Water Fountains	One for every 50 pupils or part thereof	One for every 50 pupils or part thereof	One for every 50 pupils or part thereof	One for every 50 pupils or part thereof
7.	Cleaner's Sink	One per Floor minimum	One per Floor minimum	One per Floor minimum	One per Floor minimum

Figure 30 Sanitation requirement

Table 4.12 contd. Administrative Buildings

Sl. No.	Sanitary Unit	For Males	For Females
1.	Toilet Suite (1WC+1Washbasin+ 1shower)	For individual doctor's/officer's rooms	
2.	Water Closet (W.C.)	One for every 25 persons or part thereof	Two for every 25 persons or part thereof
3.	Ablution Taps	One in each W.C.	One in each W.C.
4.	Wash Basins	One for every 25 persons or part thereof	One for every 25 persons or part thereof
5.	Baths with Shower	One on each floor	One on each floor
6.	Cleaner's Sink	One per floor minimum	One per floor minimum
7.	Kitchen sinks & dish Washers (where Kitchen is provided)	One for each floor	One for each floor
8.		Nil upto 6 persons 1 for 7-20 persons 2 for 21-45 persons 3 for 46-70 persons 4 for 71-100 persons From 101 to 200 persons add at the rate of 3%; for over 200 persons add at the rate of 2.5%.	--
9.	Drinking water fountain	One for 100 persons or part thereof	

2.21 SITE DEVELOPMENT

Level of the roads, access paths and parking areas shall be described in the plan along with specification of the materials.

Access path

Access path from plot entry and surface parking to building entrance shall be minimum of 1800 mm wide having even surface without any steps.

Parking

For parking of vehicles of differently-abled people, the following provisions shall apply:

- Surface parking for two car spaces shall be provided near entrance for the physically differently-abled persons with maximum travel distance of 30.0 m. from building entrance.
- The width of parking bay shall be minimum 3.6 meter.
- The information stating that the space is reserved for wheel chair users shall be conspicuously displayed.
- Guiding floor materials shall be provided or a device, which guides visually impaired persons with audible signals, or other devices, which serves the same purpose, shall be provided.

Building requirements

The specified facilities in buildings for differently abled persons shall be as follows:

Approach to plinth Level

Every building should have at least one entrance accessible to the differently abled and shall be indicated by proper signage. This entrance shall be approached through a ramp together with the stepped entry.

- Ramped Approach
- Stepped Approach
- Exit/Entrance Door
- Entrance Landing

Corridor connecting the entrance/ exit for the differently abled

The corridor connecting the entrance/exit for differently abled leading directly outdoors to a place where information concerning the overall use of the specified building can be provided to visually impaired persons either by a person or by signs, shall be provided as follows:

- Guiding floor materials shall be provided or device that emits sound to guide visually impaired persons.
- The minimum width shall be 1500mm.
- In case there is a difference of level, slope ways shall be provided with a slope of 1:12.

Stair-ways

One of the stair-ways near the entrance/exit for the differently abled shall have the following provisions:

- The minimum width shall be 2000 mm.
- Height of the riser shall not be more than 150 mm and width of the tread 300mum. The steps shall not have abrupt (square) nosing.
- Maximum number of risers on a flight shall be limited to 12.
- Handrails shall be provided on both sides and shall extend 300 mm on the top and bottom of each flight of steps.

Lifts

Wherever lift is required as per bye-laws. Provision of at least one lift shall be made for the wheel chair user with the following cage dimensions of lift recommended for passenger lift of 13 person's capacity of NBC 2016. BIS. Section 4.9.3 Table no.

Desirable Lift size

- Clear internal width 1100 mm
- Clear internal depth 2000 mm
- Entrance door width 900 mm

Toilets

One special W.C. in a set of toilets shall be provided for the use of differently abled with essential provision of washbasin near the entrance for the differently abled.

- The minimum size shall be 1500 mm x 1750 mm.
- Minimum clear opening of the door shall be 900mm and the door shall swing out.
- Suitable arrangement of vertical horizontal handrails with 50mm clearance from wall shall be made in the toilet.
- The W.C. seat shall be 500mm from the floor.

Harvesting provisions in various Building categories:

All buildings in a city contribute to the rainwater runoff during the monsoon and hence such runoff can be harvested for water reuse recharge.

The indicative provisions of rainwater harvesting in various buildings types are:

Rain Water Harvesting Provisions for Open spaces in cities

Table 9.1 Provisions for Rainwater harvesting by building types

Category / Use	Area of Plot (sq.m.)	Provisions to be made	Other conditions
Residential Plotted Houses			
New Proposals	100 and above	Construction of Rain Water Harvesting Structure.	Shall have emphasis on both storage and reuse.
Group Housing			
New Proposals	All plot sizes	i. Construction of Rain Water Harvesting Structure. ii. Concrete paving to be avoided and permeable materials are to be used for all open parking spaces.	Should indicate the system of Strom Water Drainage, Rain Water Harvesting Structure and Recharging Well
Public and semi public buildings			
All Proposals	All plot sizes	i. Shall have Rain Water Harvesting Structure and storage ii. Shall have Recharge pits	Shall have emphasis on both storage and reuse.
Commercial / Mixed use			
All Proposals	All plot sizes	i. Construction of Rain Water Harvesting Structure. ii. Soft landscape provisions and open spaces with Percolation pits. iii. Common treatment plant to be made part of the integrated development, funded by sale of commercial space.	Should indicate the system of Strom Water Drainage, Rain Water Harvesting Structure and Recharging Well Shall have emphasis on both storage and reuse.
Industrial			
All proposals	All plot sizes	i. Construction of Rain Water Harvesting Structure. ii. Soft landscape provisions and open spaces with Percolation pits. iii. Use of abandoned bore wells for recharging of ground water. iv. Common treatment plant to be made part of the integrated development funded by sale of commercial space.	Should indicate the system of Strom Water Drainage, Rain Water Harvesting Structure and Recharging Well. Provision should be made not to inject contaminated water into recharge structures in industrial areas and care is to be taken to keep such structures away from sewer lines, septic tanks, soak pits, landfill and other sources of contamination.
Other proposals	All plot sizes	Similar as above	Similar as above

*Note: The number of recharge bores to be provided in different plot sizes shall be accordance to Sl No 2 of Table Nos. 14.1 - 14.3 of **Chapter 14**.*

Figure 31 Rain water harvesting

2.22ENVIRONMENTAL CONDITIONS FOR BUILDINGS AND CONSTRUCTIONS

Table 14.1: Environmental Conditions for Building and Construction

(Category "A": 5000 sqmt - 20000 sqmt)

Sl. No.	Medium	Environmental conditions	MBBL Ref. Clause
1	Natural Drainage	The inlet and outlet point of natural drain system should be maintained with adequate size of channel for ensuring unrestricted flow of water.	-
2	Water conservations – Rain Water Harvesting and Ground Water Recharge	A rain water harvesting plan needs to be designed where the recharge bores (minimum one per 5000 sqm of built-up area) shall be provided. The rain water harvested should be stored in a tank for reuse in household through a provision of separate water tank and pipeline to avoid mixing with potable municipal water supply. The excess rain water harvested be linked to the tube well bore in the premise through a pipeline after filtration in the installed filters.	Table 9.1
2(a)		The unpaved area shall be more than or equal to 20% of the recreational open spaces.	10.2.1 (iv)
3	Solid Waste Management	Separate wet and dry bins must be provided at the ground level for facilitating segregation of waste.	10.2.5 (b)
4	Energy	In common areas, LED/ solar lights must be provided.	10.2 3c)
5	Air Quality and Noise	Dust, smoke and debris prevention measures such as screens, barricading shall be installed at the site during construction. Plastic/ tarpaulin sheet covers must be used for trucks bringing in sand and material at the site.	-
5 (a)		The exhaust pipe of the DG set, if installed, must be minimum 10m away from the building. In case it is less than 10m away, the exhaust pipe shall be taken up to 3m above the building.	-
6	Green cover	A minimum of 1 tree for every 80 sqm of land shall be planted and maintained. The existing trees will be counted for this purpose. Preference should be given to planting native species.	10.2.1 (i)
6(a)		Where the trees need to be cut, compensatory plantation in the ratio of 1:3 (i.e. planting of 3 trees for every 1 tree that is cut) shall be done with the obligation to provide continued maintenance for such plantations.	10.2.1 (ii)

Figure 32 Environment conditions

2.23 GREEN BUILDINGS AND SUSTAINABILITY PROVISIONS

Provisions and Applicability The green building provisions on various plot sizes are indicated in the table below:

GRIHA v.2019			
Section	Criterion No.	Criterion Name	Maximum Points
1. Sustainable Site Planning	1	Green Infrastructure	5
	2	Low Impact Design	5
	3	Design to Mitigate UHIE	2
2. Construction Management	4	Air and Soil Pollution Control	1
	5	Top Soil Preservation	1
	6	Construction Management Practices	2
3. Energy Efficiency	7	Energy Optimization	12
	8	Renewable Energy Utilization	5
	9	Low ODP and GWP Materials	1
4. Occupant Comfort	10	Visual Comfort	4
	11	Thermal and Acoustic Comfort	2
	12	Maintaining Good IAQ	6
5. Water Management	13	Water Demand Reduction	3
	14	Wastewater Treatment	3
	15	Rainwater Management	5
	16	Water Quality and Self-Sufficiency	5
6. Solid Waste Management	17	Waste Management-Post Occupancy	4
	18	Organic Waste Treatment On-Site	2
7. Sustainable Building Materials	19	Utilization of Alternative Materials in Building	5
	20	Reduction in GWP through Life Cycle Assessment	5
	21	Alternative Materials for External Site Development	2
8. Life Cycle Costing	22	Life Cycle Cost Analysis	5
9. Socio-Economic Strategies	23	Safety and Sanitation for Construction Workers	1
	24	Universal Accessibility	2
	25	Dedicated Facilities for Service Staff	2
	26	Positive Social Impact	3
10. Performance Metering and Monitoring	27	Commissioning for Final Rating	7
	28	Smart Metering and Monitoring	0
	29	Operation and Maintenance Protocol	0
Total Points			100
11. Innovation	30	Innovation	5
Grand Total Points			100 + 5

Figure 33 Griha rating

Provisions for Sanction

1. Water Conservation and Management

- Rain Water Harvesting
- Low Water Consumption Plumbing Fixtures
- Waste Water Recycle and Reuse
- Reduction of Hardscape

2. Solar Energy Utilization

- Installation of Solar Photovoltaic Panels (detailed at section 10.2.3 below)
- Installation of Solar Assisted Water Heating Systems

3. Energy Efficiency (Concept of passive solar design of buildings)

- Low Energy Consumption Lighting Fixtures (Electrical Appliances - BEE Star and Energy Efficient Appliances)
- Energy Efficiency in HVAC systems.
- Lighting of Common areas by solar energy LED devices.

4. Waste Management
- Segregation of Waste
- Organic Waste Management

5. Roof Top Solar Energy Installations

- Installation of Solar Assisted Water Heating System in Buildings
- No new building in the following categories in which there is a system of installation for supplying hot water shall be built unless the system of the installation is also having an auxiliary solar-assisted water heating system

i)	"Solar Assisted Water Heating System"	A device to heat water using solar energy as heat source.
ii)	"Auxiliary back-up"	Electricity operated or fuel fired boilers/systems to heat water coming out from solar water heating system to meet continuous requirement of hot water.
iii)	"New Building"	Such buildings of above said categories for which construction plans have been submitted to the Authority for clearance.
iv)	"Existing building"	Such buildings, which are licensed to perform their respective business.

Figure 34 Roof solar energy

Installation of Solar Water Heating System

A. New Buildings: Clearance of plan for the construction of new buildings of the aforesaid categories shall only be given if they have a provision in the building design itself for an insulated pipeline from the rooftop in the building to various distribution points where hot water is required. The building must have a provision for continuous water supply to the solar water heating system. The building should also have open space on the rooftop. which receives direct sunlight. The load bearing capacity of the roof should at least be 50 kg. per sq m. All new buildings of above said categories must complete installation of solar water heating systems before obtaining necessary license to commence their business.
B. Existing Buildings: Installation of Solar Assisted Water Heating Systems in the existing building shall be made mandatory at the time of change of use to above said category provided there is a system or installation for supplying hot water.

Capacity:

The capacity of solar water heating system to be installed on the building of different categories shall be decided in consultation with the local bodies. The recommended minimum capacity shall not be less than 25 litres per day for each bathroom and kitchen subject to the condition that maximum of 50% of the total roof area is provided with the system

Specifications:

Installation of Solar Assisted Water Heating Systems shall conform to BIS specification IS 12933. The solar collectors used in the system shall have the BIS certification mark

Auxiliary System:

Wherever hot water requirement is continuous, auxiliary heating arrangement either with electric elements or oil of adequate capacity can be provided.

Sustainable Waste Management

Zero Waste is a concept of waste management and planning approaches that emphasize waste prevention as opposed to end waste management.

The green waste can be converted into fuel cakes, and kitchen waste into manure construction & demolition waste into bricks, plastic waste into oil paper glass and steel back into the same and all residual inert materials can also be converted into bricks. Achieving zero land-fill is more conveniently possible if

Sustainability of Building Materials

Use of Factory made pre-fab/pre-cast and recycled components with Green benefits:

• Panels, hollow slabs, hollow blocks, etc. conservation of materials, less water requirement.

• Fly Ash bricks, Portland Pozzolana cement, Fly ash concrete, phosphor-gypsum- based walling & roofing panels, particle wood recycled use of industrial/ agricultural by-products. (Ref. Table 14)

• Fly ash/ AAC (Autoclaved aerated light weight concrete) panels/ CLC (Cellular lightweight concrete) panels- ensures thermal comfort (significant reduction in air conditioning requirement)

• Use of bamboo & rapidly growing plantation timbers- environmental benefits.

2.24 SERVICES

2.24.1 Ventilation Shaft

For ventilating the spaces for water closets and bathrooms, if not opening on the front side, rear and interior open spaces, shall open on the ventilation shaft, the size, of which shall not be less than the values given below: (bye laws delhi)

Height of Building (m)	Size of ventilation shaft (sq m)	Minimum size of shaft (m)
Upto 10.0	1.2	0.9
Upto 12.0	2.8	1.2
Upto 18.0	4.0	1.5
Upto 24.0	5.4	1.8
Upto 30.0	8.0	2.4
Above 30.0	9.0	3.0

Figure 35 ventilation shaft

- For buildings above 30.0 m. height, mechanical ventilation system shall be hustled besides the provision of minimum ventilation shaft
- For fully air-conditioned residential buildings for lodging purposes, the ventilation shaft need not be insisted upon, provided the air-conditioning system works in an uninterrupted manner also, provided there is an alternative source of power supply. However, it is not mandatory in case of buildings where ventilation is mechanized.

Interior Open Space for Light and Ventilation

- The whole or part of one side of one or more rooms intended for human habitation and not abutting on either the front, rear or side open spaces shall abut on an interior open space whose minimum width in all directions shall be 3.0 m in case of buildings not more than 15 m 17.5 m (with stilts) in height, and in case of buildings above 15 m/ 17.5 m (with stilts) it shall have mandatory mechanical ventilation in addition.
- Sunken Courtyard
- Skylight

2.24.2 Fire Escapes or External Stairs

- Fire escape shall not be taken into account while calculating the number of staircases for a building.
- All fire escapes shall be directly connected to the ground.
- Entrance to the fire escape shall be separate and remote from internal staircase.
- The route to fire escape shall be free of obstructions at all times except the doorway leading to the fire escape which shall have the required fire resistance.
- Fire escape shall be constructed of non-combustible materials.
- Fire escape stairs shall have straight flight not less than 125 cm wide with 25 cm treads and risers not more than 19 cm.
- Handrails shall be at a height not less than 100 cm.
- Fire escape staircase in the mercantile, business, assembly, hotel buildings above 24 m. height shall be a fire toder and in such a case width of the same shall not be less than the width of the main staircase. No combustible material shall be allowed in the fire tower.

2.24.3 Fire Lift

Following details shall apply for a fire lift in addition to above requirements:

- To enable fire service personnel to reach the upper floors with the minimum delay, one or more of the lifts shall be so designed so as to be available for the exclusive use of the fireman in an emergency and be directly accessible to every dwelling/lettable floor space on each floor.
- The lift shall have a floor area of not less than 1.4 sq.mt. It shall have a loading capacity of not less than 545 kg. (8 persons lift) with automatic closing doors.
- The electric supply shall be on a separate service from electric supply mains in a building and the cables run in a route safe from fire, that is within a lift shaft. Lights and fans in the elevator having wooden panelling or sheet steel construction shall be operated on 24-volt supply
- In case of failure of normal electric supply, it shall automatically switch over to the alternate supply. For apartment houses, this changeover of supply could be done through manually operated changeover switch. Alliteratively, the lift should be so wired that in case of power failure, it comes down at the ground level and comes to stand still with door open.

2.24.4 Basement

As provided in Chapter-4 and Building Bye-Laws.

- The access to the basement shall be either from the main or alternate staircase providing access and exit from higher floors. Where the staircase is continuing the same shall be enclosed type serving as a fire separation from the basement floor and higher floors. Open

- ramps shall be permitted if they are constructed within the building line subject to the provision of the (iv)
- In case of basement for office enough exit ways and access shall be provided with a travel distance not more than 15.0 m. The travel distance in case of dead-end shall be 7.5 m.
- The basement shall be partitioned and in no case, compartment shall be more than 500 sq m and less than 50 sq m area except parking. Each compartment shall have ventilation standards as laid down in Bye-Laws separately and independently. The partition shall be made in consultation with Chief Fire Officer
- The first basement (immediately below ground level) can be used services/parking/other permissible services. Lower basement, if provided, shall exclusively be used for car parking

2.24.5 Service ducts/refuge chute

Service duct shall be enclosed by walls and door, if any, of 2 hours fire rating. If ducts are larger than 10 sq m. the floor should seal them, but provide suitable opening for the pipes to pass through, with the gaps sealed.

2.24.6 Electrical services

Electrical Services shall conform to the following:

- The electric distribution cables/wiring shall be laid in a separate duct shall be sealed at every floor with non-combustible material having the same fire resistance as that of the duct. Low and medium voltage wiring running in shaft and in false ceiling shall run in separate conduits.
- Water mains, telephone wires, inter-com lines, gas pipes or any other service lines shall not be laid in ducts for electric cables.
- Separate conduits for water pumps, lifts, staircases and corridor lighting and blowers for pressuring system shall be directly from the main switch panel and these circuits shall be laid in separate conduit pipes, so that fire in one circuit will not affect the others. Master switches controlling essential service circuits shall be clearly labelled.

2.24.7 Air-conditioning

Air-Conditioning should conform to the following:

- Escape routes like staircase, common corridors, lift lobbies: etc. should not be used as return air passage.
- The ducting should be constructed of metal in accordance with BIS 655:196
- Wherever the ducts pass through fire walls or floor, the opening around the ducts should be sealed with fire resisting material of same rating as of walls/floors.
- Metallic ducts should be used even for the return air instead of space above the false ceiling.

- The material used for insulating the duct system (inside outside) should be of flame resistant (IS 4355: 1977) and non-conductor of heat.
- Area more than 750 sq m. on individual floor should be segregated by a firewall and automatic fire dampers for isolation should be provided.

2.24.8 Fire Dampers

These shall be located in air ducts and retum air ducts passages at the following points:

- At the fire separation wall
- Where ducts/passages enter the central vertical shaft
- Where the ducts pass through floors
- At the inlet of supply air duct and the return air duct of each compartment on every floor.

The dampers shall operate automatically and shall simultaneously switch off the air- handling fans. Manual operation facilities shall also be provided.

Note: For blowers, where extraction system and dust accumulators are used, dampers shall be provided

- Fire smoke dampers (for smoke extraction shafts) for building more than 24 m in height.
- For apartment houses in non-ventilated lobbies corridor operated by detection system and manual control sprinkler system
- For other buildings on operation of smoke heat detection system and manual control sprinkler system.
- Automatic fire dampers shall be so arranged so as to close by gravity in the direction of air movement and to remain tightly closed on operation of a fusible link

2.25 MEANS OF ESCAPE

2.25.1 Travel distance:

The maximum travel distance from seat to exit within the auditorium is determined by the need to evacuate from each level of the auditorium within 2% minutes. For traditional seating the maximum travel distance is 18 m meo sured from the gangway, for continental seating 15 m from any seat.

Exits:

From each level of the auditorium two separate exits must be provided for the first 500 seats with an additional exit for each further 250 seats.

Stairs:

Staircase fights should have at past two risers and not more than 16. Al treads should be 275 mm and risers 180 mm.

Ramps:

Wheelchair users should be provided with flat or ramped escape routes which may be separate from other routes. Ramps should not be longer than 4.5 m or steeper than 8.5% (DDA)

Number of people	Minimum total exit widths (m)
upto 200	2.2
201-300	2.4
301-400	2.8
401-500	3.2
751-1000	6.4
1001-2000	14.4

Figure 36 Ramp width

2.25.2 Conference Rooms

Fire safety norms by the National Building Code of India

Every building shall be so constructed, equipped, maintained and operated as to avoid undue danger to the life and safety of the occupants from fire, smoke, fumes, or panic during the time period necessary for escape

General Exit Requirements

An exit may be a doorway; to an internal staircase, or external staircase, or terrace(s), which have access to the street, or to the roof of a building or a refuge area. All exits shall provide continuous means of egress to the exterior of a building or to an exterior open space leading to a street.

Capacity of exits

In an assembly building (INSTITUTION CAMPUS), the capacity per storey per unit width of exit of stairways, ramps and doors is 40,50 and 60 respectively.

Doorways

No exit doorway shall be less than 1000 mm in width except assembly build ings where door width shall be not less than 2000 mm. Doorways shall be not less than 2000 mm in height.

Stairways and ramps

The minimum width of tread shall be 300 mm and the maximum height of riser shall be 150 mm for assembly buildings.

The minimum width for a staircase shall be 2m.

The minimum headroom in a passage under the landing of a staircase and under the staircase shall be 2.2 m.

The slope of a ramp shall not exceed 1 in 10. In certain cases steeper slopes maybe permitted but in no case greater than 1 in 8.

Horizontal exits

For buildings more than 24 m in height, refuge area of 15 m^2 or an area equivalent to 0.3 m^2 per person to accommodate the occupants of two consecutive floors.

3. SITE INVENTORY

- Project Name: Dr. B.R. Ambedkar University Delhi – Rohini Campus
- Location: Sector 3, Rohini, Delhi
- Site Area: 18 Acres (~72,843 sq.m)
- Estimated Built-Up Area: ~95,000 sq.m
- Campus Type: Urban, Sustainable, GRIHA 5-Star Compliant

3.1 SITE ANALYSIS

This site analysis provides a comprehensive overview of the physical, environmental, and contextual characteristics of the proposed campus development site, forming the foundational understanding for a sustainable and responsive architectural design.

3.1.1 SITE SURROUNDINGS

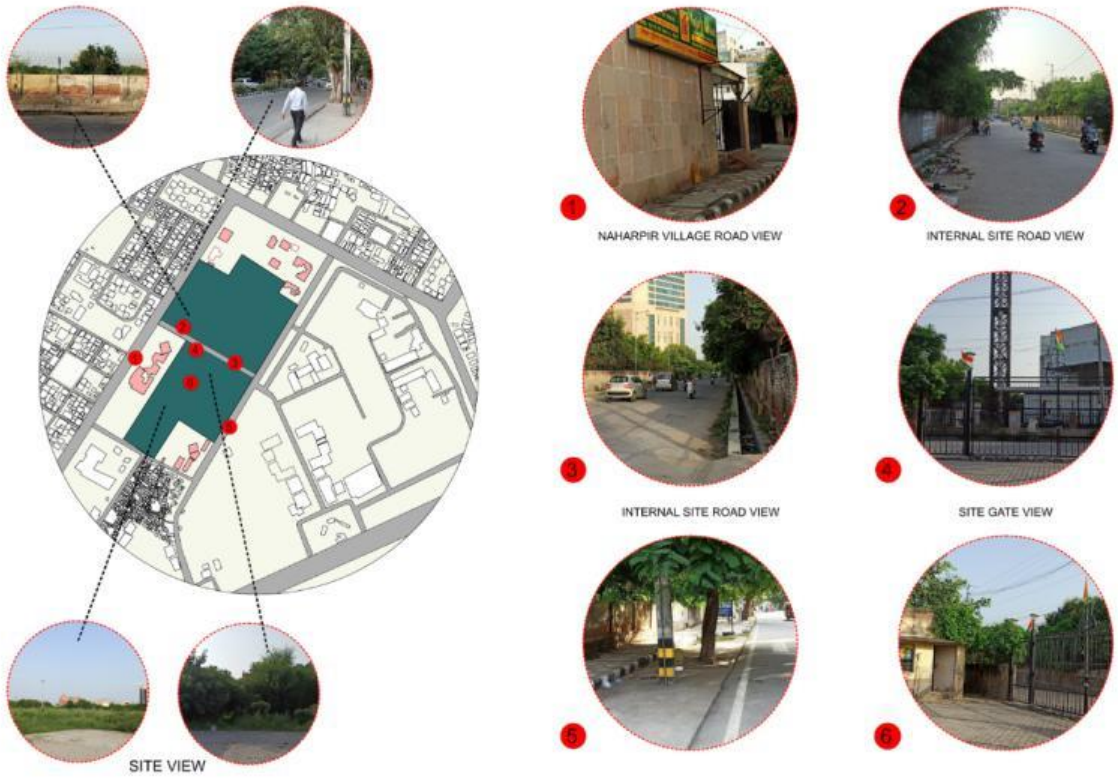


Figure 37 Site surrounding

3.1.2 Land use pattern (DDA)

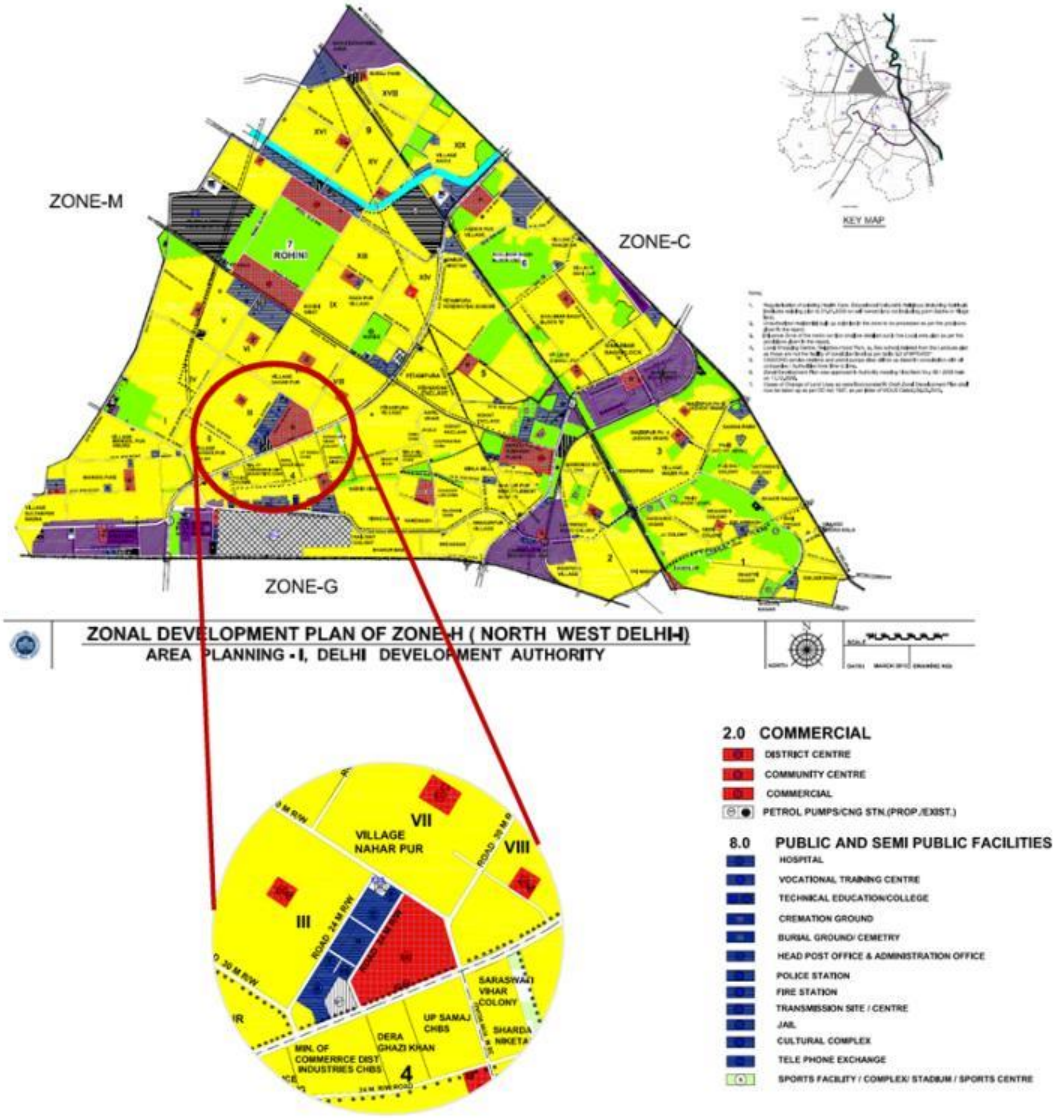


Figure 38 land use map

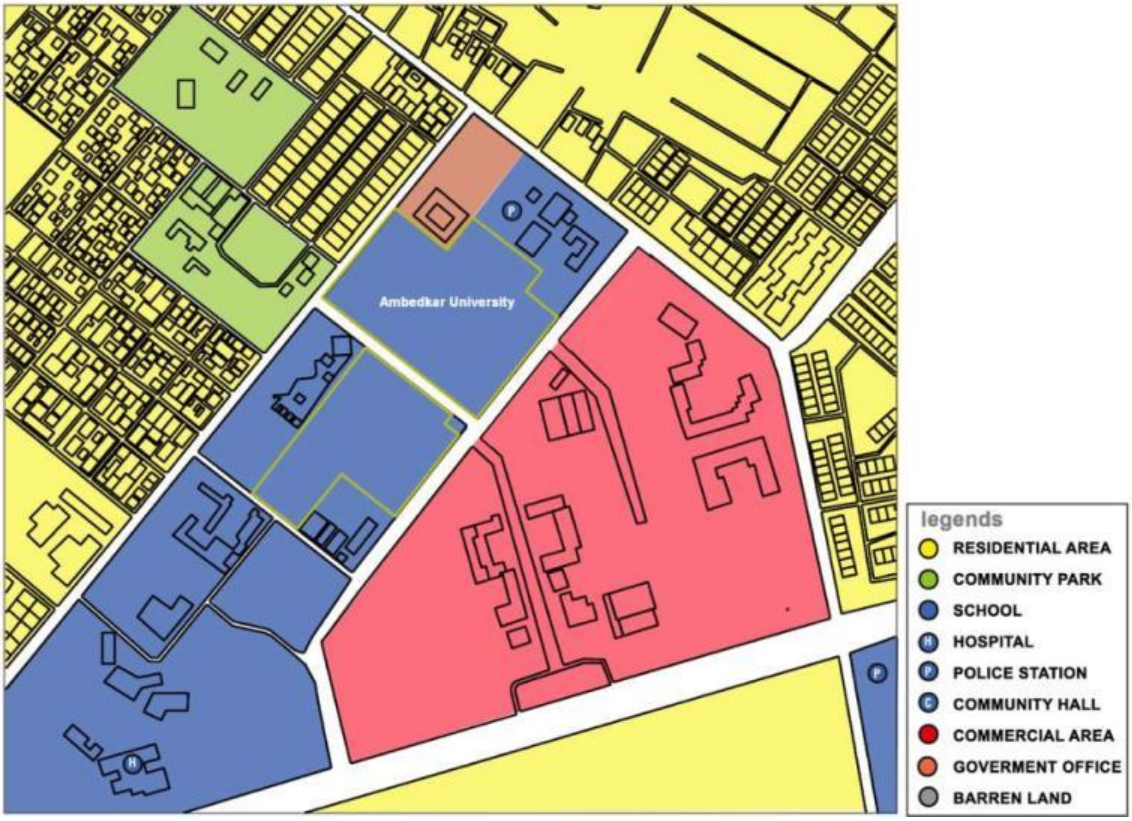


Figure 39 land use pattern of site

3.1.3 PROXIMITY OF SITE

- The site is well connected to - Outer Ring road – 0.6 km
- Metro station – Rohini East - 2.4 km , Rohini West - 3.1 km , Pitampura - 3.1 km
- New Delhi Railway Station – 15 km
- IGI International Airport - 19.6km
- Bus stands nearby are Pushpanjali Enclave Bus Stand, Kali Mandir Bus Stand, Naharpur Village Bus Stand, Rohini Sector -7 Bus Stand.

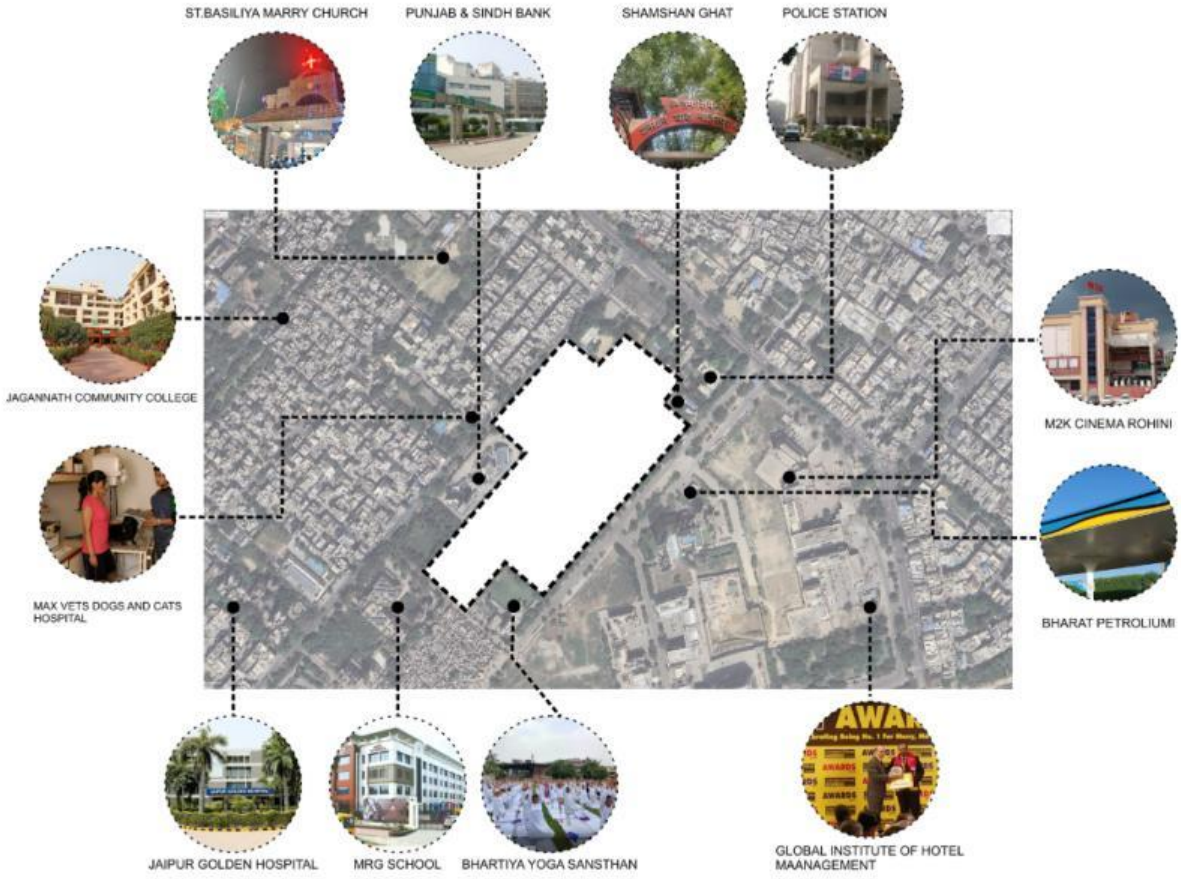


Figure 40 Proximity of site

3.1.4 Major access

- **Road Network:** The most significant vehicular access is provided by the **Outer Ring Road**, which runs directly along the southern boundary of the site. This major arterial road ensures high visibility and convenient access for vehicular traffic, including private vehicles, buses, and service vehicles. Additionally, an **existing internal road bisects the site**, providing immediate access to both the northern and southern parcels. This internal road features clearly defined **"ENTRY / EXIT" points**, which will streamline traffic flow and campus circulation.

