ARC 24511 – Thesis Project

Institute Campus Design

(Ambedkar University Delhi)

Sector-3 Rohini, Delhi, India

Submitted by:

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UNDER THE GUIDANCE OF

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DEPARTMENT OF ARCHITECTURE AND PLANNING

MAULANA AZAD NATIONAL INSTITUTE OF TECHNOLOGY, BHOPAL

CANDIDATE DECLARATION

The Thesis Project in the subject ARC 24511, entitled "**New Campus of Ambedkar University**

Rohini sctor-3, Delhi, India", is being submitted in partial fulfilment of the requirement for the award of degree of Bachelor of Architecture by the undersigned for evaluation.

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.

Date: 30th July, 2025 Anushka Yadav

211110208

RECOMMENDATION

Based on the above declaration of the student, the undersigned recommends that the work submitted by the candidate may be considered for the final end term examination of the subject ARC-5201, Thesis Project.

Date: 30th July, 2025 Dr. Yogesh Garg

Thesis Guide

CERTIFICATION OF EXAMINATION

The Bachelor of Architecture Thesis Viva-Voce examination of Ms. Anushka Yadav Scholar No.211110208 was held on

Dr. Nakul Dhagat Dr. Yogesh Garg

Head of Department **External Examiner** **Thesis Coordinator**

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ABSTRACT

The following is a comprehensive analysis and conceptual framework for designing, planning, and developing a new campus for Ambedkar University Delhi at Sector-3, Rohini, Delhi. The project conceives of a contemporary, sustainable, and inclusive learning space that reflects AUD's vision of equity, social justice, and interdisciplinarity in the humanities and social sciences.

The planned campus will showcase a dynamic interplay of built and open spaces, prioritizing ecological sensitivity, flexibility, and community engagement. The design integrates principles of environmental sustainability, spatial fluidity, and technological integration to support academic excellence and innovation. Particular emphasis is placed on developing a vibrant academic ecosystem that facilitates collective engagement, self-development, and collaborative knowledge sharing.

The development plan ensures that every aspect—academic blocks, residences, recreational spaces, and support facilities—comply with the Master Plan of Delhi 2021 and green building standards (GRIHA/LEED). With a combined area of 7.3 hectares, the campus is conceptualized as an eco-friendly urban node that feeds into the larger social and environmental context of Delhi.

This project reflects AUD's vision for the establishment of a multi-campus university founded on democratic principles, and addressing issues of modern education, the environment, and the city through architectural excellence and planning.

ACKNOWLEDGEMENT

The completion of this thesis report has been one of the most significant parts of our thesis study. We would like to acknowledge everyone who has helped us throughout in the completion of this Thesis Report, directly or indirectly.

At this moment of accomplishment, first of all we would like to thank our Thesis Coordinator & Guide ***Prof. Yogesh Garg*** *. This work would not have been possible without their guidance, support and encouragement. Their insightful leadership and knowledge benefited us to successfully overcome many difficulties through the process and taught us a lot. Their valuable suggestions helped us make our work better. Thank you so much for your continuous support and presence whenever needed.*

We would like to express our deep appreciation and indebtedness to our teachers and supervisors for their endless support, kindness, and understanding during the project duration.

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DESIGN BRIEF

1. INTRODUCTION

A university campus is far more than a collection of buildings—it is a living, evolving environment that shapes how people learn, interact, and grow. In an age where education is becoming increasingly interdisciplinary, inclusive, and socially conscious, the architecture of academic institutions must respond with equal depth. This thesis focuses on the design of a new campus for Ambedkar University Delhi at Sector-3, Rohini—an opportunity to create an academic space that not only serves its functional needs, but also reflects the university's commitment to equity, sustainability, and holistic development.

The site spans approximately 7.3 hectares and presents a unique challenge: to translate AUD's progressive vision into an architectural language that is both grounded in context and open to future change. The design approach taken in this project emphasizes flexibility, adaptability, and environmental responsibility. The aim is to create a campus that allows students and faculty to feel connected—to the built space, to nature, and to each other.

Special attention has been given to zoning and spatial planning, ensuring a seamless relationship between academic zones, residential clusters, administrative blocks, and shared open areas. The planning process focuses on natural light, ventilation, walkability, and a human-scale design that supports interaction and inclusivity. Public gathering spaces, green corridors, and informal pockets are interwoven throughout the site to encourage spontaneous dialogue and collaboration beyond the classroom.

Through this design thesis, the campus is envisioned not only as a center for higher education but also as a platform for community engagement, cultural expression, and sustainable growth. It seeks to embody the spirit of learning—open, evolving, and deeply rooted in the values of the institution it represents

1.1. Overview

- **Project Name:** Dr. B.R. Ambedkar University Delhi – Rohini Campus
- **Proposing agency:** PUBLIC WORKS DEPARTMENT (Government of N.C.T. of Delhi)

1.2. 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

1.3. Vision of the Client

1. **Equity and Social Justice with Academic Excellence**
   The university is envisioned as a space where access to quality education is not limited by social or economic background. It aims to blend academic excellence with inclusivity, ensuring that knowledge serves as a tool for empowerment.

2. **Non-Hierarchical and Collaborative Learning Culture**
   AUD promotes a democratic institutional environment, emphasizing teamwork, creativity, and horizontal structures of learning and decision-making over rigid hierarchies.

3. **Knowledge as a Social Responsibility**
   The university believes that knowledge must reach beyond classrooms and become meaningful to society at large. Learning is seen as a transformative process that contributes to real-world change by bridging societal divides.

4. **Focus on Humanities and Social Sciences**

AUD stands out as the only institution in the region dedicated exclusively to liberal arts, humanities, and social sciences—disciplines that foster critical thinking, empathy, and intercultural understanding.

5. **Shaping Sensitive and Responsible Citizens**
   The university aims to nurture students who are not only academically capable but also socially conscious—individuals who actively respond to the needs of marginalized communities and work toward building a just society.

6. **Balanced Approach to Values and Excellence**
   While committed to equity and inclusion, the university simultaneously aspires to reach high standards of academic rigor and institutional excellence, ensuring a well-rounded and impactful education.

1.4. Detailed List of 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.

1.4.1. 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.

Sl. 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

1.4.2. 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.

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	800

		other conference facilities in each cluster	
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	565	38	19	32

	Policy and Social Entrepreneurship (SBPPSE)				
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

1.4.3. 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

1.5. 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.

1.5.1. Common Facilities Proposed within the Residential Zone:

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

1.5.2. 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

1.6. 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.

1.7. SITE DETAILS

1.7.1. 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.

1.7.2. 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:

- Outer Ring Road (approx. 1 km away)
- Delhi Metro (Red Line)– Nearby stations:
- Madhuban Chowk
- Rohini East

(ii) Infrastructure

- External roads, sewerage, and stormwater 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.





1.7.3. SETBACK REGULATION

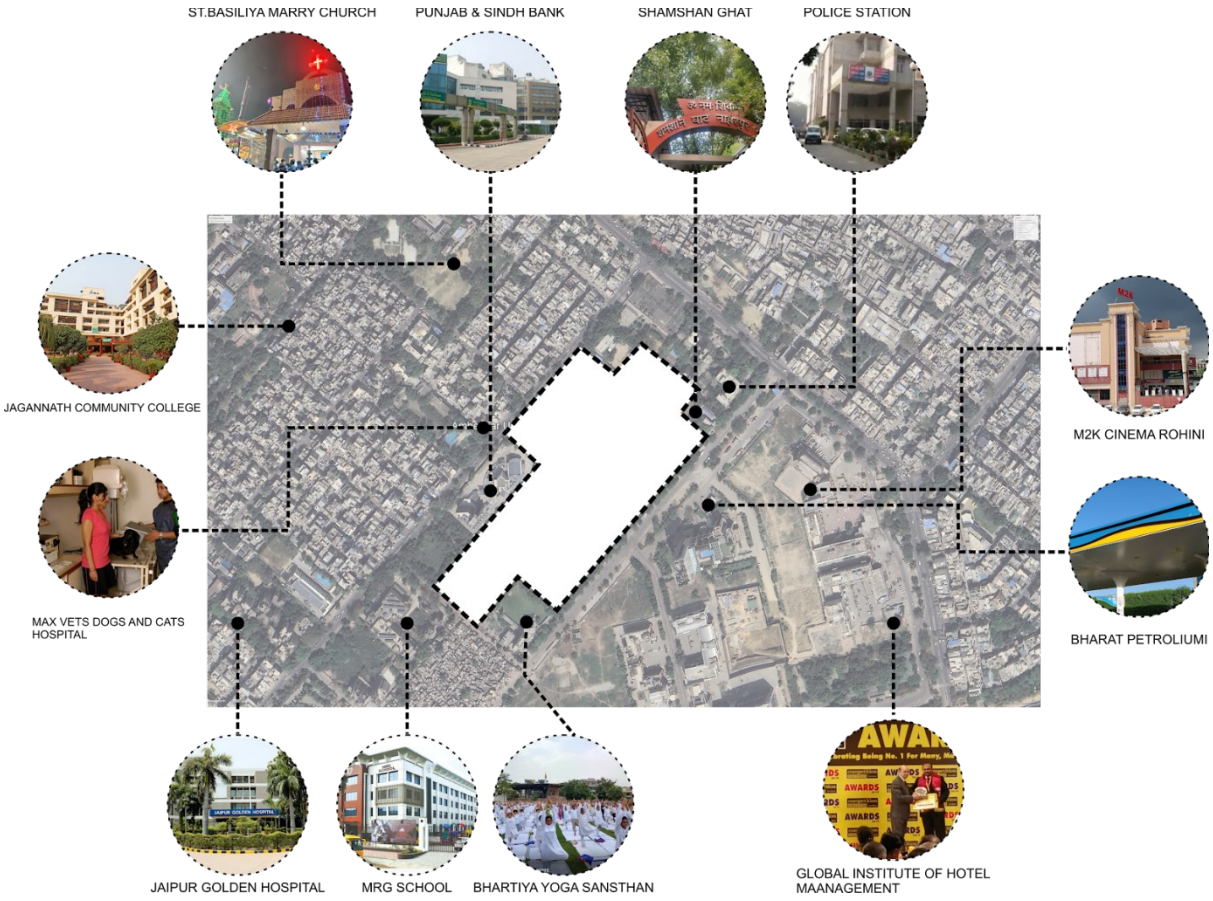
As per the guidelines outlined in the **Master Plan for Delhi 2021 (MPD-2021)** and applicable building bye-laws for institutional developments, the following setback norms apply to large institutional plots within Delhi, including the proposed **Ambedkar University Delhi campus** at **Sector-3, Rohini**:

The total site area of the campus is approximately **73,000 square meters**, placing it in the category of **plots larger than 10,000 sqm**. Therefore, the mandatory minimum setbacks are:

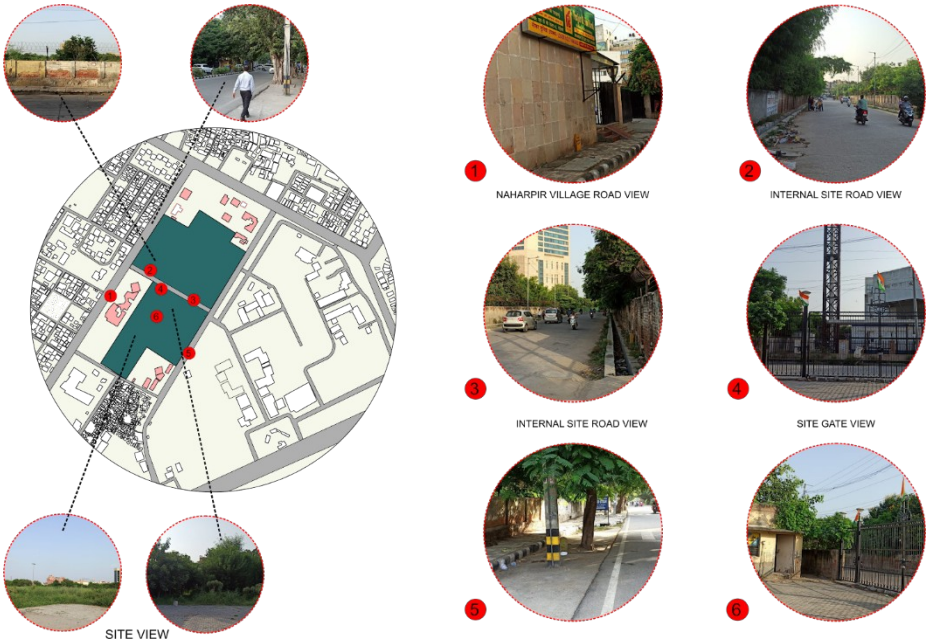
- **Front Setback:** 15 meters
- **Rear Setback:** 12 meters
- **Side Setbacks (each side):** 12 meters

1.7.4. Soil Type

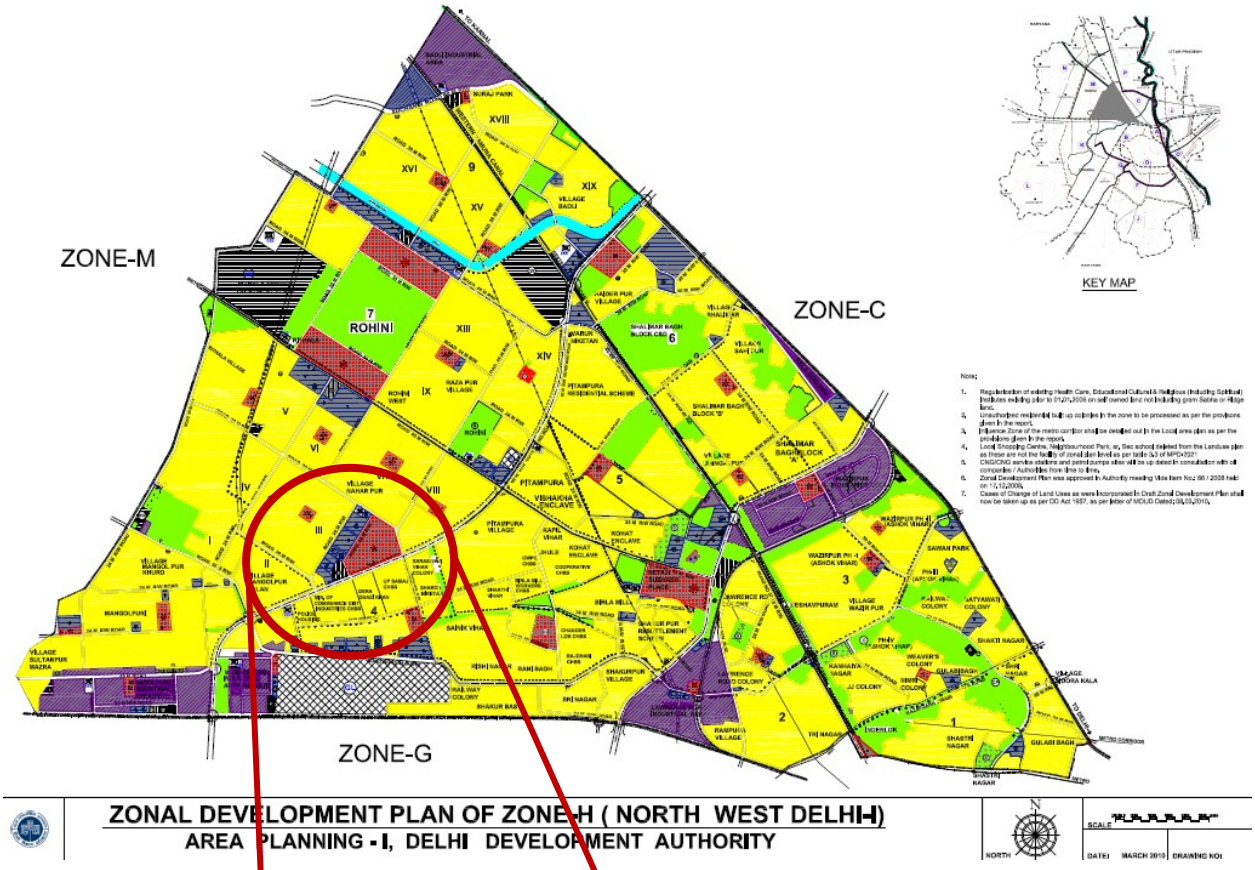
1.8. SITE PROXIMITY

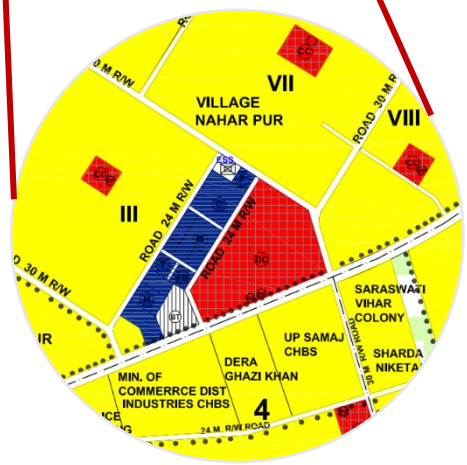


1.9. SITE EDGES



1.10. LANDUSE





2.0 COMMERCIAL

- DISTRICT CENTRE
- COMMUNITY CENTRE
- COMMERCIAL
- PETROL PUMPS/CNG STN.(PROP./EXIST.)

8.0 PUBLIC AND SEMI PUBLIC FACILITIES

- HOSPITAL
- VOCATIONAL TRAINING CENTRE
- TECHNICAL EDUCATION/COLLEGE
- CREMATION GROUND
- BURIAL GROUND/ CEMETRY
- HEAD POST OFFICE & ADMINISTRATION OFFICE
- POLICE STATION
- FIRE STATION
- TRANSMISSION SITE / CENTRE
- JAIL
- CULTURAL COMPLEX
- TELE PHONE EXCHANGE
- SPORTS FACILITY / COMPLEX/ STADIUM / SPORTS CENTRE

LITERATURE REVIEW

2. MODEL BUILDING BYELAWS (Delhi)-

A university campus is a dynamic and multifunctional environment conceived not only as a space for academic instruction, but as a collective framework for intellectual engagement, social integration, and cultural evolution. It is planned and designed to foster critical dialogue, interdisciplinary collaboration, and inclusive participation among diverse user groups, with the overarching goal of nurturing knowledge, innovation, and societal contribution.