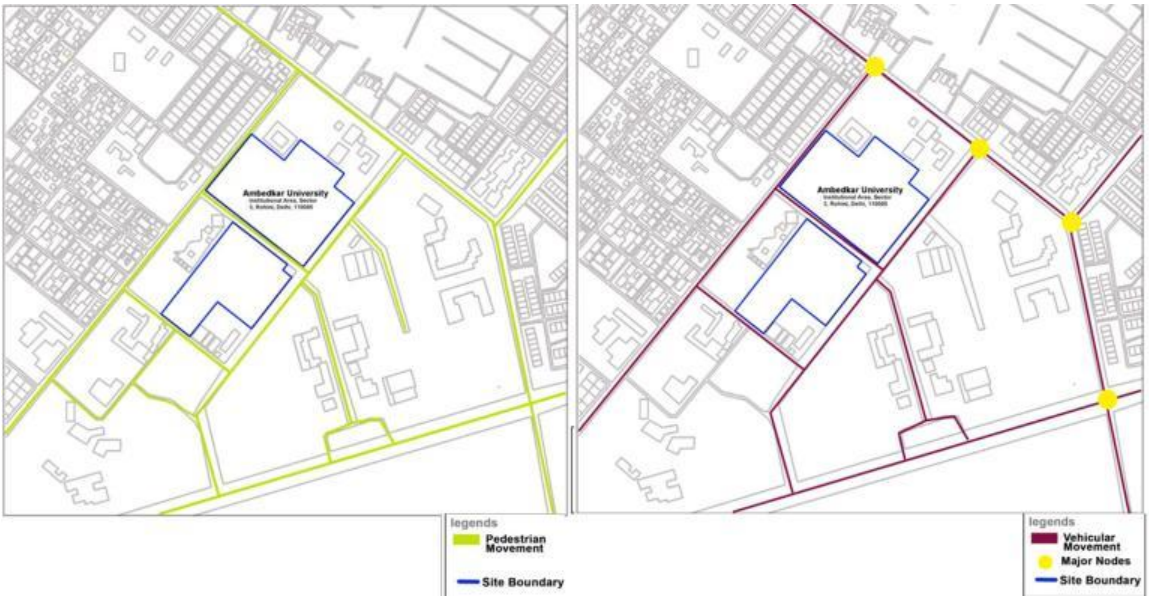


Figure 41 Major access

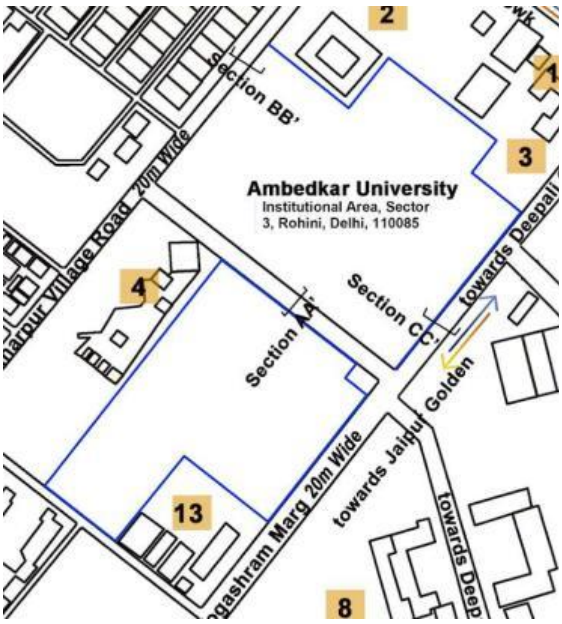


Figure 42 Site map for Major access sections

Street sections

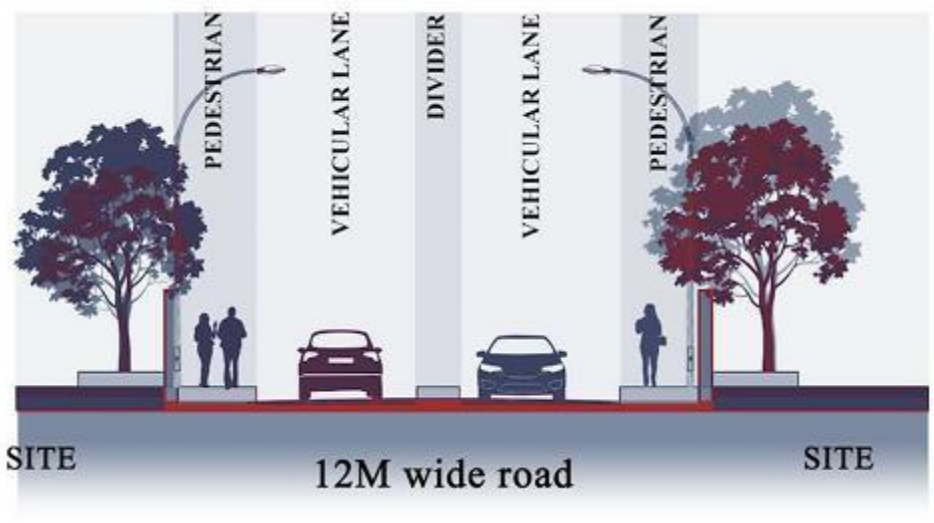


Figure 43 Street Section AA'

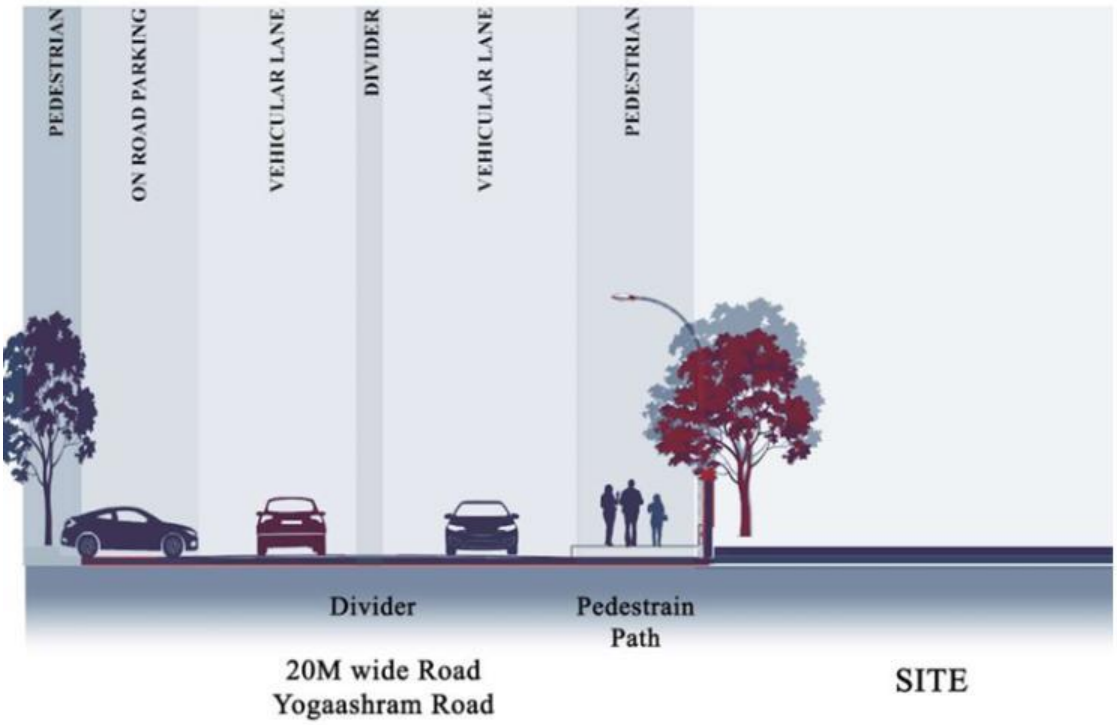


Figure 44 Street Section CC'

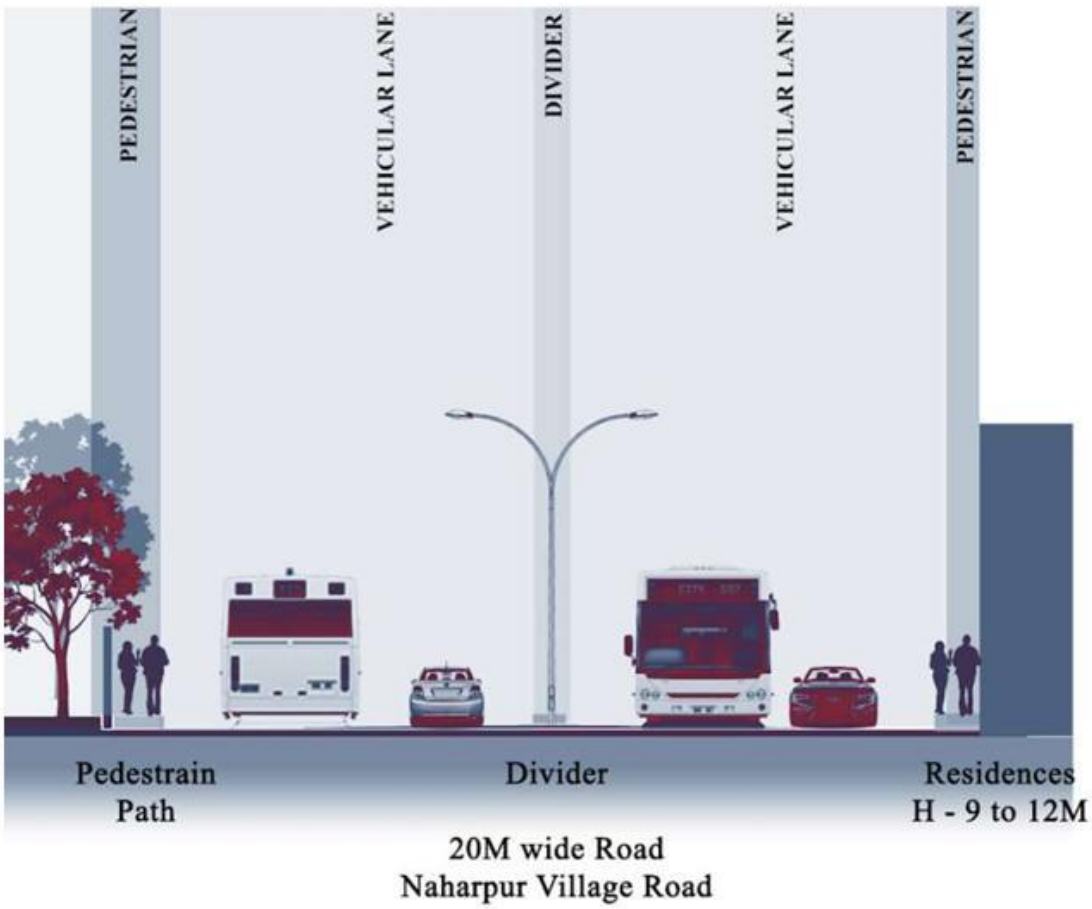


Figure 45 Street Section BB'

3.1.5. Existing Vegetation:

The site currently hosts a variety of existing tree species, primarily concentrated along the central existing road that bisects the two parcels. The identified species include Neem (Azadirachta indica), Bamboo, Peepal (Ficus religiosa), Banyan (Ficus benghalensis), Baare, and Grape. These existing trees represent valuable natural assets that can be preserved and integrated into the campus's landscape design. They offer immediate benefits such as providing shade, contributing to local biodiversity, improving air quality, and mitigating the urban heat island effect. Their presence informs strategies for site planning, building placement, and the design of green spaces.



Figure 46 Existing vegetation

Vegetation Table

Serial Number	Common Name	Scientific Name	Photo	Radius	Average Height	Foliage Type
1	Neem	*Azadirachta indica*		6 meters	7–9 feet	Evergreen
2	Bamboo	*Bambusoideae*		9–12 meters	15–20feet	Evergreen
3	Peepal	*Ficus religiosa*		2–3 meters	7–8 feet	Deciduous
4	Banyan	*Ficus benghalensis*		2–3 meters	7–8 feet	Evergreen

						
5	Baare	*Ziziphus mauritiana*		2–3 meters	7–8 feet	Semi-deciduous
6	Grape	*Vitis vinifera*		5-6 meters	6–7 feet (vine spread)	Deciduous

Table 10 Vegetation Table

3.1.6. Utilities

- **Waste water & manholes :** the site is intersected by multiple sewer lines, including both peripheral and internal alignments. These lines run along the edges and diagonally across the plot, suggesting prior or planned integration with the city's main sewer network.The location of manholes at regular intervals along the sewer lines indicates established access points for inspection and maintenance. Their strategic distribution implies readiness for integration with future campus drainage systems.



Figure 47 waste water line

Electric pole : A total of **12 electric poles** are situated **within or immediately adjacent** to the site boundary. The poles are predominantly located along the **western and southern periphery** of the site, with a few passing through the central alignment. These poles are likely part of the existing urban power grid supplying nearby residential and institutional areas.



Figure 48 : Existing electric line

3.1.7 TOPOGRAPHY AND SLOPE ANALYSIS

The contours are made at intervals of 2 metres
Highest point: 220m, **Lowest Point:** 208 m



Figure 49 site contours

Slope Zones Identified (From Map)

Zone (on Map)	Elevation Range (approx.)	Slope Nature	Remarks
North-Central Hill	208 m to 216 m	**Steep**	Retain as green mound or for visual axis; avoid building large structures
North-East Ridge	210 m to 220 m	**Moderate to Steep**	Good for stepped built-forms, amphitheatre; consider soil stabilization
Central Belt (Axis)	208 m to 214 m	**Gentle Slope**	Optimal for placing academic and cluster facilities
South-Central Zone	210 m to 214 m	**Gentle**	Ideal for hostels, cafeteria, or student centre

South-East Basin	208 m to 212 m	**Gentle to Moderate**	Potential for water harvesting, landscape ponds, or sports fields
South-West Corner	~208 m to 210 m	**Very Gentle/Flat**	Suitable for admin blocks, parking, or services zone

Table 11 Slope Zones Identified (From Map)

Design Recommendations Based on Slope

- **Place academic buildings** on **gentle slopes** (central or southern zones).
- Use **steep zones** for **amphitheatre**, landscape mounds, water cascades, or **viewpoints**.
- Ensure **roads and pedestrian paths** follow contours to minimize gradient.
- Provide **cut-off drains** and **retaining structures** in steeper parts to prevent erosion.
- Utilize **natural depressions** for **stormwater recharge** and **rain gardens**.

3.1.8 Soil Condition

- **Primary Type:** *Alluvial Soil*
- **Texture:** Generally **loamy to sandy loam**
- **Origin:** Formed by the deposition from rivers like the Yamuna and its tributaries.
- **Fertility:** Moderately fertile, suitable for crops like wheat, rice, and vegetables if irrigated and managed well.

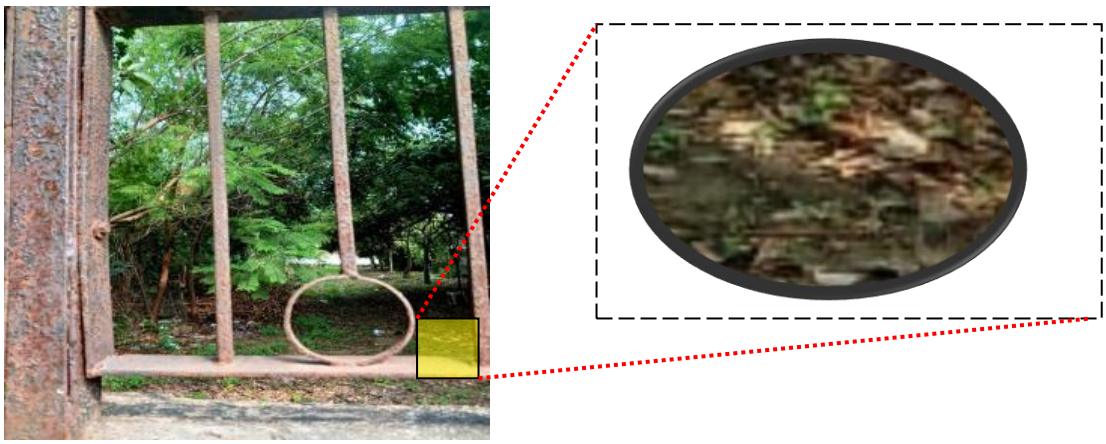


Figure 50 site soil

Characteristics of Alluvial and Clay Soils

Property	Alluvial Soil	Clay Soil
Texture	Fine to medium grain	Very fine grain, compact when dry
Drainage	Moderate to poor	Poor (retains water, low permeability)
Water Holding Capacity	High	Very high
Shear Strength	Moderate	Low when saturated
Bearing Capacity	Moderate	Low to moderate (may require soil stabilization)
Expansion/Shrinkage	Low	High (swelling and shrinking with moisture)

Table 12 characteristic of alluvial soil

Soil Analysis

Parameter	Unit	Clay Soil (Observed)	Alluvial Soil (General)	Design Implications
Safe Bearing Capacity	kN/m²	100–150	150–250	Adequate for shallow foundations with proper soil treatment
Plasticity Index (PI)	%	20–50	5–20	Clay: High shrink-swell potential Alluvial: Generally more stable
Liquid Limit (LL)	%	50–100	20–40	Clay retains water; avoid water-sensitive foundations
Shrinkage Limit (SL)	%	8–15	10–20	Clay soil prone to cracks when dry
Cohesion (C)	kPa	20–30	10–20	Clay provides good slope stability if undisturbed
Angle of Internal Friction (Φ)	Degrees	10–15	20–30	Clay: Low friction; requires stabilization in steep slopes
Moisture Content	%	20–40	10–20	Clay expands/shrinks with water; drainage is critical
Bulk Density	kN/m³	16–18	15–17	Moderately dense; compact before foundation laying
Swelling Potential	%	20–40 (Montmorillonite)	Low to medium	Clay: Expansion risk; suitable for raft/pile foundations
Permeability	m/s	10^{-7} – 10^{-9}	10^{-4} – 10^{-6}	Clay: Poor drainage Alluvial: Good drainage; combine for optimal water flow design
Soil Texture	–	Fine-grained clay	Loamy to sandy loam	Clay needs treatment; alluvial suitable for landscaping
Drainage Capacity	–	Poor	Well-drained	Ensure slope-based surface drainage; avoid basement in

				clay-rich pockets
Bearing Layer Depth	m	~1.5–2.0 (varies with compaction)	>2.0	Site investigation needed before deciding foundation type

Table 13 Soil Analysis parameter

SWOT ANALYSIS

I. STRENGTHS

- **Presence of Functional Infrastructure:** The availability of **existing roads**, **entry/exit points**, **sewer lines**, **manholes**, and **electric poles** presents a foundational advantage. These utilities not only reduce the capital cost and timeline for development but also indicate that the site is embedded in an **urbanized and service-ready grid**. The internal road acts as a **natural organizing spine**, facilitating zoning and movement.
- **Existing Trees on Site (Neem, Bamboo, Peepal, Banyan, Baare, Grape):** These provide immediate green cover, shade, and contribute to biodiversity. They can be integrated into the landscape design, preserving existing ecology and improving microclimate. Neem, Peepal, and Banyan are robust, native species.

II. WEAKNESSES

- **Surrounding Urban Density** The site is surrounded by dense residential and institutional development. While this increases community integration, it may also result in:
  - Noise spillover into academic zones.
  - Visual congestion and lack of serene visual buffers.
  - Increased vehicular and pedestrian activity around entry points, requiring more controlled access design and security measures.

- **Entry/Exit and Security Complexity**: Multiple potential entry points due to the bisecting road and urban interface may complicate campus security, requiring advanced surveillance systems, boundary control strategies, and consistent monitoring to protect both people and resources.
- **Proximity to Outer Ring Road:** While providing connectivity, the Outer Ring Road to the south will likely be a significant source of **noise pollution and air pollution**. This requires careful acoustic planning (buffer zones, building orientation, sound-insulating materials) and air quality considerations for the south-facing facades.

III. OPPORTUNITIES

- **Proximity to Public Infrastructure and Civic Amenities**
  - Being close to metro stations (Rohini West, East, Rithala), hospitals (Ambedkar Hospital), and civic services enables:
  - Quick emergency response and access to healthcare.
  - Potential integration with city-wide mobility networks (last-mile connectivity).
  - Ease of access for visitors, students, and faculty from diverse parts of Delhi.

- **Site Access from Multiple Entry Points**
  - The presence of more than one road abutting the site (including the dividing road) offers:
  - Possibility of designing separate access zones for pedestrians, vehicles, and services.
  - Flexible phasing of construction or future expansion with zonal separation.
  - Creation of independent academic, residential, and administrative cluster.

IV. THREATS

- **Urban Congestion and Noise Pollution**: The site is situated in a densely populated urban sector (Rohini Sector 3)**.**Constant vehicular and pedestrian traffic can lead to high noise levels, especially near roads.
- **Inadequate Parking and Traffic Management**: Urban plot may have limited scope for surface parking or internal vehicular circulation. Heavy external traffic on approach roads could lead to **bottlenecks during peak hours**, affecting campus accessibility and logistics.
- **Security Concerns:** An open campus with multiple entry/exit points (especially due to the bisecting road) may present security challenges that need careful planning and integration of security systems.

Group photo



3. 2 CLIMATE ANALYSIS

Factor	Observation / Input
Location	Urban Delhi context
Climate Type	Hot Semi-Arid
Summer Max Temp	~49.0–49.1 °C
Winter Min Temp	12 °C
Summer Humidity	20–28% (dry + dusty)
Monsoon Humidity	54–67% (high + sticky)
Winds Speed	9-40 Km/h
Rainfall	1756 mm

3.2.1Temprature

Delhi experiences an extreme climate with high seasonal variations. Winters (December–February) are short and mild, with temperatures ranging from **8°C to 24°C**. Summers (March–June) are intense, peaking in **May and June**, where temperatures frequently exceed **40°C**, occasionally crossing **46°C**. The monsoon season (July–August) brings slight relief but remains hot and humid, with most days in the **32–40°C** range. Post-monsoon (September–November) sees a gradual temperature decline, though **September and October** remain warm. The most common temperature band throughout the year is **28–36°C**, indicating prolonged heat exposure.

This data is critical for designing thermally efficient, climate-responsive buildings and planning sustainable developments in the region.

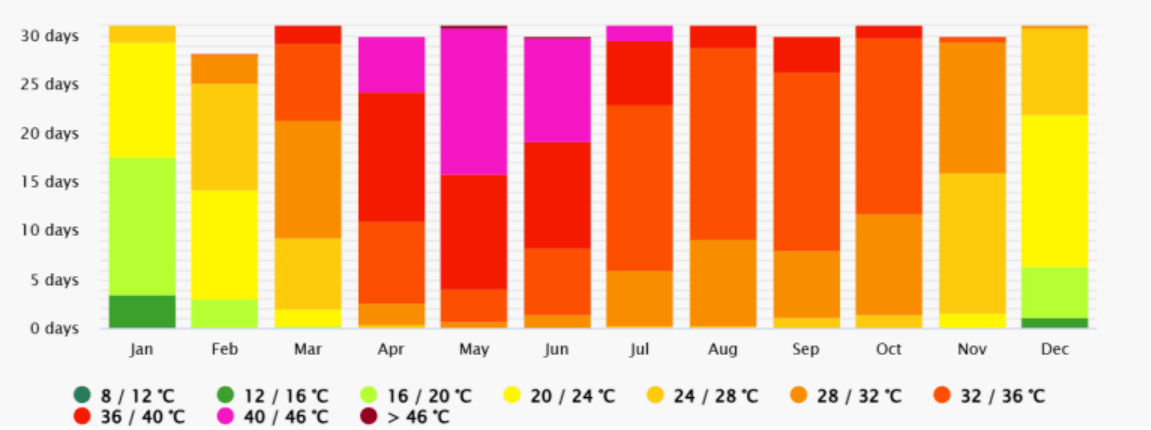


Figure 51 Delhi temp.

SUN PATH

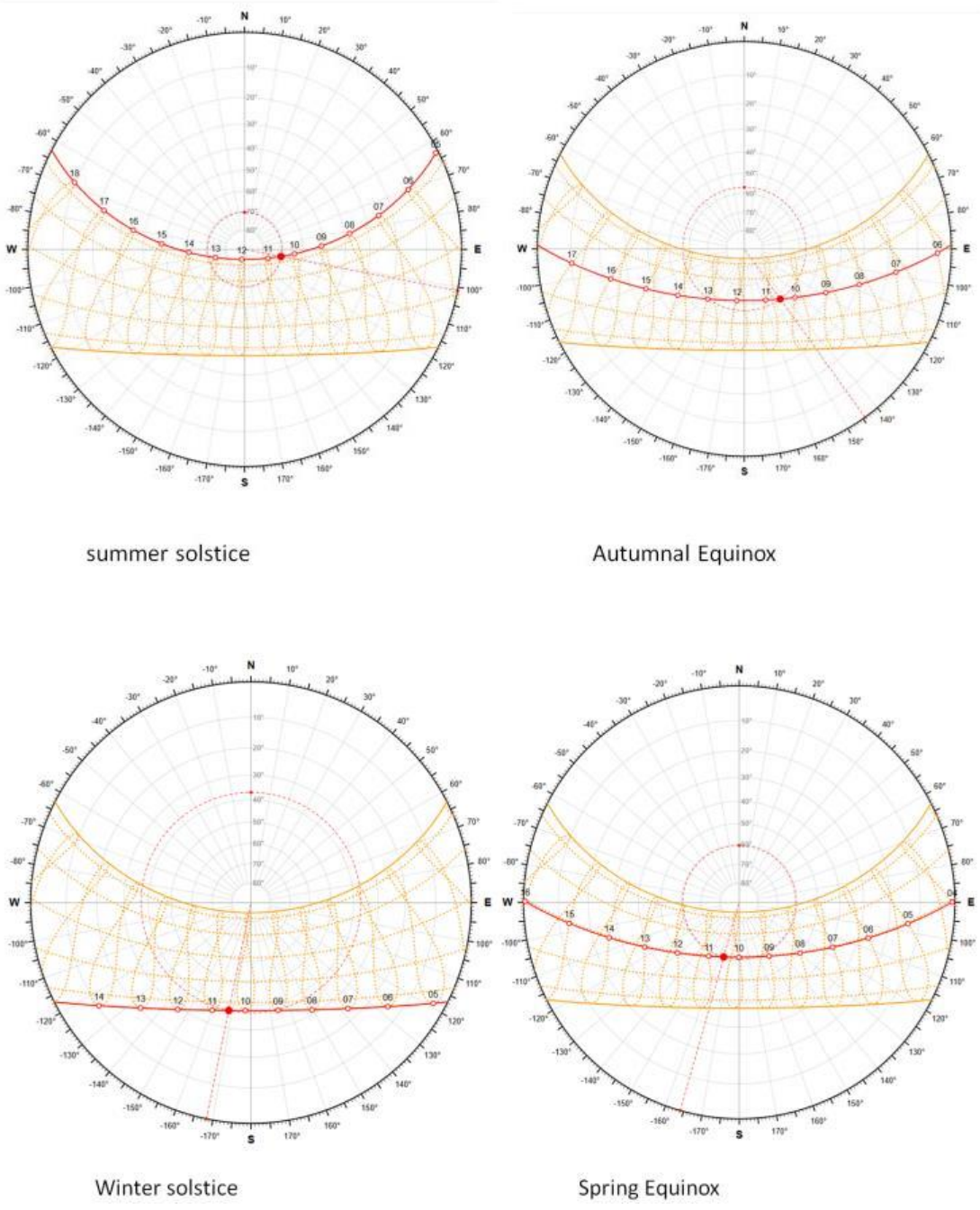
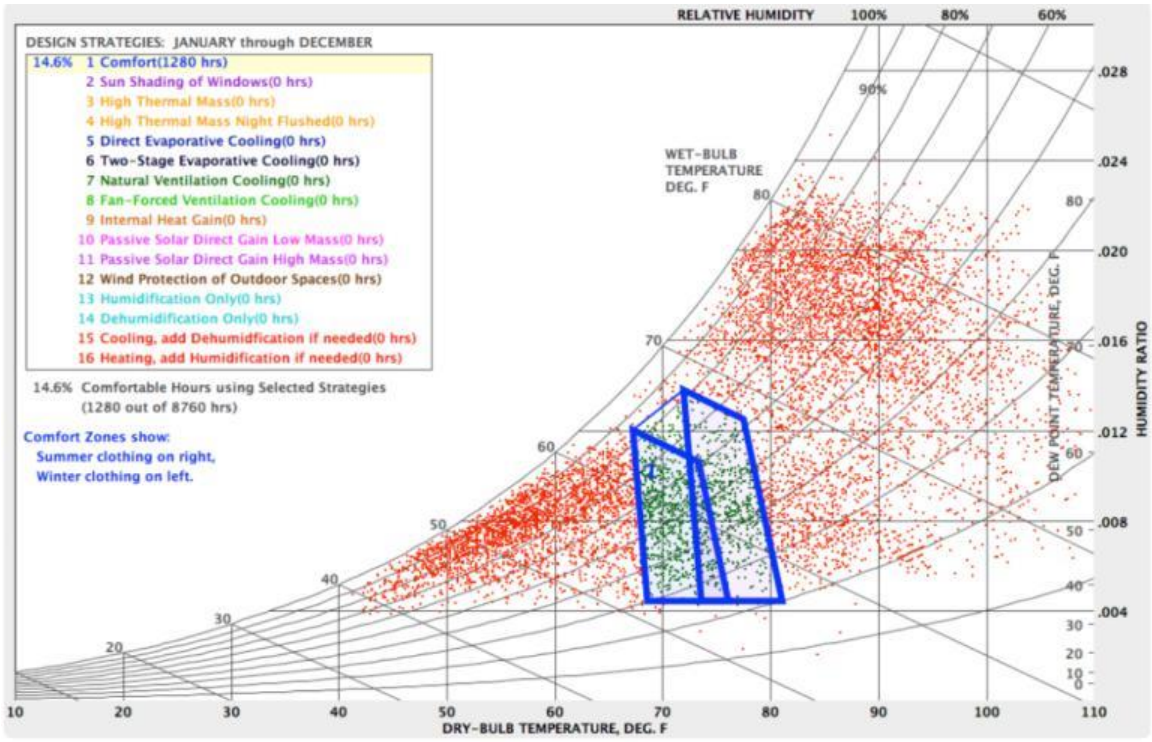


Figure 52 Stereographic sun path

Psychometric Chart



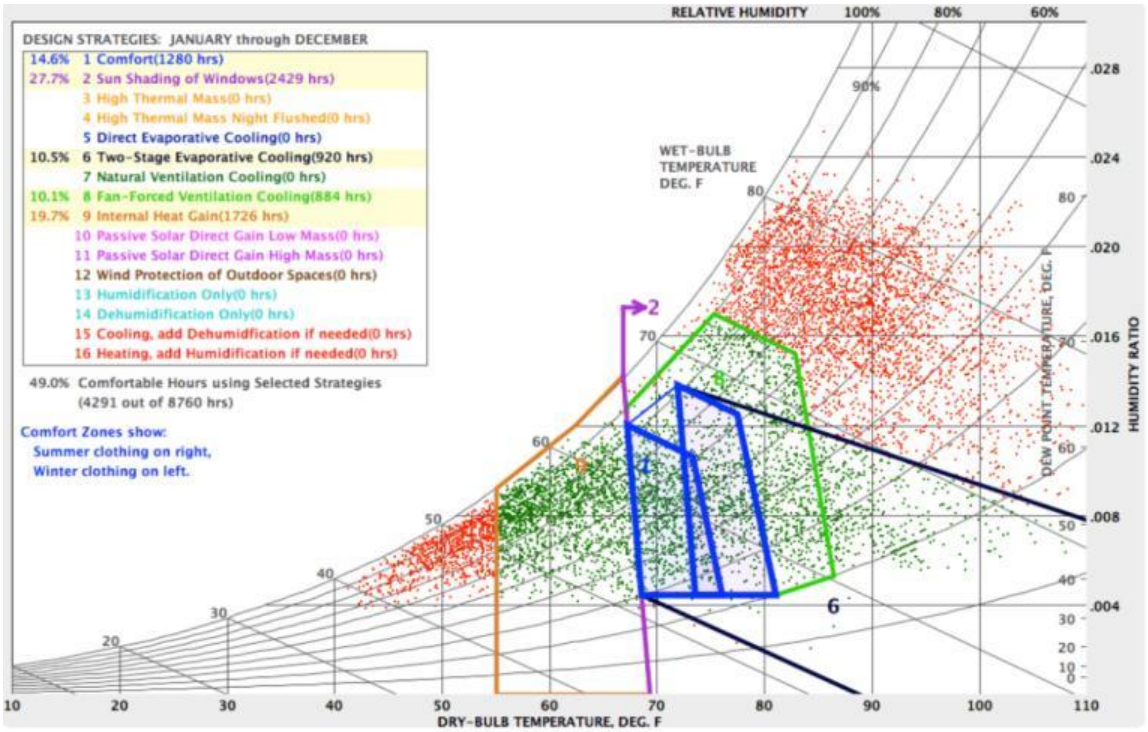


Figure 53 psychometric chart

3.2.2WIND

Over the past 10 years, Delhi has experienced moderate and consistent wind speeds, predominantly ranging between **5 to 20 km/h** throughout the year. The **strongest wind activity** typically occurs from **March to August**, with occasional days in **May and June** seeing speeds rise to **20–30 km/h**. In contrast, the **calmest periods** are from **October to February**, when wind speeds generally remain below **10–20 km/h**. High-speed winds exceeding **30 km/h** are rare. This wind profile supports the implementation of **natural ventilation**, **dust control**, and **passive cooling** strategies, making it a vital consideration in sustainable and energy-efficient building design for the region.

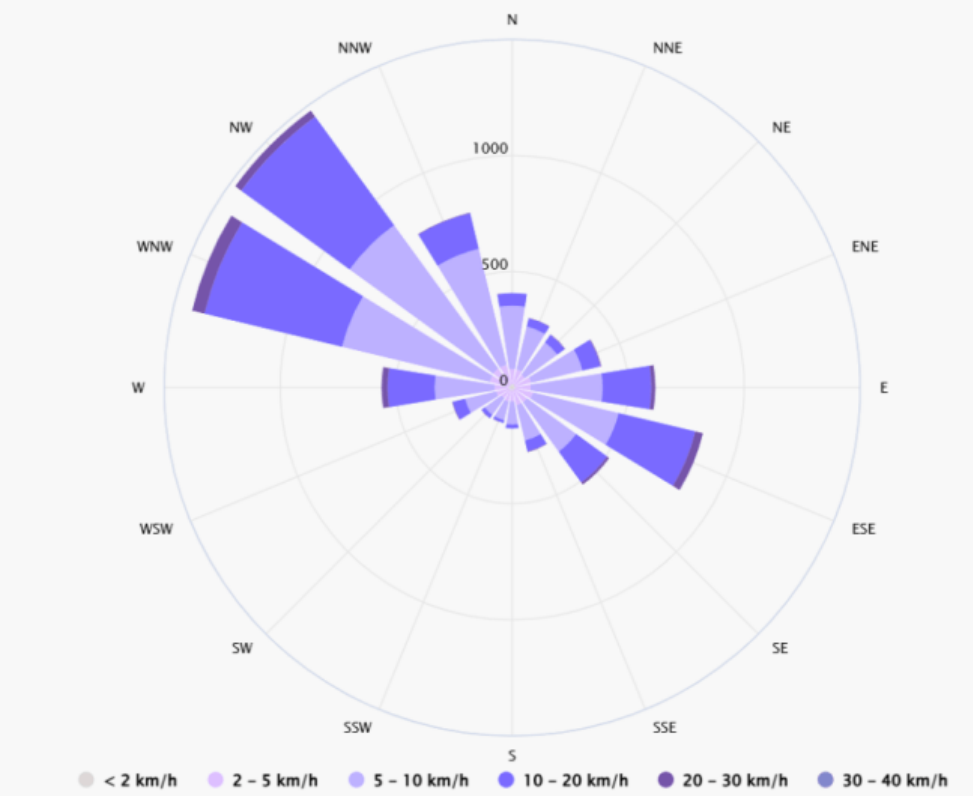


Figure 54 Wind rose diagram

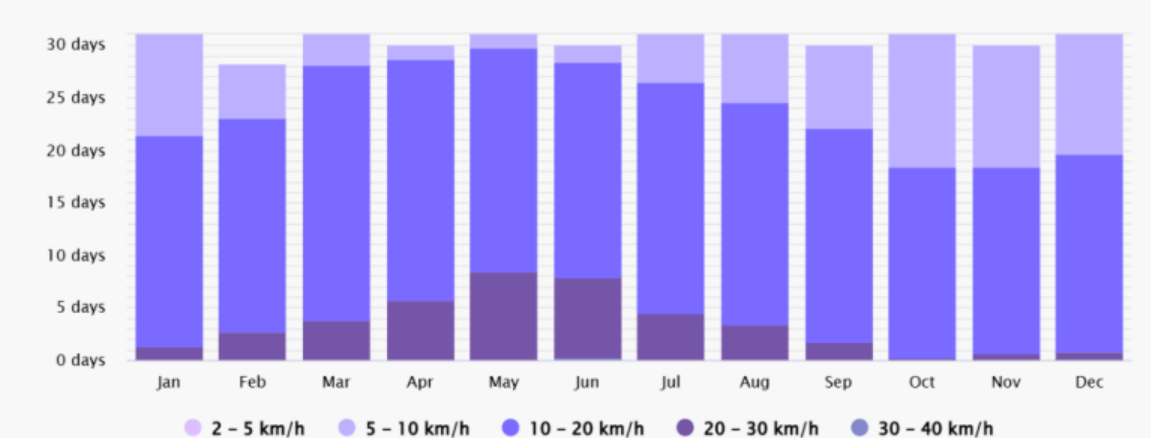


Figure 55 yearly wind data



Figure 56 site

I. Site Planning and Orientation (Based on Sun Path and Wind Directions)

1. Sun Path Optimization:

The Delhi region experiences intense solar radiation, particularly from the east and west.

- **North-South Orientation:** Align the longer facades of buildings along the north-south axis to minimize direct solar exposure.
- East and west facades should be minimized or shaded effectively.
- **Shading Strategies:** Use horizontal louvers, deep overhangs, and vertical fins on windows, especially on the east and west facades.
- Employ pergolas, recessed windows, and jaalis to reduce glare and heat.
- **Spatial Zoning:** Position less-occupied or transient spaces (toilets, storerooms, corridors) on the east and west sides.

- Place classrooms, labs, offices, and libraries on the north and south for optimal thermal comfort.
- **Semi-open Spaces:** Design shaded courtyards and open corridors that are protected from direct sun, facilitating outdoor learning and interaction.

2. Wind Direction Harnessing and Mitigation:

- Orient building openings and courtyards toward NW and NE to harness prevailing cool breezes.
- Enable cross-ventilation through operable windows placed on opposing facades.
- Incorporate wind towers, scoops, or jaali-walls in building design to draw in and direct breezes.
- Encourage stack effect in multi-storeyed buildings through roof vents and internal atriums.
- Dense trees, green belts, hedges, and berms act as natural shields.
- Reduce exposure on west facades:
- Use smaller windows with shading.
- Position services/utilities on the west to act as a thermal buffer.
- Create shaded microclimates with native trees and water features (ponds, shaded fountains).
- Maximize permeable surfaces in open areas to reduce runoff and encourage groundwater recharge.

II. Climate-Responsive Design (Hot Semi-Arid)

Building Envelope Optimization:

- **High Thermal Mass:** Utilize materials with high thermal mass (e.g., concrete, brick, stone) for walls and roofs to absorb heat during the day and release it slowly at night, moderating indoor temperatures.
- **Insulation:** Incorporate adequate insulation in roofs and walls to minimize heat transfer. This is crucial for both summer heat gain and winter heat loss.
- **Light-Colored/Reflective Roofs (Cool Roofs):** Use light-colored or highly reflective materials for roofs to reduce solar absorption and lower the building's surface temperature, combating the heat island effect.

Passive Cooling Strategies:

- **Natural Ventilation:** As mentioned above, design for maximum cross-ventilation, stack ventilation, and wind-driven ventilation.
- **Evaporative Cooling:** Consider evaporative cooling systems, especially during the dry summer months, to lower ambient air temperature. This can be integrated into air handling units or through landscape features.
- **Night Purging:** Design systems to allow for night purging, flushing out accumulated heat from the building interior by opening windows during cooler night hours.
- **Day lighting:** Maximize the use of natural daylight to reduce reliance on artificial lighting. Design appropriate window sizes, orientations, and light shelves/louvers to bring in diffused light without excessive glare or heat gain.

- Utilize atrium spaces and skylights with appropriate shading for deeper penetration of daylight.

4 CASESTUDY

4.1DETAILED CASE STUDY REPORT 1 – NIFT DELHI

4.1.1. Project Overview

- **Name**: National Institute of Fashion Technology (NIFT), Delhi
- **Location**: Hauz Khas, New Delhi, India
- **Architects**: B.V. Doshi, in collaboration with the NIFT Design Team
- **Client**: Ministry of Textiles, Government of India
- **Type**: Educational and Design Institute Campus
- **Built-up Area**: Approximate (3 acers)



Figure 57 aerial view

NIFT Delhi, the premier institute for fashion design and related studies in India, is located in a dense urban context and serves as a vibrant educational and creative environment for students pursuing design, management, and technology in fashion. It is designed to encourage interaction, creativity, and community engagement within a compact site footprint.

4.1.2. Design Brief & Objectives

- To create a campus that embodies the dynamic and creative spirit of fashion education.
- Integrate academic, administrative, and recreational spaces cohesively.
- Provide a functional, flexible, and climate-responsive environment for students and faculty.
- Facilitate exhibitions, workshops, and fashion shows within campus spaces.

4.1.3. Site Planning & Layout

- The campus is structured around a central pedestrian spine and informal nodes.
- The **amphitheatre**, positioned at the heart of the campus, was intended to act as the social and cultural core. (NIFT)



Figure 58 NIFT OAT



Figure 59 NIFT Layout

- Buildings are arranged with courtyards and connecting walkways, creating interaction spaces at different levels.
- The **back gate** offers access to service zones and connects with urban surroundings.



Figure 60 back gate

4.1.4. Concept

Doshi's concept of the building revolves around **form-imagery perception**, thus providing the building with roots, life, and history. The NIFT campus becomes a **village square** growing organically over time to become a theatre, the scene for unfolding drama of day-to-day life. For

the central kund, elements like **courts, wide casually aligned steps, water-channels, green areas, overlooking terraces, and bridges** emerge as key space-making devices.

According to B.V. Doshi, the following **architectural references** were:

- **Step Well:** Steps leading to water bodies surrounded by platforms and galleries.
- **Indian Bazaars:** Inspired the introverted alley-like movement system and informal display spaces.
- **Kund:** The main spatial anchor guiding wayfinding and congregation.



Figure 61 amphitheater

4.1.5. Orientation & Site Planning

- **Axis Alignment:** The entire building complex is aligned along the northwest-southeast (NW-SE) axis, a deliberate decision to maximize exposure to prevailing winds and daylight. (the architects diary)

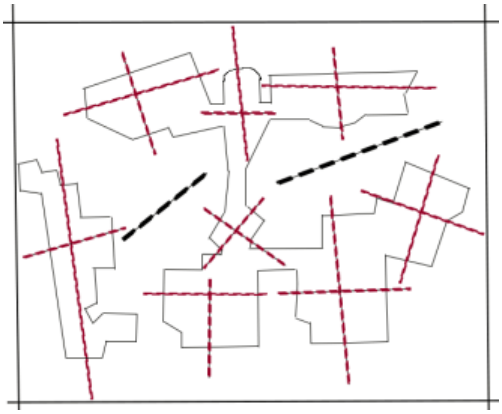


Figure 62 Orientation & Site Planning

- **Zoning Logic:** Different building blocks are placed according to site lines, with peripheral structures respecting the site geometry to ensure seamless spatial distribution.
- **Window Placement:** Windows in the academic block are directed toward NW and SE, causing intense solar glare and heat gain during the day, particularly in summer months.
- **Pedestrian Spine:** The layout is organized around a central pedestrian axis that connects academic, administrative, and recreational spaces, enhancing circulation and interaction.



Figure 63 Interacting zone

- **Courtyard Strategy:** Interspersed courtyards function as buffers for ventilation and congregation, although the lack of shading vegetation affects their thermal comfort.
- **Amphitheatre Misalignment:** Initially intended as a central performance space with optimal orientation, the amphitheatre was rotated during construction, leading to poor solar orientation and reduced usability.

4.1.6. Circulation

- **Multilevel Circulation:** The circulation system includes three-level walkways, enhancing both vertical and horizontal movement while promoting natural cross-ventilation.
- **Components:** Designed elements include corridors, steps, staircases, lobbies, lounges, bridges, and terraces—all interconnected to support functional and experiential flow.
- **Bridge Functionality:** Glass-screened bridges act as both physical connectors and symbolic extensions of student movement. They also double as catwalks for fashion shows and visual displays.



Figure 64 Bridge

- **Corridor Utilization:** Corridors are intentionally wide and vibrant, used for installations, exhibitions, and spontaneous student-led events, making them more than mere passageways.
- **Circulation Aesthetics:** Movement spaces are layered and often overlook courtyards or open zones, creating moments of pause and engagement with the environment.
- **Staircases:** A total of five staircases serve academic and administrative blocks, along with two lifts to ensure accessibility and ease of movement.
- **Design Intent:** The circulation is not only functional but designed to foster interaction, creativity, and a sense of place, in line with Doshi's belief in spatial storytelling.

4.1.7. Structure, Construction & Materials

- Based on a **modular frame structure** with a square module of **7.88m**.
- Roofing uses **waffle slabs (1.7m x 1.7m)** for large column-free areas (~6.85 sqm).
- External walls are **990 mm thick**, providing sun insulation and reducing thermal gain.
- **Structure:** RCC and brick walls.
- **Cladding:** Random rubble stone masonry on plinth and walls, steel frame with reflected glass, and use of **imported float and non-reflecting glass** as a material system.



Figure 65 Facade

- **Façade Treatment:** Exteriors in grey grit, while interiors feature contrasting compositions in **white, beig, and grey**, often reflected through the glass walls.
- **Floor Finish:**
  - **Reception:** Black granite and white marble check
  - **Corridors:** Kota green and Jaisalmer yellow

4.1.8. Landscape Design

- While substantial **green spaces** are limited, careful landscaping adds character.
- **High and low platforms** with soft/hard landscaping enrich the amphitheatre court.
- **Site boundary** lined with **deciduous and evergreen trees**.
- Use of **potted plants** at entrances enhances user experience.
- However, soft landscaping across campus is minimal, and **environmental performance suffers** due to lack of natural shading.

4.1.10. Climate Responsiveness & Performance

- **Orientation Strategy:** The NW-SE orientation helps capture prevailing winds and winter sunlight, making it effective for cross-ventilation and passive lighting.
- **Thermal Mass Usage:** The building uses thick external walls (~990mm) to slow heat transfer, which stabilizes interior temperatures across the day.
- **Waffle Slab Design:** Waffle slabs (1.7m x 1.7m) reduce the need for internal columns and help disperse heat more evenly, supporting passive cooling.



Figure 66 waffle slab

- **Shading Elements:** Shaded terraces, projections, and bridges provide partial sun protection and define circulation paths with comfortable microclimates.
- **Courtyards:** Semi-open courtyards enhance air flow and serve as thermal buffers, though their effectiveness is reduced by a lack of greenery.

Challenges:

- SE-facing glazed windows cause unwanted solar heat gain.
- The amphitheatre lacks overhead shading and vegetation, making it hot and less usable during peak sun hours.
- Limited soft landscaping and trees reduce evaporative cooling, undermining the intent of a passive strategy.

4.1.11. User Experience

- **Amphitheatre Orientation and Performance:** The amphitheatre, intended as the campus's focal social and cultural space, failed to deliver on expectations due to a reversal in orientation during construction. This resulted in poor solar alignment, leading to glare and thermal discomfort during peak daytime usage. Its limited seating capacity of 300 further restricts its ability to host major institutional events.
- **Creative Adaptation by Students:** Despite architectural shortcomings, students have demonstrated adaptive reuse of spaces. Underutilized corridors, staircases, and terraces are frequently transformed into spontaneous exhibition zones and performance platforms. This flexible use of space reflects the inherent potential of the campus design to support user-driven innovation.
- **Vibrant Movement and Display Areas:** Circulation paths serve more than just functional movement they act as dynamic galleries and informal gathering zones. This fosters continuous interaction between students and the built environment, enhancing the creative atmosphere of the institute.

- **Interactive Semi-Open Spaces:** Courtyards, terraces, and open bays provide breathing zones that support informal social interactions. These spaces contribute to a lively campus culture, even as they sometimes fall short in thermal comfort due to limited landscape shading.
- **Environmental Shortcomings:** While the spatial layout supports creativity and interaction, critiques persist about its lack of adequate shade, minimal green buffers, and inconsistent thermal performance particularly in summers when Delhi's climate is harsh.
- **Overall Spatial Experience:** The campus succeeds in offering an animated, user-responsive environment despite its technical and climatic shortcomings. Its ability to evolve with its users underscores the success of its fundamental spatial logic, even as it highlights areas needing improvement in construction fidelity and environmental performance.

4.1.12. Comparative Inferences for Thesis Relevance

- The NW-SE campus orientation shows awareness of climatic responses, but inconsistent execution (e.g., SE-facing glazing and amphitheatre orientation) weakens environmental performance.
- Modular grid planning using a 7.88m waffle slab system offers spatial flexibility, essential for dynamic academic environments.
- Circulation areas such as corridors and stairwells can become vibrant exhibition and social zones when designed with user interaction in mind.
- Passive cooling strategies, though integrated, were undermined by limited landscaping and insufficient solar protection measures.
- The campus reflects how creativity and adaptability can flourish even within spatial and climatic limitations when architecture allows for user agency.

Group photo in NIFT case study



4.2 DETAILED CASE STUDY REPORT 2 – CEPT UNIVERSITY, AHMEDABAD

4.2.1. Project Overview

- **Name:** CEPT University (Centre for Environmental Planning and Technology
- **Location:** Navrangpura, Ahmedabad, Gujarat, India
- **Architect:** B.V. Doshi
- **Client:** CEPT Trust / Government of Gujarat
- **Type:** Educational Campus for Architecture, Planning, Design, and Management
- **Site Area:** Approx. 12.5 acres
- **Built Character:** Open-ended, interactive, and climate-responsive

CEPT University is a physical manifestation of B.V. Doshi's ideology of participatory and evolutionary architecture. The design reflects his belief in democratic education where students, teachers, and spaces engage in mutual dialogue. The campus avoids hierarchical spatial distribution, promoting inclusivity and community. Architecture here is not a product but a framework for events, learning, and reinterpretation. The open campus challenges the notion of closed classrooms, transforming learning into an everyday, spatially embedded experience.

4.2.2. Design Brief & Objectives

- **Foster a Living Campus:** Create a campus that supports informal learning through lived experiences and everyday encounters.
- **Interdisciplinary Integration:** Accommodate various departments architecture, planning, design without clear spatial segregation.
- **Spatial Freedom:** Allow flexibility of use across time and disciplines.
- **Climatic Performance:** Design spaces with minimal mechanical dependence by integrating vernacular strategies.

The objective was not to design an architectural monument but to establish a learning environment that evolves organically. Doshi emphasized that true learning happens outside formal boundaries. The architecture invites reinterpretation—voids become classrooms, platforms become discussion hubs, and boundaries dissolve between disciplines. The user is not passive but becomes a co-creator. (CEPT University)

4.2.3. Site Planning & Layout

- **Organic Growth:** Buildings arranged informally around shaded courts and green pockets.
- **Pedestrian Focused:** Central spine with lateral movement paths; minimal vehicular intrusion.
- **Open-Ended Layout:** No rigid zoning spaces evolve as per user needs.

- **Spatial Hierarchy:** Includes sunken courts, stepped plazas, narrow alleys, and wide terraces.
- **Interconnected Courtyards:** Act as transition and congregation spaces.
- **Incremental Growth:** Structures are positioned to allow future development.



Figure 67 site plan

The planning imitates Indian urban morphology dense, layered, and irregular planning is anti-zoning. It allows for serendipitous encounters and growth without master plan rigidity. Spaces are layered to provide different experiential realms light, shadow, gathering, solitude all coexisting like a town square.

4.2.4. Architectural Concept

- **Learning Without Boundaries:** Inspired by the idea of a "bazaar" of ideas flexible and interactive.
- **Spatial Openness:** Seamless connections between inside and outside blur built and natural environments.
- **Symbolism:** Reflects traditional Indian spatial values (courtyards, terraces, steps).
- **Unfinished Aesthetic:** Encourages appropriation and personalization by users.
- **Multiplicity of Experience:** Spaces are not singularly defined, allowing for flexible functions.



Figure 68 seating area

CEPT is not a closed academic fort but a porous organism that lives and breathes. The idea is to provide a setting for the drama of daily student life a village where learning emerges from conversations, encounters, and rituals. The campus invites reinterpretation and ritual use.

4.2.5. Orientation & Site Response

- **North-South Axis:** Minimizes harsh solar exposure; improves comfort.
- **Microclimate Design:** Shaded courts and breezeways facilitate natural cooling.
- **Tree Canopies:** Modulate temperature and shield against solar glare.

Responsive design begins with climate using nature in architecture. Trees are roofs. Earth is the floor. The built form adapts to Ahmedabad's hot-dry climate by optimizing orientation and integrating thermal mass and landscape.

4.2.6. Circulation

- **Informal and Layered Movement:** No rigid corridors; paths flow organically.
- **Integrated Pause Points:** Steps, shaded thresholds, terraces become social nodes.
- **Visual Transparency:** Encourages spatial engagement and curiosity.



Figure 69 circulation

Movement through CEPT is designed as an experience. architecture should stimulate wandering. The campus layout resists linearity, prompting users to explore, pause, and interact. Every path is an invitation to discovery.

4.2.7. Materials

- **Finish Palette:** Exposed concrete, rough Kota stone, stone chips, and cement plaster.
- **Fenestration:** Steel/aluminum window frames, often operable; minimal glass to reduce heat gain.
- **Stone:** Used for its durability, local availability, and natural beauty, often integrated into flooring, walls, and landscape elements.
- **Tactile Qualities:** The textures of exposed brick, rough concrete, and natural foliage engage the sense of touch.

The use of local materials reflects contextualism and affordability. cost-effective, has excellent thermal properties, and contributes to a warm, earthy aesthetic that blends with the Indian context. to creating architecture that was in harmony with its environment, responsive to human needs, culturally resonant, and built with integrity and a forward-looking vision for sustainability.

4.2.8. Landscape Design

- **Courtyards and Semi-Open Spaces:** The campus is replete with courtyards, both enclosed and semi-enclosed, that bring nature into the heart of the buildings. These spaces are extensions of the learning environment, where discussions, casual meetings, and individual reflection can take place amidst greenery.

- **Verandahs, Balconies, and Pergolas:** These architectural elements act as transitional zones, offering shade and allowing for natural ventilation while providing visual and physical connections to the surrounding landscape. The play of light and shadow created by pergolas on the exposed brick and concrete walls is a hallmark of his design, constantly changing the experience of the space.
- **Strategic Openings:** Windows and doors are not just openings but carefully positioned elements that frame views of the landscape, allowing natural light and breezes to penetrate deep into the interiors.
- **Shade and Microclimates:** Extensive tree planting, particularly indigenous species like Neem, provides crucial shade, creating cooler microclimates within the campus. These shaded areas are invaluable for outdoor activities during the day.



Figure 70 open areas

4.2.9. Climate Responsiveness

1. Orientation and Massing:

- North-South Orientation: The buildings at CEPT are predominantly oriented along the north-south axis. This minimizes exposure to the harsh east and west sun, which are particularly intense in Ahmedabad. The longer facades face north and south, allowing for controlled daylighting and ventilation.
- Distributed Massing: Instead of a single monolithic block, the campus is composed of several smaller, interconnected blocks. This allows for the creation of numerous open spaces, courtyards, and pathways that facilitate airflow and provide shaded relief.

2. Passive Cooling Strategies:

- **Thermal Mass (Exposed Brick and Concrete):** Doshi extensively used exposed brick and concrete for the building envelopes. These materials have high thermal mass, meaning they absorb heat slowly during the day and release it gradually at night. This helps to moderate indoor temperatures, keeping interiors cooler during the day and warmer at night, reducing the need for mechanical cooling
- **North-Facing Slanted Windows and Skylights:** Studios are designed with large, north-facing slanted windows and skylights. North light is diffuse and consistent, providing ample natural illumination without excessive heat gain or glare. This reduces the need for artificial lighting during the day.



Figure 71 window design

4.2.10. User Experience & Adaptability

- **Student-Led Space Use:** Terraces, staircases, and corridors used for informal study and events.
- **Exhibition Culture:** Walls and open areas become impromptu display zones.
- **Interactive Learning:** Layout encourages constant engagement with built environment.
- **Ownership of Campus:** Students treat campus as a living space, not a passive backdrop.
- **Open Critique Culture:** Spaces enable informal discussions, site teaching, and peer learning.

4.2.11. Comparative Inference for Thesis Relevance

- **Spatial Democracy:** CEPT demonstrates a break from institutional rigidity by promoting inclusivity, freedom of movement, and blurred academic boundaries. Unlike many traditional campuses, it creates a community-oriented academic environment.
- **Participatory Architecture:** The spatial openness allows students and faculty to continuously reinterpret their surroundings, affirming Doshi's philosophy that architecture must evolve through occupation. CEPT is not a monument but a living, learning organism.

- **Passive Climatic Strategy & Modern Additions:** The original design utilizes thermal mass, orientation, and vegetation for passive cooling, contrasting with later expansions that sometimes compromise these ideals. This tension highlights the importance of fidelity to architectural ethos in future development.
- **Educational Tool:** The exposed structural systems, raw materiality, and unfinished aesthetics of CEPT make the campus itself a tool for learning turning the act of inhabiting into a continuous educational experience. The buildings teach construction logic, material behavior, and spatial adaptation.
- **Landscape as Architecture:** Unlike merely decorative greens, CEPT integrates landscape as part of the spatial language. It performs climatically, socially, and pedagogically encouraging interaction and pause, not just transit.

Site visit in CEPT



4.3 DETAILED CASE STUDY REPORT – IIT GANDHINAGAR (DESK STUDY1)

4.3.1. Project Overview

- **Name**: Indian Institute of Technology (IIT), Gandhinagar
- **Location**: Gandhinagar, Gujarat, India
- **Architects**: Ar. Vinod Gupta (Space Design Consultants), Ar. Ujan Ghosh (Upal Ghosh Associates)
- **Client**: Government of India
- **Completion Year**: 2015
- **Site Area**: 400 acres (~5,600,000 sq. ft.)
- **Built-up Area**: 520,961 sq.m
- **Designed Capacity**: 10,000 students (in phases)

4.3.2. Design Brief & Objectives

- Develop a vibrant, sustainable, and functional academic campus
- Foster faculty-student engagement and holistic community life
- Achieve zero energy import, zero water import, and zero waste export
- Set a benchmark in ecological campus design aligned with GRIHA norms
- Integrate natural features like ravines and riverbanks into the planning

4.3.3. Site Context & Planning

- Located on the western bank of the Sabarmati River
- Southern zone developed for academics and residential needs
- Northern portion reserved as a natural habitat for native fauna
- Ravines converted into water management systems
- Site planning preserves natural topography and views

5.3.4. Phasing & Zoning

- **Phase 1 & 1A**: 3,600 students
- **Phase 2**: 4,800 additional students
- Functional zoning: Academic core, residences, recreation, guest housing
- All major built forms are low-rise and walk-up for accessibility and energy efficiency (iit gandhi nagar)

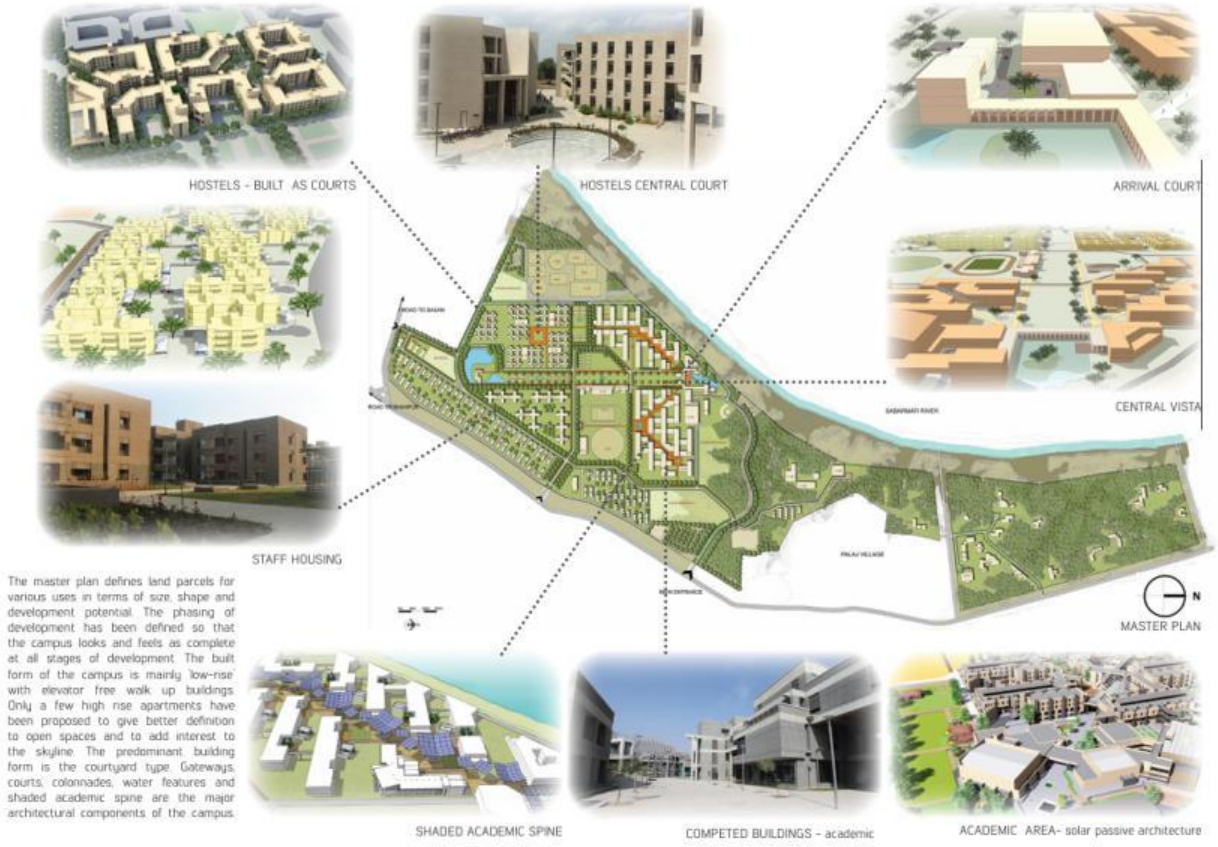


Figure 72 zoning

4.3.5. Architectural Features

The architectural vocabulary reflects a blend of traditional Indian planning principles and contemporary needs:

- **Academic Spine**: A shaded, continuous walkway that connects classrooms, laboratories, and seminar halls. It acts as the central organizational element that weaves together the academic zone, ensuring thermal comfort and ease of movement.
- **Courtyard Planning**: Major building blocks, including hostels, residences, and academic blocks, are arranged around landscaped courtyards. These spaces allow cross ventilation, optimize daylighting, and act as social interaction nodes.
- **Arrival Court**: The primary entry point for visitors and students, the Arrival Court establishes a ceremonial sense of arrival and orientation. It is connected visually to the river and serves as a prominent threshold into the academic zone.
- **Jal Mandaps**: These multi-functional structures symbolize the integration of architecture and ecology. Positioned across the site, they act as rainwater collection and celebration spaces, blending functionality with aesthetics.

- **Herbal Garden and Green Pockets**: Distributed throughout the campus, these gardens are planted with medicinal herbs and native flora. They promote biodiversity, create microclimates, and serve as educational tools for environmental learning.
- **Hostel Blocks**: Built in a clustered format around internal courts, the hostel blocks support community living, natural ventilation, and visual connectivity. Each block is designed to ensure passive cooling, acoustic comfort, and safety.
- **Terraced Platforms and Amphitheatre**: Multi-tiered seating integrated with landscape offers space for performances, student assemblies, and informal gatherings.
- **Material Palette and Expression**: The consistent use of fly ash bricks, exposed RCC, and grit plaster creates a minimalist yet robust aesthetic. These materials age well, reduce maintenance, and reflect the regional context.
- **Rooflines and Shading Devices**: Sloped roofs, extended overhangs, and shading devices like pergolas and recessed fenestrations are used extensively to minimize direct solar gain.
- **Integrated Built-Nature Relationships**: Building masses frame natural vistas, connect to shaded walkways, and are scaled to human proportions, maintaining a sense of intimacy across such a large campus.

These architectural choices together create a language of climate responsiveness, human-centric scale, and environmental integration. The built environment at IITGN becomes a living laboratory where design decisions translate into real-world sustainability and experiential learning.

4.3.6. Climate & Sustainability

Gandhinagar experiences an extreme climate characterized by a long, hot, and dry summer, a humid monsoon season, and a relatively short winter. The design of IIT Gandhinagar is a response to this climatic context, with passive and active strategies incorporated throughout the campus:

- **Thermal Comfort**: Buildings are oriented and designed to minimize heat gain. The use of cavity walls filled with insulating materials and fly ash bricks enhances thermal performance and reduces the dependency on mechanical cooling.

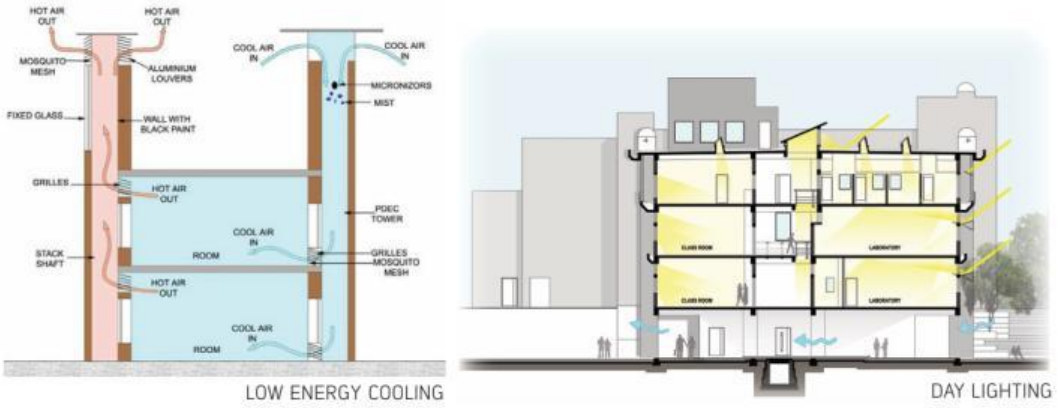


Figure 73 climate responsive techniques

- **Solar Shading and Natural Cooling**: Deep overhangs, recessed windows, shaded colonnades, and tree-lined pathways ensure that indoor and outdoor spaces remain cool. Passive cooling strategies like cross-ventilation and thermal mass are prioritized in residential and academic blocks.