2.1. Regulatory Standards for Public and Semi-public

3.10.1 General

Maximum ground coverage	30%
In hills	25%
Maximum floor area ratio	2.00
In hills	1.00
Maximum height	26 m.
In hills	15 m.

3.10.2 Government offices integrated office complex

Maximum ground coverage	30%
Maximum floor area ratio	2.00
In hills	1.00
Maximum height	37 m.
In hills	15 m.

Other Control:

i) The integrated office complex shall include Central Government Office, Local Government Office, Public Undertaking Offices and Courts.

ii) Basements up to the building envelope line to the maximum extent of plot area shall be allowed and if used for parking and services should not be counted in FAR.

2.2. Regulatory Standards for Colleges

Maximum ground coverage	35%
In hills	25%
Maximum floor area ratio	1.50
In hills	0.75
Maximum height	15 m.

Note:

1. *In case of the above premises the total area of the plot shall be divided in*
   - *i) School/college building area*
   - *ii) Play field area*
   - *iii) Parking area*
   - *iv) Residential and hostel area*
2. *The maximum ground coverage and FAR shall be calculated only on the areas meant for building.*

Table 3.9 Development Controls for Other Education Facilities

Sl. No	Category	Maximum		
		Ground Coverage	FAR	Height
1.	Play School, Coaching Centre, Computer Training Institute, Physical Education Centre etc.	N.A.	N.A.	N.A.
2	School for Mentally Challenged.	50%	1.20	18 mt.
3	School for*differently abled persons.	50 %	1.20	18 mt

Notes:

Pre-Primary Schools/Nursery Schools/Montessori Schools/Creche, Play Schools, may be permissible in residential use premises as per Mixed use policy.

Other Controls:

1. *In case of new schools, the front boundary wall shall be recessed by 6 mt. to accommodate visitors parking within setback area.*
2. *Playground shall be developed on pool basis in different areas at neighborhood level.*
3. *Practice of providing dedicated Nursery School plots in the layout plan discontinued as same is permissible in Mixed use.*
4. *In case of schools for mentally / *differently abled persons, 20% of the maximum Far can be utilized for residential use of essential staff and student accommodation.*

2.3. Regulatory Standards for Large Educational Campuses (Above 8 Hectares)

3.11.5 Education and Research Centre (large campus i.e. above 8 Ha.)

Large campuses of universities, medical and engineering colleges and other education and research institutes shall be covered under these regulations. The campus will be divided into three parts and the regulations shall apply, as given below:

i) Academic, including administration (45% of the total land area)

Maximum ground coverage	30%
In hills	20%
Maximum floor area ratio	1.20
In hills	0.80
Maximum height	37 m.
In hills	15 m.

Basement below the ground floor and to the maximum extent of ground coverage shall be allowed and if used for parking and services should not be counted in FAR.

ii) Residential (25% of total land area)

This will be developed at a density of 400 PPHa gross. The land shall be reserved for residential facilities @ 9.2 sqmt. per person. Sub-division regulations as given for group housing shall apply.

iii) Sports and Cultural Activities (15% of the total area)

Maximum ground coverage	10%
Maximum FAR	15

iv) *Parks and landscape* (15% of the total land area): Suitable landscape plan to be prepared for this area.

2.4. Socio – Cultural Facilities

Sl.No	Category	Maximum			Other Controls
		Ground Coverage	FAR	Height	
1.	a. Multipurpose Community Hall. b. Banquet hall	30% 30%	1.20 1.20	26m 26m	1. Parking standard @3.0ECS/100sq m of floor area. 2. Other controls related to basements etc. are given at end of this chapter.
2.	a. Community Recreational Club. b. Recreational Club	30% 25%	1.20	26m	Parking standard @2ECS/100sq.m of floor area.
3.	Socio- cultural activities such as auditorium, music, dance & drama centre/mediation & spiritual centre etc.	35%	1.20	26m	1. Parking standard @ 2ECS/100sq.m of floor area. 2. A proper scheme for visitors parking and parking adequacy statement shall be prepared taking into consideration large number of visitors.
4.	Exhibition cum Fair Ground	20%	0.20	26m	Subject to statutory clearances.
5.	Science centre	30%	1.20	NR,	Parking standard @2ECS.
6.	International Convention Centre	30%	1.20	Subject to approval of AAI, Fire Department and other statutory bodies	Parking standard @2ECS.

Notes:

i.In case of community recreational clubs, 0.50 FAR shall be admissible on the area beyond 2000 sqm.

ii.In the open area apart from outdoor games/sport facilities, swimming pool would be permissible upto an area of 300sqm. Free from ground coverage.

iii.Basement within the ground envelope shall be allowed for parking, stilt floor for parking is permissible.

iv.30% of basement area for services, storage shall not be counted in FAR.

2.5. 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.

a) 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.

2.6. General Building requirements and Services

2.6.1. Understanding Occupant Load Standards for Different Building Types

This part sets out the standard space requirements of various parts of a building (for all types of buildings – low/ high rise).

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.*

2.7. Minimum room size and height requirement for educational buildings

2.7.1. Height

The height of all rooms for human habitation shall not be less than 2.75 m measured from the surface of the floor to the lowest point of the ceiling (bottom of slab) provided that the minimum clear headway under any beam shall not be less than 2.4 m. In the case of pitched roof, the average height of rooms shall not be less than 2.75 m. The minimum clear head room under a beam, folded plates or eaves shall be 2.4 m. In the case of air-conditioned rooms, a height of not less than 2.4 m measured from the surface of the floor to the lowest point of air-conditioning duct or the false ceiling shall be provided.

2.7.2. Size

The area of habitable room shall not be less than 9.5 m2, where there is only one room with a minimum width of
2.4 m. Where there are two rooms, one of these shall not be less than 9.5 m2 and the other not less than 7.5 m2, with a minimum width of 2.1 m.

2.8. Bathroom and Water – Closets

2.8.1. Height

The height of a bathroom or water-closet measured from the surface of the floor to the lowest point in the ceiling (bottom of slab) shall not be less than 2.1 m.

2.8.2. Size

The area of a bathroom shall not be less than 1.8 m2 with a minimum width of 1.2 m. The floor area of water-closet shall be 1.1 m2 with a minimum width of 0.9 m. If bath and water-closet are combined, its floor area shall not be less than 2.8 m2 with a minimum width of 1.2 m.

2.8.3. Other Requirements

Every bathroom or water-closet shall:

a) be so situated that at least one of its walls shall open to external air;
b) not be directly over or under any room other than another water-closet, washing place, bath or terrace, unless it has a water-tight floor;
c) have the platform or seat made of water-tight non-absorbent material;
d) be enclosed by walls or partitions and the surface of every such wall or partition shall be finished with a smooth impervious material to a height of not less than 1 m above the floor of such a room;
e) be provided with an impervious floor covering, sloping towards the drain with a suitable grade and not towards VERANDAH or any other room; and
f) have a window or ventilator, opening to a shaft or open space, of area not less than 0.3 m2 with side not less than 0.3 m.

2.9. Basement Provisions as per Building Regulations

The following regulations govern the design, use, and construction of basements in accordance with the applicable Development Control Rules:

2.9.1. Basement Usage and Design Regulations

- Basements shall strictly not be used for residential purposes under any circumstances.
- Construction of basements shall be permitted only by the Competent Authority, subject to compliance with the designated **land use** and all relevant provisions specified in the Development Control Rules.
- Basements constructed **within the building envelope** and adhering to **maximum ground floor coverage norms** may be used for the following purposes only:
  a**) Storage** of household or other goods composed of ordinarily **non-combustible** materials.
  b) Use as **strong rooms, bank cellars**, and similar secure facilities.
  c) Installation of **air-conditioning equipment** and other mechanical systems or utilities that serve the building.
  d) Provision of **vehicular parking spaces**.
- All basements must meet the following structural and safety requirements:
  a) A **minimum height of 2.4 meters** shall be maintained from the basement floor to the underside of the roof slab or ceiling.
  b) **Adequate ventilation** must be provided in accordance with the occupancy type. If natural ventilation is insufficient, **mechanical ventilation systems** such as exhaust fans or blowers must be installed.
  c) The **ceiling height** above the average surrounding ground level shall be **not less than 0.9 meters and not more than 1.2 meters**.
  d) Proper **surface drainage systems** shall be installed to prevent rainwater or surface runoff from entering the basement.
  e) The **walls and floors** of the basement shall be **watertight** and designed to withstand soil pressure and moisture. Adequate **damp-proofing treatments** shall be incorporated.
  f) **Access to the basement** must be separate from the main and alternative staircases that serve the upper floors.
  g) Where staircases are continuous across multiple floors, they must be of the **enclosed type, effectively serving as a fire separation** between the basement and upper floors. Open ramps for basement access may be permitted within the building line, subject to drainage provisions mentioned in (d).
  h) **Exit provisions** from the basement must comply with **Part 4 – Fire and Life Safety** of the building code.

2.10. Septic Tanks

2.10.1. Design, Location, and Construction Standards

In accordance with the Model Building Bye-Laws, 2016 (TCPO) and NBC 2005 (Part 9: Plumbing Services), the construction and placement of septic tanks for sewage disposal must adhere strictly to the following guidelines to ensure public health, hygiene, and structural safety.

2.10.2. Location of Septic Tanks and Subsurface Absorption Systems

- Septic tanks must not be located closer than 18 meters from any source of drinking water (e.g., wells), ensuring protection from bacterial contamination of groundwater.
- The tank must be at least 6 meters away from the nearest habitable structure, or as far as possible within economic constraints, to prevent damage and odor nuisance (Model Bye-Laws, 2016, Clause 4.15.1).

2.10.3. Dimensional and Material Requirements

Minimum internal dimensions:

- Width: 750 mm
- Depth below water level: 1 meter
- Liquid holding capacity: 1 cubic meter
- The length of the septic tank should be 2 to 4 times its width.
- Tanks can be constructed from brickwork, stone masonry, concrete, or other approved materials (Clause 4.15.2a & b).

2.10.4. Effluent Disposal Regulations

- Effluent must not be discharged into open drains or water bodies without adequate treatment to avoid environmental pollution (Clause 4.15.2c).
- The minimum pipe diameter for outlets must be 100 mm, and the direction of flow in junctions should not exceed an angle of 45° from the main flow line (Clause 4.15.2d).

2.10.5. Drainage Gradient and Ventilation

- Gradient of dispersion trenches and under-drainage should lie between 1:300 and 1:400 (Clause 4.15.2e).
- Every septic tank must include a ventilation pipe (minimum diameter 50 mm) with a **mosquito-proof wire mesh cover.
- The pipe should extend:
- 2 m above ground level if tank is 15 m or more from any building.
- 2 m above the building roofline if tank is closer than 15 m (Clause 4.15.2f).

2.10.6. Seepage Pit Design (if used for Effluent Disposal)

Pits should have:

- Minimum cross-sectional dimension of 0.90 m
- Minimum depth of 1.00 m below inlet pipe
- Lining materials: Stone, brick, or concrete blocks with **dry joints, backed with **75 mm gravel.
- For large pits, top portion may be narrowed to minimize RCC slab size.
- Near trees or where unlined pits are used, pit should be filled with loose stones.
- Masonry ring to prevent surface flooding and anti-mosquito inlet pipe drop of 0.90 m should be provided (Clause 4.15.2g).

2.10.7. Dispersion Trench Alternative

Trench dimensions:

- Depth: 0.50 m – 1.00 m
- Width: 0.30 m – 1.00 m
- Length: Not more than 30 m
- Spacing between trenches: Minimum 1.8 m
- Trenches should be laid on a gentle gradient, lined with **150 mm to 250 mm of washed gravel, and contain **open-jointed earthenware or concrete pipes (diameter 75 mm to 100 mm) (Clause 4.15.2h).

2.11. Staircase/ Exit Requirements

4.17 Staircase/Exit Requirements

4.17.1 The minimum clear width, minimum tread width and maximum riser of staircases for buildings shall be as given as below (*see also* Part 4 'Fire and Life Safety of NBC 2005).

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

4.17.3 Minimum tread

The minimum width of tread without nosing shall be 250 mm for residential buildings. The minimum width of tread for other buildings shall be 300 mm.

4.17.4 Maximum riser

4.17.4.1 The maximum height of riser shall be 190 mm for residential buildings and 150 mm for other buildings and these shall be limited to 12 per flight.

4.17.4.2 The minimum head-room in a passage under the landing of a staircase shall be 2.2 m. The minimum clear head-room in any staircase shall be 2.2 m.

4.17.5 Exit Requirements

All aspects of exit requirements for corridors, doors, stair cases, ramps, etc in respect of widths, travel distance shall be as per Part 4 'Fire and Life Safety' of NBC,2005.

2.11.1. Types of Exits

a) Permissible Exit Types:

Exits may be of horizontal or vertical type, and include:

- Doorways
- Corridors and passages
- Internal staircases
- External staircases
- Ramps to verandas
- Terraces with access to a street

Horizontal exits connecting to adjoining buildings on the same level

b) Not Considered as Exits:

These do not qualify as exit routes for fire safety purposes.

- Lifts,
- Escalators, and
- Revolving doors

2.11.2. Wheelchair Accessibility

At least one primary entrance to every building shall be accessible to individuals using wheelchairs and clearly marked with signage. That entrance should be located on a level that also provides elevator access for unhindered vertical movement.

2.11.3. Arrangement of Exits

When designing university or institutional campuses (like AUD Rohini), the arrangement of exits must follow these guidelines to ensure efficient and safe evacuation during emergencies:

a) Exit Placement and Travel Distance:

For all academic buildings, hostels, libraries, and auditoriums: The maximum walking distance from any point on a floor to the nearest exit must not exceed:

- 22.5 meters for residential (e.g., hostels) and educational/institutional buildings (e.g., classrooms, admin blocks).
- 30.0 meters for assembly spaces (e.g., auditoriums), office zones, cafeterias, or storage areas.
- Where more than one exit is required (e.g., in larger blocks or floors):
- Exits must be spaced as far apart as possible, creating multiple safe escape paths.
- Every part of the floor should have clear and direct access to at least one exit.

b) Distance from Remote Points:

For campus buildings with larger floor plates (like libraries or lecture halls):

- The distance from the most remote corner to an exit should not exceed half of the permitted maximums.
- For educational/institutional use: 11.25 meters
- For assembly/business/office use: 15.0 meters
- Exception: For buildings housing vulnerable populations (e.g., medical, or special needs blocks), the maximum travel distance from remote points must not exceed 6.0 meters.

2.12. Roof Drainage and Rainwater Management

(As per Model Building Bye-Laws, 2016, TCPO – Section 4.18)

The roof of a building must be designed and constructed to effectively drain rainwater using appropriately sized and adequately placed rainwater pipes. These pipes should be arranged, jointed, and fixed in a manner that ensures water is carried away from the building without causing dampness to any part of the walls, roof, or foundations—either of the building itself or adjacent structures.

2.12.1. Connection Requirements:

Rainwater pipes may be mandated by the Authority to connect to a drain, sewer, or a covered channel formed beneath the public footpath to lead water directly to the road gutter or any other approved outlet system.

2.12.2. Pipe Placement:

Rainwater pipes must be fixed to the exterior of the building's walls, either exposed or recessed within grooves formed in the walls. Any alternative method must be pre-approved by the Authority.

2.12.3. Rainwater Harvesting Recommendation:

It is recommended to conserve rainwater using appropriate Rain Water Harvesting (RWH) techniques, including roof water collection systems. Reference should be made to Part 9, Plumbing Services, Section 1 of the National Building Code (NBC) 2005, for further technical guidelines.

3. MASTER PLAN DELHI 2021 –

Sl. No.	Category	Maximum			Other Controls
		Ground Coverage	FAR	Height	
1	Vocational Training Centre (ITI/Polytechnic / Vocational/ Training Institute/ Management Institute/ Teacher Training Institutes etc.) / Research and Development centre.	35%	[1][225]	37 m	1. [2][Upto 30% of max. permissible FAR can be used for hostel accommodation for the students.] 2. Parking standard @ 1.33 ECS / 100 sq m of floor area. The areas earmarked for parking if misused liable to be municipalized / taken over by the authority. 3. Other controls related to basements etc. are given in the Development Code chapter.
2	General College				
3	Professional College (Technical)				

Sl. No.	Category	Maximum			Other Controls
		Ground Coverage	FAR	Height	
4	University Campus including International Education Centre (IEC) – Large campus (10 ha and above) will be divided into following four parts: a) Academic including Administration (45% of total land area)	30%	[1][225]	37 m	1. Parking standard @ 1.33 ECS / 100 sq m of floor area. 2. Other controls related to basements etc. are given in the Development Code chapter. 3. Landscape plan to be prepared.
	b) Residential (25% of total land area)	1. Regulations for group housing shall apply. 2. The land shall be reserved for facilities as per residential norms.			
	c) Sports and Cultural activities (15%)	10%	15	26 m	
	d) Parks and Landscape (15%)	N. A.			

3.1. Standards specified by RPF of the Tender Document –

Based on the provided RFP document for the New Campus of Ambedkar University Delhi (AUD) at Sector-3, Rohini, Delhi-110085, here are the details regarding area and calculations, along with standardized provisions:

Project Overview and Site Details:

- ***Name of Work:*** *Comprehensive Consultancy Services for Planning, Designing and Development of New Campus of Ambedkar University Delhi (Phase-I works) at Sector-3, Rohini, Delhi-110085.*
- ***Project Location:*** *Sector-3, Rohini, Delhi-110085.*
- ***Total Plot Area:*** *7.3 hectares (73,000 sqm).*
- ***Encumbrances:*** *The site is free from all encumbrances, including overhead power lines.*
- ***Site Division:*** *The 7.3-hectare plot is divided by a 13.5-meter-wide public road almost in the center. The new campus will be developed taking this road into account, considering it will remain a public road accessible to the neighboring population and maintenance agencies.*

Area Allocation and Permissible Built-Up Area:

Land Use Allocation (as per prevalent by-laws in Delhi):

- *Institutional Use: 70% of the plot area*
- *Residential Use: 30% of the plot area*
- *Current FAR: 225*
- *Total Permissible Built-up Area at Rohini plot: 160,875 sqm*
- *Broad Utilization of Permissible Built-up Area (Approx. 85%):*

Category	Proposed Area (sqm)	Remarks
Institutional Areas	90,000	
Residential Areas	46,000	
Basement, Parking, and Service Area	31,680	Built-up area not included in FAR
Total Area (Phase 1)	167,680	

3.2. Programmatic Brief - Facilities and Proposed Areas:

The campus facilities are categorized into Central, Cluster, and School/Centre levels.