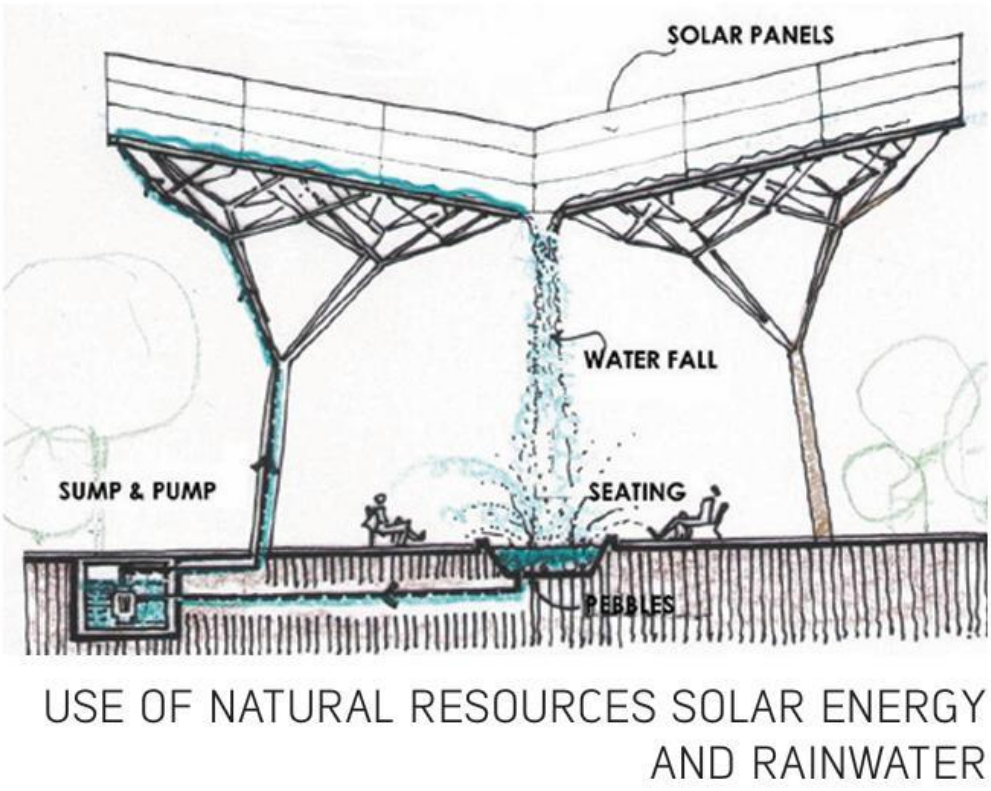


Figure 74 solar panels

- **Rain Protection**: Covered walkways and shaded verandahs provide protection during heavy rainfall while also serving as circulation corridors, maintaining connectivity in all seasons.
- **Material Use**: Locally sourced and environmentally friendly materials, such as exposed concrete and grit plaster, are used throughout the campus to reduce the carbon footprint and minimize lifecycle maintenance.
- **Daylighting**: Fenestration design optimizes natural light while reducing glare and heat, contributing to reduced artificial lighting needs during the day.

4.3.7. Environmental Strategies

The IITGN campus has been envisioned as a model for sustainable development through integration of efficient environmental management systems:

- **Water Management**: The campus follows a zero-discharge policy. All wastewater is treated on-site using DEWATS (Decentralized Wastewater Treatment Systems) and root zone systems. The treated water is reused for landscape irrigation and flushing. (re-thinkthefuture)
- **Rainwater Harvesting**: Sloped rooflines, ground channels, and Jal Mandaps collect rainwater efficiently. Rainwater is stored and percolated to recharge groundwater levels, reducing dependence on external sources.
- **Renewable Energy**: A combination of rooftop solar panels and a solar carport system generates up to 500 kWp of clean energy, reducing the campus's carbon footprint significantly.
- **Waste Management**: Organic waste from residential and food facilities is managed via biogas plants and composting pits. Segregation at source ensures efficient recycling and composting.
- **Green Transport**: The campus promotes non-motorized mobility through shaded pedestrian paths, dedicated cycling tracks, shared bicycle systems, and e-rickshaw services. Vehicular access is restricted, especially in academic zones.
- **Edible Landscaping and Local Cultivation**: Fruit-bearing and medicinal plants, including moringa, are cultivated across the campus, integrating agriculture into the academic landscape.
- **Biodiversity Preservation**: The northern zone of the site remains largely undisturbed to preserve the natural habitat of species like Nilgai and to maintain the ecological balance.

4.3.8. User-Centric Design At the core of IIT Gandhinagar's planning philosophy is a strong commitment to user comfort, social engagement, and inclusivity:

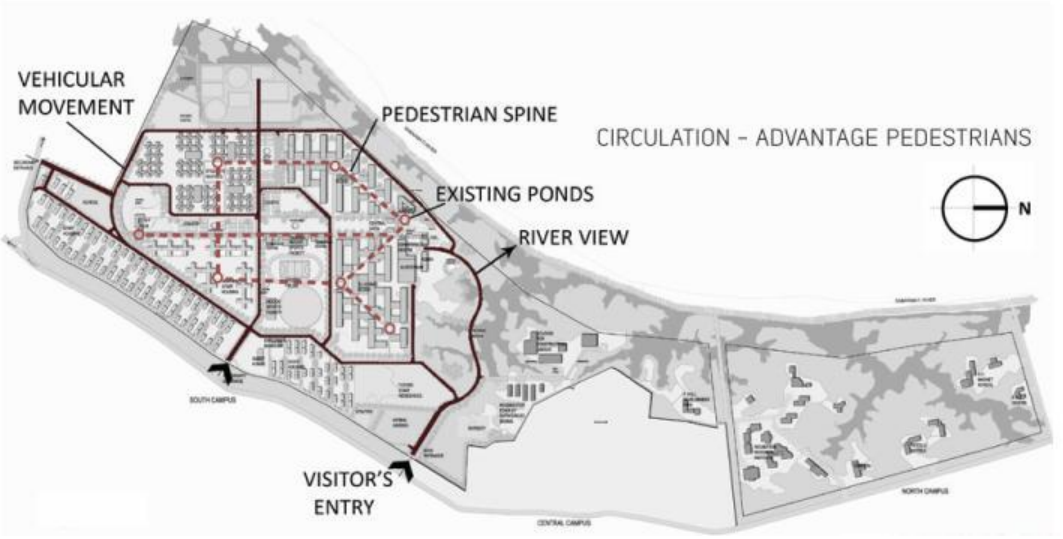


Figure 75 circulation

- **Universal Accessibility**: Buildings and open spaces are designed in compliance with universal design principles, ensuring access for people of all abilities. Ramps, tactile pathways, and accessible toilets are standard.
- **Pedestrian-Oriented Planning**: The academic and residential zones are walkable and interconnected via shaded corridors and tree-lined paths, encouraging healthy lifestyles and spontaneous social interactions.
- **Community Interaction Spaces**: Multiple public nodes such as the amphitheatre, food courts, courtyards, and garden plazas act as social condensers. These promote a vibrant campus culture and academic discourse beyond classrooms.
- **Safety and Comfort**: Residential blocks are designed with internal courtyards and monitored entrances. Natural surveillance and well-lit pathways enhance safety, especially for female students.
- **Student-Centric Amenities**: Recreational spaces, indoor and outdoor sports areas, open-air study zones, and self-learning pavilions provide diverse spaces for holistic student development.
- **Psychological Well-being**: Integration of green spaces, water features, and nature trails helps reduce stress and improve mental well-being for campus residents.

4.3.9. Sustainability Certifications and Practices

IIT Gandhinagar is widely recognized for its commitment to environmentally responsible design and operation. The campus is the first in India to be awarded a **5-Star GRIHA LD (Green Rating for Integrated Habitat Assessment for Large Developments)** rating, showcasing its excellence in sustainable master planning.

- **GRIHA LD Certification**: The 5-star rating acknowledges IITGN's efforts to optimize energy and water use, minimize environmental impact, and promote green transportation. This rating sets a precedent for large educational campuses nationwide. (iit gandhilagar)

- **Zero Sewage Discharge**: No sewage leaves the campus. Instead, wastewater and sewage are treated using anaerobic baffled reactors and a root zone treatment system. Recycled water is distributed through a dual piping network and is reused for irrigation and flushing.

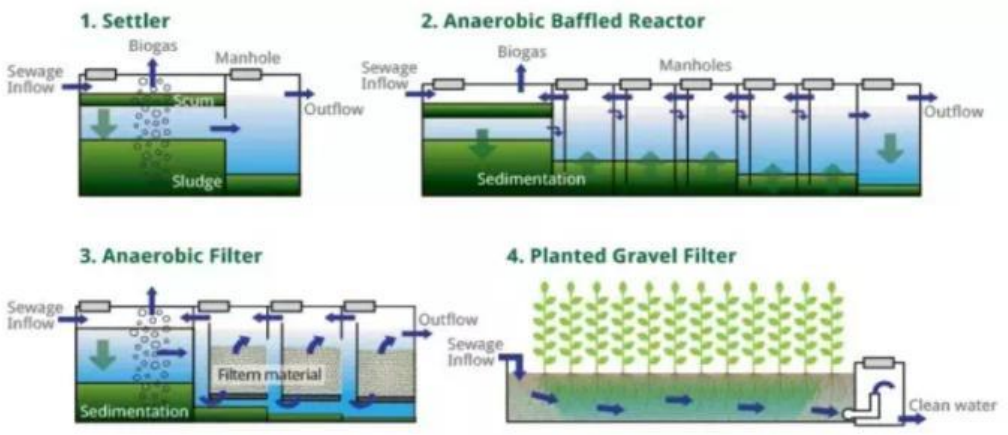


Figure 76 baffle rector

- **Energy Optimization**: The campus is 46% more energy-efficient than standard GRIHA LD base buildings. Energy conservation is achieved using fly ash bricks in cavity wall construction, which minimizes heat gain. External finishes of exposed concrete and grit plaster enhance durability while reducing cooling loads. The central courtyard "Samvad Court" uses a perforated roof structure to create dynamic light and shadow, enhancing thermal comfort.
- **Solar Carport & Rooftop Panels**: IITGN generates up to 500 kWp of solar energy from a combination of rooftop systems and a 90-vehicle solar carport. This innovative parking solution not only supports clean energy but also provides shade and protection for vehicles.



Figure 77 solar panels in parking area

- **Water Management**: The campus has reduced its annual water demand by approximately 41.86% through reuse of treated wastewater. All fixtures are low-flow, and 100% of wastewater is treated via the DEWATS system. Rainwater harvesting is accomplished through Jal Mandaps – structures modeled after traditional step-wells that celebrate water collection. The campus rooftops are connected to a stormwater collection network feeding these mandaps via gravity.
- **Solid Waste Management**: IITGN has implemented a comprehensive waste strategy. Biogas plants process segregated food waste from hostels, while compost pits manage kitchen waste. The resulting compost is used in the landscape, closing the organic waste loop.
- **Sustainable Transport**: The layout promotes walkability with universally accessible, shaded footpaths. Green transportation is supported by two CNG vans that shuttle between the housing and academic blocks. Electric vehicle charging points are available in over 10% of parking slots. Additionally, the 'Sustainable Cycle Pooling Initiative' encourages eco-friendly commuting among students and staff.

4.4. DETAILED CASE STUDY REPORT – IIT DELHI (DESK STUDY 2)

4.4.1 Project Overview

- **Name:** Indian Institute of Technology (IIT), Delhi
- **Location:** Hauz Khas, New Delhi, India
- **Architects:** Jugal Kishore Chowdhury and Benjamin Polk
- **Client:** Government of India
- **Type:** Technical and Research-Based Educational Institute
- **Campus Area:** Approx. 320 Acres

4.4.2 land use

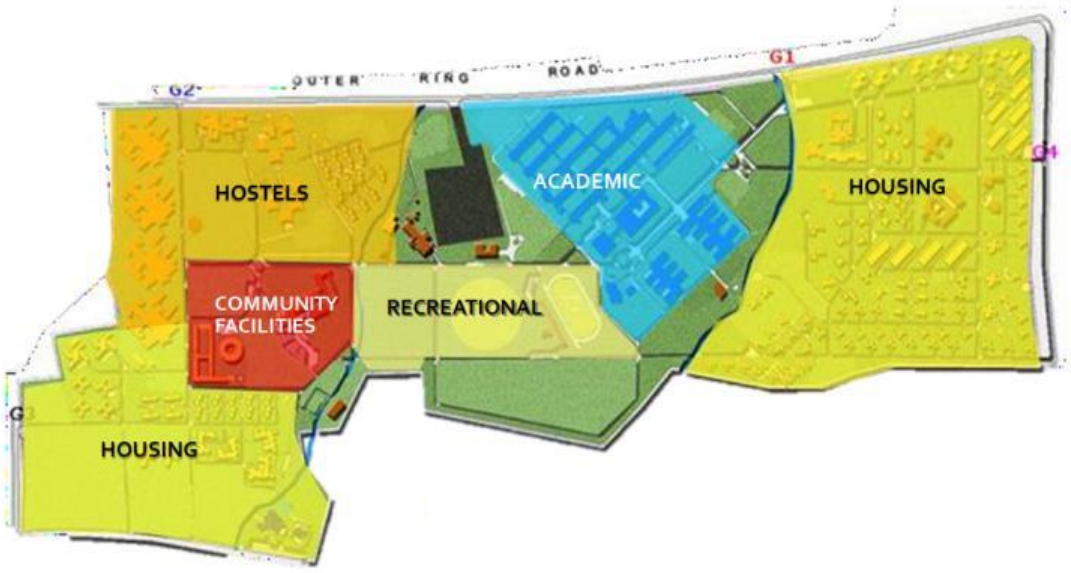


Figure 78 land use map of IIT Delhi

- The campus area has been divided into four functional zones which are as follows:
- Residential zone for students;
- Residential zone for the faculty and staff.
- Academic zone for academic buildings and workshops; and
- Cultural-cum-social and recreational zone for students.

The site being longitudinal in shape, the last two zones have been located mid-way between the two residential zones in order to reduce walking distance. The main academic building accommodates various teaching and research activities (IIT DELHI)

4.4.3 Site planning: zoning

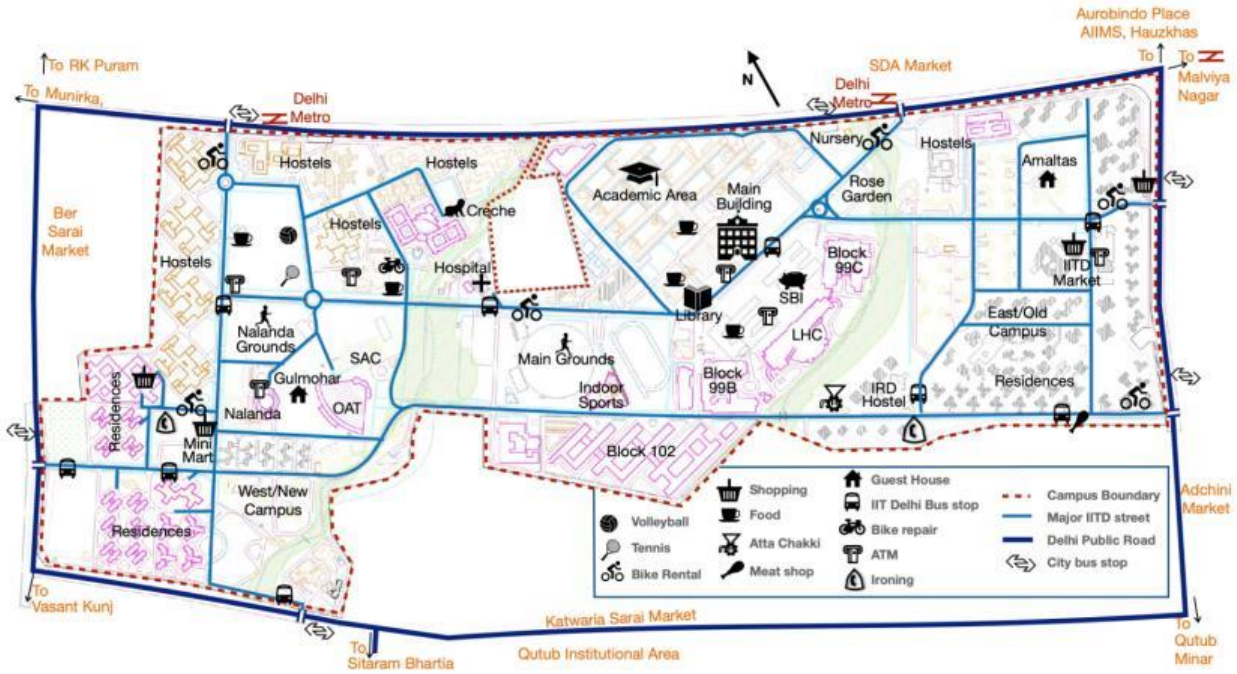


Figure 79 detailed site plan

Functional Zoning of the Campus

The layout follows a **zoned planning logic**, with distinct areas:

A. Academic Core (Central-Eastern Zone)

Contains:

- Main Building
- Library
- LHC (Lecture Hall Complex)
- Block 99B, 99C, 102
- IRD (Industrial R&D) Hostel

Surrounded by eateries (coffee symbols), ATM, SBI Bank, and other academic infrastructure.

Designed for intellectual activity and centrally accessible from all sides.

B. Hostels

Hostels are clustered in the:

- Northwest
- North-Central
- Northeast zones
- Strategically placed close to academic areas and sports facilities.

- Includes recreational and food services like volleyball, tennis, bike rentals, and mess facilities.

C. Faculty & Staff Residences (South and Western Zones)

- Residential zones are located in:
  - **West/New Campus**
  - **East/Old Campus**
  - **Southern edges**
- These are quieter areas with easy access to family services like grocery marts, playgrounds, and parks.

D. Recreational & Cultural Facilities

- Spread across the campus:
  - **SAC (Student Activity Centre)**
  - **Nalanda Grounds, OAT (Open-Air Theatre), Indoor Sports Hall**
  - **Rose Garden** and **Main Grounds** for events and informal gatherings.

4.4.5 Orientation & Environmental Response

- **Orientation Principle:** North-south building alignment minimizes direct solar gain.
- **Thermal Control:**
  - Use of recessed windows and deep verandahs.
  - Exposed thermal mass (brick and concrete) to regulate diurnal temperature fluctuations.
- **Daylighting & Ventilation:** Internal light wells and ventilation shafts enhance natural comfort.
- **Inference:** Orientation decisions reflect climate-conscious design, although some retrofit opportunities exist to enhance performance further.



Figure 80 iit delhi acedmic block

4.4.6 Circulation

- **Primary Movement Network:** Radial loop road with subsidiary access roads.
- **Pedestrian Prioritization:**
  - Covered corridors connect major departments.
  - Shaded tree-lined avenues for comfortable walking.
- **Multimodal Mobility:** Dedicated cycle paths, shuttle bus loops, and parking zones.
- **Inference:** Prioritization of human-scale mobility enhances accessibility and social interaction.

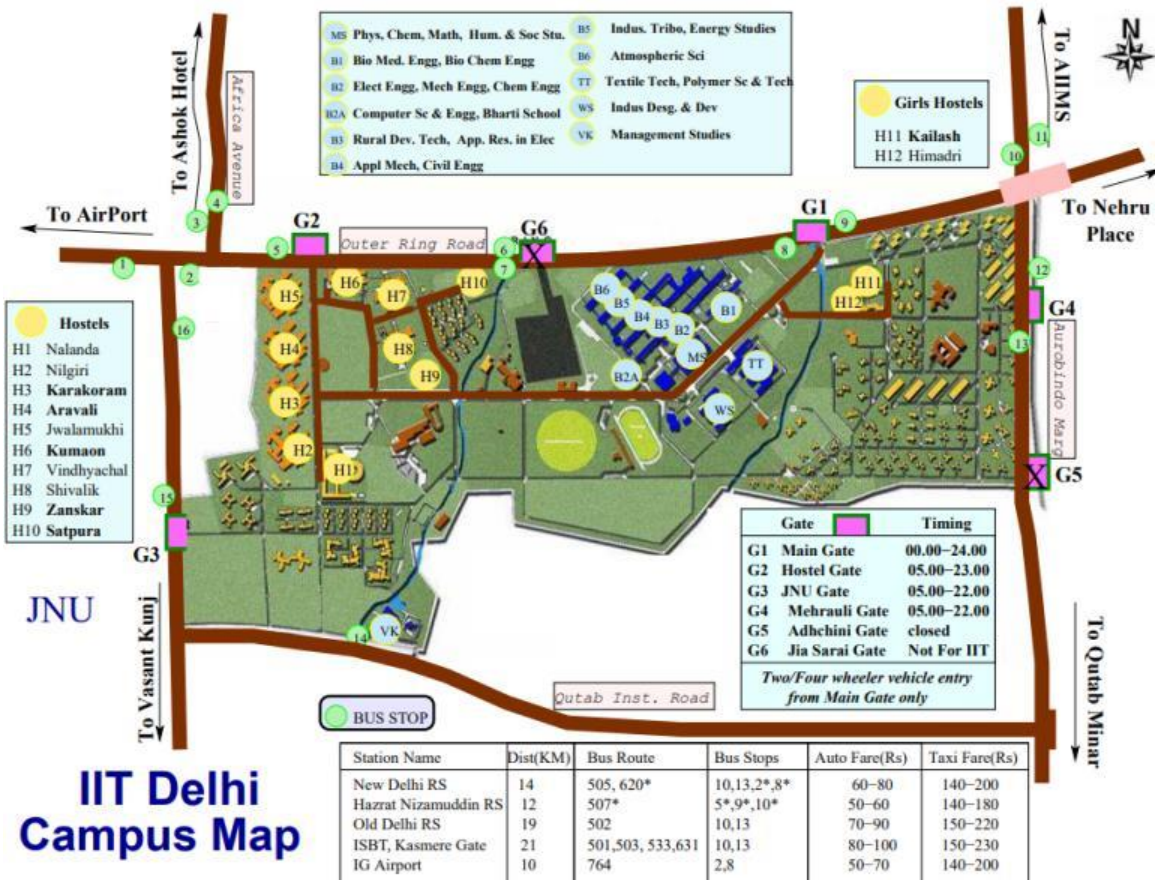


Figure 81 Circulation inside the campus

4.4.7 Material Palette:

- Exposed red brick: cost-effective, low maintenance, and thermally resilient.
- Dholpur sandstone: adds regional character and durability.
- RCC details: emphasize structural clarity.
- **Façade Treatment:**
- Linear massing with recessed fenestration and horizontal shading devices.
- Use of natural textures avoids need for artificial finishes.



Figure 82 Facade material

4.4.8 Hostel Design

- **Typology:** Courtyard-based hostels encouraging ventilation and interaction.
- **Amenities:** Mess, recreation halls, prayer rooms, and study lounges integrated.
- **Social Dynamics:** Terraces and stairwells double as informal gathering spaces.
- **Thermal Comfort:** Orientation and open layout promote passive cooling.
- **Inference:** Hostel design supports a balance of academic life and social engagement.



Figure 83 Hostel IIT Delhi

4.4.9 Faculty & Staff Housing

- **Layout:** Grid-based residential sectors with playgrounds and internal parks.
- **Typological Variety:** Multiple unit sizes accommodate family structures.
- **Sustainability:** Recent upgrades include solar panels and rainwater harvesting.
- **Inference:** Housing design reflects sensitivity to user needs and ecological concerns.



Figure 84 Faculty Housing

4.4.10 Student Activity Centre (SAC)

- **Purpose:** Designed to be the heart of student-led activities.
- **Spaces:** Seminar rooms, indoor sports, gymnasium, music studios, and an amphitheatre.
- **Design Language:** Open plan with strong acoustics and ease of access.
- **Inference:** Supports holistic development beyond academics.

4.4.11 Landscape Design

- **Strategy:** Ecological layering through trees, lawns, and water bodies.
- **Indigenous Planting:** Neem, Peepal, and other native species used for resilience.
- **Hardscape-Softscape Ratio:** Balance ensures usable open space and thermal regulation.
- **Multipurpose Lawns:** Serve both as microclimatic elements and community spaces.
- **Inference:** Landscape acts as an environmental moderator and social integrator.



Figure 85 Landscape

4.4.12. Sustainable Design Strategies

A. Site & Master Planning

- IIT Delhi has established a formal Green Office and a Green Agenda, aligning its master plan and future construction with environmental norms and GRIHA sustainability principles
- The institute ensures that new buildings are designed after public review to maintain ecology-sensitive site planning

B. Building Orientation & Climate Responsiveness

- Buildings (such as classrooms and lecture halls) are **oriented to optimize daylight and natural ventilation**, reducing the reliance on mechanical cooling and artificial lighting
- **Roof and wall insulation**, cavity walls, and dry cladding help reduce solar heat gain and operational energy demand

C. Water & Waste Management

- IIT Delhi's campus features a **dual plumbing system**, **on-site sewage treatment**, and treated wastewater reuse for landscaping—enabling **zero liquid discharge** status
- **Rainwater harvesting** infrastructure includes multiple pits with over **473 kL storage capacity**, exceeding regulatory norms, helping to maintain groundwater balance.
- **Solid waste is rigorously segregated** (bio, dry, e-waste), with composting via smart composters and vermicompost pits to recycle wet waste on-site

D. Energy Efficiency & Renewables

- IIT Delhi has commissioned approximately **220 kWp of rooftop solar panels** on new academic blocks, integrated into overall building management systems (BMS) for centralized monitoring
- The institute also employs **solar hot water systems** (e.g. for hostels and kitchens) with backup options, together with phased energy audits to improve efficiency

E. Materials & Indoor Environment

- Use of **low-VOC paints, adhesives**, and building materials with low embodied and operational energy (e.g., AAC blocks, fly-ash bricks, double glazing) is emphasized
- Passive strategies such as **cross ventilation, shading devices, and daylight optimization** improve occupant comfort and reduce energy use.

Key Performance Outcomes

- While exact performance metrics (e.g., % energy savings) are not publicly disclosed, achieving a **4-Star GRIHA rating** typically implies:
- At least **40–50% energy savings** over a conventional building
- **Significant reductions in potable water use**
- Effective **waste diversion and reuse**

- Enhanced **thermal comfort and indoor air quality** (Green Agenda)

4.4.12 Comparative Inferences for Thesis Relevance

1. Integrated Campus Planning vs. Fragmented Campuses

- **Observation:** IIT Delhi exemplifies a master-planned, integrated campus with clearly delineated zones for academics, residences, recreation, and services.
- **Relevance:** This contrasts with many urban institutions where expansion occurs haphazardly, leading to functional overlap and inefficient circulation. A thesis exploring future-ready campus design must emphasize integration from inception.

2. Human-Scale Mobility vs. Vehicular Dominance

- **Observation:** IIT Delhi prioritizes walkability and multimodal circulation (cycling, shaded walkways, shuttle loops), improving accessibility and social engagement.
- **Relevance:** In many campuses, heavy dependence on vehicles alienates users from spaces. A thesis could investigate how IIT Delhi's pedestrian-forward design supports inclusivity, health, and ecological sustainability.

3. Modular Expansion Potential vs. Rigid Gridlocks

- **Observation:** The modular spatial planning at IIT Delhi supports incremental and non-disruptive expansion of academic and residential blocks.
- **Relevance:** Rigidly zoned campuses often struggle with spatial redundancy during future development. This makes IIT Delhi an adaptable case study for long-term master planning

4. Community-Oriented Hostels vs. Isolated Dormitories

- **Observation:** Hostel courtyards, terraces, and internal common areas encourage interaction, blending residence with recreation.
- **Relevance:** Many modern hostels isolate students within dense blocks. IIT Delhi's approach to integrating micro-communities supports socio-emotional wellness—an increasingly critical dimension of educational design.

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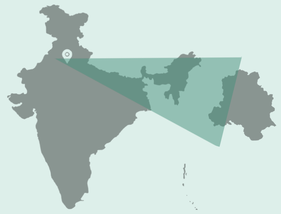
SITE ANALYSIS

ABOUT SITE

Name of the Project: Proposed university campus
Campus Type: Urban, Sustainable, GRIHA 5-Star Compliant
Location: Institutional Area, Rohini, Near Rajiv Gandhi Cancer Hospital,Delhi
Site coordinates: 28.701949476843787, 77.11295968201958



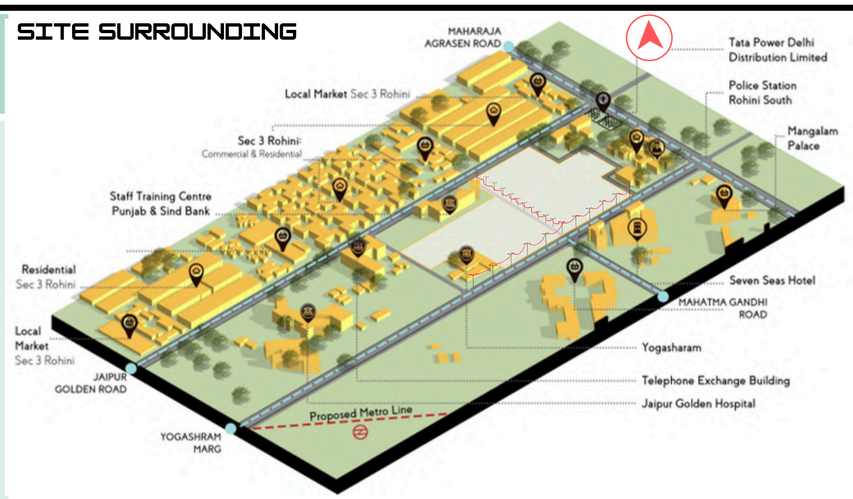
Proposing Authority: Public Works Department (PWD), Government of NCT of Delhi



Project Details: Dr. B.R. Ambedkar University new campus at Rohini Sector 3 Delhi is a live project released in the year 2018. The campus will have auditorium, convention centre, seminar and conference facilities, library, cafeterias, students centre, indoors and outdoors sports facilities, guest-house, health centre, display and performance areas, convenience/utility centre and crèche. The University had initiated an interactive process to ascertain the needs and ideas of all the stakeholders of the campus.

S. No.	Description	Proposed
1	Site Area (in hectares)	7.3 hectares
2	Site Area (in sqm)	73,000 sqm
3	Max Built-up Area	1,60,875 sqm
4	Planned Built-up Area	1,67,680 sqm
5	Ground Coverage	35%
6	F.A.R.	2.25
7	Institutional Zone	70%
8	Residential Zone	30%
9	Basement, Parking & Service Area (not counted in FAR)	31,680 sqm
10	Max Height	37m

SITE SURROUNDING



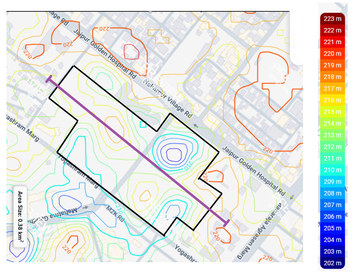
CONNECTIVITY TO SITE

- Metro station Rohini West (Red Line) 0.5–0.9 km (~5mins walk)
- Metro station Rohini East / Rithala 1.1–1.3 km(~10–15 mins walk)
- Rithala Bus Stand ~ 3.4m (20–25 mins walk)
- New Delhi Railway Station – 15 km
- IGI International Airport - 19.6km

Bus stands nearby are Pushpanjali Enclave Bus Stand, Kali Mandir Bus Stand, Naharpur Village Bus Stand, Rohini Sector -7 Bus Stand 0.6M . Jaipur golden hosital is 0.5km from site

TOPOGRAPHY AND SOIL TYPE

- **Topography:**The site is almost flat, with minimal contour difference, making it suitable for ease of construction and circulation planning.
- **Soil Type:**The soil is predominantly alluvial soil, commonly found in river plains. It is fertile and easy to work with but has low bearing capacity, which may require soil stabilization or deep foundations for heavy structures.

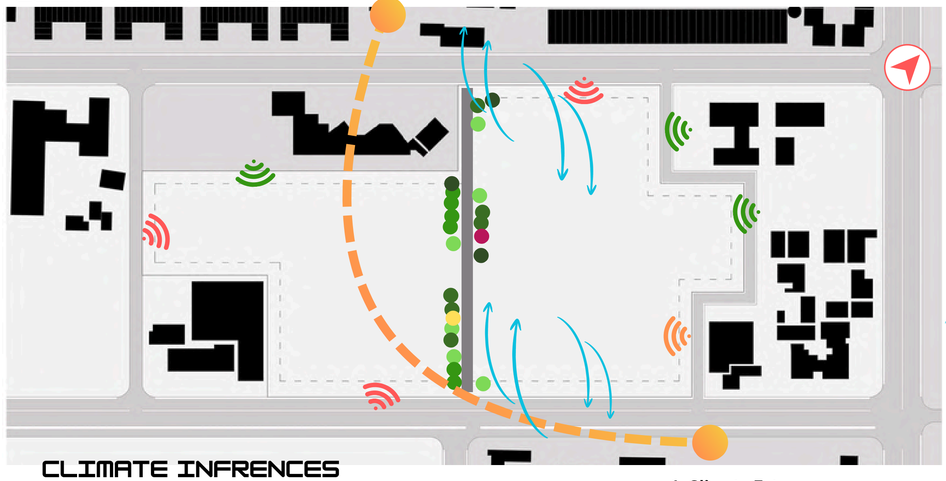


SECTION AA'

- **Fertility:**High natural fertility, suitable for supporting dense vegetation and landscape features .
- **Drainage:**Moderate to good drainage, but prone to waterlogging during heavy rains .
- **Bearing Capacity**:Generally low, which may require deep foundations for large-scale buildings.
- **Vegetation:**The site has existing Neem, Bamboo, Banyan, Peepal, Baare, Bahugina, and Mango trees along the periphery, creating a natural green buffer.

S	• The context has a good blend of commercial spaces and public transport. • Existing trees act as a noise barrier • Fertility – Highly fertile soil, supports dense vegetation and landscaping
W	• Low Bearing Capacity – Generally weak soil • Noise spill over • increase vehicular and pedestrian activity leads to traffic congestion • Waterlogging Due to a fine silt and clay mix, drainage issues may occur during heavy rainfall or flooding.
O	• Groundwater Recharge – Alluvial plains often sit above aquifers potential for water harvesting systems. • Ease of access for visitors, students, and faculty, with multiple entry and exit points. • quick emergency response
T	• Inadequate parking and traffic management • Security concern due to multiple entry and exit points

CLIMATE ANALYSIS



CLIMATE INFRENCES

Name	Delhi – Rohini Campus Site			
Location	Rohini, Delhi, India			
Climate Zone Type	Composite (hot-dry, warm-humid, cold)			
Climate Description	Extremely hot summers, short humid monsoon, and cold winters with high diurnal variation; dust storms and winter smog are common			
Name	Summer	Monsoon	Winter	
Season Dates	Mar 1 – Jun 30	Jul 1 – Sep 30	Oct 1 – Feb 28	
Prevailing Weather Conditions	Hot, dry, dusty winds (loo)	Humid, cloudy, heavy rainfall	Cold, dry with fog/smog	
Average Minimum Temperature	25°C	26°C	7°C	
Average Maximum Temperature	45°C	34°C	21°C	
Precipitation	-	-	-	
Number of Rainy Days	5–9	57-60	3–5	
Seasonal Precipitation (%)	5%	85%	5%	
Number of Snowy Days	0	0	0	
Seasonal Snow (in)	0	0	0	
Wind – Most Common Condition	Hot dry NW winds	Moist SE monsoon winds	Calm to light NW winds	
Wind – Second Most Common	Breezy evenings, dust storms	Occasional storms	Fog, stagnant air	
Average Daylight (hrs)	13.5	12	10.5	
Average Daily Sunshine (hrs)	9	5	7	
Average Daily Cloud (hrs)	2–3	7–8	3–4	
% Days Needing Heating	0	0	100%	
Heating Energy Demand	Negligible	Negligible	High	
% Days Needing Cooling	80%	50%	0	
Cooling Energy Demand	Very High	Negligible	Negligible	
% Days with High / Very High Air Pollution	40% (dust storms, ozone)	20% (humidity + vehicular)	60% (smog & PM2.5)	
Facade orientation	Glazing ratio (Maximum with typical envelope design)	Shading (Maximum with best practice façade design)	Overall recommendation	Highest scoring shading option
North	35–40%	75–80%	Shading not needed	No shading
Northeast	30–35%	75–80%	Shading not needed	No shading
East	20–25%	70–75%	Embrace beneficial warming sun, avoid shading	No shading
Southeast	20–25%	70–75%	Embrace beneficial warming sun, avoid shading	No shading
South	25–30%	75–80%	Horizontal overhangs, green buffers	Horizontal overhangs
Southwest	15–20%	70–75%	Strongest shading needed + deep overhangs	Green buffers + pergolas
West	15–20%	70–75%	Embrace beneficial warming sun, avoid shading	No shading
Northwest	20–25%	70–75%	Shading not needed	No shading

1: Climate Extremes
- Delhi experiences intense summer heat (often exceeding 45°C), cold winters, and a humid monsoon season.
- These extremes create high energy demands for both cooling and heating.

Recommendation
Climate-Responsive Design
- Incorporate passive cooling strategies like cross ventilation, courtyards, and evaporative cooling.

2. Solar Exposure & Orientation
- The site receives strong solar radiation, especially from the southwest and south.

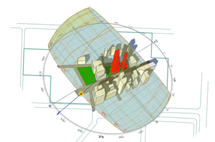
Recommendation
- Use horizontal louvers or deep overhangs on south façades.
- Apply vertical fins or green walls on southwest façades to reduce heat gain.
- opt for low-E glazing and light-colored exterior finishes to reflect solar radiation.

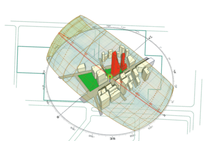
3.Air Pollution & Dust
- Delhi faces severe air pollution, especially in winter due to smog and in summer from dust storms.
- This affects indoor air quality and visibility.

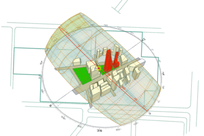
Recommendation .
- Use vegetative buffers around the site perimeter.

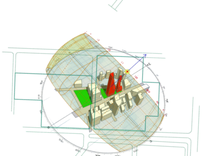
4: Monsoon Rainfall
- Rainfall is seasonally concentrated, leading to waterlogging and drainage issues. due to alluvial soil and flat land
- There's also potential for rainwater harvesting.

Recommendation
- permeable paving to manage runoff.
- Use rainwater harvesting tanks and bioswales for groundwater recharge.


WINTER SOLSTICE


SPRING/VERNAL EQUINOX4


AUTUMN/FALL EQUINOX


SUMMER SOLSTICE

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CASE STUDY AND DESK APPRAISAL

NIFT DELHI



Location: Hauz Khas, New Delhi (28.545° N, 77.195° E)
Architect: B.V. Doshi
Design Theme: Sunken stepwell courtyard inspired by Indian baolis and bazaars
Key Features: Central courtyard, terraces, bridges, academic blocks around the core.
Composite – hot summers, humid monsoon, and cold winters (Delhi region)

LAYOUT : Based on compact courtyard planning.



Overall Movement Structure

- **Central Sunken Court** (Stepwell) is the organizing element.
  - All academic and functional blocks are arranged around this core.
  - Circulation flows inward-outward — everything connects back to the courtyard.
- **Ring-like Pathways** around the courtyard form the primary circulation spine, linking classrooms, studios, and admin spaces.
- **Bridges & Terraces** connect different levels and blocks, ensuring multi-level circulation without breaking continuity.

Orientation & Site Planning Axis Alignment: The entire building complex is aligned along the northwest-southeast (NW-SE) axis, a deliberate decision to maximize exposure to prevailing winds and daylight.

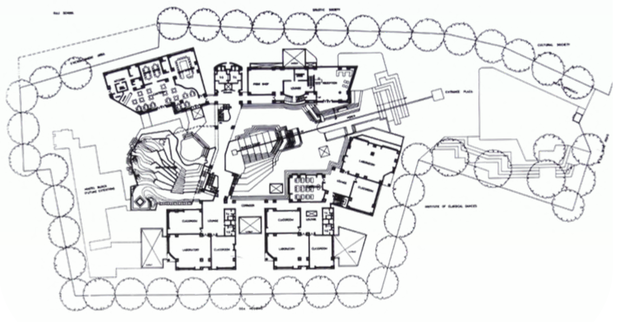
1. **UNIQUE FEATURES: KUND**

- Delhi's climate is composite (very hot summers, humid monsoons, cold winters).
- A sunken courtyard creates a cool microclimate by:
- Lowering ground level (reducing direct exposure to harsh sun and dust storms).
- Using thermal mass of surrounding walls for coolth storage.
- Encouraging air movement across levels, improving comfort.
- The kund becomes both a climatic device and a social condenser.

Bridges in NIFT Delhi (As Traveling Connectors)

- Primary Function
- The bridges mainly serve as horizontal circulation paths.
- They let students move easily between blocks without going down into the kund each time.
- This reduces walking distances and ensures direct connectivity across the campus.

1. **Multifunctional → circulation + exhibition + social space.**
2. **Visually porous → open, airy, and connected to the kund.**
3. **Spatially dramatic → create layered experiences of movement.**



CEPT



Location: Navrangpura, Ahmedabad, Gujarat (approx. 23.043° N, 72.562° E)
Architect: B.V. Doshi
Design Theme: Open, flexible, studio-based learning spaces; integration with nature
Design Theme: Open, flexible, studio-based learning spaces; integration with nature
Key Features: Exposed brick & concrete, shaded courts, interconnected terraces, flexible studios
Climate Type : Hot Semi-Arid – extremely hot & dry summers, mild winters, scanty monsoon (Ahmedabad region)

LAYOUT : Based on Free space.



Overall Movement in CEPT University

1. Open & Free-Flow Circulation

- CEPT's campus is not rigidly zoned; it has a fluid, non-linear movement.
- Students and faculty can move freely between studios, courts, and terraces, blurring boundaries between "inside" and "outside."
- Circulation happens as much in open courtyards and steps as in corridors.

Orientation

- Hot semi-arid climate (very hot summers, mild winters, short monsoon).
- Buildings aligned to catch prevailing southwest summer winds.
- Large North-facing openings → soft daylight in studios.
- South & West sides → deep verandahs, shading devices, and vegetation.

Site Planning

- Campus = open, porous, and flexible.
- No rigid central core → instead, a network of courts, terraces, and shaded open spaces.
- Buildings (studios, library, workshops) are scattered but interconnected through open passages.
- Movement flows like a townscape, blending indoors and outdoors.
- Courtyards and trees form microclimates, breaking the heat.
- Planning is outward and dispersed, encouraging exploration

UNIQUE FEATURES

Flexible & Informal Circulation

- Multiple pathways, stairs, and levels → no fixed hierarchy.
- You can move across roofs, through shaded corridors, or across courts movement is fluid.
- Circulation doubles as learning and interaction space.

Blurred Boundaries (Inside ⇔ Outside)

- No rigid walls separating classrooms, corridors, and open courts.
- Learning spills into courtyards, steps, and terraces.
- Open-air discussions, crits, and exhibitions are part of daily life → the whole campus is a classroom.



IIT GANDHINAGAR



Location: Palaj, Gandhinagar, Gujarat (23.215° N, 72.684° E)
Architect:HCP Design (Bimal Patel)
Climate Type: Hot Semi-Arid Climate
Design Theme: Sustainable, pedestrian-centric academic township
Key Features:Grid site planning, central pedestrian spine, shaded bridges, courtyards, water-sensitive design, LEED Platinum certification

LAYOUT : Based on grid pattern .



Key Features

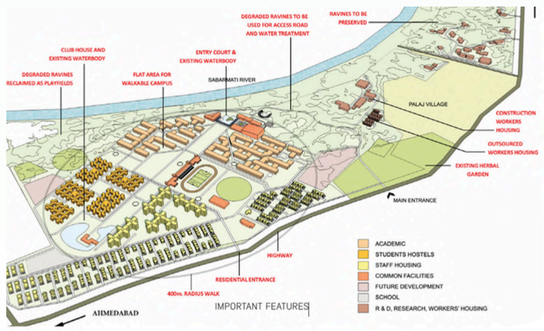
- Grid-based site planning with academic blocks, hostels, and faculty housing.
- Central pedestrian spine connecting academic, hostel, and recreational zones.
- Bridges and shaded corridors enhance walkability in the hot climate.
- Courtyards and shaded verandahs for passive cooling.
- Water-sensitive planning with efficient stormwater drainage and water reuse.
- Green campus with dense plantation to reduce heat island effect.
- LEED Platinum certification – among the most sustainable campuses in India.

Orientation & Site Planning

- Academic blocks oriented North–South to minimize harsh solar gain.
- East–West facades treated with fins, recessed windows, and shading devices.
- Courtyards placed strategically to promote cross-ventilation and natural cooling.
- Pedestrian-friendly planning – vehicles restricted at periphery → inner campus walkable & bike-friendly.

Unique Features of IIT Gandhinagar

- Highly Sustainable Campus – LEED Platinum certified, energy-efficient buildings.
- Water Management – rainwater harvesting, wastewater recycling, and zero discharge.
- Pedestrian-Oriented Planning – unlike many IITs, IITGN is a car-free core.
- Bridges & Shaded Walkways – circulation is designed to double as social space (similar to Doshi's approach).
- Compact Academic Core – promotes interdisciplinary collaboration by clustering labs and departments.
- Residential + Academic Integration – housing, hostels, and facilities are seamlessly tied to academic life.
- Minimalist Architectural Language – simple exposed concrete & brick forms → functional, climate-sensitive, yet modern.



IIT DELHI



Location: Hauz Khas, New Delhi (28.545° N, 77.192° E)
Architect:J.K. Chowdhury
Climate Type: Composite Climate (hot summers, humid monsoon, cold winters)
Design Theme: Self-sufficient modern academic township
Key Features
Academic core, hostel clusters, faculty housing, OAT, lawns, tree-lined avenues

LAYOUT : Based on modified gridiron layout.



Key Features

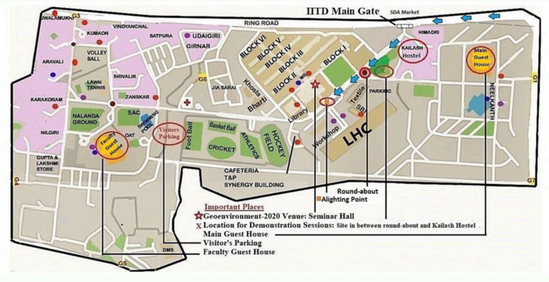
- Central Academic Zone: lecture halls, labs, admin block.
- Large residential zone: staff & faculty housing.
- Hostels: grouped on one side, creating a strong student community cluster.
- Main spine road: connects the academic core to residential & hostel areas.
- Open Air Theatre (OAT) & cultural spaces for large gatherings.
- Lush greenery, tree-lined avenues, and wide boulevards.

Orientation & Site Planning

- Academic blocks: oriented to balance solar gain; shading devices & verandahs reduce heat.
- North–South axes used for circulation → less solar glare.
- Hostels placed to the west/south-west of the academic core → protect classrooms from hot winds.
- Residential areas pushed to the periphery → quieter zones with more greenery.
- Large open lawns & green buffers for micro-climate cooling.

Unique Features of IIT Delhi

- Balanced Zoning: clear division of academic, hostel, and housing → efficient functioning.
- Green Spine & Lawns: circulation merges with open lawns, making movement more experiential.
- Hostel Culture: strong identity of each hostel with its own courts & activity spaces.
- Cultural & Social Life: OAT, lawns, and plazas play a huge role in movement turning into interaction.
- Adaptability: campus expanded over decades, yet retains symmetry & logic in circulation.



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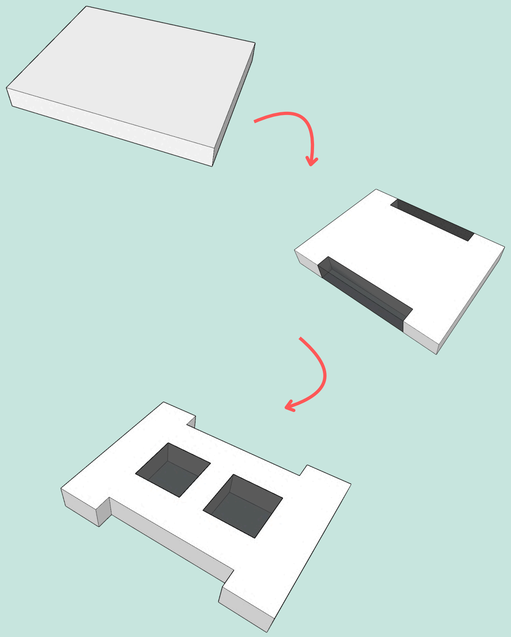
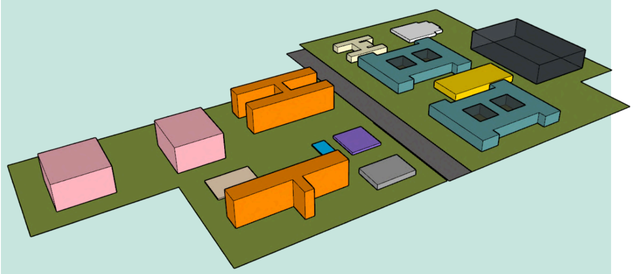
FORM AND ZONING

FORM DEVELOPMENT





ZONING

- CENTER FACILITIES
- ACADEMIC BLOCK
- STAFF HOUSING
- HOSTEL

CONCEPT

SLOW SPACES (PAUSE POINTS)

Concept:

Slow Spaces are intentionally designed pockets within a campus that encourage students to pause, slow down, and take short mental breaks during their fast-paced schedules. Unlike primary circulation or high-activity areas, these are low-pressure, calming micro-environments that allow students to reset mentally and emotionally before continuing their day. They become “breathing zones” distributed across the campus.

Why Slow Spaces Matter:
College students often experience constant movement—from classes to labs, assignments, and social commitments. Slow Spaces counter this by offering micro-moments of rest. Such environments help:

- Reduce mental fatigue
- Lower stress levels
- Improve focus and emotional stability
- Promote mindfulness practices
- Create a healthier study-life rhythm

ESSENTIAL LAYERING

Just like Delhi evolved over centuries Mughal gardens within British planning, medieval bazaars beside modern roads campus can have multiple layers of function, space, visual and time that overlap instead of being isolated.

Functional Layers (Interwoven Uses)

- Bringing together academics, living, and social spaces
- Mixed-use Nodes – Central plaza with food courts + amphitheater + student clubs
- Living-Learning Clusters – Hostels combined with study lounges, and recreation zones.

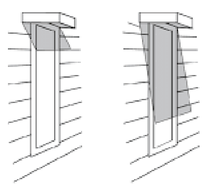


Perceptual Layers (What people feel in space)

This is about atmosphere, climate response, acoustics, and cultural cues.

Architectural Elements:

- Light & Shadow Play – Deep chajjas, jaalis, pergolas creating dynamic shade (movement of time felt in space).
- Material Tactility – Rough stone pathways (heritage feel), smooth polished concrete (modern feel), terracotta flooring (warm vernacular feel).





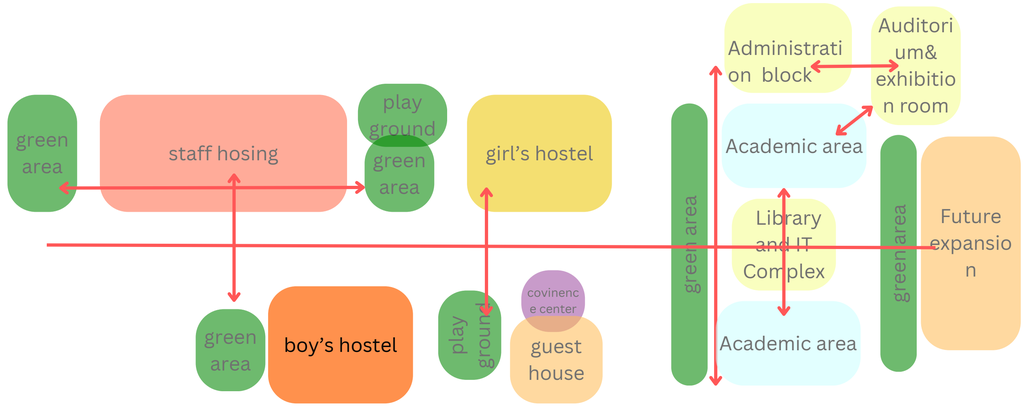
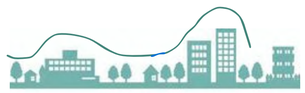


CHART OF CIRCULATION

Visual Layers (What people see and how space is revealed)

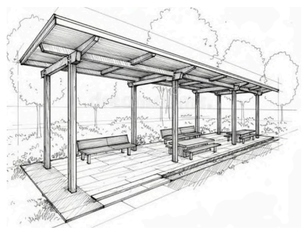
- Skyline Composition – Varying heights (high-rise hostels, mid-rise academics, create a layered visual rhythm.
- Landscape Foregrounds & Backgrounds – Trees, water bodies, and greens that create depth in the visual journey.

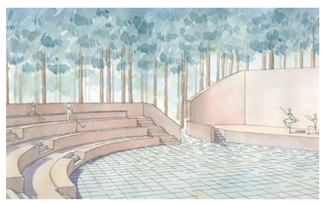




Spatial Layers (Different Scales of Spaces)
Courtyards, plazas, and ceremonial greens intersecting.

- Small-scale (Intimate) – Courtyards with water bodies, shaded alcoves, pergolas, study pavilions.
- Medium-scale(Semi-public)–Cafeteriaplaza,courts, amphitheater.





Char bagh for landscaping

- Cooling – Water and greenery lower temperature.
- Ventilation – Open layout improves airflow.

MATERIAL USE



BEIGE / BUFF DHOLPUR SANDSTONE

- Popular for modern public buildings & landscapes
- Smooth finishing, less heat absorption
- Good workability for jalis, carvings



ECO PAVERS

- Voids or gaps for water percolation.
- provide a smooth, non-slippery surface and reduce drainage issues.
- Lower surface temperature compared toconcrete/asphalt



FLY ASH BRICKS (AAC BLOCKS / CLC BLOCKS)

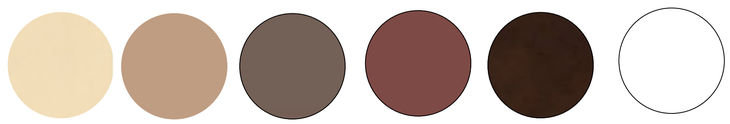
- Uses industrial waste → reduces landfill
- High thermal insulation → reduces AC load
- Lightweight → faster construction, less foundation load



RECYCLED STEEL

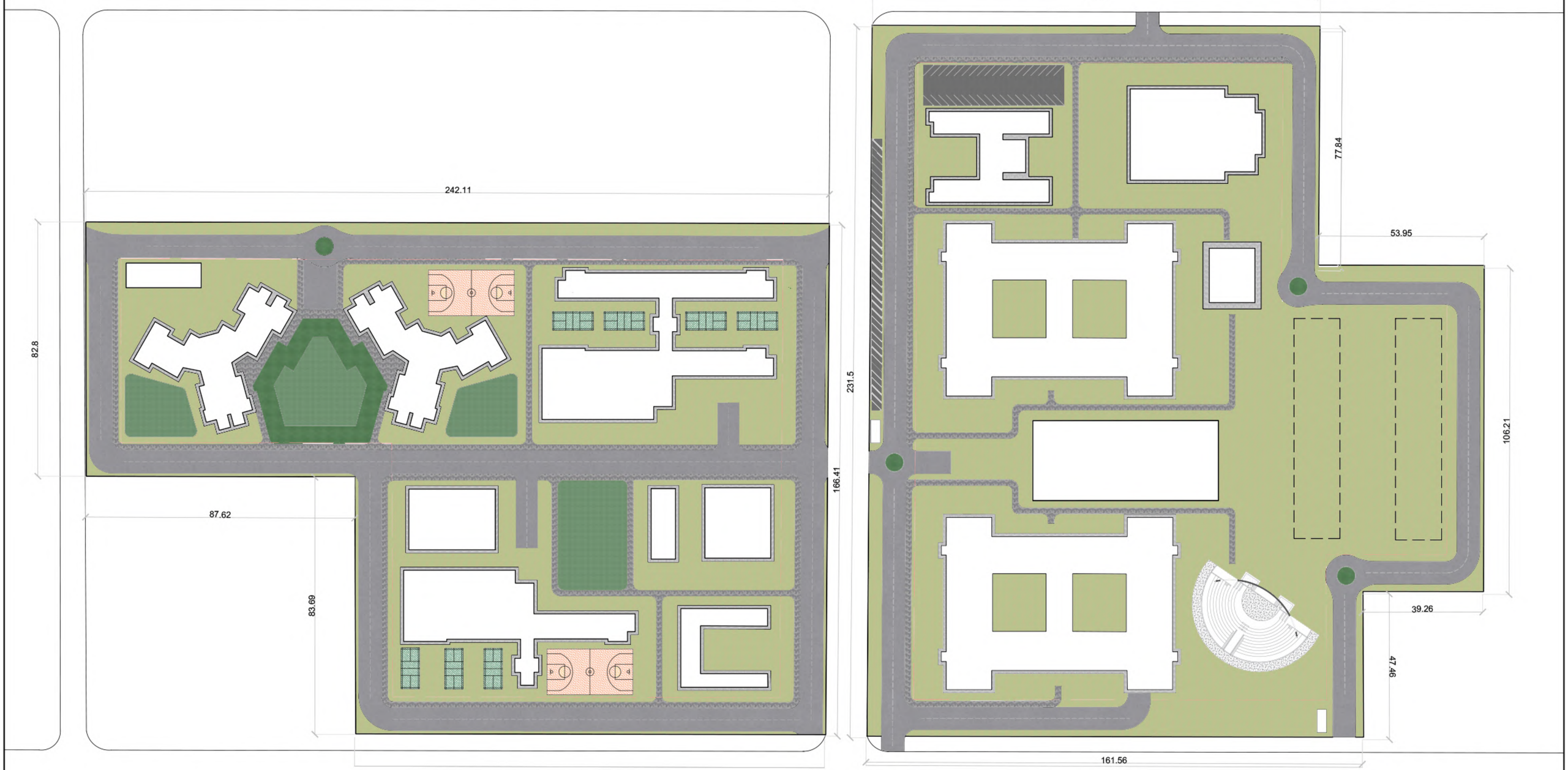
- Producing recycled steel uses 60–75% less energy than manufacturing new steel.
- Reduces CO_2 emissions, pollution, and mining impact.

COLOUR PALETTE



ANUSHKA PRAJAPATI
211110209

THESIS GUIDED BY:
DR.NAKUL DHAGAT



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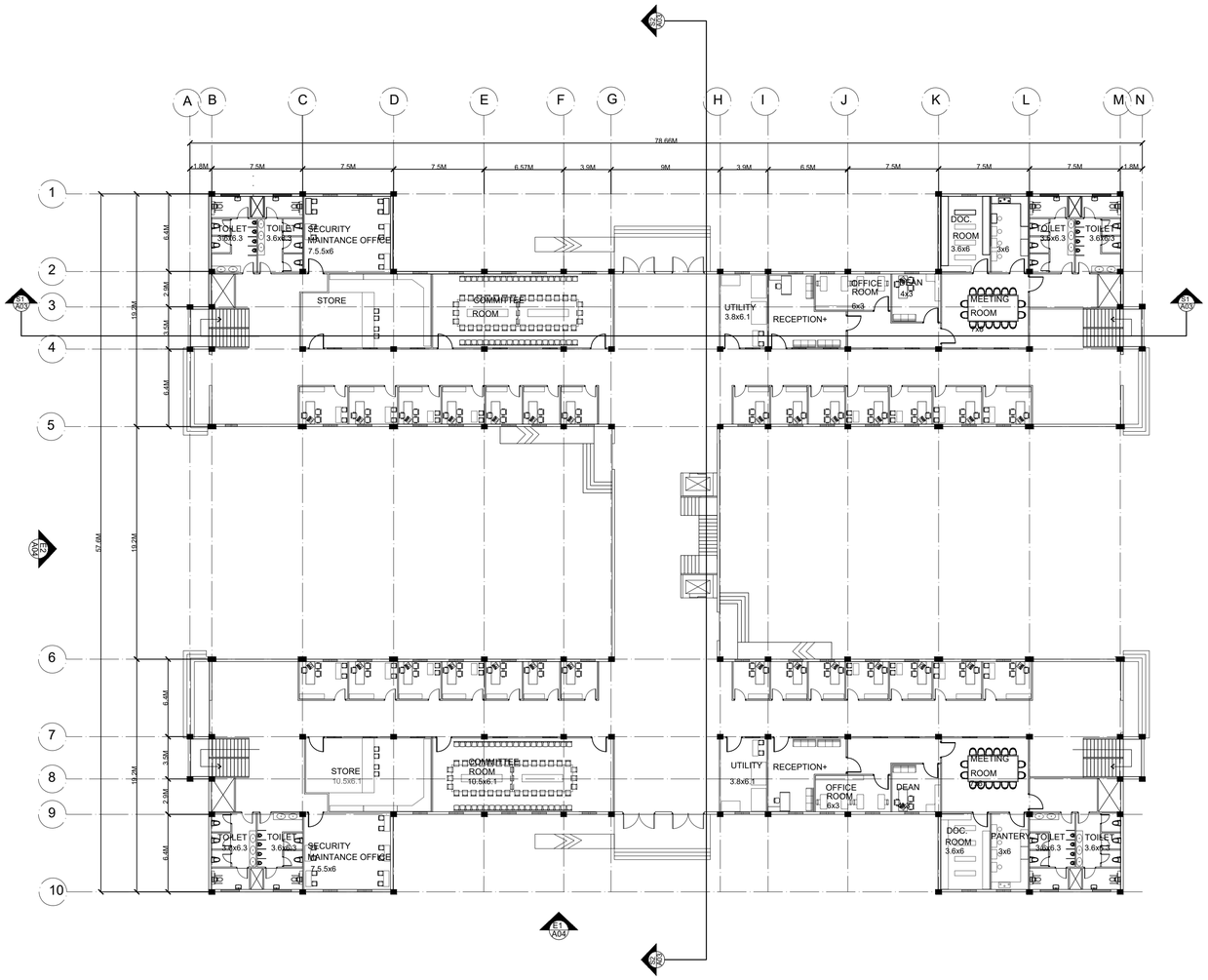

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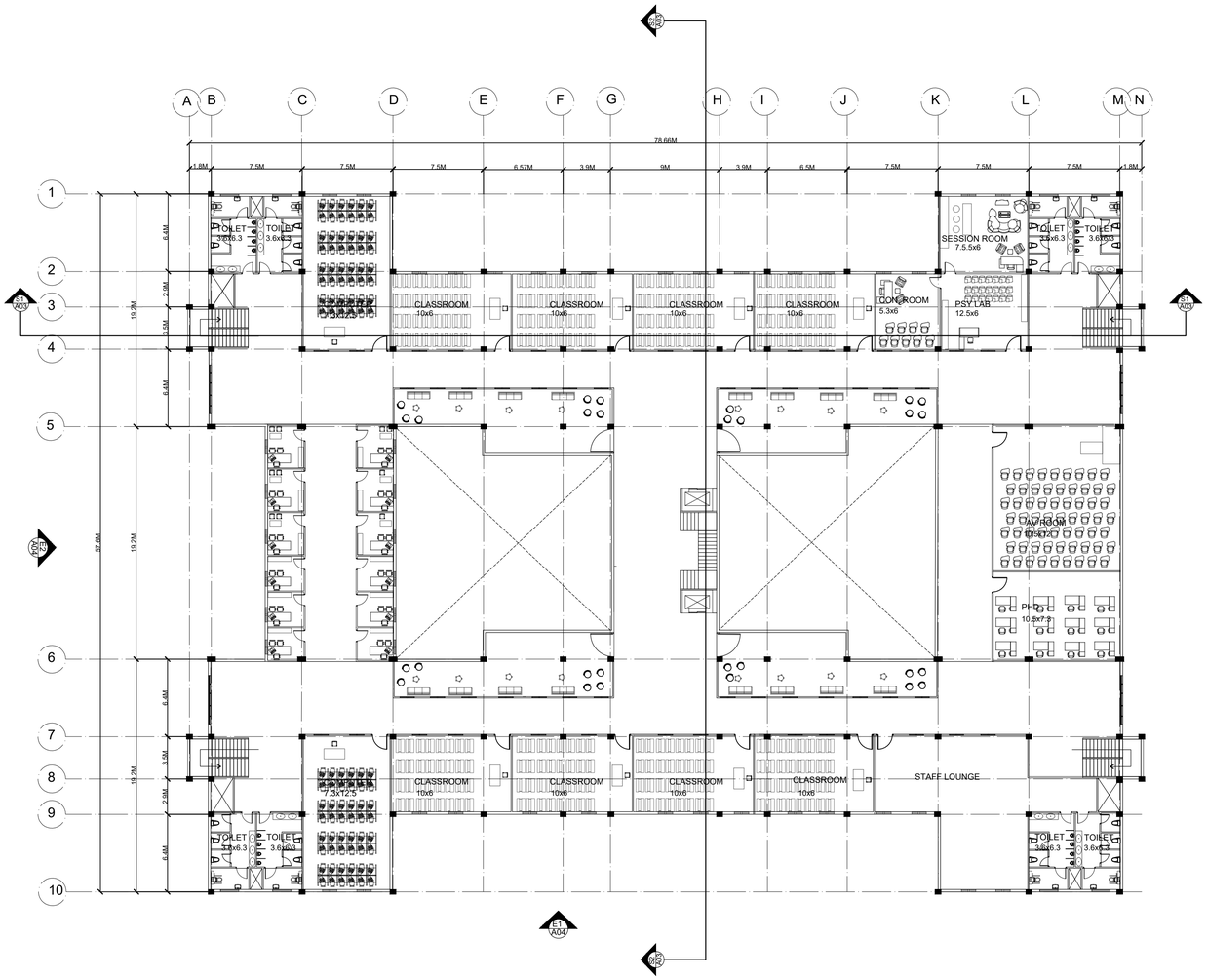

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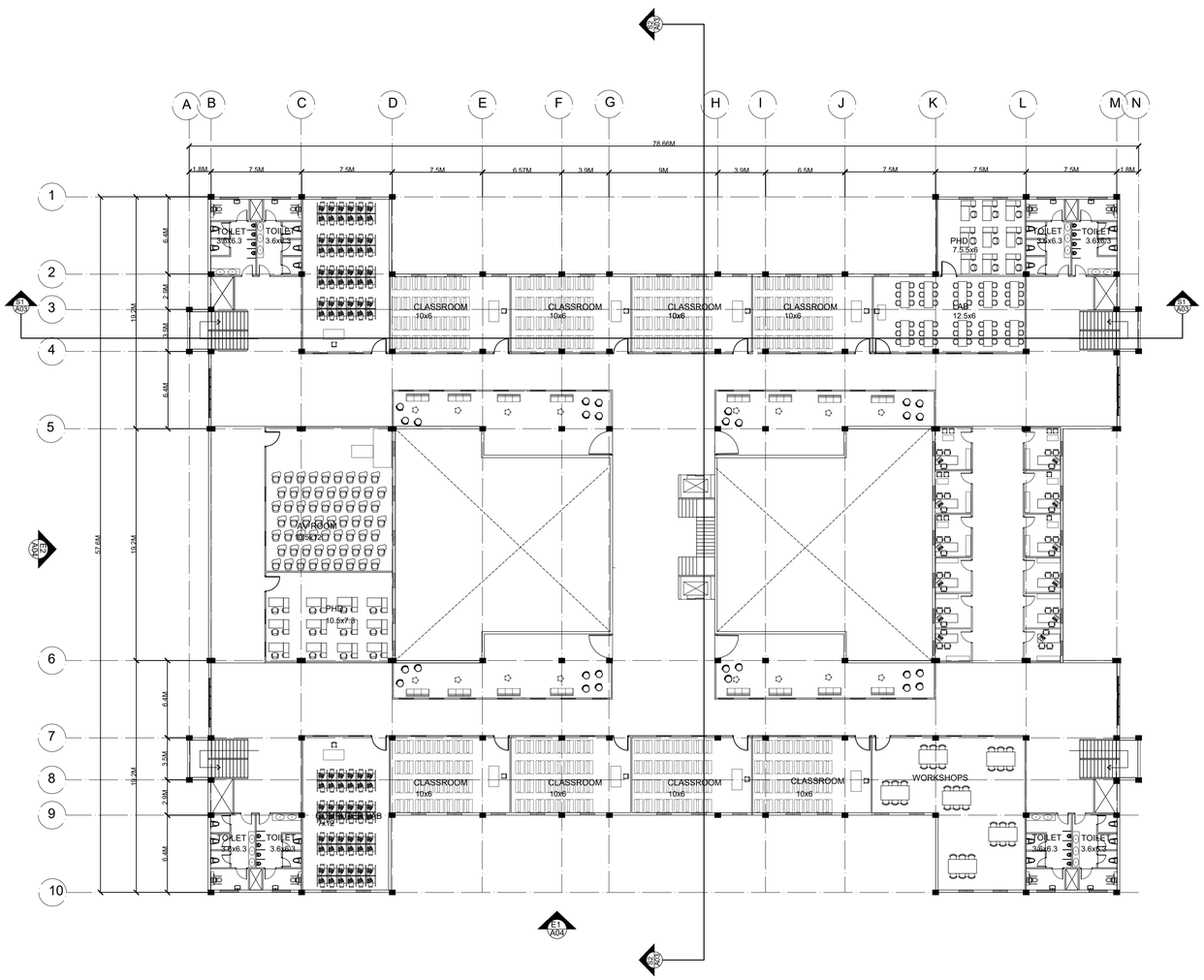