3.2.1. Central Facilities at Campus Level:

Infrastructure	**Facilities**	**Proposed Area (sqm)**
Administrative Block	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 230 total staff strength)	3500
Library & IT Complex	Book-storage facilities, reading spaces with computer terminals and offices for library services and staff (2 lakh books)	10500
Auditorium Complex	Auditorium (500 persons), Committee / meeting / Seminar rooms (2 nos. of 50 persons / 2 nos. of 150 persons capacity)	4000
Student Centre	Space for student activities, reading rooms, Placement office, recreation rooms, indoor sports and lockers etc. (350 students)	1000
Exhibition Centre	For exhibitions	500

Cafeteria	Canteen facilities for 350 Students/Staff/ Visitors	2000
Convenience/Utility Centre	Shopping Centre, Food Courts, Bank, ATM, Post Office, Book & Stationery stores, etc.	750
Faculty Centre/Club	Meeting halls for informal gatherings, dining rooms, indoor sports facilities, etc. (100 persons capacity)	500
Health Centre	OPD facilities and 6 beds for emergencies.	250
Covered Parking Block	Near the entrance with sitting space for drivers.	100
University Crèche	Capacity for 50 children	250
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, fire fighting and other services.	2000
Sports Centre	Indoor/Outdoor sports facilities	1000
Basement Parking and Service Area	Parking and service area	31680

3.2.2. Cluster Level Facilities (for 2 clusters):

Infrastructure	**Facilities**	**Total Proposed Area (sqm) for 2 clusters**
Classrooms	Standard sizes of 30/60/120 students capacity (60% of the students strength)	10000
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
Committee Rooms	2 rooms of 75 capacity each with audio-visual and other conference facilities in each cluster	800
Faculty Rooms	Similar facilities in all faculty rooms (100% rooms for Regular & Visiting Faculty, 10% extra capacity for transit faculty from other AUD campus and from local institutes).	5000
Faculty/Staff Lounge	Sitting and retiring spaces, changing rooms and pantry, etc. for 50 persons in each cluster	500

Staff Rooms	Servicing common facilities in the cluster (25% of total staff strength)	800
Utility Rooms	Photocopying/printing/scanning/pantry services for faculty and staff	800
Common Student Rooms	Reading rooms with computer terminals; recreation room / Indoor sports/lockers, etc. for a capacity of 100 students	800
Security Office, Maintenance, Staff Offices	For round the clock security and maintenance	800
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**

3.2.3. School/Centre Facilities (for each of 13 Schools/Centres):

Infrastructure	**Facilities**	**Proposed Area (sqm)**
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
Documentation Centre	Photocopying, Project work	300
Store	Supplies and Stationary	150

- **Residential Zone Requirements:**

Faculty housing: 50% of total strength

Staff housing: 30% of total strength

Students hostel: 25% of total strength

Ratios: Girls:Boys = 2:1 , PG:UG = 1:1

Occupancy: PG: Single Occupancy , UG: Double Occupancy

3.2.4. Common Facilities for Residential Area:

Infrastructure	Facilities
Community Centre	Multi-purpose Hall, indoor games and kitchen facilities, etc. (1500 sqm)
Guest House	A 10-room Guest House (750 sqm)
Faculty Transit Accommodation	A 20-room facility for Faculty with double room sets, attached to the Guest House using common facilities (1500 sqm)
Convenience Centre	Shops, Bank, ATMs, Post Office, etc. (500 sqm)

4. DELHI DEVELOPMENT AUTHORITY

4.1. Environmental Conditions For Buildings And Constructions

(Category '3': 50000 to 150000 m2)

MEDIUM	S.N.	ENVIRONMENTAL CONDITIONS
Topography and Natural Drainage	1	The natural drain system should be maintained for ensuring unrestricted flow of water. No construction shall be allowed to obstruct the natural drainage through the site. No construction is allowed on wetland and water bodies. Check dams, bio- swales, landscape, and other sustainable urban drainage systems (SUDS) are allowed for maintaining the drainage pattern and to harvest rain water. Buildings shall be designed to follow the natural topography as much as possible. Minimum cutting and filling should be done.
Water conservation - Rain Water Harvesting, and Ground Water Recharge	2	A complete plan for rain water harvesting, water efficiency and conservation should be prepared. The local bye-law provisions on rain water harvesting should be followed. If local bye-law provisions are not available, adequate provision for storage and recharge should be followed as per the Ministry of Urban Development Model Building Bye- laws, 2016. A rain water harvesting plan needs to be designed where the recharge bores of minimum one recharge bore per 5,000 square meters of built up area and storage capacity of minimum one day of total fresh water requirement shall be provided. In areas where ground water recharge is not feasible, the rain water should be harvested and stored for reuse. The ground water shall not be withdrawn without approval from the Competent Authority. All recharge should be limited to shallow aquifer.
	2(a)	At least 20% of the open spaces as required by the local building bye-laws shall be pervious. Use of Grass pavers, paver blocks with at least 50% opening, landscape etc. would be considered as pervious surface.
	2(b)	Use of water efficient appliances should be promoted. Low flow fixtures or sensors be used to promote water conservation.
	2(c)	Separation of grey and black water should be done by the use of dual plumbing system. In case of single stack system separate recirculation lines for flushing by giving dual plumbing system be done.
Solid Waste Management	3	Solid waste: Separate wet and dry bins must be provided in each unit and at the ground level for facilitating segregation of waste. The provisions of the Solid Waste (Management) Rules 2016 and the e-waste (Management) Rules 2016, and the Plastics Waste (Management) Rules 2016 shall be followed.
	3(a)	All non-biodegradable waste shall be handed over to authorized recyclers for which a written tie up must be done with the authorized recyclers.
	3(b)	Organic waste composter/Vermiculture pit with a minimum capacity of 0.3 kg/person/day must be installed.
Sewage Treatment Plant	4	Onsite sewage treatment of capacity of treating 100% waste water to be installed. Treated waste water shall be reused on site for landscape, flushing, cooling tower, and other end-uses. Excess treated water shall be discharged as per CPCB norms. Natural treatment systems shall be promoted. Sludge from the onsite sewage treatment, including septic tanks, shall be collected, conveyed and disposed as per the Ministry of Urban Development, Central Public Health and Environmental Engineering Organisation (CPHEEO) Manual on Sewerage and Sewage Treatment Systems, 2013.
Energy	5	Compliance with the Energy Conservation Building Code (ECBC) of Bureau of Energy Efficiency shall be ensured. Buildings in the States which have notified their own ECBC, shall comply with the State ECBC. Outdoor and common area lighting shall be LED. Concept of passive solar design that minimize energy consumption in buildings by using design elements, such as building orientation, landscaping, efficient building envelope, appropriate fenestration, increased day lighting design and thermal mass etc. shall be incorporated in the building design. Wall, window, and roof u-values shall be as per ECBC specifications.
	5(a)	Solar, wind or other Renewable Energy shall be installed to meet electricity generation equivalent to 1% of the demand load or as per the state level/ local building bye-laws requirement, whichever is higher.

	5(b)	Solar water heating shall be provided to meet 20% of the hot water demand of the commercial and institutional building or as per the requirement of the local building bye-laws, whichever is higher. Residential buildings are also recommended to meet its hot water demand from solar water heaters, as far as possible.
	5(c)	Use of environment friendly materials in bricks, blocks and other construction materials, shall be required for at least 20% of the construction material quantity. These include flyash bricks, hollow bricks, AACs, Fly Ash Lime Gypsum blocks, Compressed earth blocks, and other environment friendly materials. Fly ash should be used as building material in the construction as per the provisions of the Fly Ash Notification of September, 1999 as amended from time to time.
Air Quality and Noise	6	Dust, smoke & other air pollution prevention measures shall be provided for the building as well as the site. These measures shall include screens for the building under construction, continuous dust/ wind breaking walls all around the site (at least 3meter height). Plastic/tarpaulin sheet covers shall be provided for vehicles bringing in sand, cement, murram and other construction materials prone to causing dust pollution at the site as well as taking out debris from the site. Wheel washing for the vehicles used be done. Sand, murram, loose soil, cement, stored on site shall be covered adequately so as to prevent dust pollution. Wet jet shall be provided for grinding and stone cutting. Unpaved surfaces and loose soil shall be adequately sprinkled with water to suppress dust. All construction and demolition debris shall be stored at the site (and not dumped on the roads or open spaces outside) before they are properly disposed. All demolition and construction waste shall be managed as per the provisions of the Construction and Demolition Waste Rules 2016. All workers working at the construction site and involved in loading, unloading, carriage of construction material and construction debris or working in any area with dust pollution shall be provided with dust mask. For indoor air quality the ventilation provisions as per National Building Code of India.
	6(a)	The location of the DG set and exhaust pipe height shall be as per the provisions of the CPCB norms.
Green Cover	7	A minimum of 1 tree for every 80 sq.mt. of land should be planted and maintained. The existing trees will be counted for this purpose. Preference should be given to planting native species.
	7(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 and maintained.
Top Soil Preservation and Reuse	8	Topsoil should be stripped to a depth of 20 cm from the areas proposed for buildings, roads, paved areas, and external services. It should be stockpiled appropriately in designated areas and reapplied during plantation of the proposed vegetation on site.
Transport	9	A comprehensive mobility plan, as per MoUD best practices guidelines (URDPFI), shall be prepared to include motorized, non-motorized, public, and private networks. Road should be designed with due consideration for environment, and safety of users. The road system can be designed with the basic criteria. 1. Hierarchy of roads with proper segregation of vehicular and pedestrian traffic. 2. Traffic calming measures. 3. Proper design of entry and exit points. 4. Parking norms as per local regulation.
Environment Management Plan	10	An environmental management plan (EMP) shall be prepared and implemented to ensure compliance with the environmental conditions specified in item number 1 to 9 above. A dedicated Environment Monitoring Cell with defined functions and responsibility shall be put in place to implement the EMP. The environmental cell shall ensure that the environment infrastructure like Sewage Treatment Plant, Landscaping, Rain Water Harvesting, Energy efficiency and conservation, water efficiency and conservation, solid waste management, renewable energy etc. are kept operational and meet the required standards. The environmental cell shall also keep the record of environment monitoring and those related to the environment infrastructure.

viii) A maximum of 50% of interior exit stairways are permitted to egress through an atrium on the level of exit discharge.

ix) Since the design of each atrium varies in many aspects, hence drawings for use of kiosks in Atrium shall be referred to Delhi Fire Service for approval.

x) The atrium usage shall not be more than 25% of the atrium floor and subject to above mentioned conditions.

4.2. Sanitation requirements

4.2.1. Educational occupancy

S.No	Type of occupancy	Consumption (in lt.)
1.	Residential i. EWS/LIG dwelling units(LPCD/ dwelling unit) ii. . MIG and above category flats/houses/floors (LPCD/ dwelling unit) iii. Hotels with lodging accommodation (per bed)	 135 225 180
2.	Educational a) Day schools(per head per day) b) Boarding schools(per head per day)	 45 135
3	Institutional(medical hospitals) a)no. of beds not exceeding 100 b)no. of beds exceeding 100 c) medical quarters and hotels	 340 450 135
4	Assembly – cinema theatres, auditoria, etc. (per seat accommodation)	15
5.	Government or semi-public business	45
6	Mercantile(commercial) a) Restaurants(per seat) b) Other business building	 70 45
7	Industrial a. Factories where bath- rooms are to be provided. b. Factories where bath-rooms are not to be provided	 45 30
8.	Storage(including warehouses)	30
9.	Hazardous	30
10.	Intermediate stations (excluding mail and express stops.	45(25)*
11.	Junction stations	70(45)*
12.	Terminal stations	45
13.	International and domestic Airports	70

*The values in parenthesis are for such stations, where bathing facilities are not provided.

Table 9.6: Sanitation Requirements for Educational Occupancy

S.No	Sanitary Unit	Boarding Institution		Other Educational Institution	
		For Boys	For Girls	For Boys	For Girls
1.	Water Closet (W.C.)	One for every 8 pupils or part thereof	One for every 6 pupils or part thereof	One for every 25 pupils or part thereof	One for every 15 pupils 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 40 pupils or part thereof	One for every40 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

Notes:

i. *One water tap with draining arrangements shall be provided for every 50 persons or part thereof, in the vicinity of wate closets and urinal.*

ii. *For teaching staff, the schedule of sanitary units to be provided shall be the same as in case of office buildings (Table 9.9).*

4.2.2. Administrative Building

Table 9.7 (contd.): Administrative Buildings

S.No	Sanitary Unit	For Males	For Females
1	Water Closet (W.C.)	One for every 25 persons or part thereof	One for every 15 persons or part thereof
2	Ablution Taps	One in each W.C.	One in each W.C.
3	Wash Basins	One for every 25 persons or part thereof	One for every 25 persons or part thereof
4	Baths with Shower	One on each floor	One on each floor
5	Bed pan washing sink	--	--
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	Urinals	Nil up to 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%	--

a. Rain Water Harvesting (by Recharge)

b. Low Water Consumption Plumbing Fixtures

c. Waste Water Recycle and Reuse

d. Reduction of hardscape

2.Solar Energy Utilization

a. Installation of Solar Photovoltaic Panels

b. Installation of Solar Assisted Water Heating Systems

3.Energy Efficiency

a. Low Energy Consumption Lighting Fixtures (Electrical Appliances – BEE Star and Energy Efficient Appliances)

b. Energy Efficiency in HVAC systems

4.Waste Management

a. Segregation of Waste

b. Organic Waste Management

4.2.3. Residential building

Table 9.10: Sanitation requirements for residencs

S.No.	Sanitary Unit	Dwelling with individual conveniences	Dwelling without individual conveniences.
1	Bath Room	One provided with water tap	One for every two tenement
2	Water Closet (WC)	One	One for every two tenement
3	Sink (or Nahani) in the Floor	One	-------
	Water Tap	One	One with drainage arrangement in each tenement. One in common bath rooms and common water closet.

Note:

Where only one water closet is provided in a dwelling, the bath and water closet shall be separately accommodated.

4.3. Provisions for Green Buildings

4.3.1. provisions and applicability for various plot sizes

Category of Plot Sizes (sq.m.)	Category of Plot Sizes (sq.m.)	Provisions for Green Building (as per Clause 10.2)
I	up to105	Optional usage of 2 (a), 2(b).
II	105 to 500	1(a), 2(a),2(b), 4(a)
	500 to 1,000	1(a), 1(c), 2(a),2(b), 4(a)
	1,000 to 3,000	1(a), 1(c), 1(d), 2(a),2(b), 3(b), 4(a)
III	Above 3,000	1(a), 1(b), 1(c), 1(d), 2(a), 2(b), 3(a), 3(b), 4(a), 4(b)

Notes:

**The schemes/ projects formulated on the basis of provisions given in Master plan/ Zonal Development Plan will require approval as indicated:*

{Chapter 3 of these Bye-Laws, NBC (latest), ECBC 2007 or latest, BEE Star rating/ IGBC/ GRIHA Certification}

***EIA**- Environmental Impact Assessment Study Report, **ECC**- Environmental Clearance Certificate, **MoEF** – Ministry of Environment and Forest,**NBC** – National Building Code, **ECBC** – Energy Conservation Building Code, **BEE** – Bureau of Energy Efficiency, **LEED**– Leadership in Energy and Environment Design, **IGBC** – Indian Green Building Council, **GRIHA**– Green Rating for Integrated Habitat Assessment, **TERI** – The Energy and Resources Institute.*

The prevailing provisions of the above shall be applicable. However if there are any modification in the same, the modified provisions shall become automatically applicable.

10.2 Provisions for Sanction:

(As per Annexure – X)

1. Water Conservation and Management
   a. Rain Water Harvesting (by Recharge)
   b. Low Water Consumption Plumbing Fixtures
   c. Waste Water Recycle and Reuse
   d. Reduction of hardscape
2. Solar Energy Utilization
   a. Installation of Solar Photovoltaic Panels
   b. Installation of Solar Assisted Water Heating Systems
3. Energy Efficiency
   a. Low Energy Consumption Lighting Fixtures (Electrical Appliances – BEE Star and Energy Efficient Appliances)
   b. Energy Efficiency in HVAC systems
4. Waste Management
   a. Segregation of Waste
   b. Organic Waste Management

5. NATIONAL BUILDING CODES (NBC)

5.1. Educational building fire prevention

a) Buildings intended for educational occupancy shall not be used for storage of any hazardous material.

b) Gymnasiums, indoor stadiums and similar occupancies are permitted to have floors/ running tracks of wood, cinder, synthetic or the like.

5.1.1. Life safety provisions for educational buildings

a) Every room with a capacity of over 45 persons in area shall have at least two doorways. Exit doors shall be operated by panic bars except that doors leading from classrooms directly to the outside may be equipped with the same type of lock as is used on classroom doors leading to corridor, with no provision whatsoever for locking against egress from the classroom.

b) A building, which will have only the first floor and is accessible to not more than 20 pupils at any time, may be used for school purposes with the following exceptions:

   1) Exterior walls or parts of walls which are less than 900 mm from adjacent property lines shall have no openings therein.
   2) Classrooms may have only one exit not less than 900 mm wide.

c) Rooms or areas for use by the preschool, kindergarten, Class/Grade 1 students shall be located on ground floor/level of exit discharge. Rooms or areas occupied by Class/Grade II students shall be located not above one floor higher than ground floor/level of exit discharge.

d) Of the minimum exits as specified in **4.4.2.4.3.1**, the naturally ventilated exit staircases, may not require provision of fire door. However, fire door shall be provided for all other staircases and pressurized staircases.