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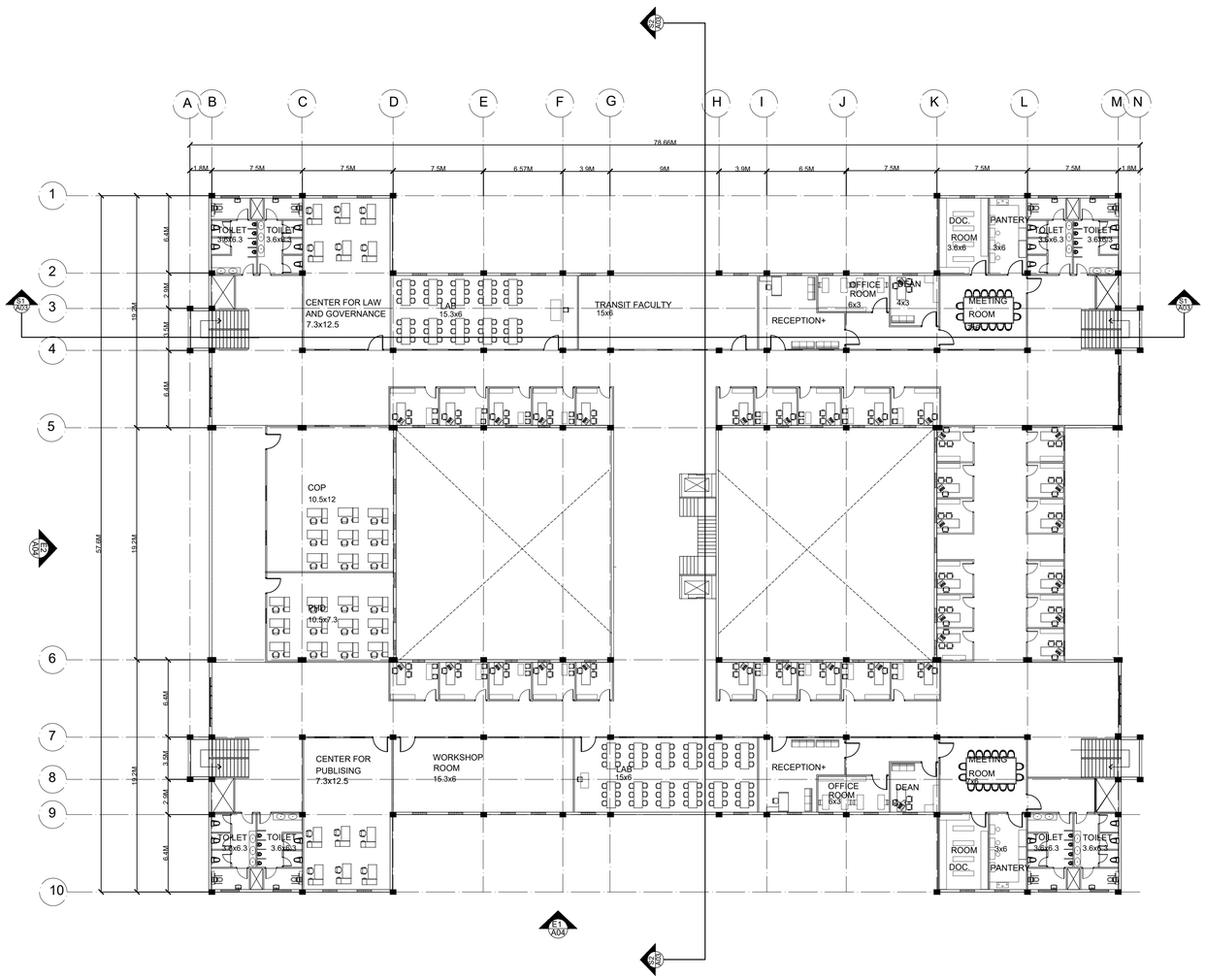

THIRD FLOOR

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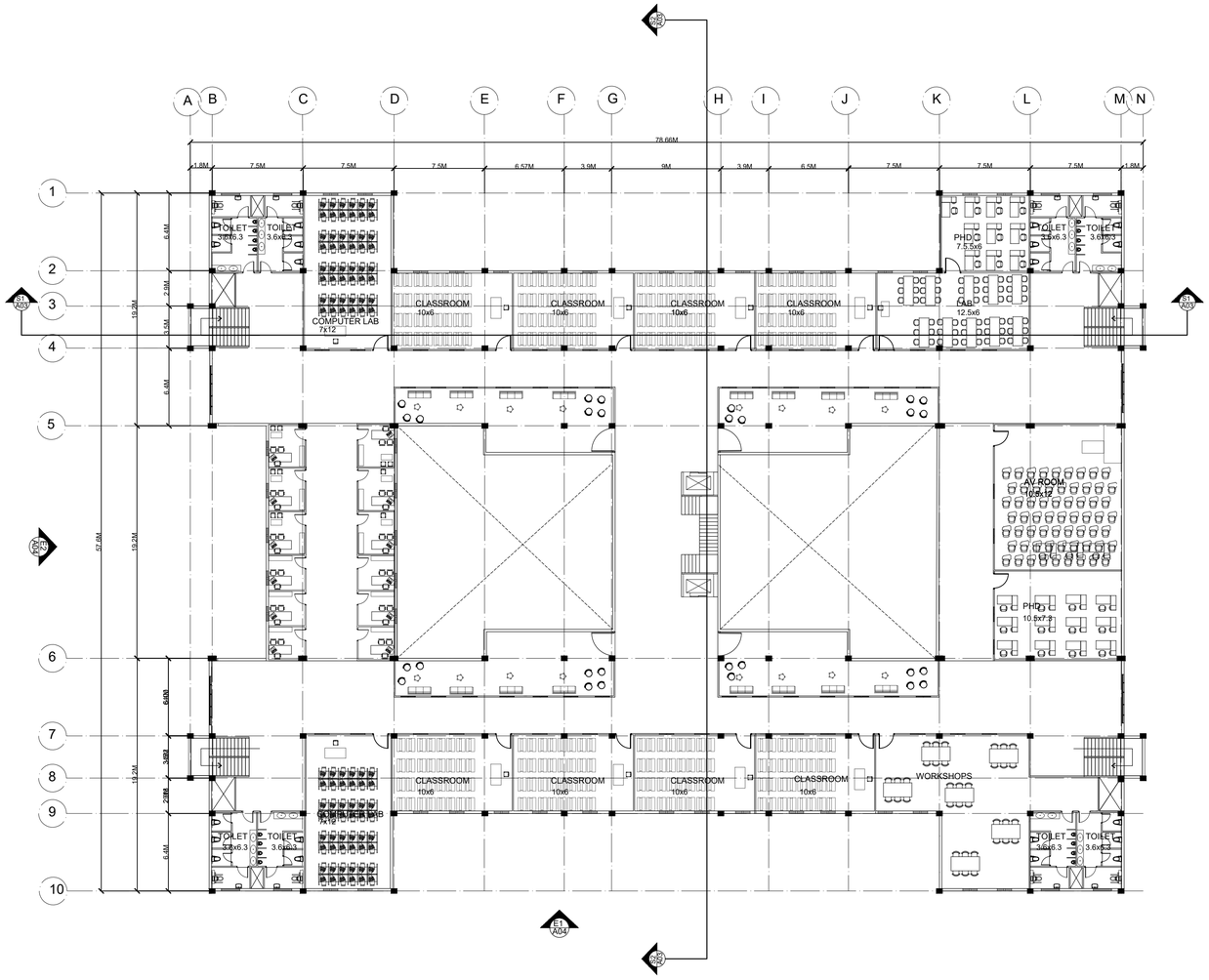
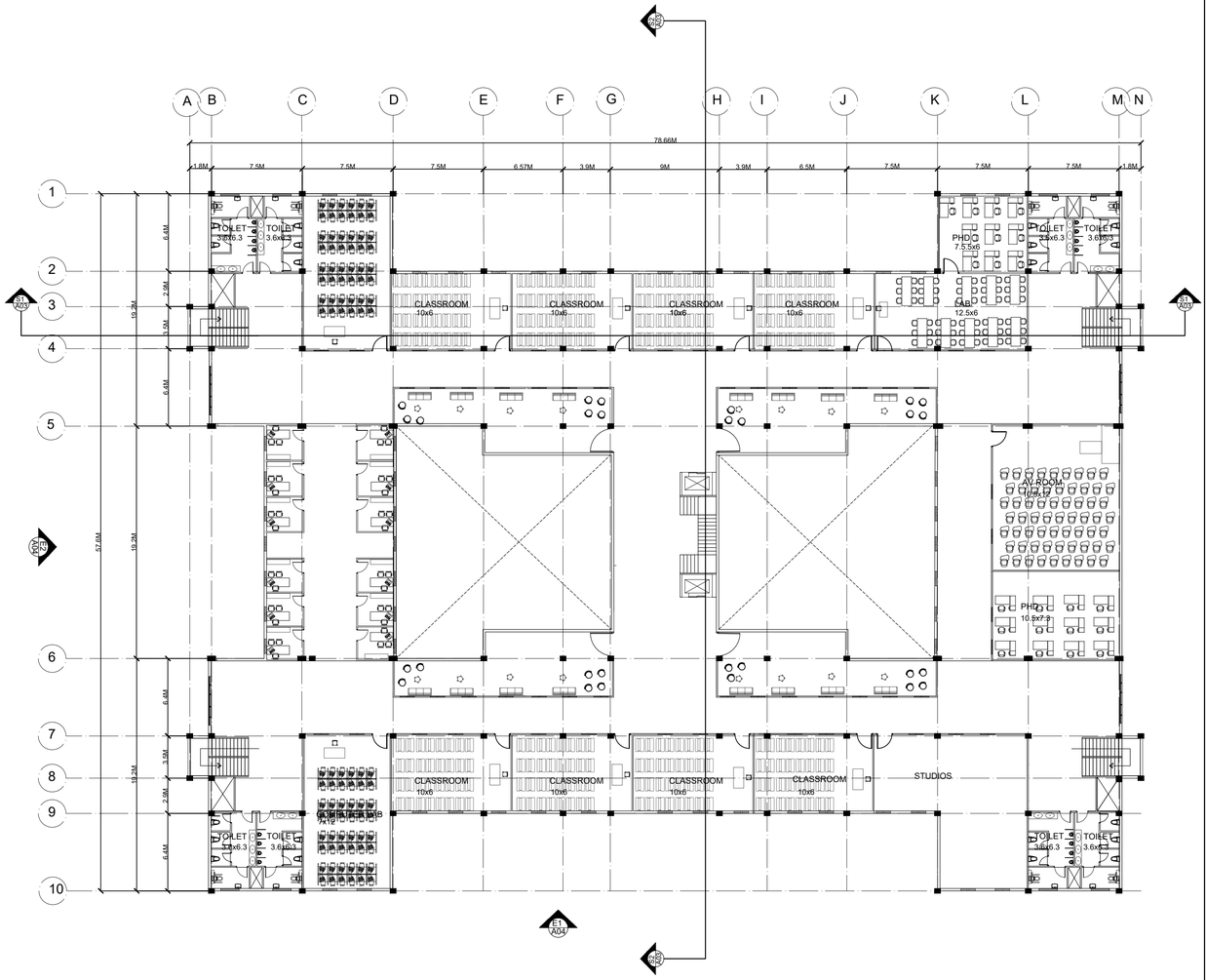


FOURTH FLOOR



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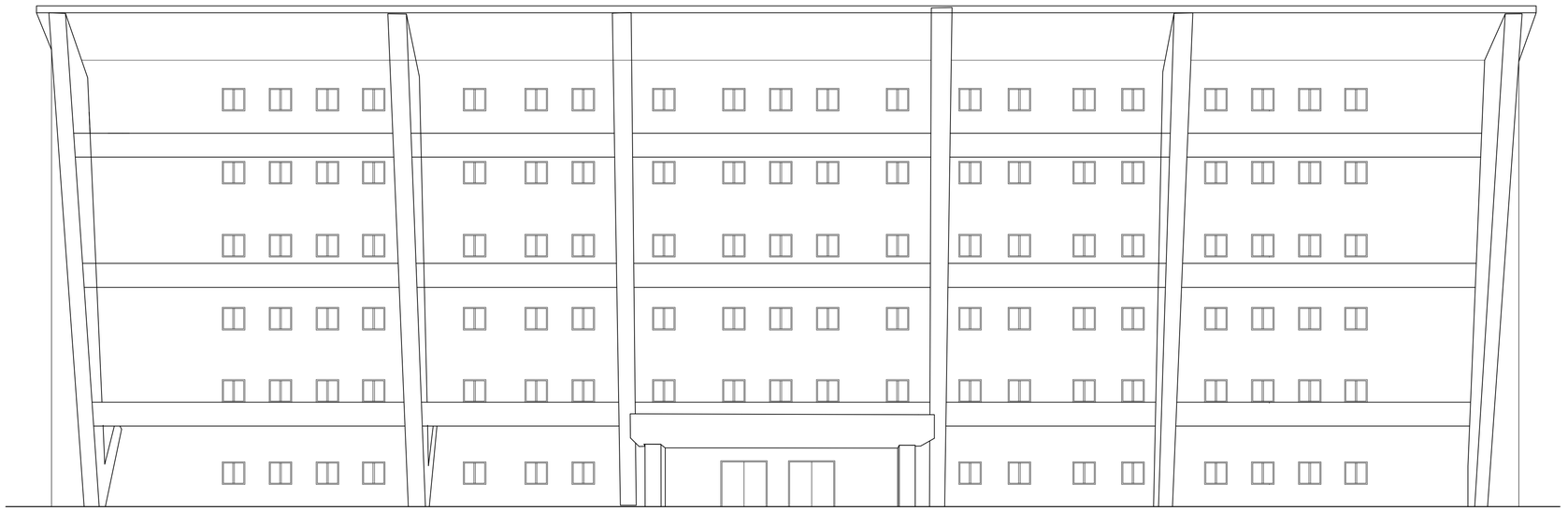
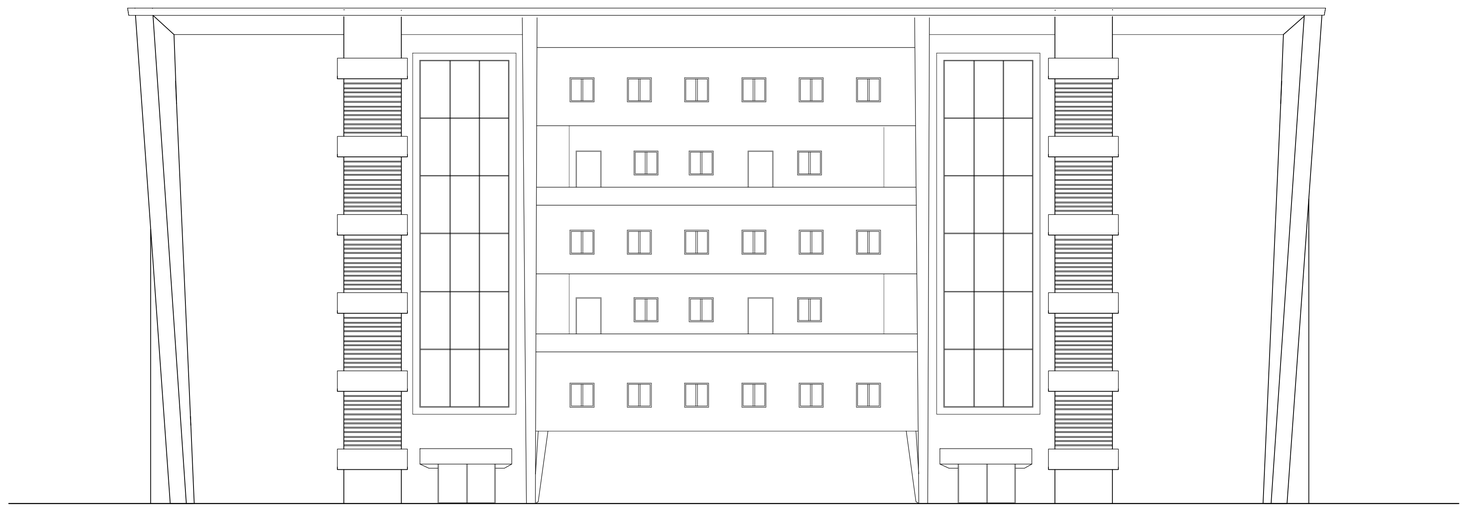


ELEVATION 1



ELEVATION 2

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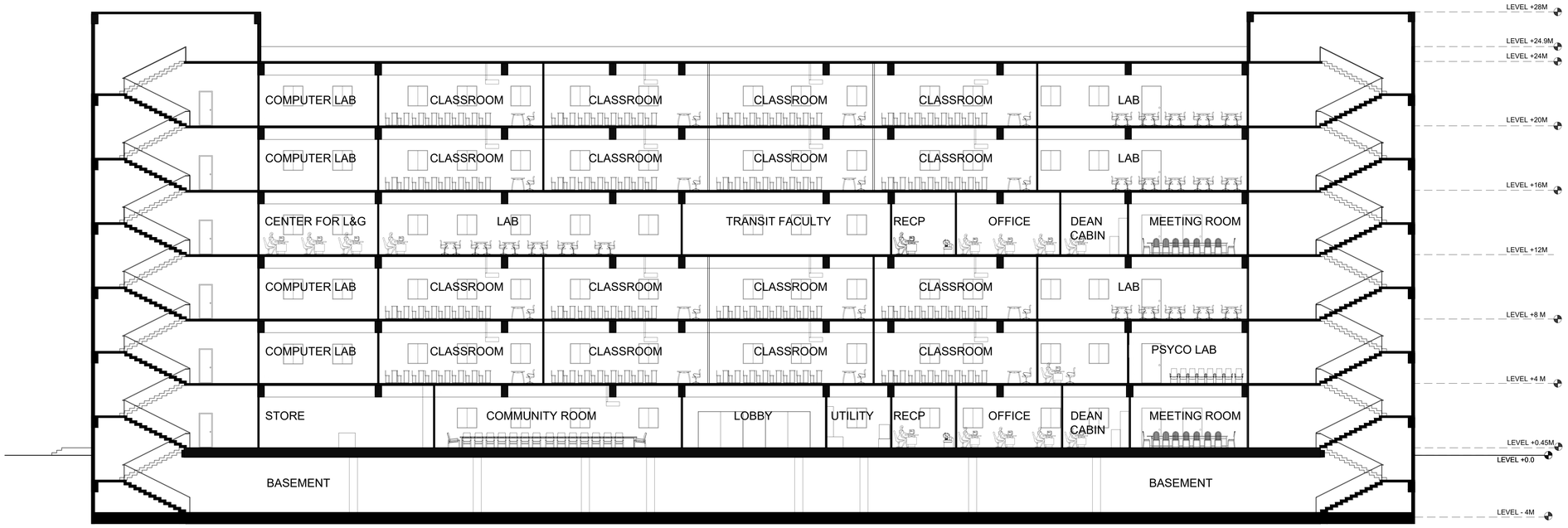
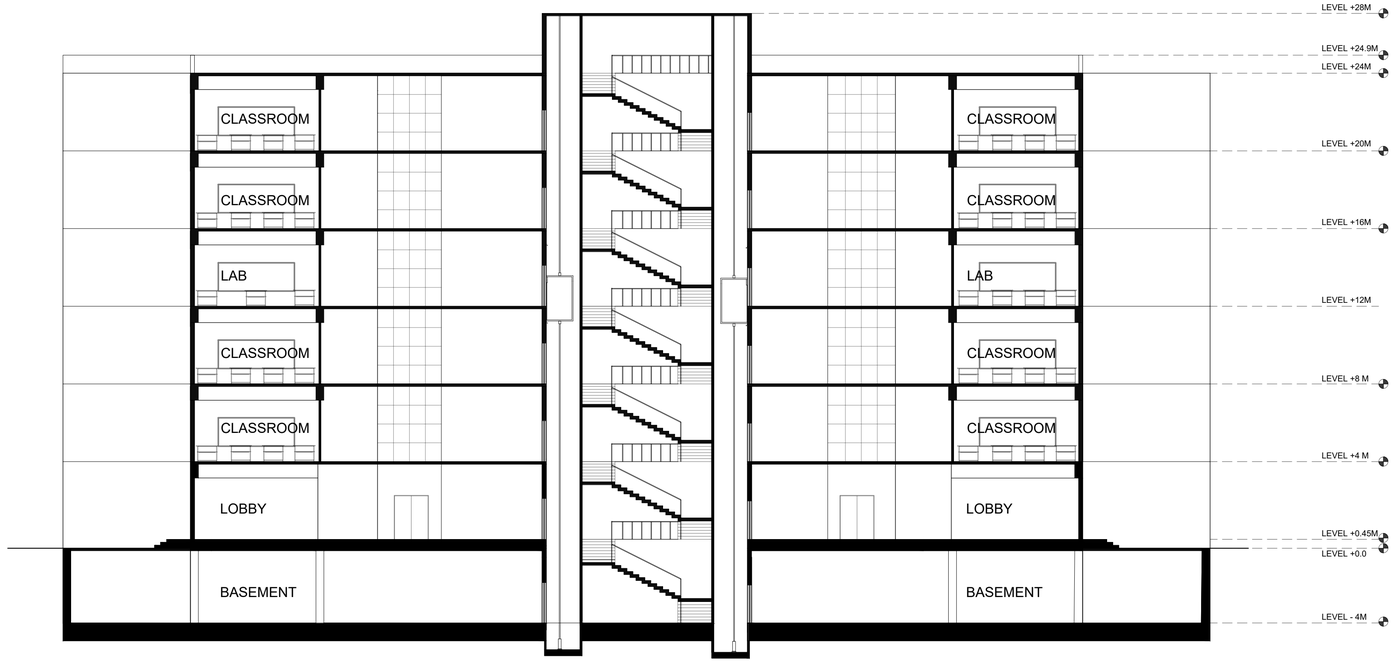


SECTION 1



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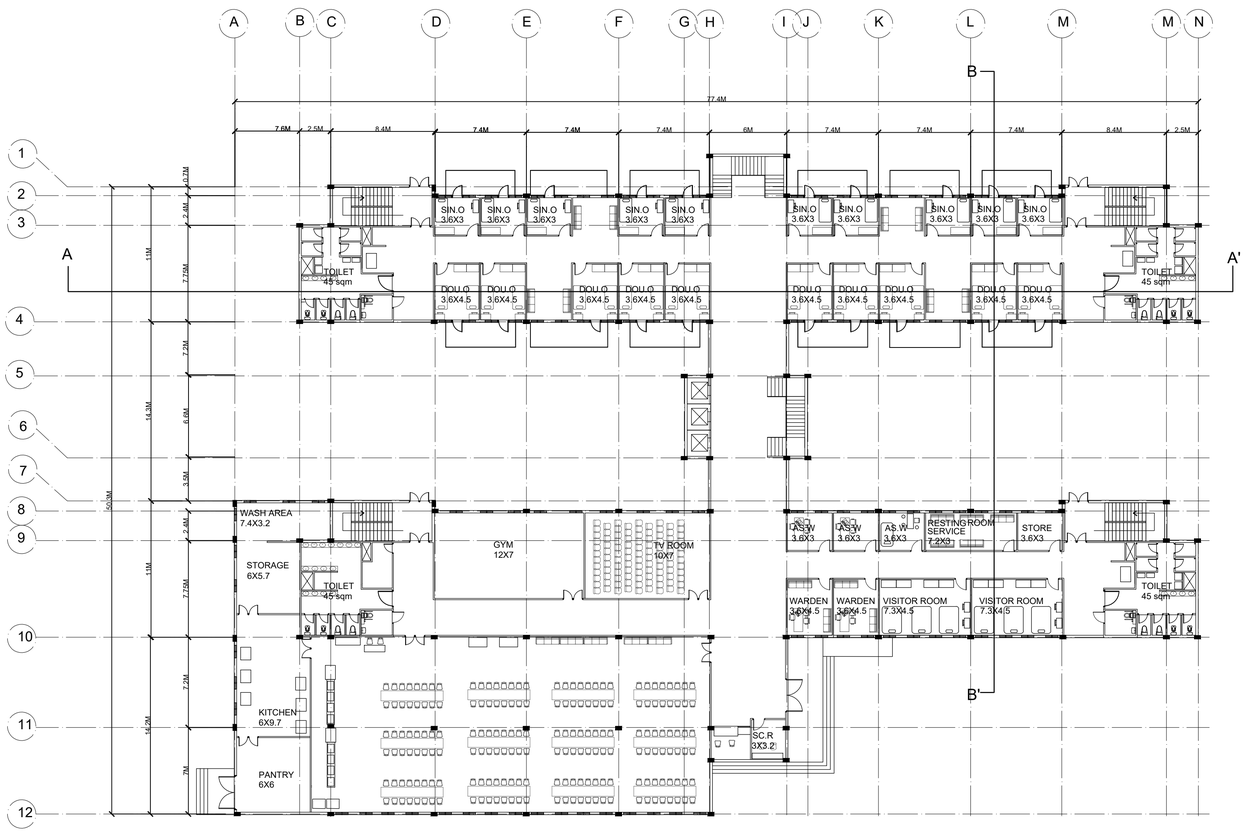
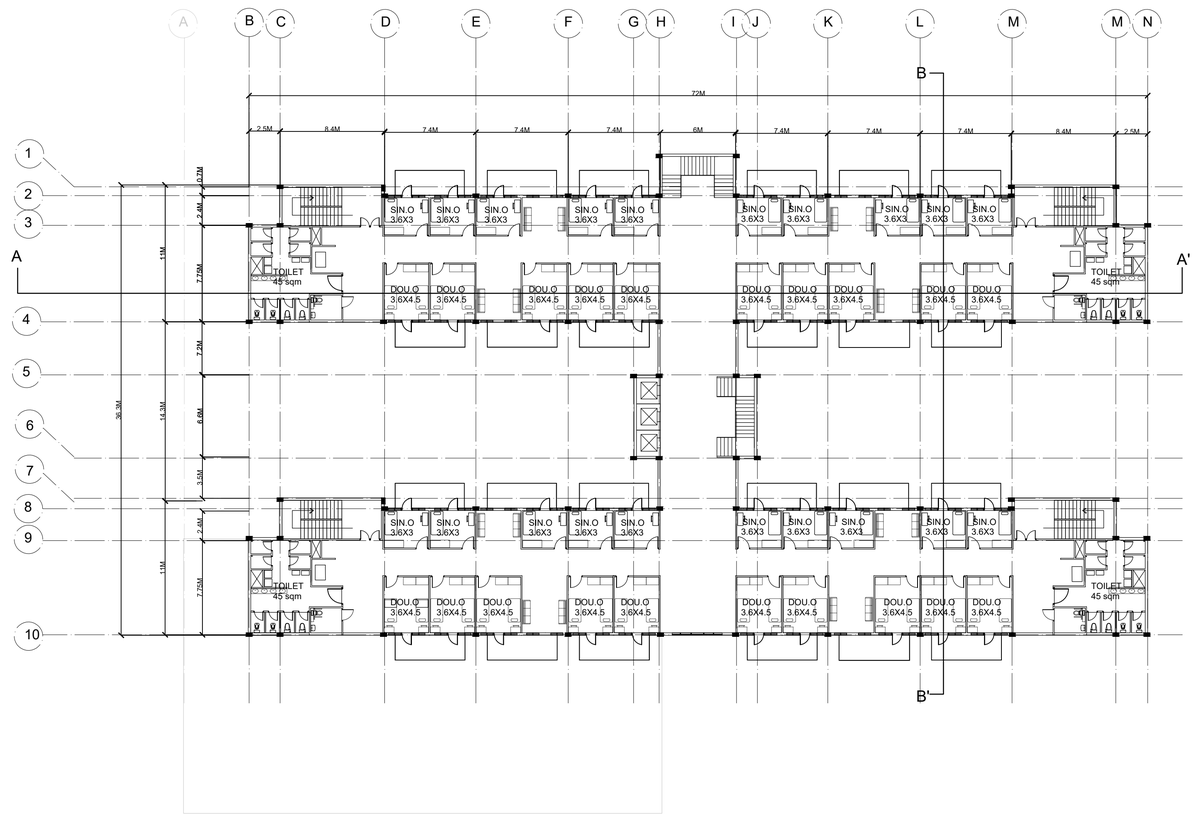
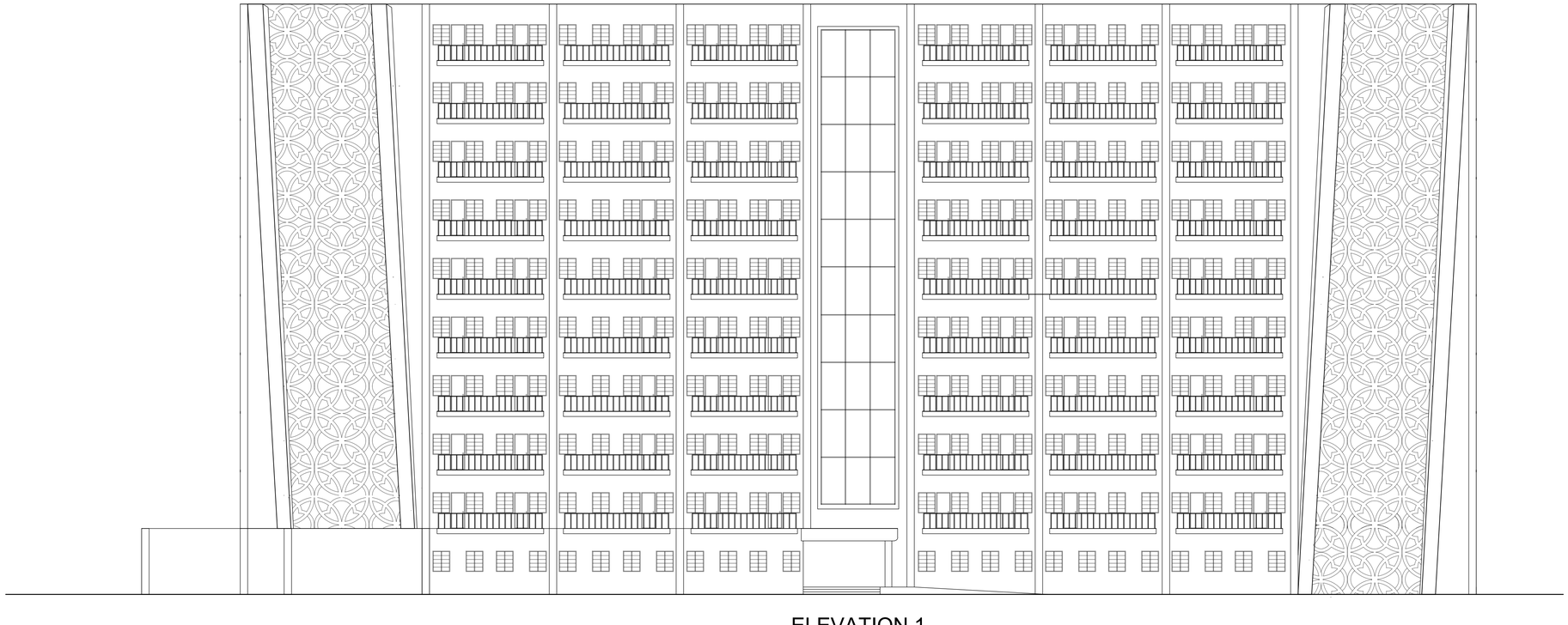


GROUND FLOOR



FIRST TO TEN FLOOR

NOTE:- ALL DMN IN M SCALE :-1:250	PROJECT TYPE:- INSTITUTE (Dr. B.R. Ambedkar University – Rohini Campus)	SHEET TITLE:- GIRL'S HOSTEL	THESIS GUIDED BY:- DR.NAKUL DHAGAT (DEPARTMENT OF ARCHITECTURE&PLANNING MANIT, BHOPAL)	SUBMITTED BY:- ANUSHKA PRAJAPATI 211110209 THESIS 2025	N	SHEET NO. AR-04



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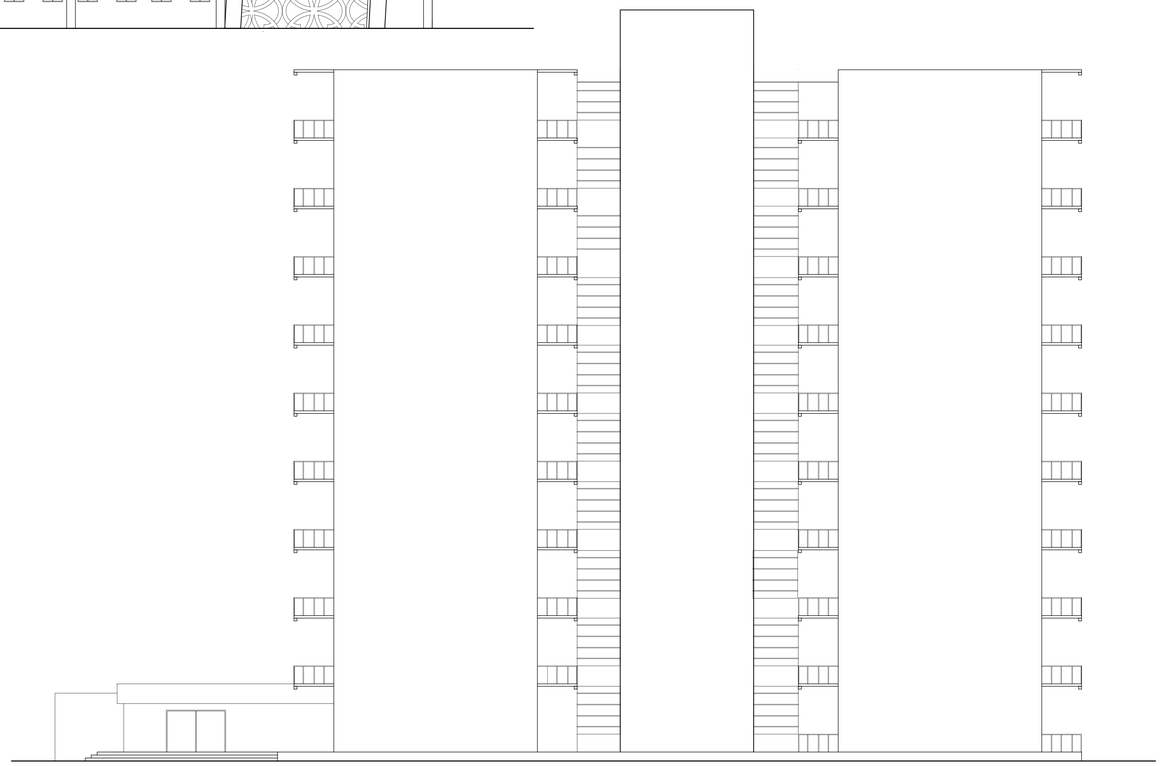

ELEVATION 2

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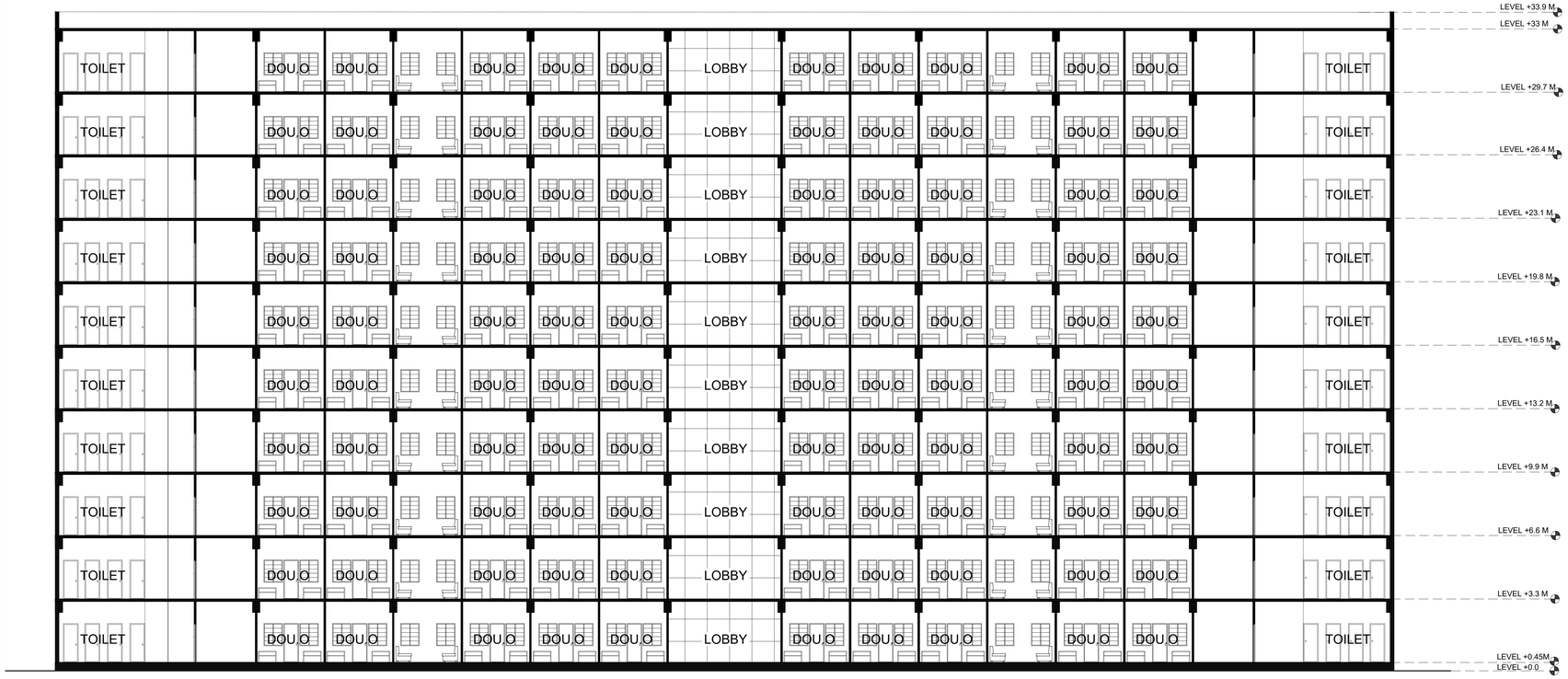

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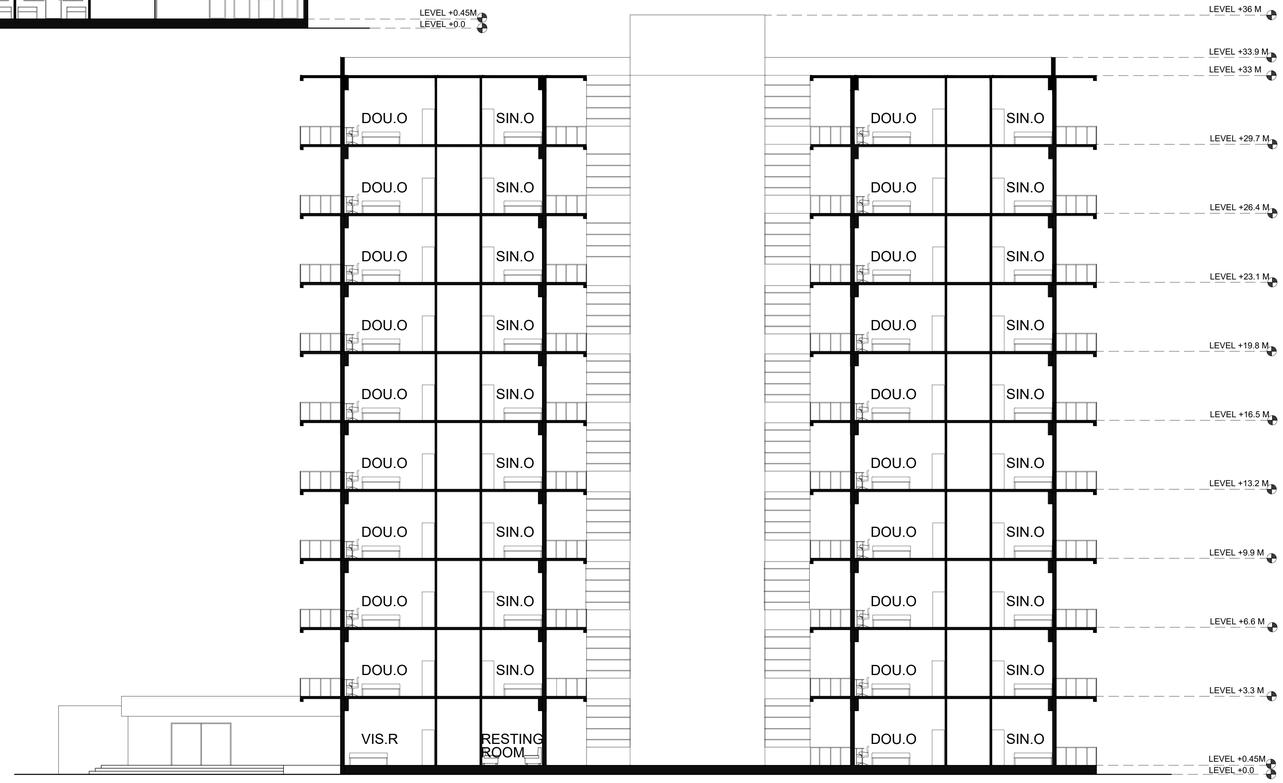

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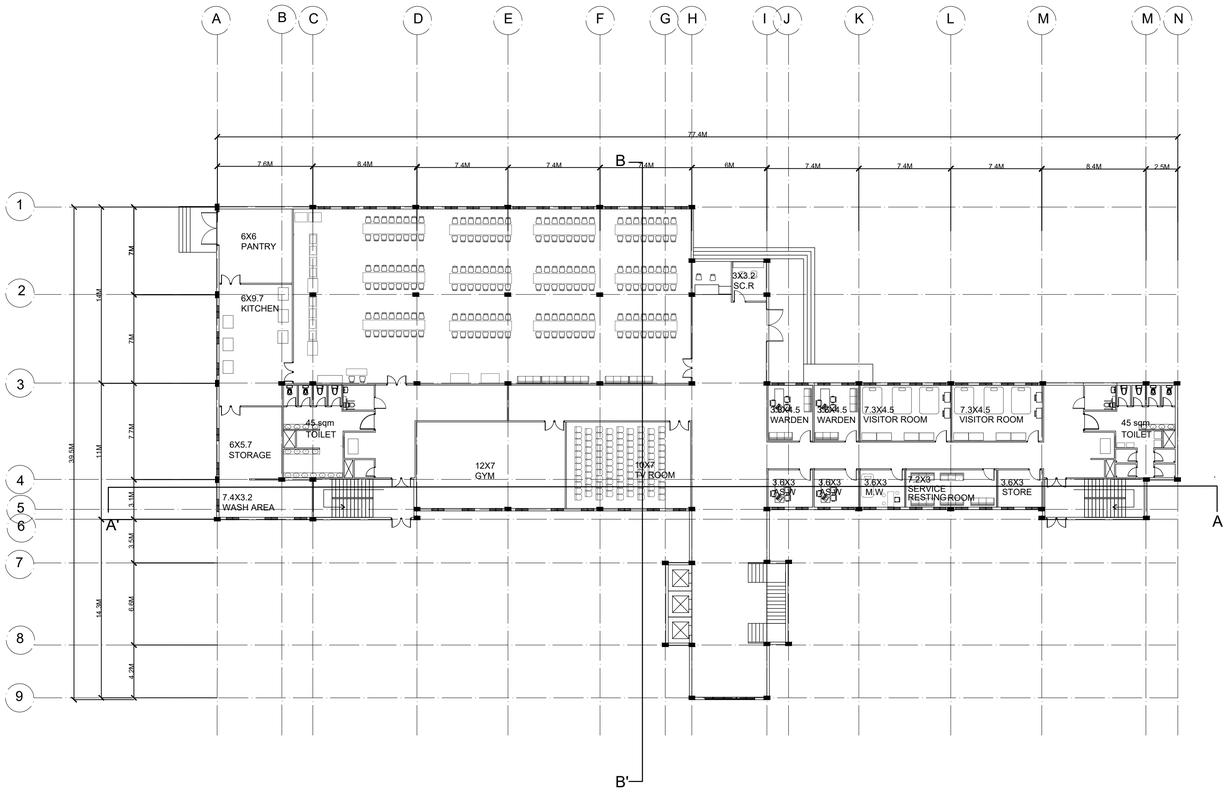

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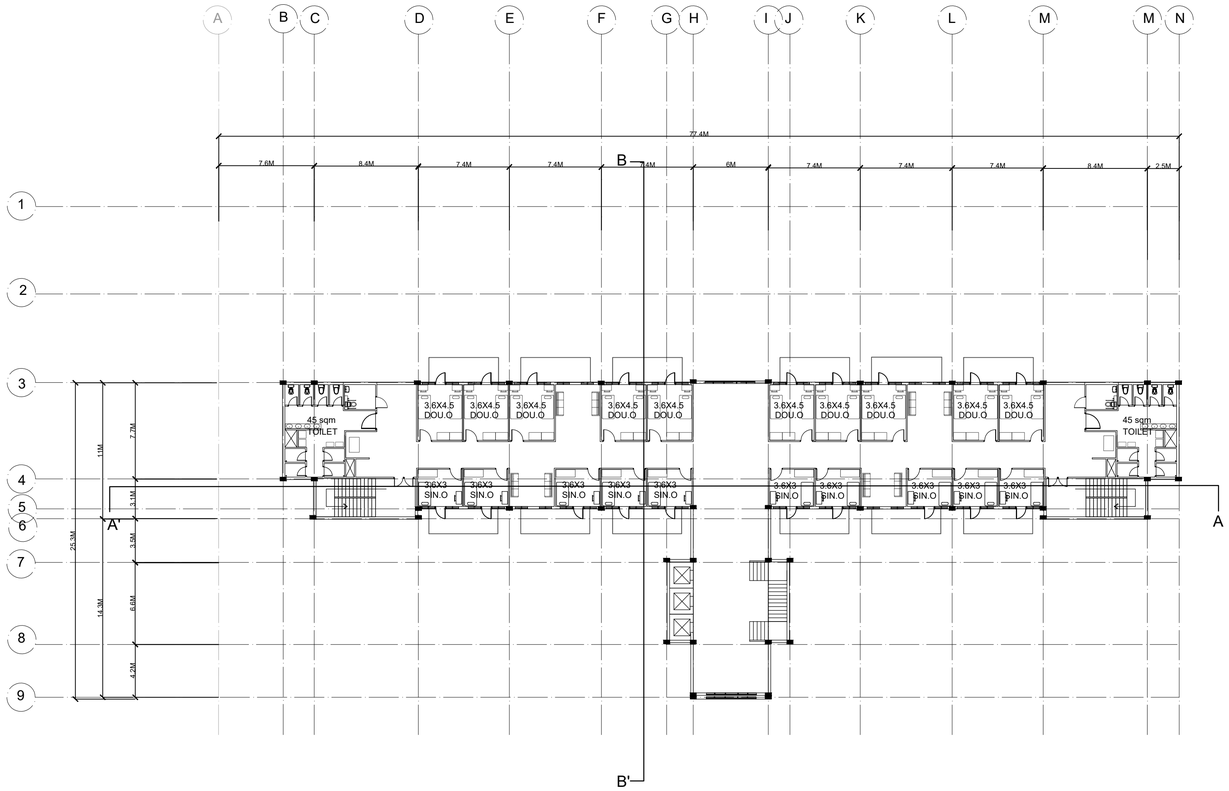

FIRST TO TEN FLOOR

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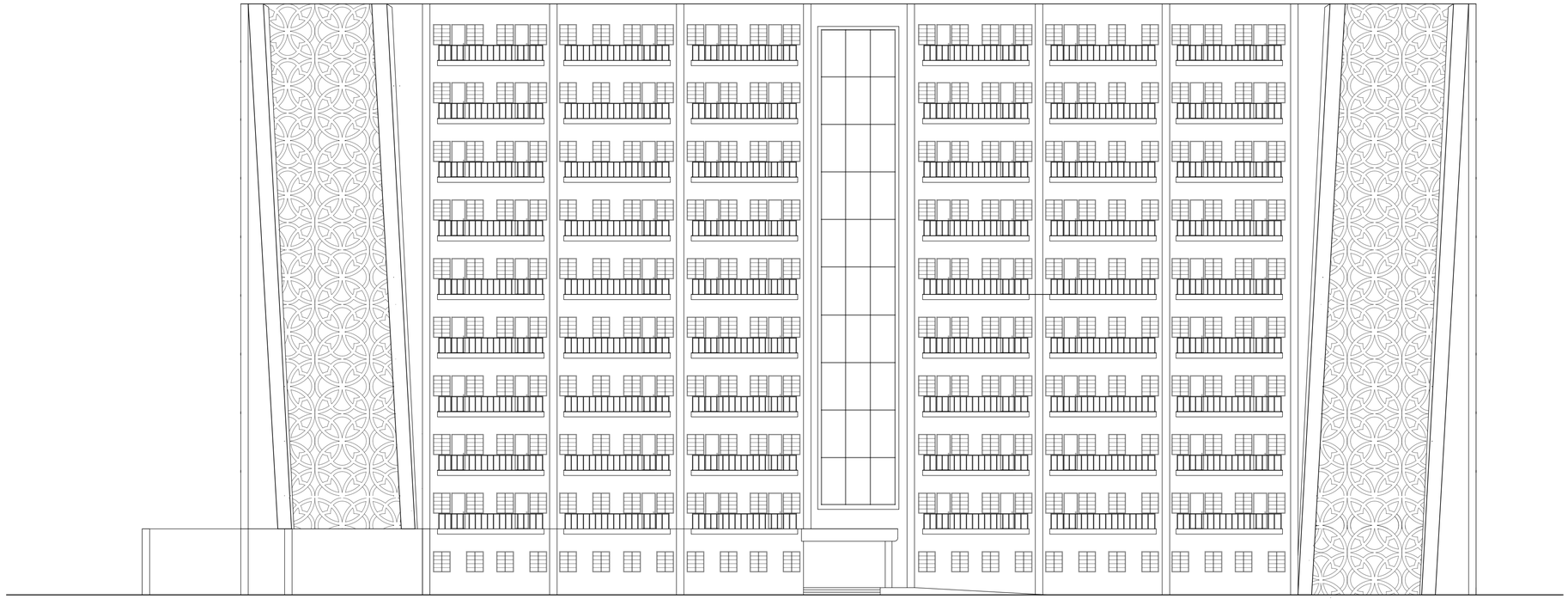

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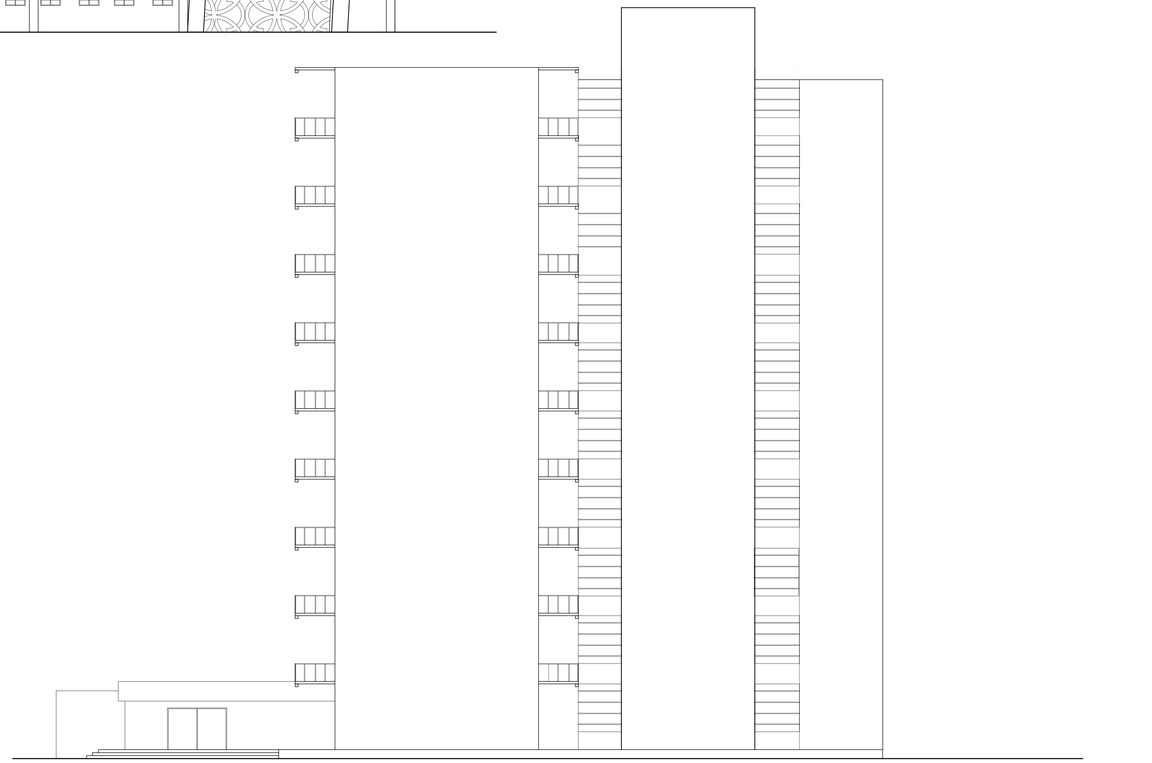

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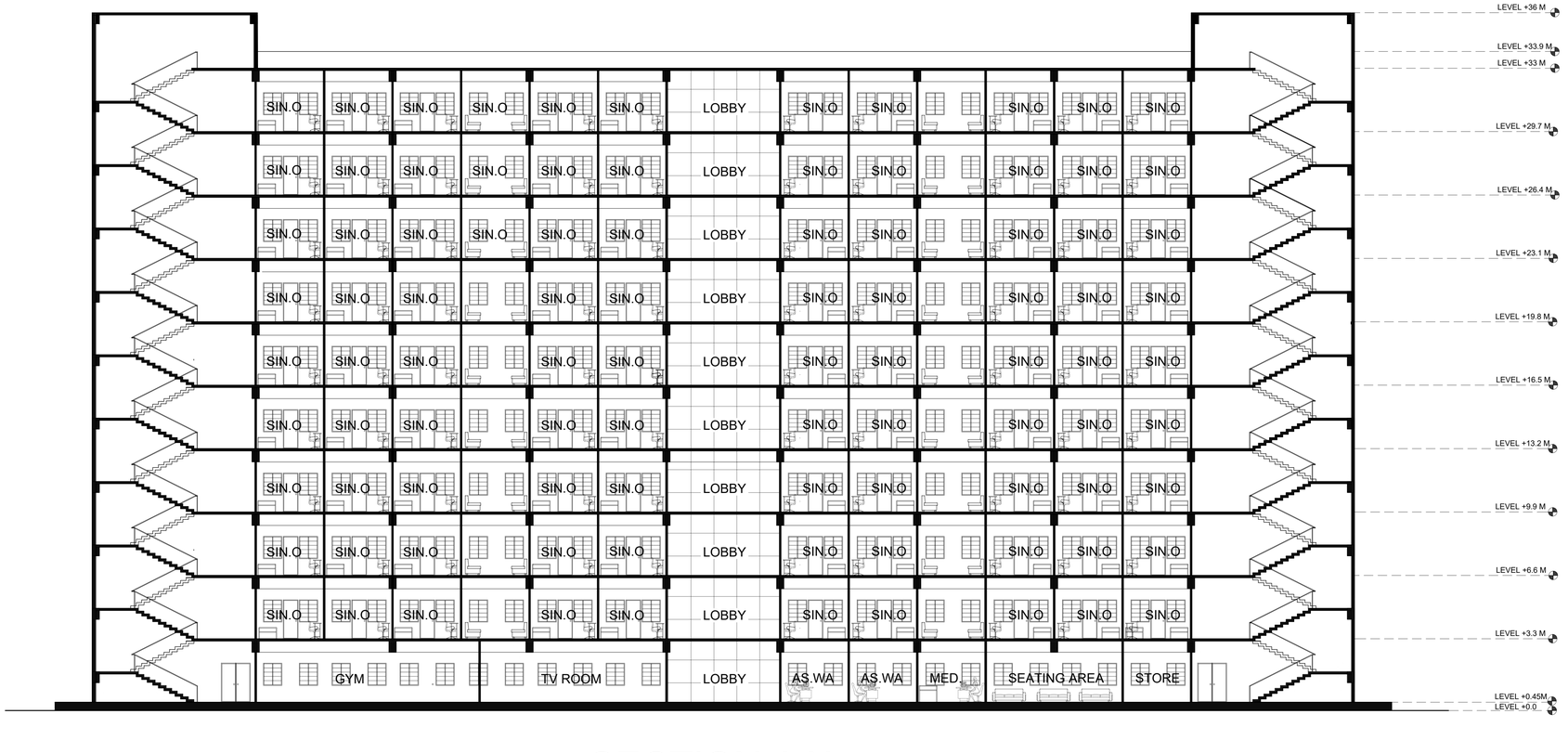

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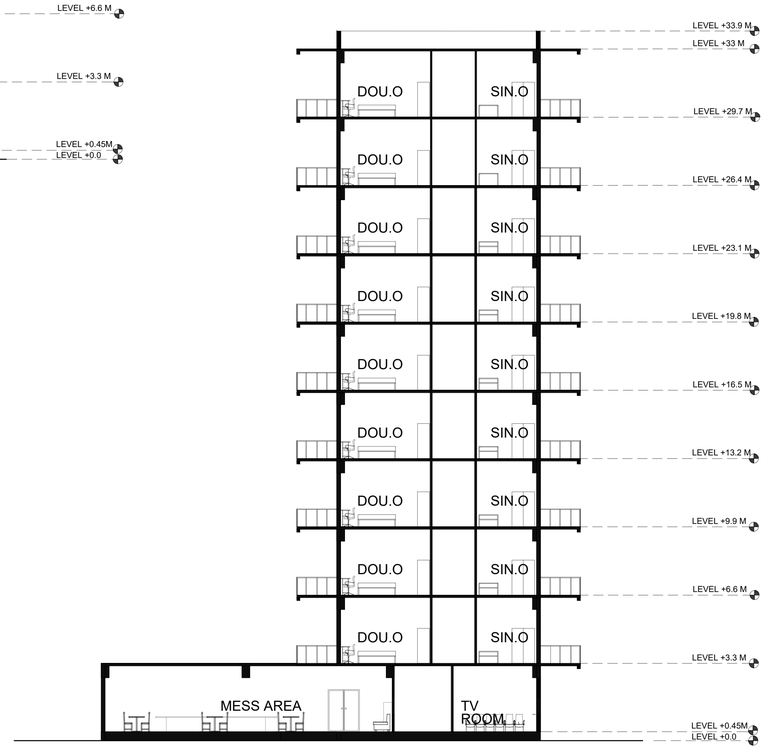

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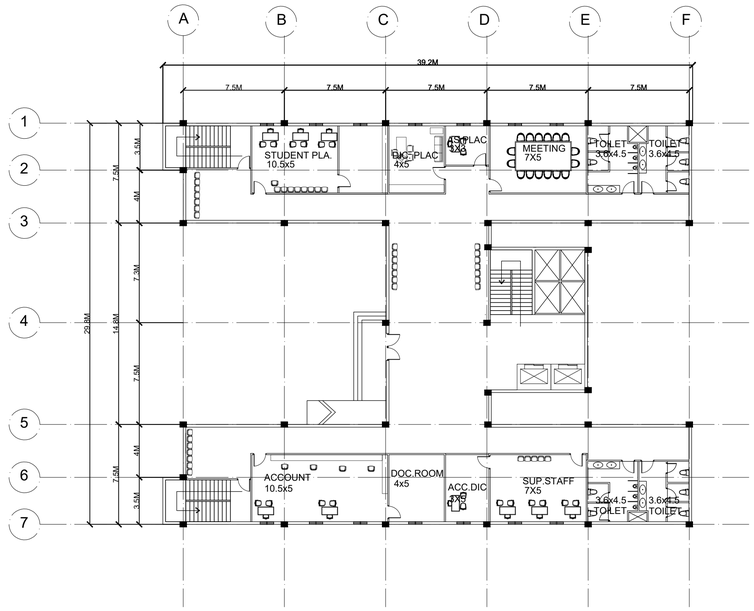

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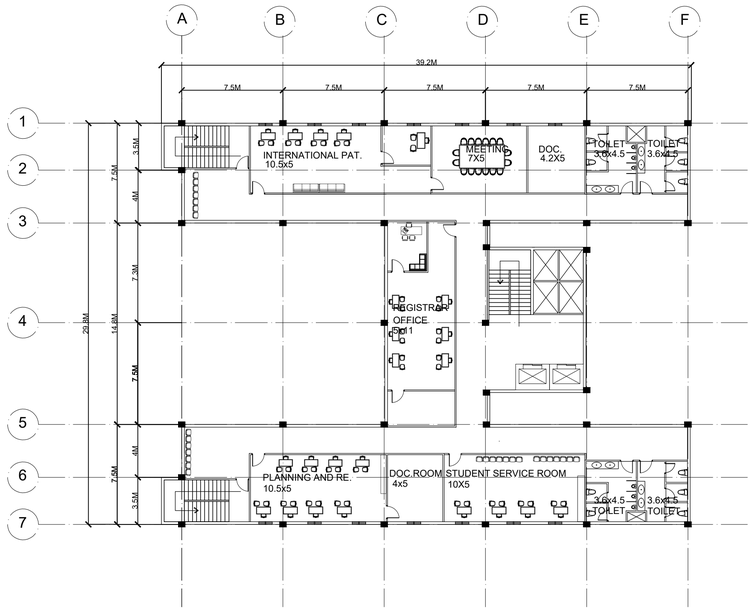

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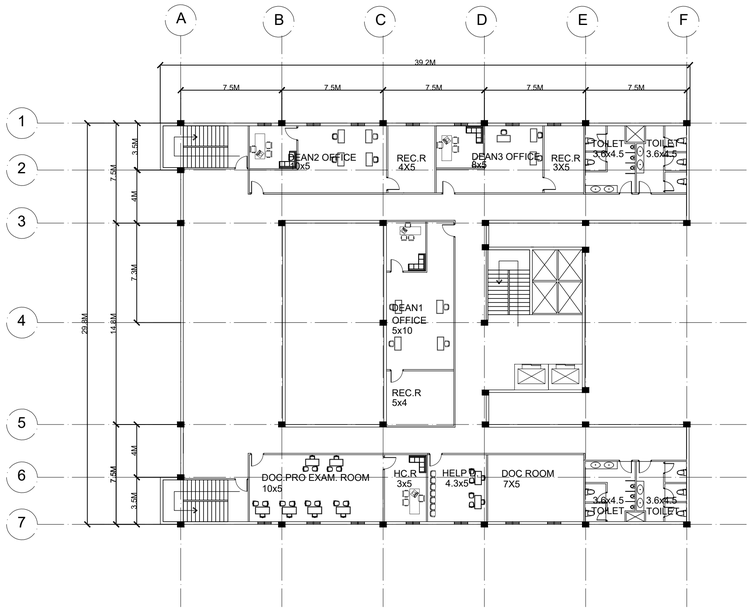

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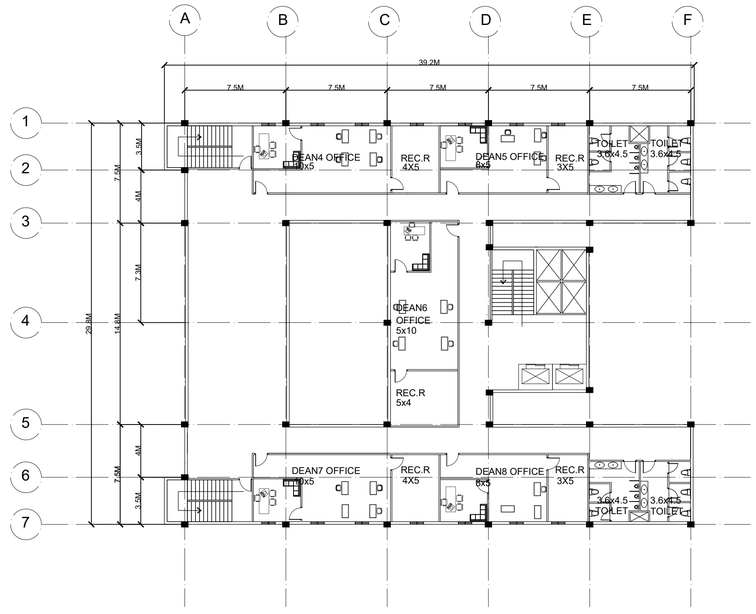

THIRD AND FOURTH FLOOR

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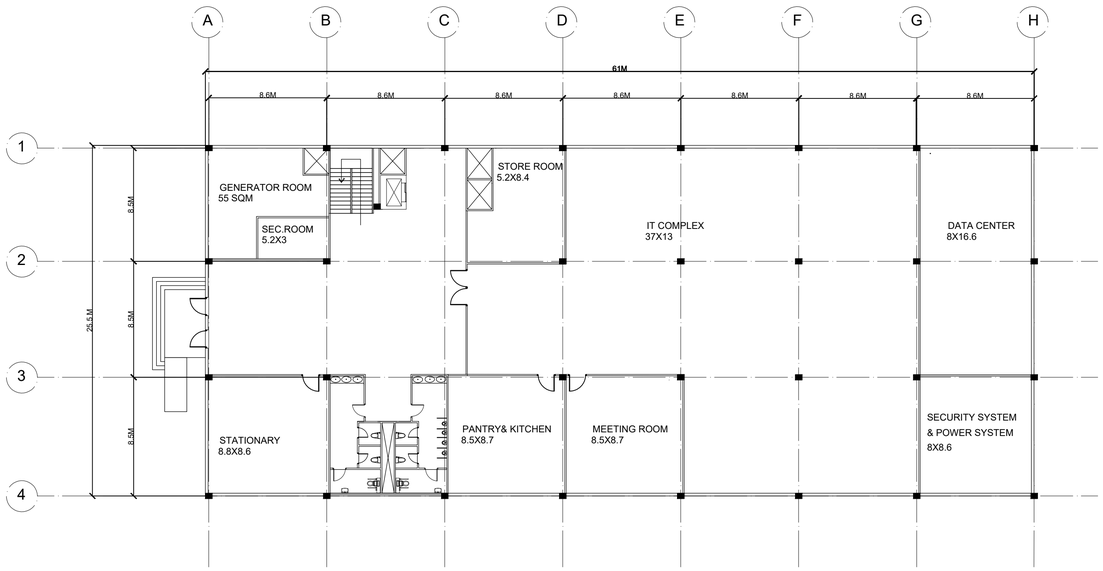

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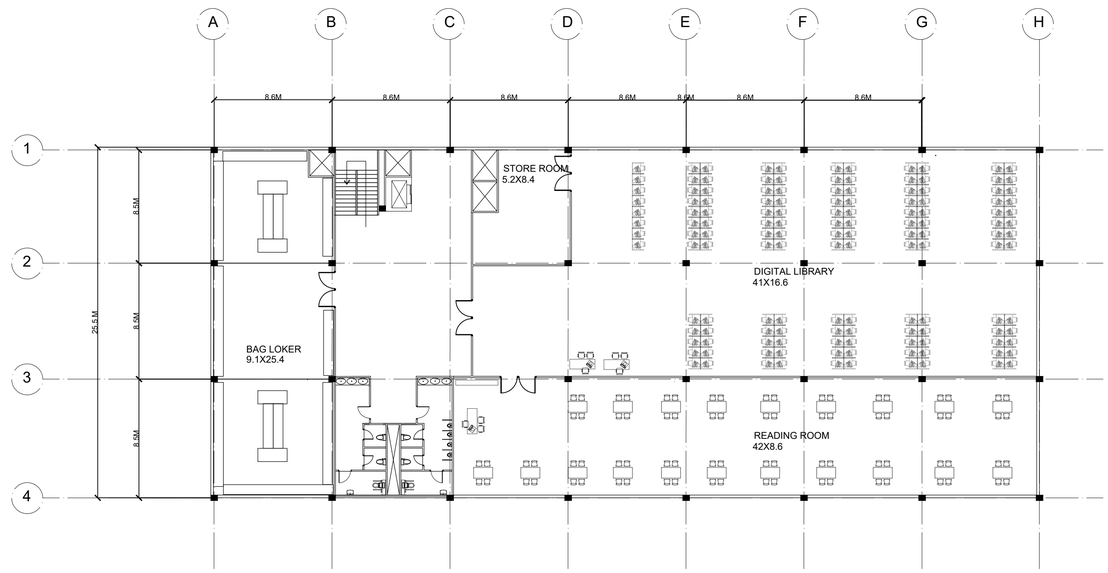

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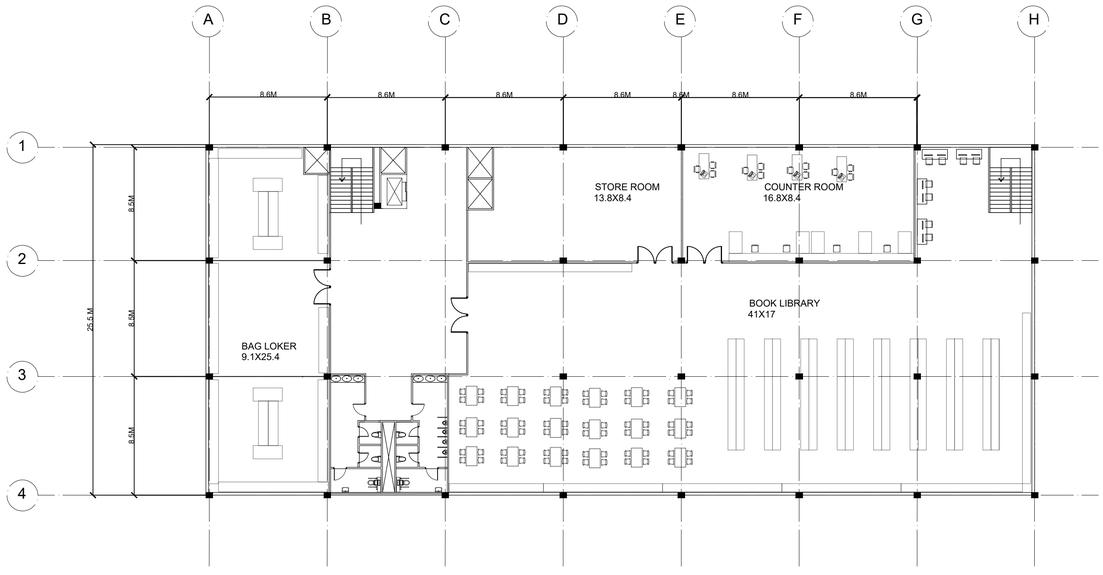

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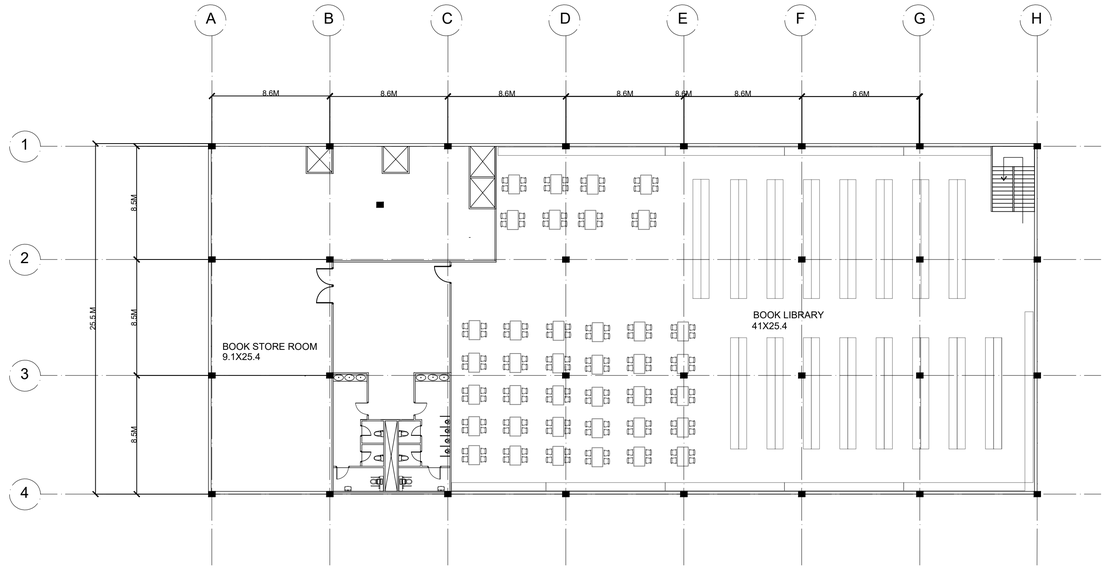