6.2.3 *Additional Precautions*

a) Storage of volatile flammable liquids shall be prohibited and the handling of such liquids shall be restricted to science laboratories only.

b) All exterior openings in a boiler room or rooms containing central heating equipment,

5.1.2. Life safety provisions for Assembly buildings

6.4.2 *Life Safety*

6.4.2.1 The following shall be applicable:

a) Exit door width for assembly buildings shall not be less than 2.0 m.

b) Every place of assembly of sub-division D-1 shall have at least four separate exits as remote from each other as practicable.

c) Every place of assembly of sub-division D-2 shall have at least two separate exits as remote from each other as practicable and if of capacity over 600, at least three exits shall be provided with each exit not less than of 2.0 m width.

d) Clear aisles not less than 1.2 m in width shall be formed at right angles to the line of seating in such number and manner that no seat shall be more than seven seats away from an aisle. Rows of seats opening on to an aisle at one end only shall have not more than seven seats. Under the conditions, where all these aisles do not directly meet the exit doors, cross-aisles shall be provided parallel to the line of seating so as to provide direct access to the exit, provided that not less than one cross aisle for every 10 rows shall be required. The width of cross-aisles shall be minimum of 1 m. Steps shall not be placed in aisles to overcome differences in levels, unless the gradient exceeds 1 in 10.

5.2. Types of Exits

a) Permissible Exit Types:

Exits may be of horizontal or vertical type, and include:

- Doorways
- Corridors and passages
- Internal staircases
- External staircases
- Ramps to verandas
- Terraces with access to a street

Horizontal exits connecting to adjoining buildings on the same level

b) Not Considered as Exits:

These do not qualify as exit routes for fire safety purposes.

- Lifts,
- Escalators, and
- Revolving doors

5.2.1. Wheelchair Accessibility

At least one primary entrance to every building shall be accessible to individuals using wheelchairs and clearly marked with signage. That entrance should be located on a level that also provides elevator access for unhindered vertical movement.

5.2.2. Arrangement of Exits

When designing university or institutional campuses (like AUD Rohini), the arrangement of exits must follow these guidelines to ensure efficient and safe evacuation during emergencies:

a) Exit Placement and Travel Distance:

For all academic buildings, hostels, libraries, and auditoriums: The maximum walking distance from any point on a floor to the nearest exit must not exceed:

- 22.5 meters for residential (e.g., hostels) and educational/institutional buildings (e.g., classrooms, admin blocks).
- 30.0 meters for assembly spaces (e.g., auditoriums), office zones, cafeterias, or storage areas.
- Where more than one exit is required (e.g., in larger blocks or floors):
- Exits must be spaced as far apart as possible, creating multiple safe escape paths.
- Every part of the floor should have clear and direct access to at least one exit.

b) Distance from Remote Points:

For campus buildings with larger floor plates (like libraries or lecture halls):

- The distance from the most remote corner to an exit should not exceed half of the permitted maximums.
- For educational/institutional use: 11.25 meters
- For assembly/business/office use: 15.0 meters
- Exception: For buildings housing vulnerable populations (e.g., medical, or special needs blocks), the maximum travel distance from remote points must not exceed 6.0 meters.

5.3. Roof Drainage and Rainwater Management

(As per Model Building Bye-Laws, 2016, TCPO – Section 4.18)

The roof of a building must be designed and constructed to effectively drain rainwater using appropriately sized and adequately placed rainwater pipes. These pipes should be arranged, jointed, and fixed in a manner that ensures water is carried away from the building without causing dampness to any part of the walls, roof, or foundations—either of the building itself or adjacent structures.

5.4. Campus Buildings as Per NBC 2016 And Delhi Bye-Laws.

Parameter	Standard/Limit	Source	Remarks
FAR (General)	1.5 – 2.25	NBC 2016 – Part 3	
FAR (Delhi – Institutional)	2.25 (225%)	UBBL Delhi 2016 / MPD-2021	Confirmed in site RFP for AUD
Ground Coverage	30–35%	NBC 2016 – Part 3 / UBBL Delhi	Typical for institutional campuses
Setbacks	6 meters minimum	NBC 2016 / UBBL Delhi	For fire tender movement and ventilation
Basement (FAR Exemption)	Not included in FAR	NBC 2016 – Part 3	Allowed for parking/services only
Open Space (Recreational)	15–25% of site area	NBC 2016 – Part 3	Mandatory for campuses
Building Height	Subject to FAR + fire rules	NBC 2016 / Fire Dept.	No fixed height cap if fire NOC obtained

5.4.1. Comparative FAR for occupancies facing one public street of atleast 9mt width

(*Foreword*, *Clauses* 2.26, 9.2 *and* 9.2.1)

Sl No.	Occupancy Classification	Type of Construction			
		Type 1	Type 2	Type 3	Type 4
(1)	(2)	(3)	(4)	(5)	(6)
i)	Residential	UL	2.0	1.4	1.0
ii)	Educational	UL	2.0	1.4	1.0
iii)	Institutional	UL	1.5	1.0	0.8
iv)	Assembly	UL	1.0	0.7	0.5
v)	Business	UL	2.9	2.3	1.6
vi)	Mercantile	8.0	1.8	1.4	1.0
vii)	Industrial	7.5	1.9	1.6	1.3
viii)	Storage (*see* Note 4)	6.0	1.5	1.3	1.0
ix)	Hazardous (*see* Note 4)	2.8	1.1	0.9	NP

UL – Unlimited.
NP – Not Permitted.

5.4.2. Minimum requirement for fire fighting installations

Sl No.	Type of Building Occupancy	Type of Installation								Water Supply (litre)		Pump Capacity (litre/min)	
		Fire Exting-uisher	First Aid Hose Reel	Wet Riser	Down Comer	Yard Hydrant	Automatic Sprinkler System	Manually Operated Electronic Fire Alarm Systems (*see* Note 1)	Automatic Detection and Alarm System (*see* Note 2)	Under-ground Static Water Storage Tank Combined Capacity for Wet Riser, Yard Hydrant and Sprinklers per Set of Pumps	Terrace Tank over Respective Tower Terrace	Pump Near Underground Static Water Storage Tank (Fire Pump) with Minimum Pressure of 3.5 kg/cm^2 at Remotest Location	At the Terrace Tank Level with Minimum Pressure of 3.5 kg/cm^2
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
EDUCATIONAL BUILDINGS (B) (*see* Note 16)													
1)	Less than 15 m in height												
	i) Ground plus one or more storeys	R	R	NR	NR	NR	R (*see* Note 4)	NR	NR	NR	10 000 (5 000) (*see* Note 6)	NR	450 (450) (*see* Note 6)
2)	15 m and above but not exceeding 24 m in height	R	R	NR	R	NR	R (*see* Note 4)	R	NR	NR	25 000	NR	900
3)	Above 24 m but not exceeding 30 m in height	R	R	R	NR	R	R (*see* Note 4)	R	NR	50 000	(5 000) (*see* Note 6)	(*see* Note 14)	NR

5.5. Standards for Building access width and open spaces

For all assembly buildings like, theatres, cinema houses, assembly halls, stadia; educational buildings; markets, hospitals; industrial buildings and other buildings which attract large crowd, the means of access shall not be less than the following:

Sl No.	*Width of Means of Access* m	*Length of Means of Access* m
i)	12.0	200
ii)	15.0	400
iii)	18.0	600
iv)	24.0	above 600

12.2.1.1 The requirements of **12.2.1** apply to residential, business and mercantile buildings. For educational and industrial buildings, the following minimum requirements apply :

a) Educational buildings : Ceiling height 3.6 m for all regions; in cold regions, 3 m

a) *Educational buildings* — Except for nursery schools, the open spaces around the building shall be not less than 6 m.

b) *Institutional buildings* — The open spaces around the building shall be not less than 6 m.

c) *Assembly buildings* — The open space at front shall be not less than 12 m and the other open spaces around the building shall be not less than 6 m.

NOTE — However, if assembly buildings are permitted in purely residential zones, the open spaces around the building shall be not less than 12 m.

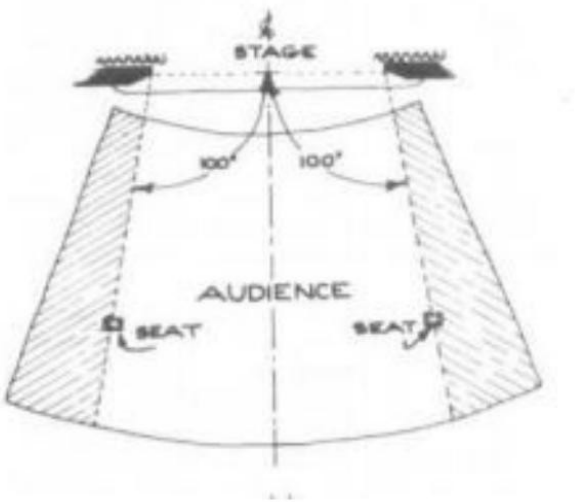
5.6. Area division

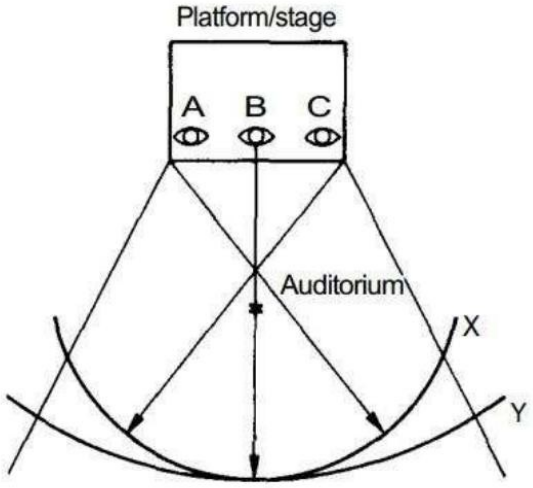
2) University campus	
Area:	10.00 ha to 60.00 ha
i) Residential (if included) area	25 percent of total land area
ii) Sports and cultural activities	15 percent of total land area
iii) Parks and landscape including green belt	15 percent of total land area

5.7. Auditorium Design

The auditorium is the heart of building, where the primary activity of experiencing and presenting performances take place. Audience seating is arranged to view the stage and the stage is a platform from which the performer can be communicate to the audience. The relationship between the two is very crucial for the success of convention centres. Mostly auditorium is designed to fulfil no of purposes. The objective of designer will be to use 100% usage of space. Auditorium should be designed in such a way that every member should be able to see and hear the performance of stage.

The three-dimensional volume of an auditorium is conditioned by the need for all members of the audience to be able to see the whole of the platform or stage: and to hear the actor, singer, musician, or speaker. Seating density, floor rake and seating layout are partly determined by this, partly to give the audience an appropriate level of comfort and essentially to ensure a means of escape in an emergency. Fire, within the time required by safety considerations and by legislation.





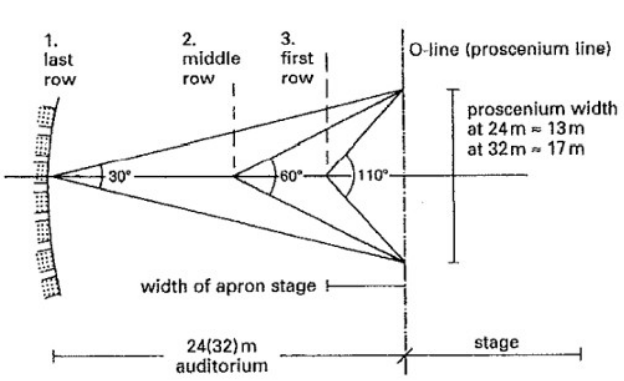
5.7.1. Audience Requirements

Every member of the audience should be able to see and hear clearly whatever is happening on every part of the stage or platform. The greater the encirclement of the audience of the platform or stage, the more

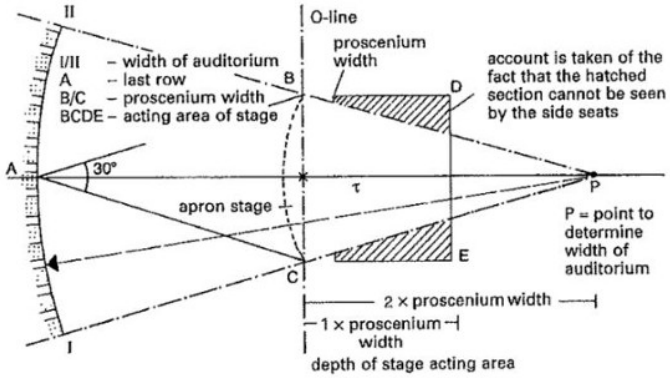
people can be accommodated within the aural and visual limitations up to 180° encirclement. With a full encirclement, the distance from the platform or stage is restricted to six rows.

Proportions of the auditorium these are derived from the psychological awareness and angle of view of the spectator, or the requirement for a good view from all seats. Options are:

1. Good view, without moving head, but light eye movements of approx. 30°.
2. Good view with slight head movements and light eye movements of approx. 60°.
3. Max. Awareness angle without head movement approx. 110°, i.e., all actions in the field are 'in view'. Outside this field, there is uncertainty, because 'something' is out of view.
4. Full head and shoulder movement allows an angle of view of 360°.



7 Proportions of traditional auditorium plan

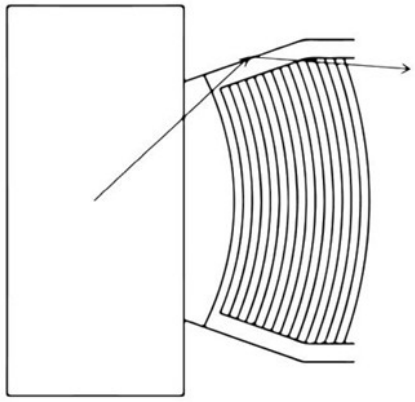


8 Auditorium width

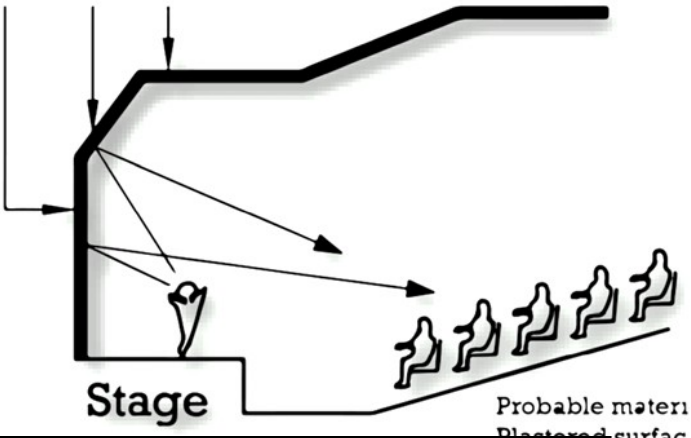
Proportions of the classic auditorium Opera, multi-purpose theatre, and traditional playhouse -7 0: distance of the furthest row from the start of the stage should not exceed: -

Playhouse, max. 24 m (max. distance for the recognition of facial expressions); Opera, 32 m (large movements are still recognisable).

Auditorium width is determined by the spectators at the side being able to see the stage adequately -8. The theatre situation is fundamentally one of the relationships between the performers and the audience. The audience wants to hear and see the show without distraction and in comfort and safety, as stated, but its ultimate objective in attending the show is to receive the utmost sensory stimulation toward the maximum emotional and intellectual experience.



Angled side wall allows better side wall reflection



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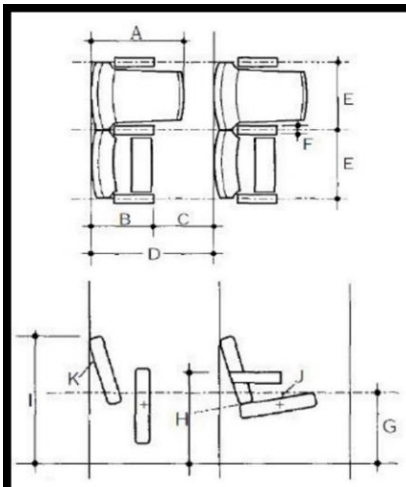
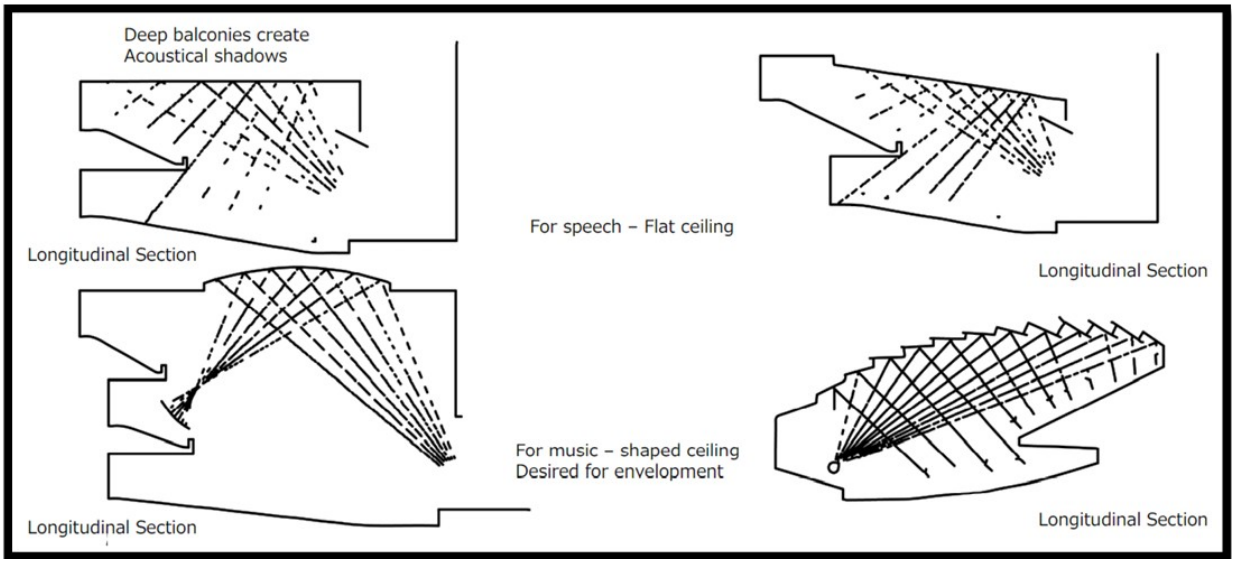
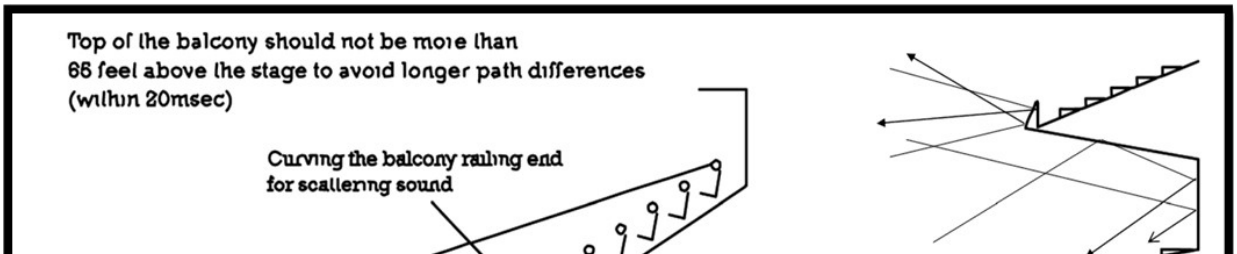


Dimension	Description	Minimum(mm)	Maximum(mm)	Drawnn as
A	Overall seat depth	600	720	650
B	Tipped seat depth	425	500	450
C	Seatway	305	-	400
D	Back to back seat spacing	760	-	850
E	Seat width for seat with arms	500	750	525
F	Annrest height	50	-	50
G	Seat height	430	450	440
H	Armrest height	600		600
I	Seatback height	800	850	800
J	Seat inclination	17	9	7
K	Back inclination	15	20	15

Table 1 : Dimension of auditorium seats

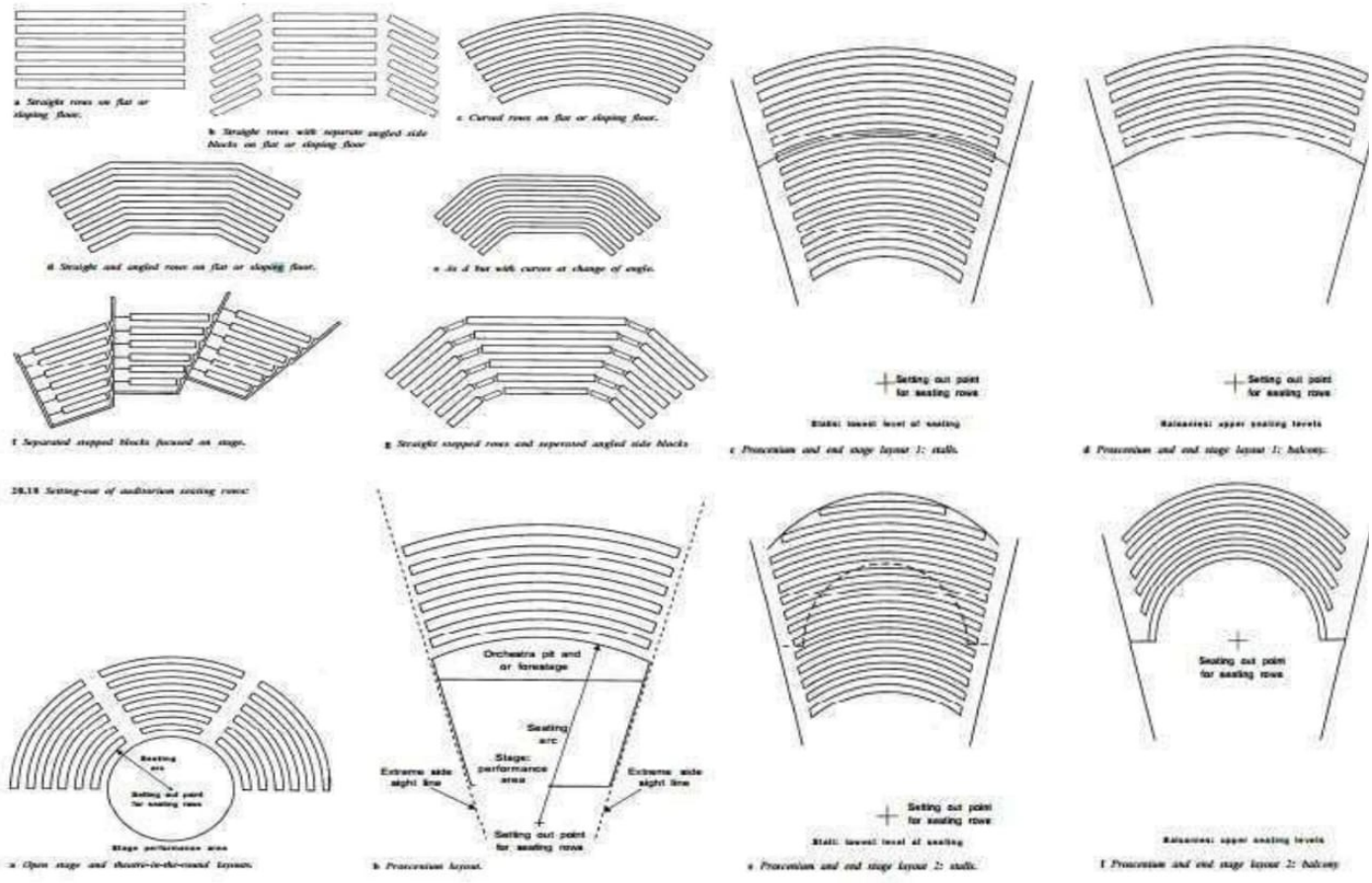




5.7.2. Seating

With traditional seating, the maximum number is 22 if there are gangways at both ends of the row, and 11 for gangways at one end. Rows with more than 22 seats are permitted if the audience is not thereby imperiled.

- minimum Dimension of seating with arms =500mm Without arms =450mm
- Seat height = 430-450 mm
- Angle of inclination= 7-9 degree with horizontal Back Height = 800-850mm
- Angle of inclination = 15-20 degree
- Seat Depth= 600-720 mm, reduced to 425-500mm when the seat is tipped Other Factors affecting seating is,
- Acoustics: Upholstery to satisfy the acoustic requirements, usually the level of absorbency when unoccupied
- Ventilation & heating: Air supply or extract under a seat
- Upholstery: Thickness of padding should provide comfort & avoid fatigue, material of padding and finish must satisfy fire regulations



Seating geometry

Seating is usually laid out in straight or curved rows focused toward the platform or stage. Further forms are the angled row, straight row with the curved change of direction, and straight rows within emphasised blocks of seats.

Seating density

Seats with arms and tippable seat can occupy a space as small as 500 mm wide with a how-to-row dimension of 760 mm: but can be as large as 750 mm wide by 1400 mm. The area per seat therefore varies between 0.38 m^2 and 3.05 m^2.

Row to row spacing

Spacing is controlled by the clearway between the leading edge of the seat and the rear of the back of the seat in front. For traditional seating, the minimum clearway for people to pass along the row is 300 mm and this dimension increases with the number of seats in a row. For continental seating the clearway is not less than 400 mm and not more than 500 mm

Gangways

As gangways are essential to escape routes, their widths are determined by the number of seats served. The minimum is 1100 mm. They can be ramped up to 10%. If the seating rake is steeper, gangways must-have steps extending the full width and these must have consistent treads and risers in each run.

5.8. Reception And Waiting

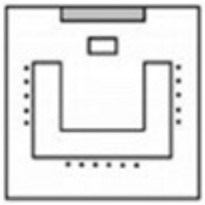
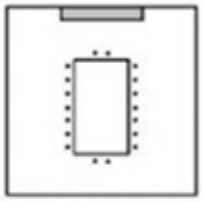
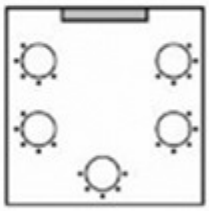
Reception and waiting areas should ensure efficient flow, comfort, and accessibility. Standards typically include:

- Space Allocation: Sufficient space for queuing and seating to avoid congestion.
- Accessibility: Compliance with ADA (or local equivalent) for barrier-free access.
- Lighting: Adequate natural and artificial lighting for comfort and ambiance.
- Acoustics: Sound-absorbing materials to reduce noise.
- Signage: Clear, visible signs for navigation.
- Furniture: Ergonomic and durable seating.
- Technology: Integration of digital screens for information and entertainment.

5.9. Conference Room

A conference hall or conference room is a room provided for singular events such as business conferences and meetings. Sometimes other rooms are modified for large conferences such as arenas or concert halls. Conference rooms can be winning dowels for security purposes.

5.9.1. Types of Seating

	Type	Description	Layout
1.	U shaped	• Seating around three sides of the room. • It is good for presentations from front. • Presentation space in the middle of the room. • Can be used for up to 50 persons. • Per seat area is 3.25m².	
2.	Boardroom style	• Centrally located table. • Classic layout ideal for debate and discussion. • Seating capacity 5-30 persons. • Per seat area is 3.71m².	
3.	Cabaret style	• All delegates facing front-center on round tables. • Large space in the middle of the room. • Ideal for small-group work. • Per seat area is 1.57m².	
4.	Theater style	• Used for product launches, presentations, displays. • Used to present to large numbers of delegates. • Can be used for 100-250 persons. • Per seat area is 0.83 m².	

5.9.2. Space Standards

Type	Dimension
A	1210-1520
B	100-150
C	510-610
D	150-255
E	460-610
F	790-910

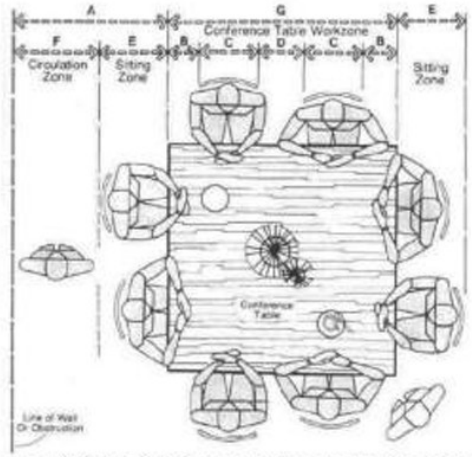
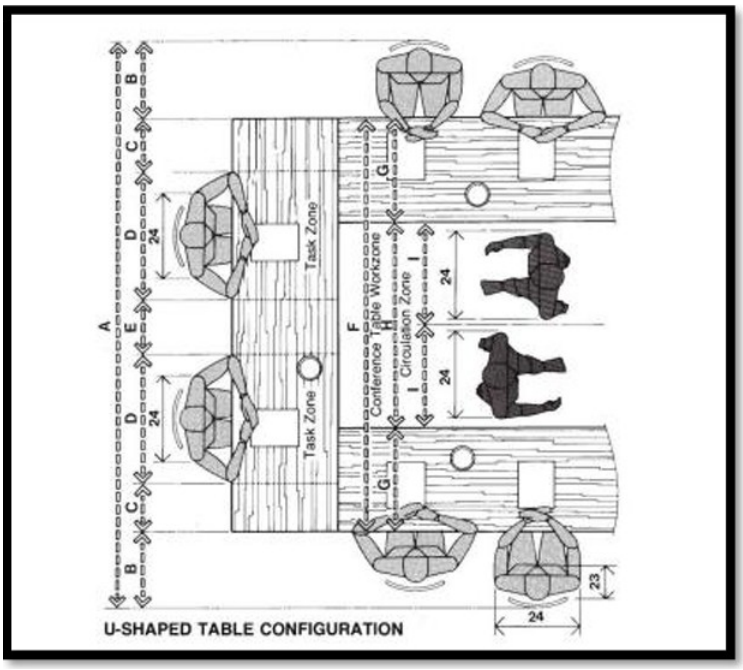


Figure 22: Seating standards for a conference table

5.9.3. The basic dimensions of a U-shaped conference table are given below:



	in	cm
A	138-180	350.5-457.2
B	18-24	45.7-61.0
C	12-21	30.5-53.3
D	32-36	81.3-91.4
E	14-18	35.6-45.7
F	108-132	274.3-335.3
G	24-36	61.0-91.4
H	60	152.4
I	30	76.2
J	72	182.9
K	24-28	61.0-71.1
L	3-6	7.6-15.2
M	12-16	30.5-40.6

5.10. Barrier-Free Norms

A wheelchair user's movement pivots around his or her shoulders. Therefore, the range of reach is limited, approximately 630 mm for an adult male. While sitting in a wheelchair, the height of the eyes from the floor is about 1190 mm for an adult male.

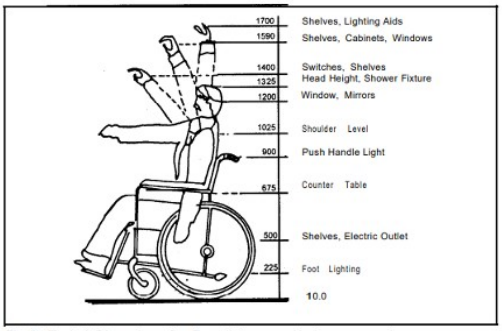


Fig.-9. Typical Dimensions for Essential uses with in easy reach

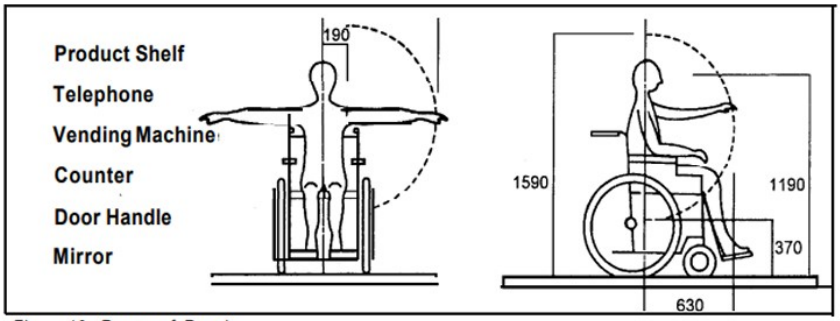
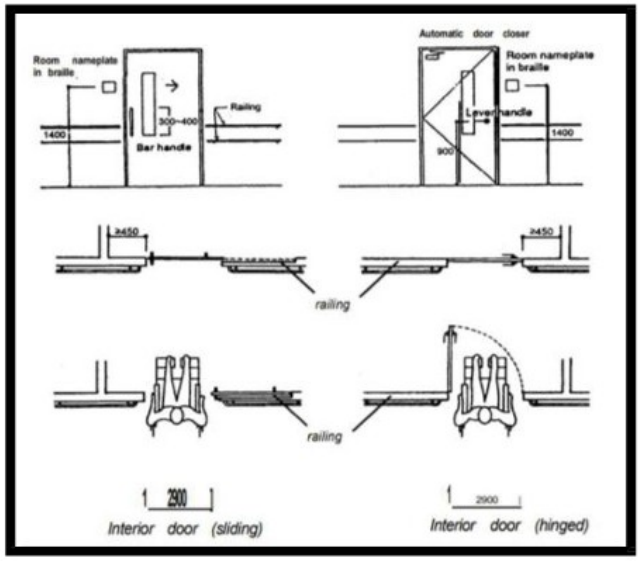
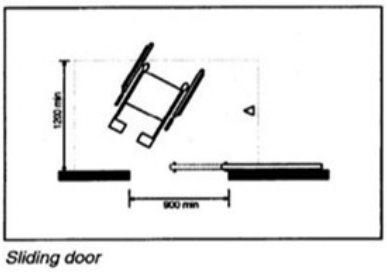


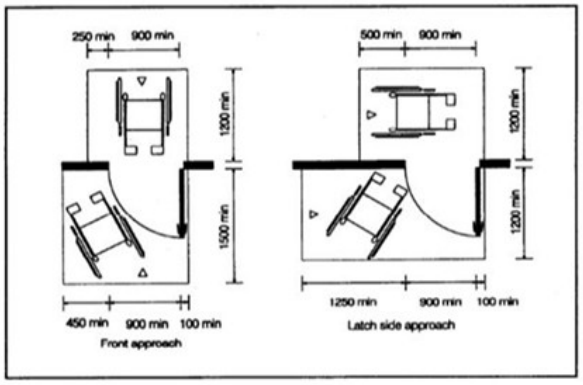
Fig. - 10. Range of Reach

5.10.1. Entrance/Exit Doors





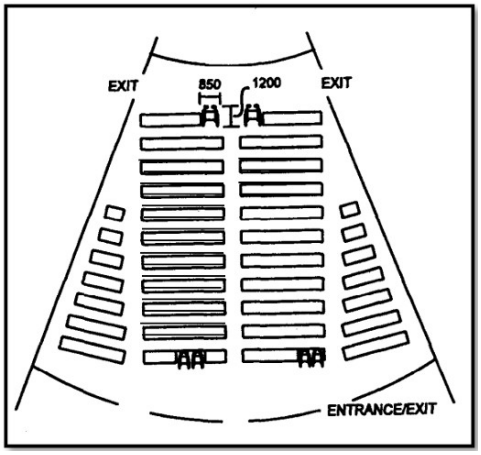
Sliding door



Minimum clear opening of the entrance door shall be 900 mm. and it shall not be provided with a step that obstructs the passage of a wheel chair user. Threshold shall not be raised more than 12 mm.

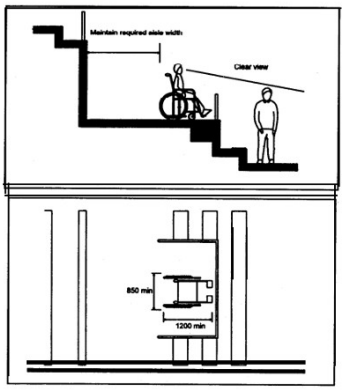
5.10.2. Auditorium

- Applies to wheelchair spaces in auditoria, assembly halls, theatres, and similar facilities.
- Accessible seating space should be provided in a variety of locations to give persons with physical disabilities a choice.



Step width	600	800	1000
A	605-620	805-820	1005-1020
B	1170-1220	1320-1420	1570-1620
C	1280	1480	1680
Transportation capacity/hr	5000-6000	7000-8000	8000-10000

Plan view of guest seating arrangement



5.11. Vertical Circulation:

5.11.1. Elevators:

Location:

Passenger lifts should be within a reasonable walking distance from the furthest part of the floor areas served (say, 70 m maximum) and, where they are the only or main lifts near an entrance. The location of goods and service lifts will depend on their function, but they should not open into passenger lift lobbies or public areas.