THIRD FLOOR

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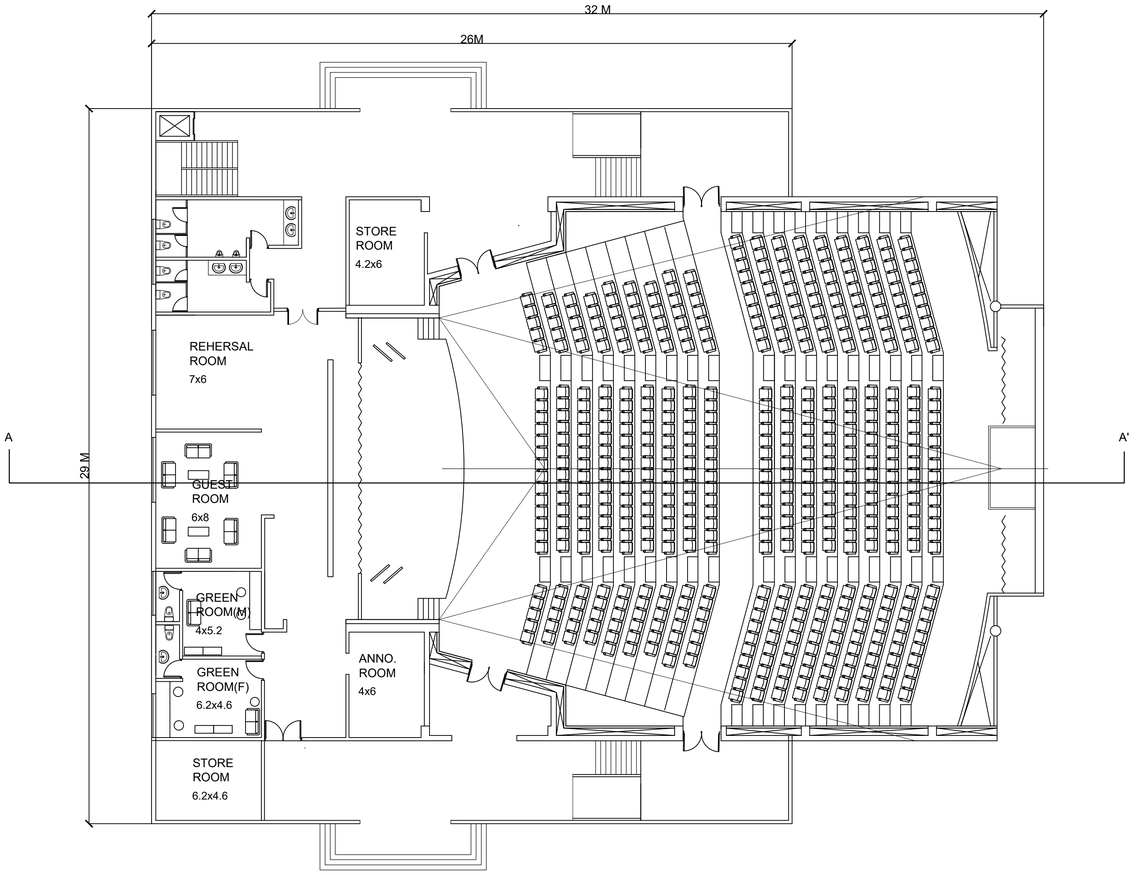

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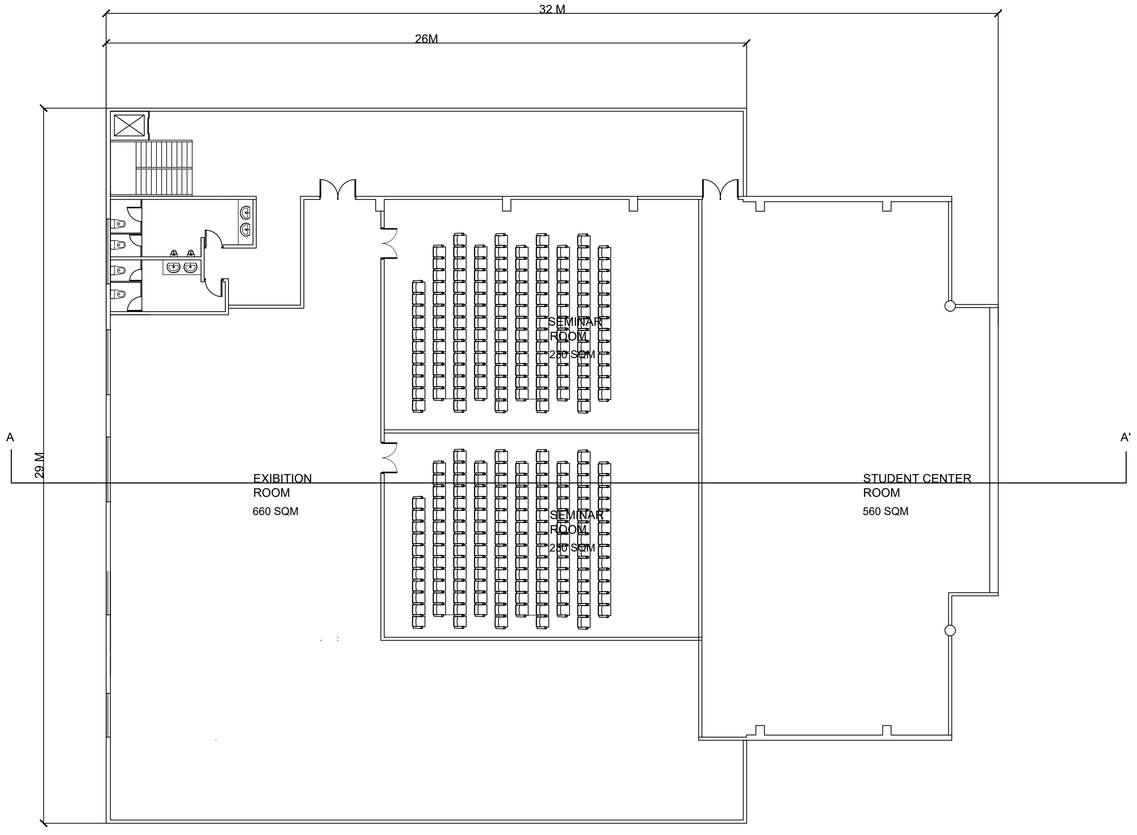
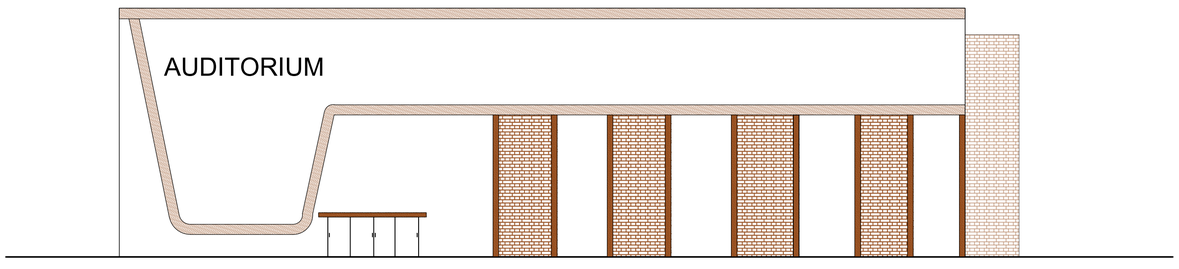
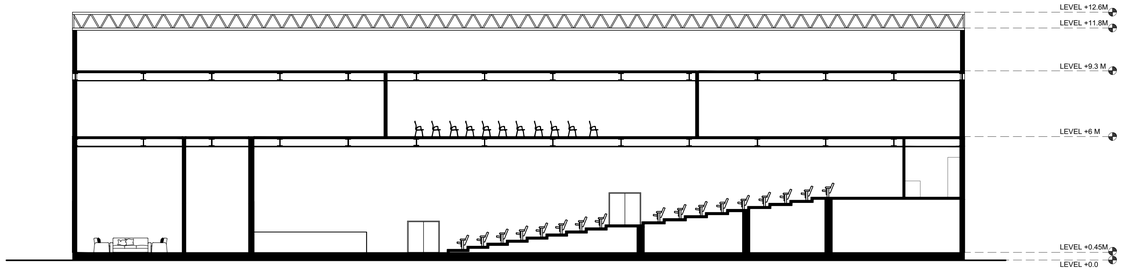


FIRST FLOOR



ELEVATION



SECTION AA'

NOTE:-	PROJECT TYPE:-	SHEET TITLE:-	THESIS GUIDED BY:-	SUBMITTED BY:-		SHEET NO.
ALL DMN IN M SCALE :-1:	INSTITUTE (Dr. B.R. Ambedkar University – Rohini Campus)	AUDITORIUM PLAN&SECTION	DR.NAKUL DHAGAT (DEPARTMENT OF ARCHITECTURE&PLANNING MANIT, BHOPAL)	ANUSHKA PRAJAPATI 211110209 THESIS 2025	N	A

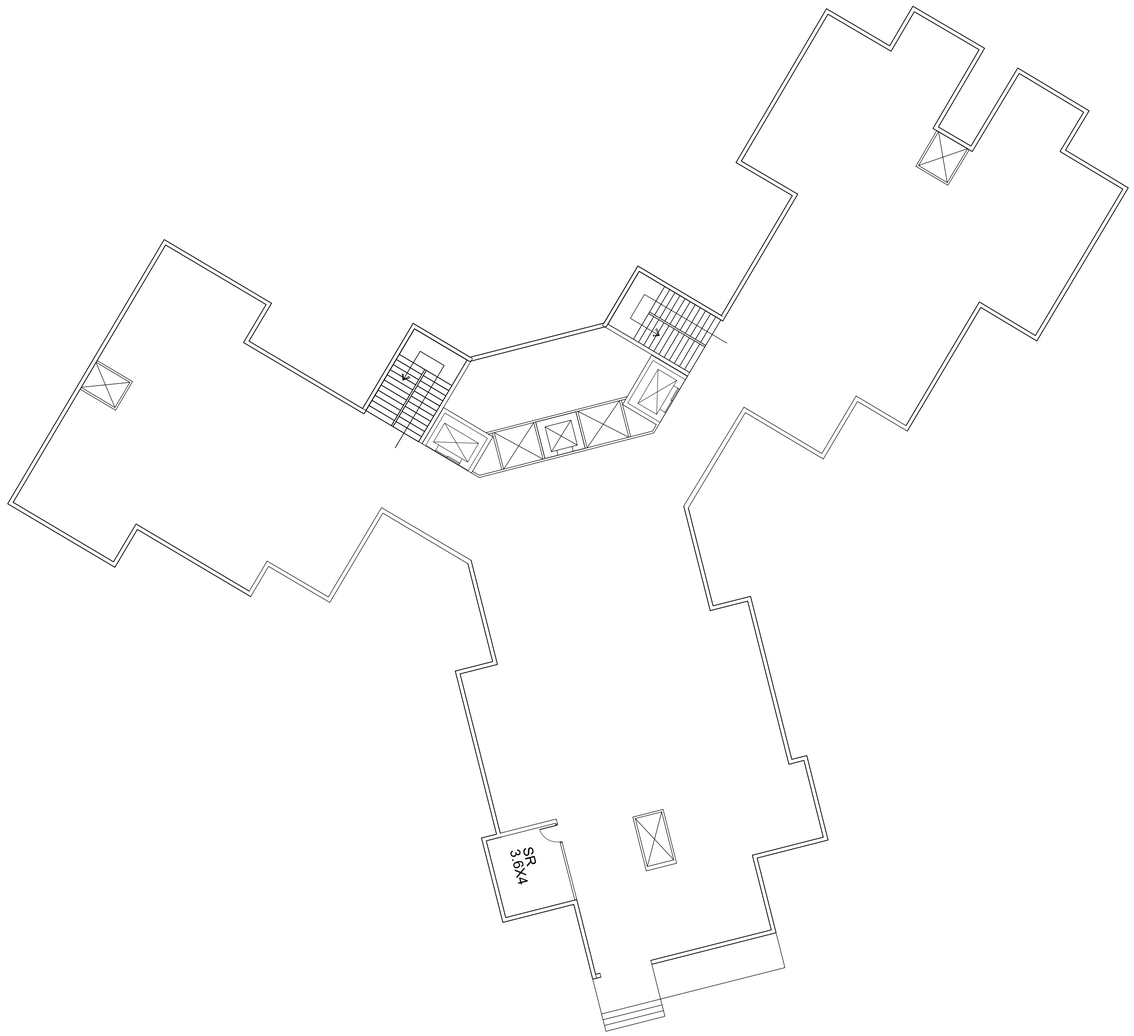


7 FLOOR



13 FLOOR

NOTE:- ALL DMN IN M SCALE :-1:150	PROJECT TYPE:- INSTITUTE (Dr. B.R. Ambedkar University – Rohini Campus)	SHEET TITLE:- FACULTY HOUSING	THESIS GUIDED BY:- DR.NAKUL DHAGAT (DEPARTMENT OF ARCHITECTURE&PLANNING MANIT, BHOPAL)	SUBMITTED BY:- ANUSHKA PRAJAPATI 211110209 THESIS 2025	N	SHEET NO. A13



GROUND FLOOR

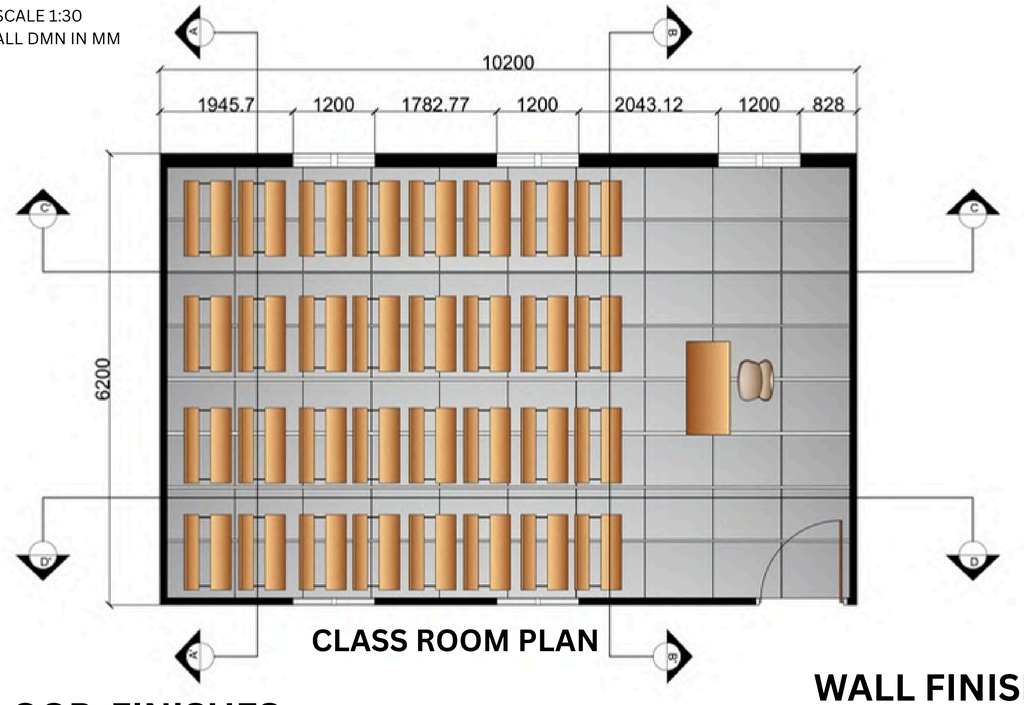


1 TO 6 , 8 TO 12 FLOOR

NOTE:- ALL DMN IN M SCALE :-1:150	PROJECT TYPE:- INSTITUTE (Dr. B.R. Ambedkar University – Rohini Campus)	SHEET TITLE:- FACULTY HOUSING	THESIS GUIDED BY:- DR.NAKUL DHAGAT (DEPARTMENT OF ARCHITECTURE&PLANNING MANIT, BHOPAL)	SUBMITTED BY:- ANUSHKA PRAJAPATI 211110209 THESIS 2025	N	SHEET NO. A13

CLASSROOM INTERIOR

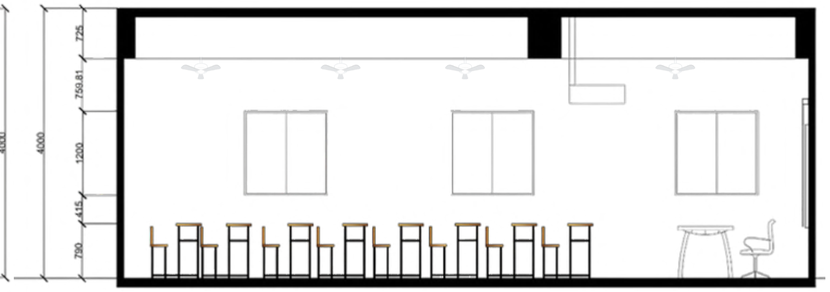
SCALE 1:30
ALL DMN IN MM



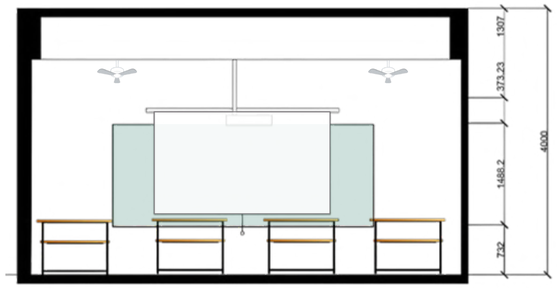
CLASS ROOM PLAN



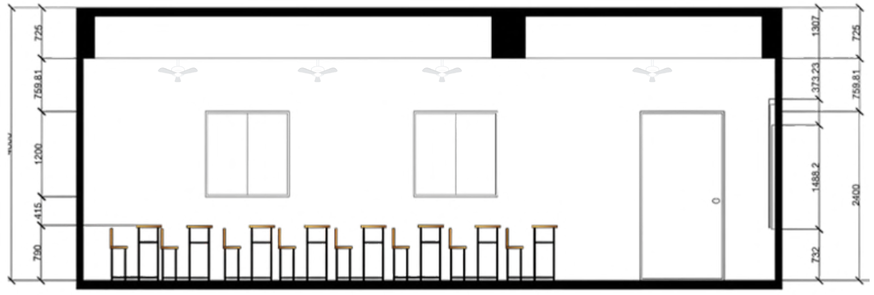
SECTION AA'



SECTION CC''

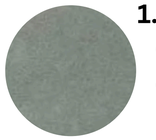


SECTION BB'



SECTION DD'

FLOOR FINISHES



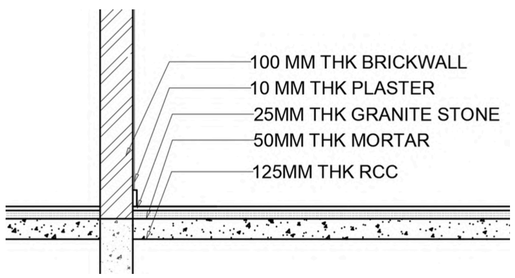
1.KOTA STONE :

- Extremely durable and long-lasting.
- Provides a smooth but non-slippery surface ideal for heavy foot traffic.
- Economical and easily available in India.
- Maintains a cool temperature in hot climates

2.Tandur Stone / Shahabad Stone



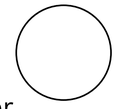
- Similar to Kota but lighter in color — greyish or beige tone, giving a brighter classroom feel.
- Good load-bearing capacity.
- Withstands heavy foot traffic.
- It stays cool in hot climates and moderately warm in winters, maintaining comfortable indoor temperatures.



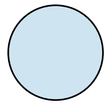
DETAILED SECTION

SCALE 1:10
ALL DMN IN MM

WALL FINISHES



L161:"Absolute White," an off-white from Asian Paints.:



5P0281:"Blue Mist" paint from Berger Paints

MATERIAL



study desk

MDF / Particleboard with Eco-Resins



dispaly board

Bagasse Board it is eco-friendly, strong, affordable, and easy to work with.



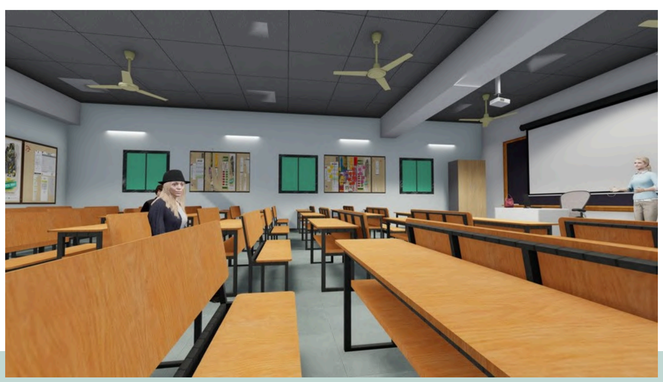
window frame

Recycled Steel Frames High durability and strength.

RENDER VIEWS OF CLASSROOM











ANUSHKA PRAJAPATI
211110209

THESIS GUIDED BY:
DR.NAKUL DHAGAT

LANDSCAPE

BENCHES USED IN PARK





BENCHES USED IN NEAR ACADEMIC BLOCK AND GREEN CANOPY ON PEDESTRIAN ROAD





CHARBAGH IN RESIDENENTIAL PARK











PARK

CAFE







CHILDREN PARK

TREES USE FOR LANDSCAPING

Common Name	Scientific Name	Type	Key Features / Uses	Suitability for Delhi Climate
Kadam / Kadamba	*Neolamarckia cadamba*	Shade / Flowering	Fast-growing, fragrant round flowers	Excellent – tolerates heat & pollution
Kachnar	*Bauhinia variegata*	Flowering	Pink/white orchid-like flowers	Very good – thrives in dry warm climate
Neem	*Azadirachta indica*	Shade	Highly drought-resistant, medicinal	Excellent – heat & drought tolerant
Amaltas	*Cassia fistula*	Flowering	Yellow cascading flowers	Excellent – thrives in high heat
Arjun	*Terminalia arjuna*	Shade	Tall, medicinal bark, good avenue tree	Very good – heat & pollution tolerant
Ashoka (False Ashoka)	*Polyalthia longifolia*	Screening	Tall, slim columnar tree	Good – heat & pollution tolerant
Jamun	*Syzygium cumini*	Shade / Fruit	Hardy evergreen foliage	Very good – adapted to North Indian
Mango	*Mangifera indica*	Shade / Fruit	Dense canopy, hardy	Excellent – thrives in hot climates
Sheesham	*Dalbergia sissoo*	Shade / Timber	Hardy, fast-growing	Excellent – drought and heat tolerant
Putranjiva	*Putranjiva roxburghii*	Evergreen	Dense foliage, ornamental, pollution-tolerant	Very good – suitable for hot, dry urban climates

MATERIAL USE FOR LANDSCAPING



Eco Pavers

- Voids or gaps for water percolation.
- provide a smooth, non-slippery surface and reduce drainage issues.
- Lower surface temperature compared toconcrete/asphalt

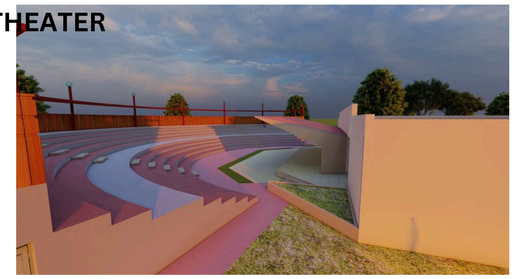


Permeable Concrete

- Allows rainwater infiltration
- Reduces runoff and promotes groundwater recharge
- Reduces urban flooding
- Low heat buildup

AMPHITHEATER





MATERIAL USE IN BENCES



WPC (Wood Plastic Composite)

- Less heat absorption than metal/stone
- Comfortable in outdoor sun
- UV-resistant, no repainting needed



Permeable Concrete Bench

- Uses fly ash or GGBS
- Allows water percolation
- Stays cooler due to air voids



Bamboo Composite (Engineered Bamboo)

- Very eco-friendly manufacturing
- Does not trap heat like stone
- Low chemical emission
- Can break down naturally after lifespan

EXTERIOR VIEW

ACADEMIC BLOCK



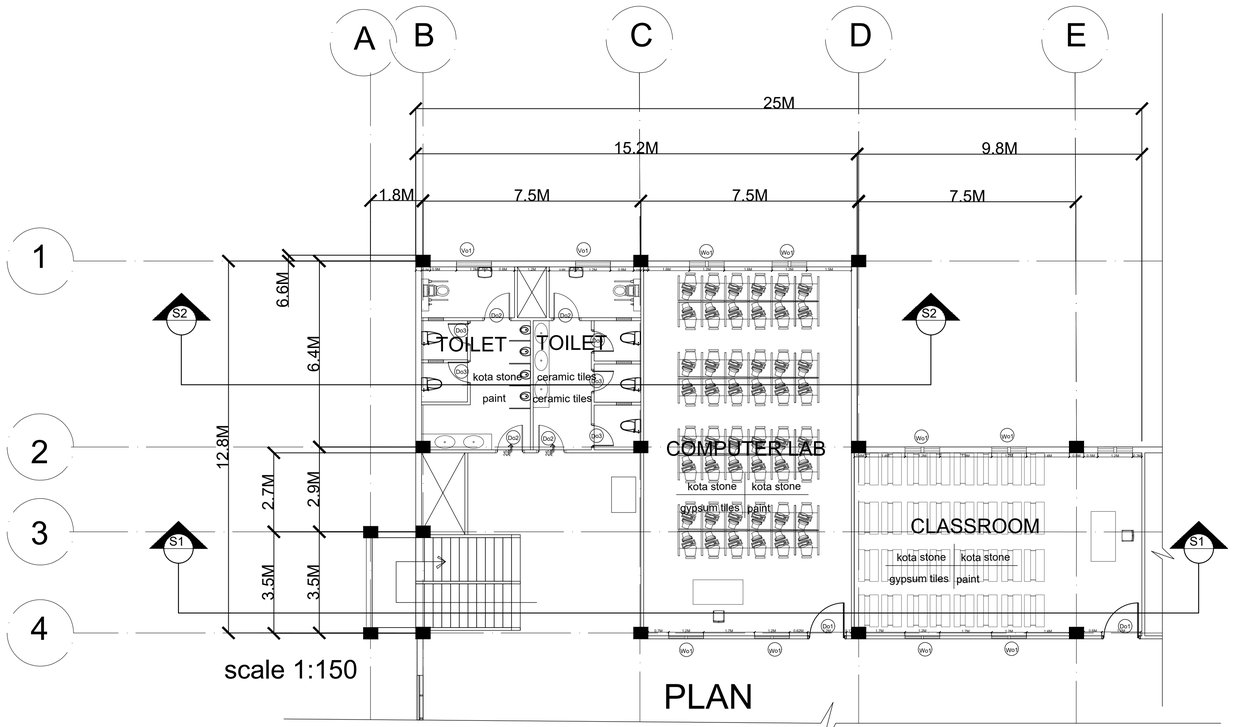






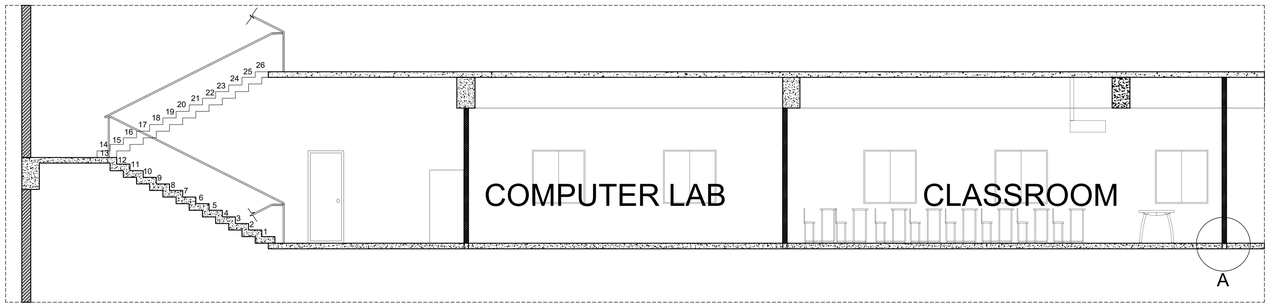






scale 1:150

PLAN



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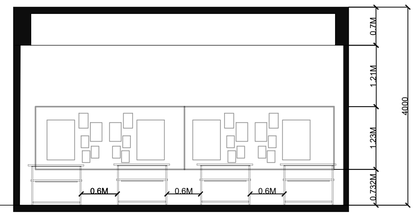
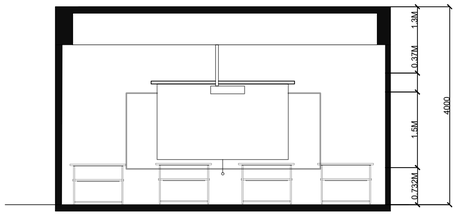
SECTION 1



DETAILED SECTION AA'



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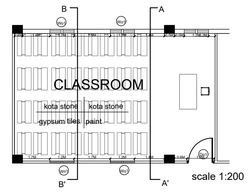

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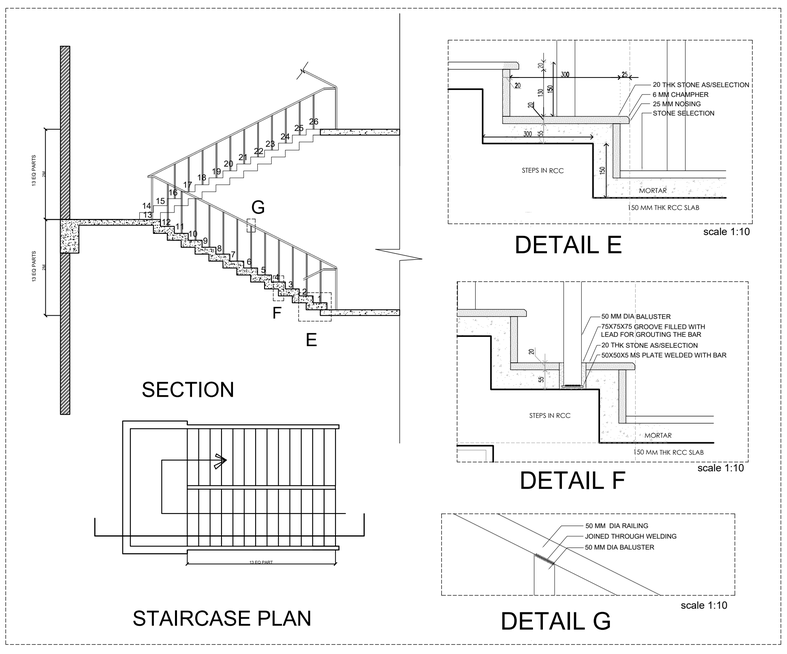


SECTION

STAIRCASE PLAN

DETAIL E

scale 1:10

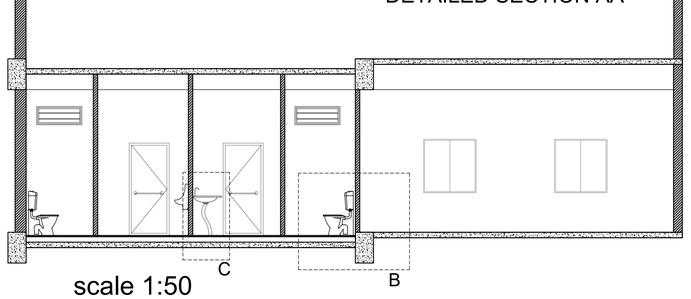
DETAIL F

scale 1:10

DETAIL G

scale 1:10

scale 1:50



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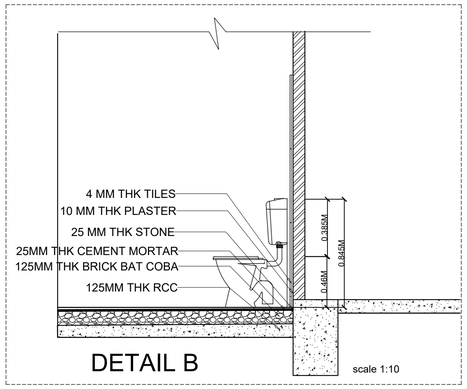
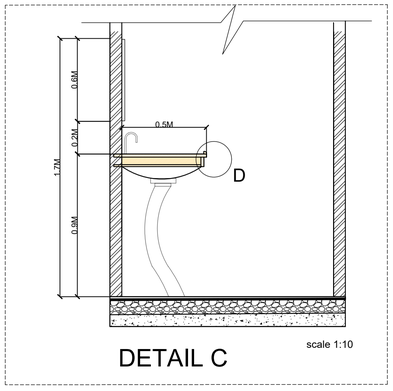
SECTION 2



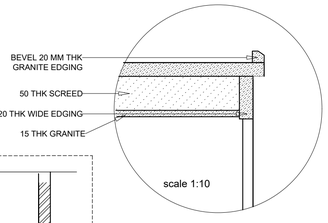
DETAIL B

scale 1:10



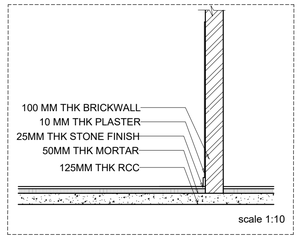
DETAIL C

scale 1:10



DETAIL D

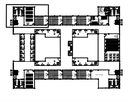
scale 1:10



DETAIL A

scale 1:10

SCHEDULE					
NAME	WIDTH	CILL	LINTEL	HEIGHT	REMARKS
D01	1.2M	-	2.1M	2.1M	FOUR PANEL WOODEN DOOR
D02	0.9M	-	2.1M	2.1M	DOUBLE PANEL WOODEN DOOR
D03	0.7M	-	2.1M	2.1M	DOUBLE PANEL WOODEN DOOR
W01	1.2M	0.9	2.1M	1.2M	ALUMINUM FRAME SLIDING WINDOW
V01	1.2M	2.1M	2.7M	0.6M	ALUMINIUM LOUVE-RED VENTILATOR



NOTE:-	PROJECT TYPE:-	SHEET TITLE:-	THESIS GUIDED BY:-	SUBMITTED BY:-		SHEET NO.
ALL DMN IN M	INSTITUTE (Dr. B.R. Ambedkar University – Rohini Campus)	SECTIONS OF ACADEMIC CLUSTER	DR.NAKUL DHAGAT (DEPARTMENT OF ARCHITECTURE&PLANNING MANIT, BHOPAL)	ANUSHKA PRAJAPATI 211110209 THESIS 2025	N	A03