Planning a passenger lift:

Cul-de-sac or recessed lobbies, are essential to get the maximum performance from lift groups. Clearly, having called for lift service the waiting passengers should not have to walk further than necessary to the responding lift car, and should not be obstructed by passers-by.

- Provision of the lifts shall be made for all multi-storeyed building having a height of 15.0 m. and above.
- All the floors shall be accessible for 24 hrs. by the lift. The lift provided in the buildings shall not be considered as a means of escape in case of emergency.
- Grounding switch at ground floor level to enable the fire service to ground the lift car in case of emergency shall also be provided.
- The lift machine room shall be separate and no other machinery be installed in it.

5.11.2. 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.

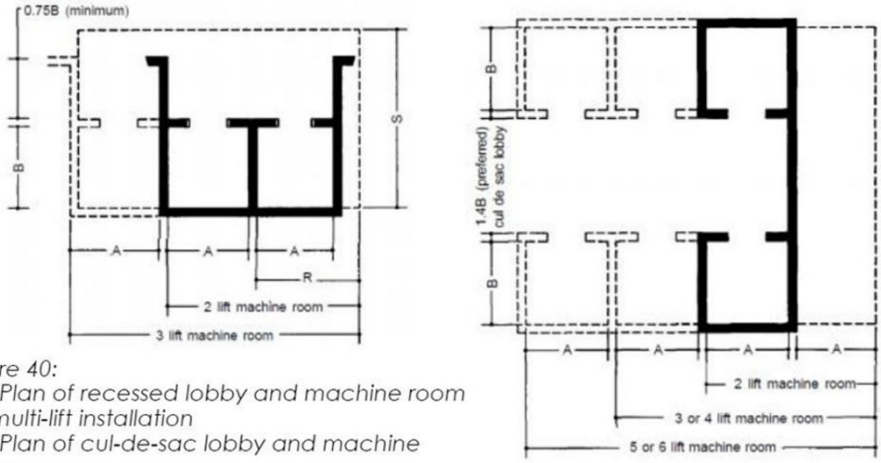


Figure 40:
(a.) Plan of recessed lobby and machine room for multi-lift installation
(b.) Plan of cul-de-sac lobby and machine room

- **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

5.11.3. 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:

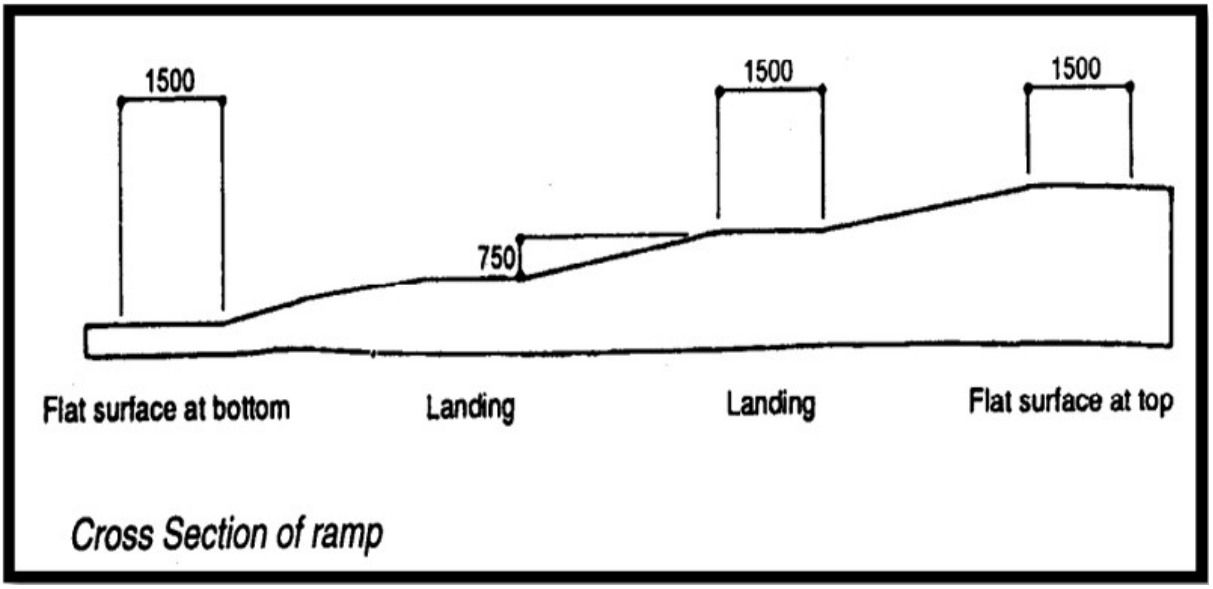
All assembly buildings having area more than 500 m on each floor shall have a minimum of two staircases.

- The minimum width for a staircase in an assembly building shall be 1500mm. 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.

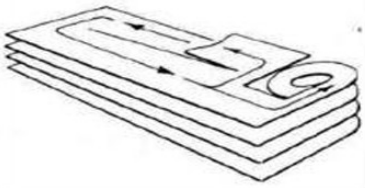
5.12. Vehicular Ramps

- 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.

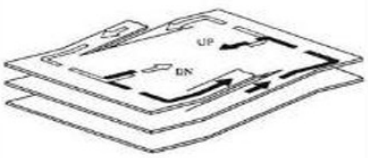
- Provide a flat surface 1500 mm or more in length at the top and bottom of the ramp for a wheelchair to pause and prevent it from going out of control.



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	

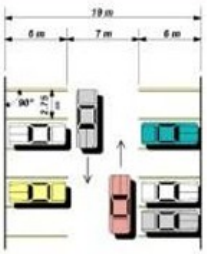
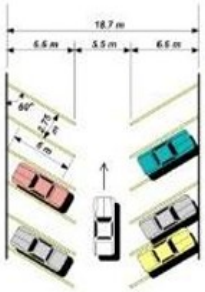
Ramp Design:

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	

5.13. Parking

5.13.1. Surface Parking

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.

5.13.2. 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.

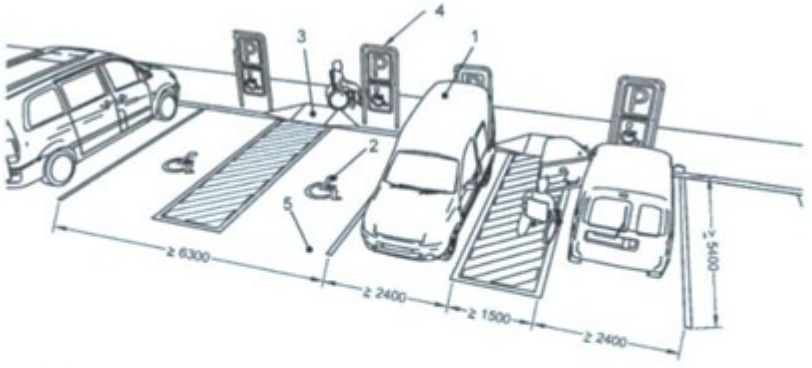
- The access to the basement shall be separate from the main and alternative staircase providing access and exit from higher floors.
- Area per ECS for basement car parking as per DDA is 32 m².

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



Key
1 Minimum unobstructed height for vans 2 600 mm
2 Symbol of accessibility
3 Kerb ramp
4 Signage, including symbol of accessibility
5 Firm ground

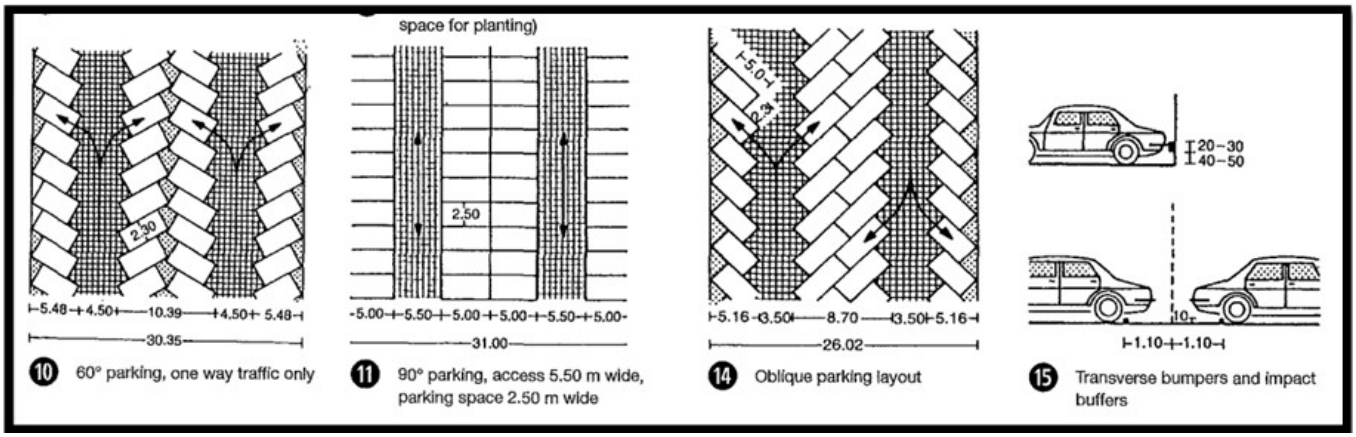
All dimensions in millimetres.

FIG. 38 ACCESSIBLE PARKING SPACES ACCESSIBLE PARKING SPACES WITH ONE SHARED TRANSFER AREA

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



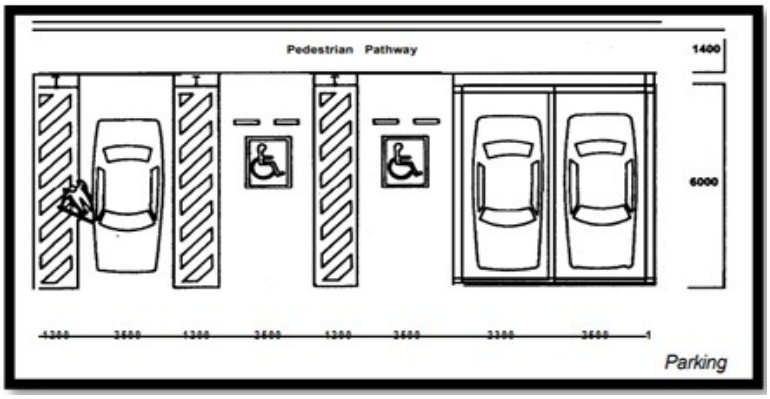
10 60° parking, one way traffic only

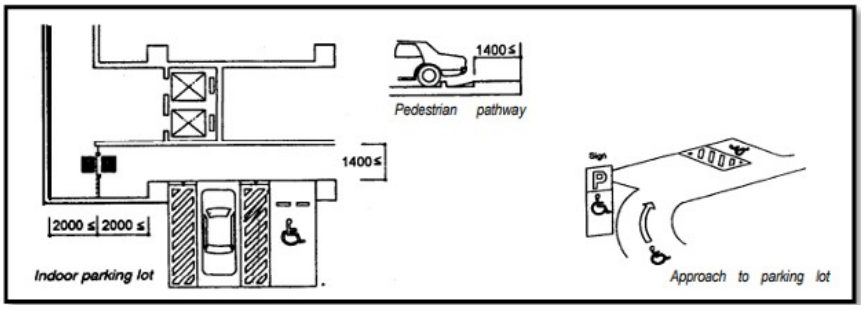
11 90° parking, access 5.50 m wide, parking space 2.50 m wide

14 Oblique parking layout

15 Transverse bumpers and impact buffers

5.13.3. 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.

5.14. 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.



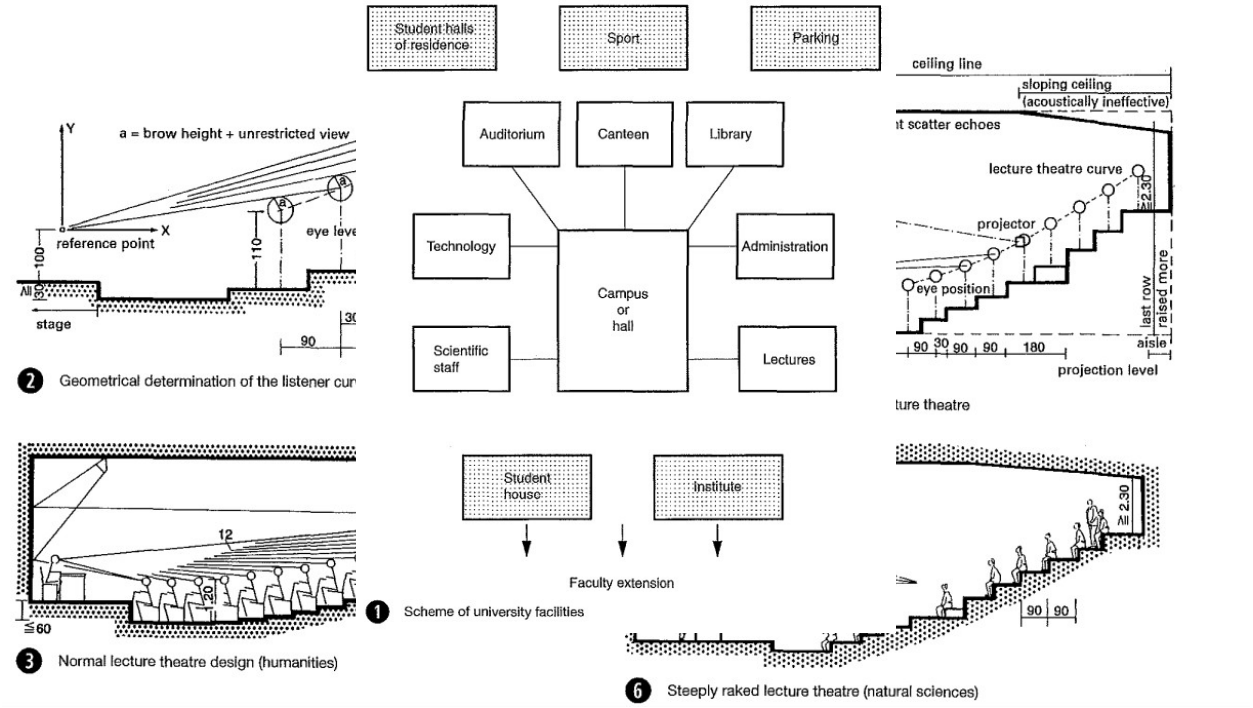
6. NEUFERT

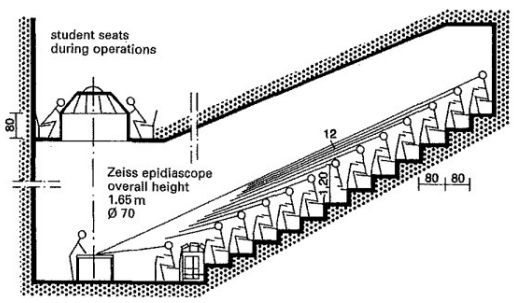
6.1. Lecture Theatres:

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}.

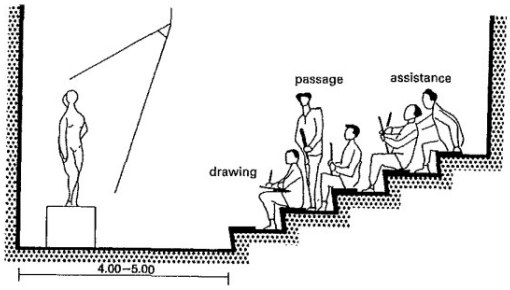
Basic space requirements for all subjects Lecture theatre for basic and special lectures, seminar and tutorial rooms (partially with PC workplaces) for detailed instruction of the course material, specialised libraries, rooms for scientific assistants, conference and examination rooms.

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).





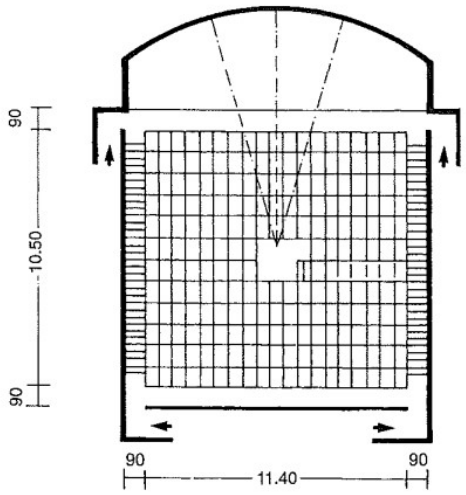
4 Lecture theatre for demonstrations on a bench (medicine)



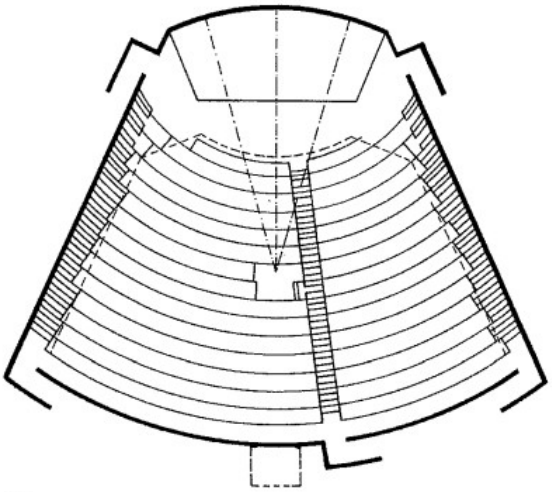
7 Steps in life drawing class with seated area of 0.65 m² per student (technical artistic subjects)

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)

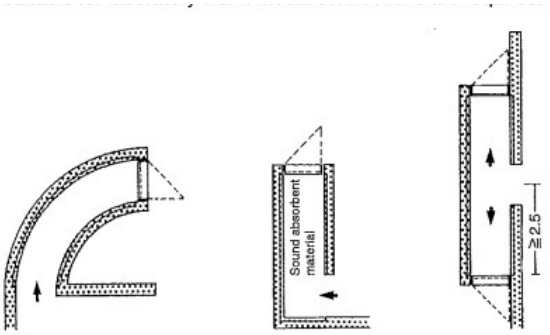
Lecturers enter the lecture theatre at the front, from the preparation room, and experimental apparatus can be rolled into the theatre. Common lecture theatre sizes are 100, 150, 200, 300, 400, 600, 800 seats. Lecture theatres with up to 200 seats, ceiling height approx. 3.5 m can be integrated into 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.



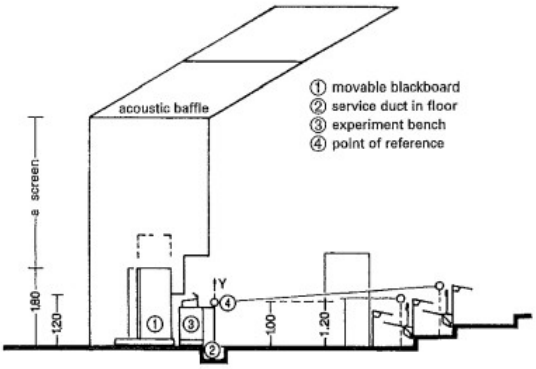
1 Rectangular lecture theatre with 200 seats



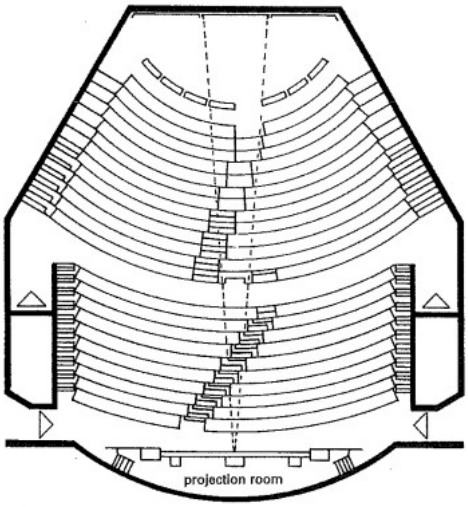
2 Trapezoidal lecture theatre with 400 seats



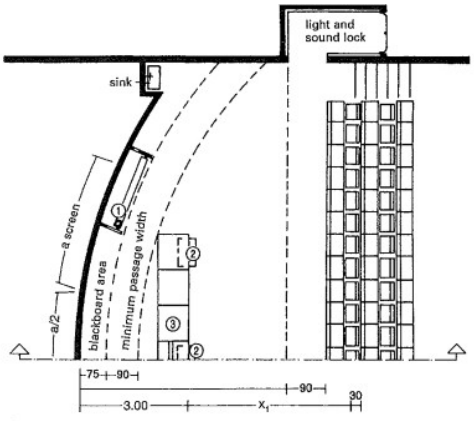
4 Floor plans for light and sound booths



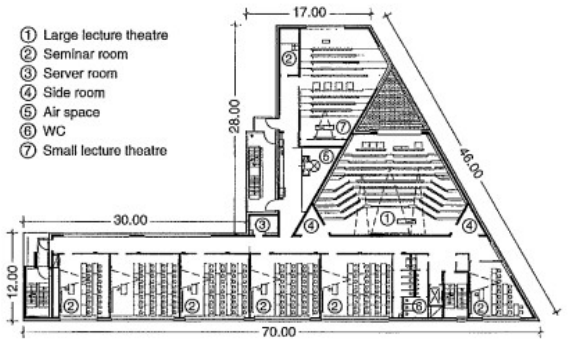
5 Longitudinal section → 6



3 Lecture theatre with 800 seats



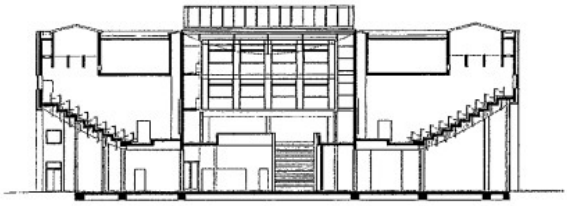
6 Plan of podium area



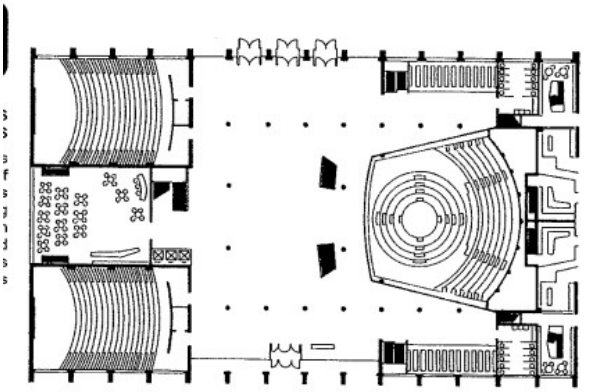
① Bremerhaven University, third floor Arch.: Kister Scheithauer Gross

UNIVERSITIES AND COLLEGES

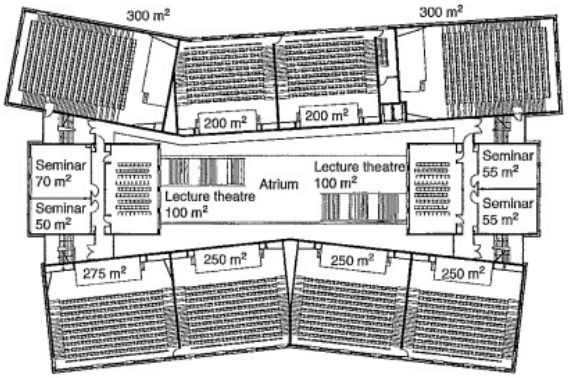
Examples of Lecture Theatres



④ Section → ⑤

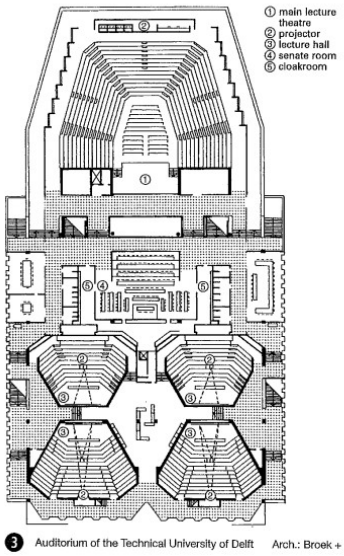


② Council building, Freiburg University, ground floor entrance hall and two-storey Auditorium Maximum Arch.: O.E. Schweizer

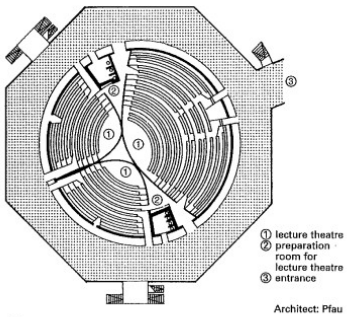


⑤ Lecture theatres, Gräfin Dönhoff Building, first floor, Frankfurt an der Oder University Arch.: Yamaguchi und Essig Architekten BDA

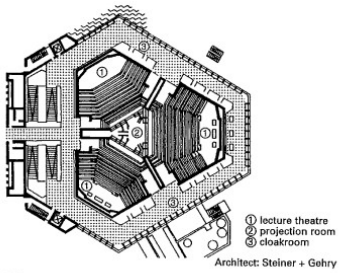
② Council building, Freiburg University, ground floor entrance hall and two-storey Auditorium Maximum Arch.: O.E. Schweizer



③ Auditorium of the Technical University of Delft Arch.: Broek + Bakema



⑥ Student building in Düsseldorf



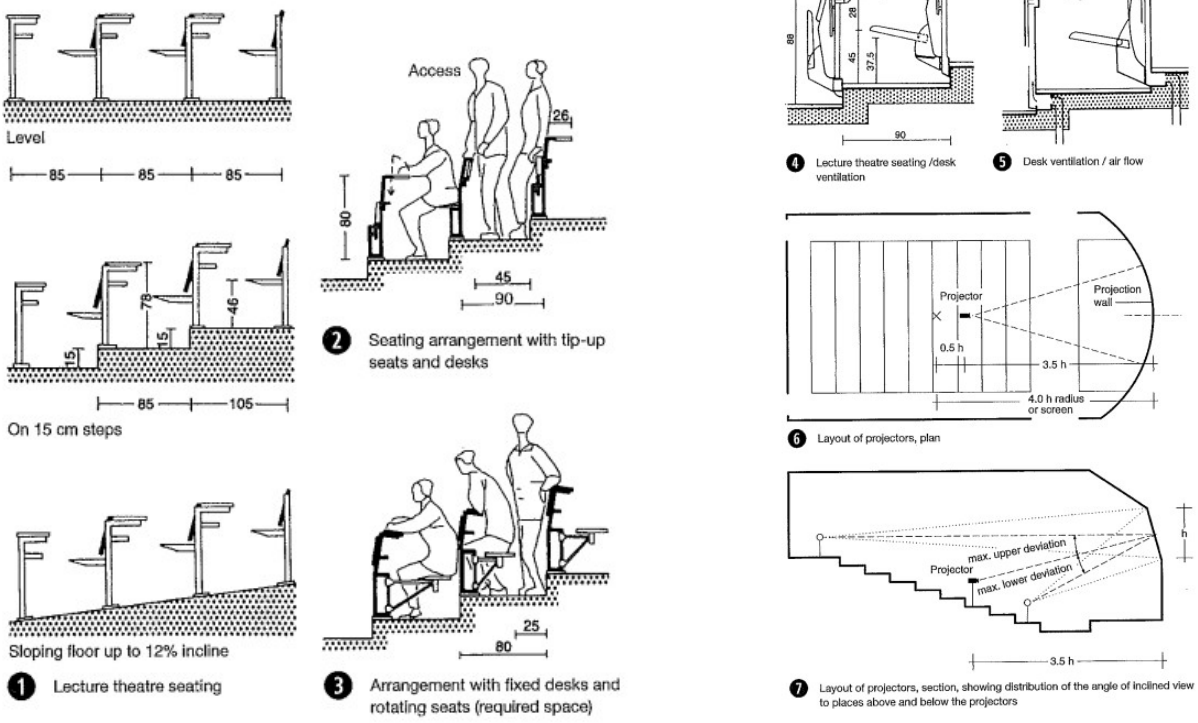
⑦ Lecture theatre of the ETH Hönggerberg, Zurich

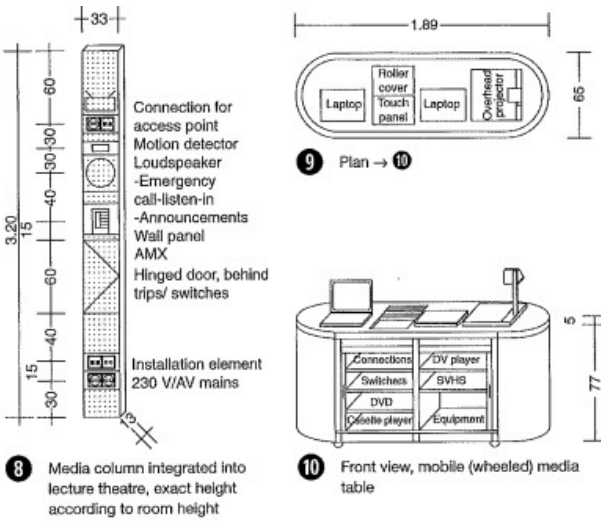
6.1.1. S

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.

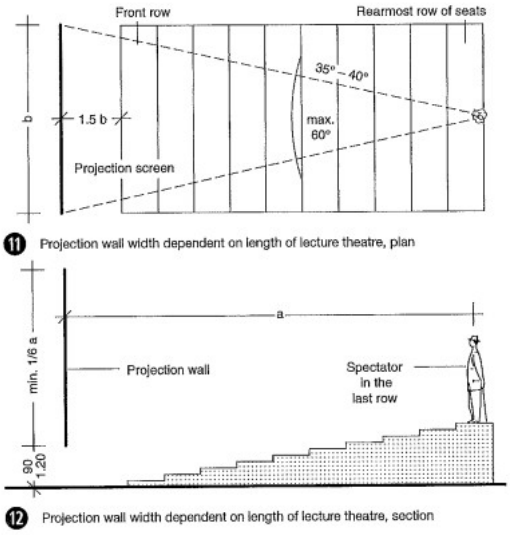




8 Media column integrated into lecture theatre, exact height according to room height

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

6.2. 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.

6.2.1. 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.

6.2.2. 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.

6.2.3. 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

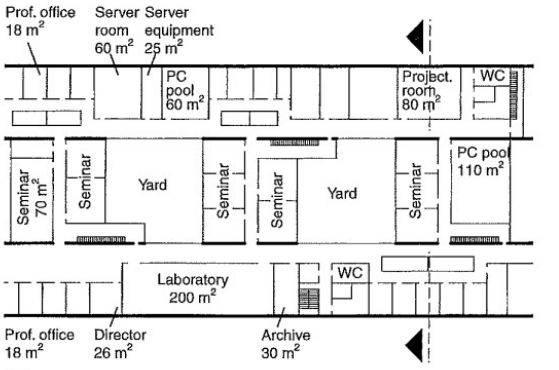
Space required 1.0-1.2 m2/200 vols

Reading places -7

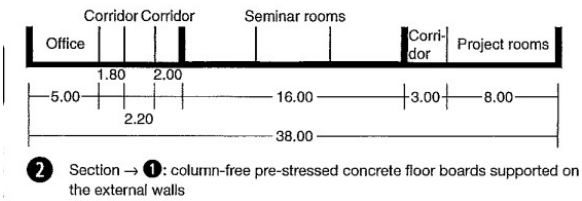
Width 0.9-1.0 m/depth 0.8 m

Space required 2.4-2.5 m2 per place

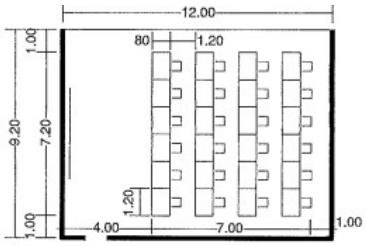
Entrance control, with storage for cases/bags; catalogue, copier room



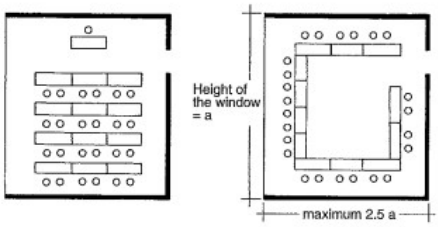
1 Plan of a university building; seminar rooms are used by many departments



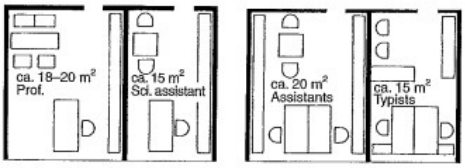
2 Section → 1: column-free pre-stressed concrete floor boards supported on the external walls



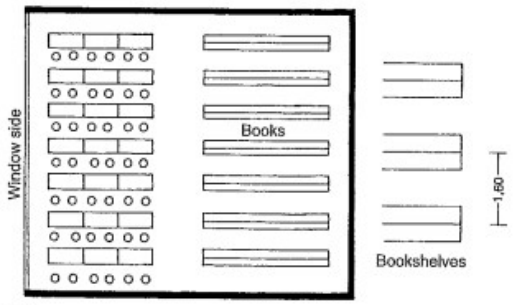
3 Dimensions of a computer room



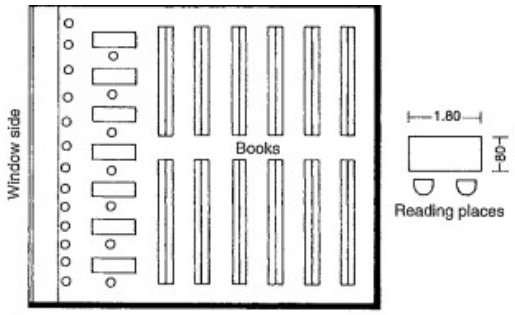
4 Dimensions of seminar rooms with natural ventilation



5 Basic equipment for service rooms



6 Arrangement of reading places and bookshelves



7 Arrangement of reading places and bookshelves

6.3. Laboratories:

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

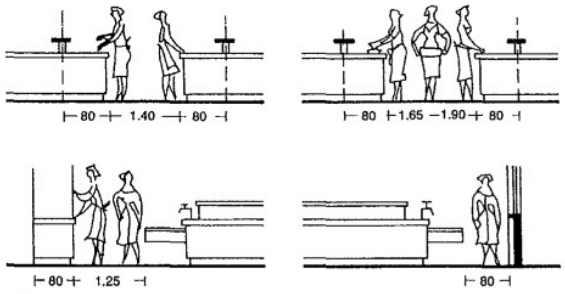
Tuition-related practical laboratories with a large number of workstations collected together and mostly with simple basic equipment - 3

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

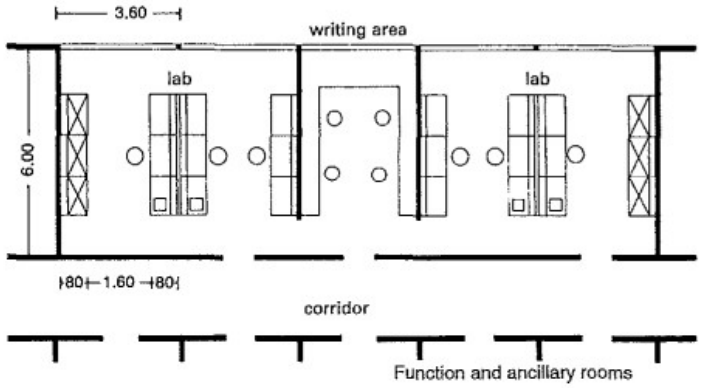
According to subject: Chemistry and biology laboratories have permanently installed laboratory benches. Rooms have a high rate of air exchange and frequently additional fume cupboards with air extraction - p. 204 -7 for work producing gas and smoke. Fume cupboards are often installed in their own rooms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

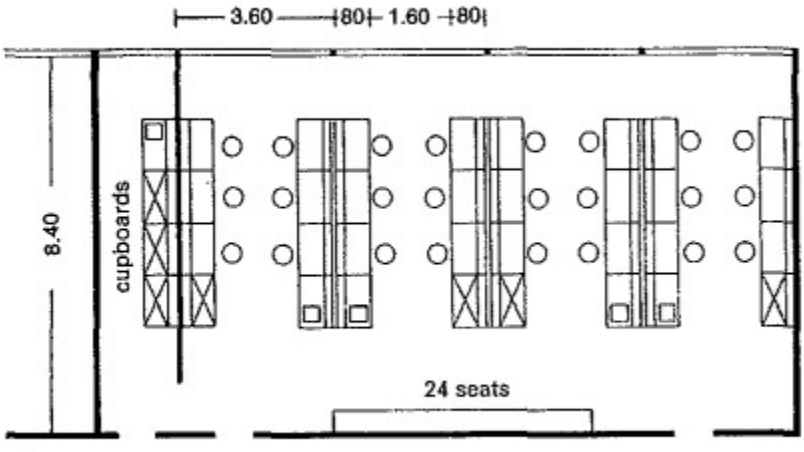
Clean room laboratories are used for work requiring especially dust-free filtered air, e.g. in microelectronics or for particularly dangerous substances, whose release into the surrounding rooms should be prevented by special air circulation and filtering (microbiology, gene technology) -4.



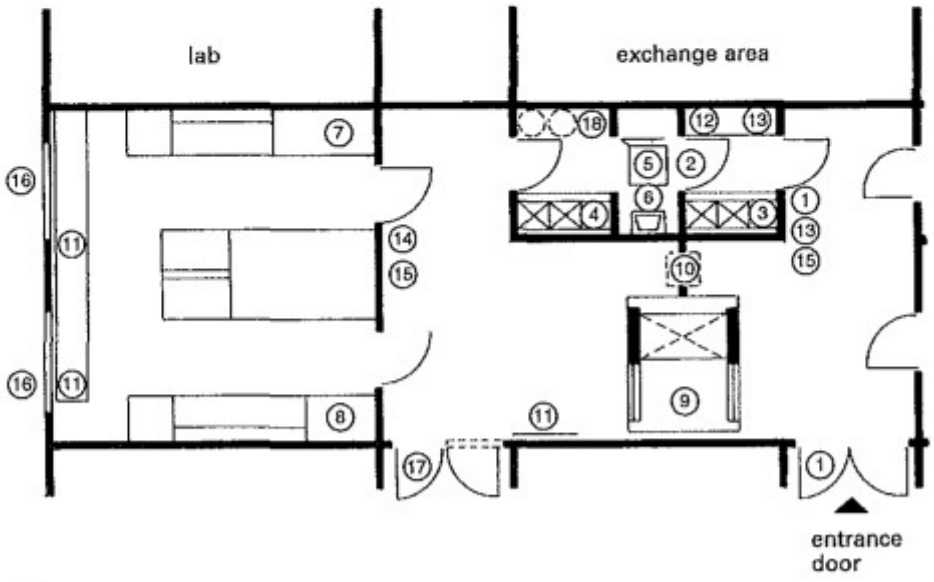
1 Minimum passage width at workstations



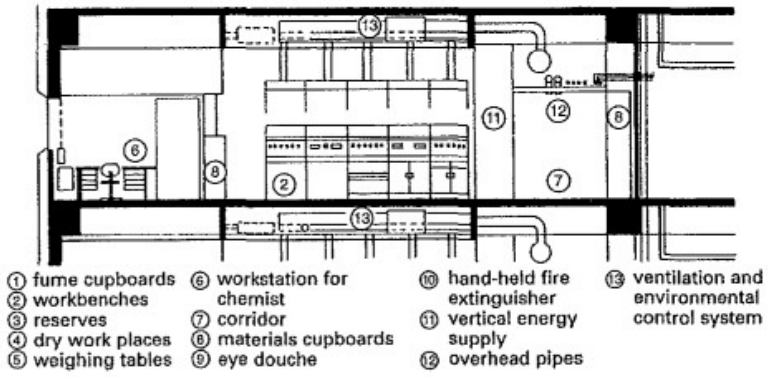
2 Research laboratory



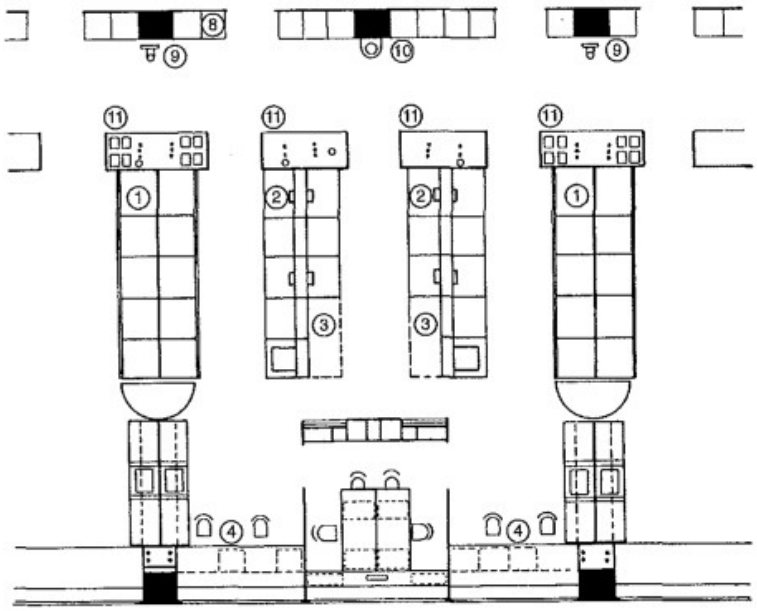
3 Teaching and practical laboratory



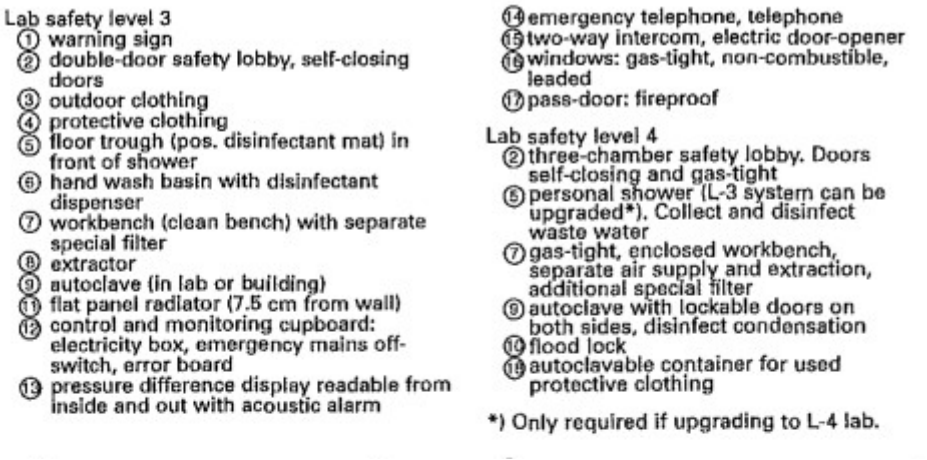
4 Clean room laboratory, example



5 Section, BASF plastics laboratory Arch.: Suter u. Suter



6 Plan → 5



Cold laboratories are used for tasks requiring extreme temperature conditions, photographic work and as darkrooms. Workrooms without equipment installed also belong in the close laboratory area: Study cubicles; social/rest rooms for laboratory staff; central rooms for general storage, chemical stores and issue, with particular safety measures; isotope stores with decay containers etc. Animal laboratories are a special case, with rooms for keeping the animals, which have special equipment appropriate to the species and require their own air circulation.

Laboratory workstations The determining design unit for the laboratory workstation is the laboratory bench, permanently installed or mobile, whose dimensions together with the associated work and passage areas define the laboratory axis, which forms the basic spatial unit ~1 - 3.

Standard dimensions for the normal working bench: 120 em width in practical laboratories, several times that in research laboratories, 80 em depth work surface including socket strip.

Benches and fume cupboards are mostly in the form of a building block system: element widths 120 em, fume cupboards 120 and 180.

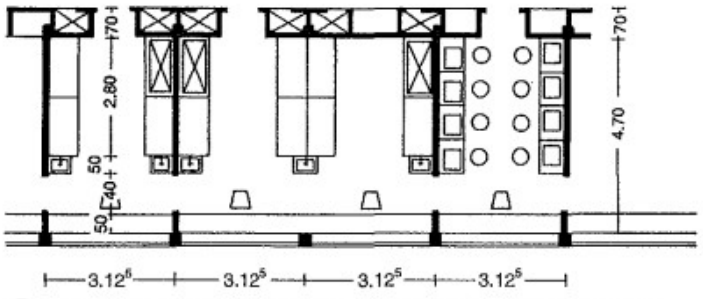
The socket strip is an independent element with all electricity supply systems. Benches and low-level cupboards are placed in front of it.

Steel tubing supports the construction of laboratory benches, whose work surfaces are of artificial stone panels without joints, seldom tiled, and chemically resistant plastic panels. Low-level cupboards are of wood or plastic-coated chipboard. Supply services are fed from above out of the ceiling cavity or from below through the floor structure.

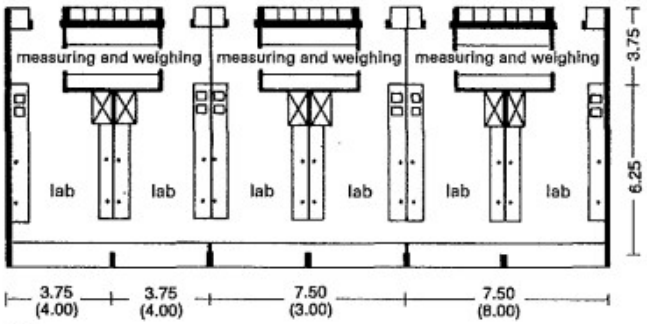
6.3.1. Ventilation

Of low- or high-pressure systems, the latter are particularly recommended for multi-storied institute buildings with large-scale air requirements, in order to reduce the ducts' cross-section. Cooling and humidification as required. Ventilation equipment has the highest demand for space of all services installations. All laboratories in which work with chemicals takes place must have artificial ventilation and extraction. Air changes per hour: chemistry laboratories 8 times biology laboratories 4 times physics laboratories 3-4 times (in the extraction area).

Electrical installation Each building will need its own transformer station if the numbers of connections are high or if special electricity supplies are specified. Electrical service rooms must be enclosed in fire-resistant walls and may not be crossed by other pipework or cables.



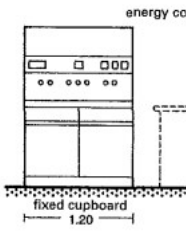
1 Room dimensions derive from size of bench (workstation). Services and cupboards are in the corridor wall. Weighing room is separate.



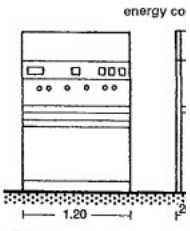
2 Uniform laboratories with measurement and weighing rooms in front, University Clinic, Frankfurt am Main Arch.: Schlempp + Schwethelm

ries 8 times
s 4 times
s 3–4 times
rea)

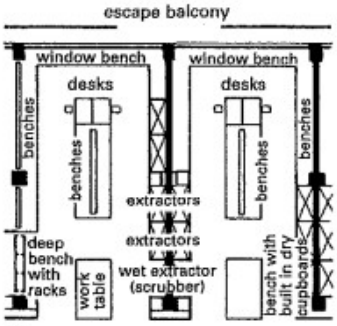
r station if the numbers
icity supplies are speci-
nclosed in fire-resistant
ework or cables.



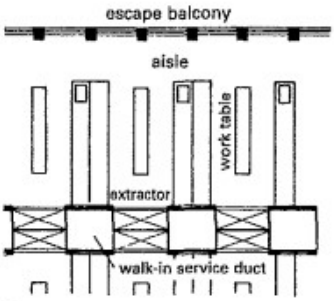
5 Chemistry laboratory



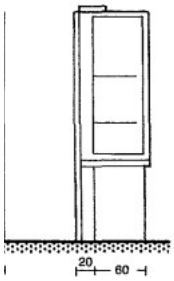
6 Physics laboratory be



3 Laboratory equipment in main scientific laboratory (Bayer AG dye plant)

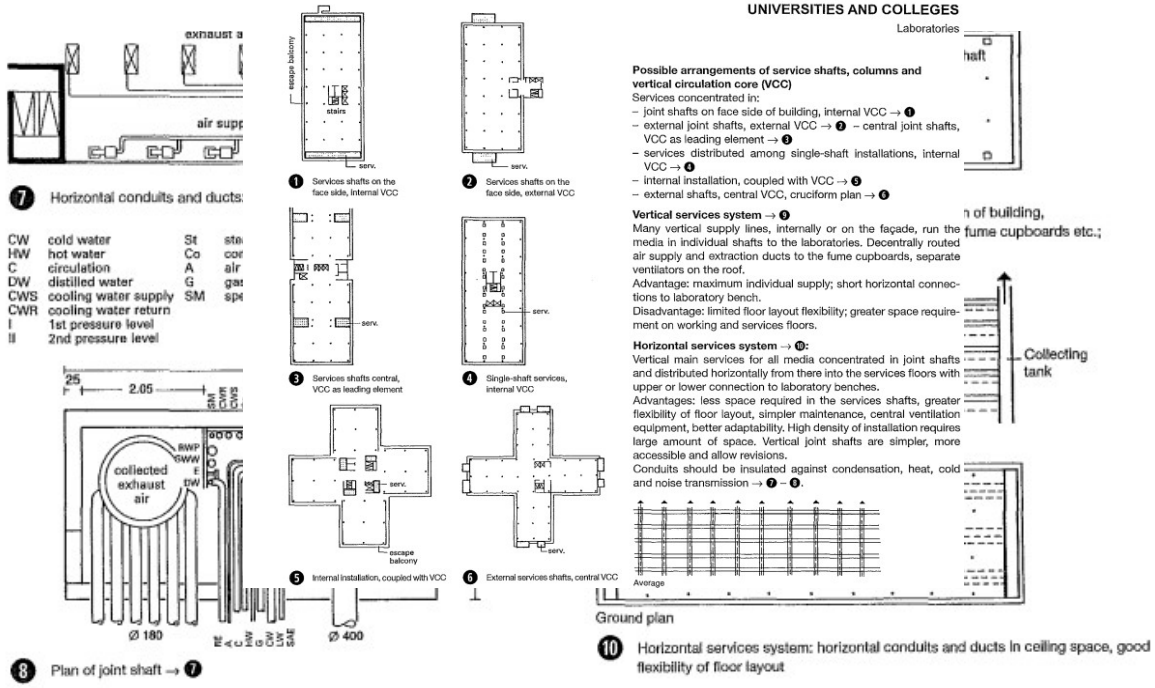


4 Arrangement of equipment in accessible service ducts (BASF)



Possible arrangements of service shafts, columns and vertical circulation core {VCC) Services concentrated in: - joint shafts on face side of building, internal vee --7 0 - external joint shafts, external

vee --7 8 - central joint shafts, vee as leading element --7 e - services distributed among single-shaft installations, internal vee --7 o - internal installation, coupled with vee --7 e - external shafts, central VCC, cruciform plan --7 0 Vertical services system --7 0 Many vertical supply lines, internally or on the fac;:ade, run the media in individual shafts to the laboratories. Decentrally routed air supply and extraction ducts to the fume cupboards, separate ventilators on the roof. Advantage: maximum individual supply; short horizontal connections to laboratory bench. Disadvantage: limited floor layout flexibility; greater space requirement on working and services floors. Horizontal services system --7 Cl!>: Vertical main services for all media concentrated in joint shafts and distributed horizontally from there into the services floors with upper or lower connection to laboratory benches. Advantages: less space required in the services shafts, greater flexibility of floor layout, simpler maintenance, central ventilation equipment, better adaptability. High density of installation requires large amount of space. Vertical joint shafts are simpler, more accessible and allow revisions. Conduits should be insulated against condensation, heat, cold and noise transmission --7 0-e.



Structure and fittings grid

Good structural grids to achieve mostly column-free rooms have the following dimensions:

7.20 x 7.20 m, 7.20 x 8.40 m, 8.40 x 8.40 m, normal storey height 4.0 m, clear room height ~3.0 m.

The structural grid is a multiple of the typical planning grid of 120 x 120 em (decimetric system). Reinforced concrete frame construction, as pre-cast elements or cast in situ, is preferred on account of the flexibility of plan.

Following programme and layout requirements, with installation at high and low level, plus natural and artificial lighting and ventilation rooms, results in areas with different potential uses and technical

qualities. Laboratories therefore have large internal zones and are arranged as three-block facilities ---1 - 3. The length of the building is influenced by the maximum reasonable length of the horizontal runs of wet services .

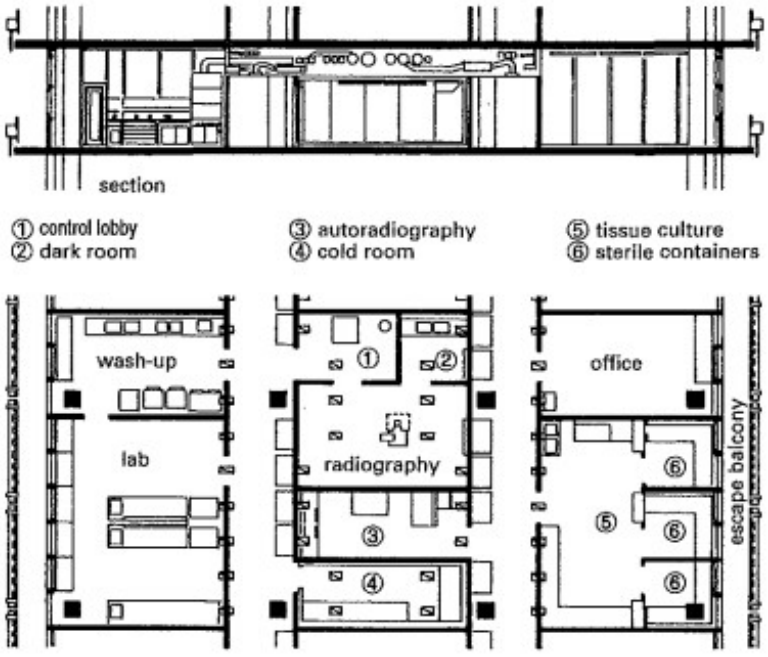
Columns are placed on a grid offset from the structural grid to increase the flexibility of servicing. Separation of areas is via a room-enclosing system consisting of partitions and suspended ceilings. Movable partitions should be easily operated and have chemical-resistant surfaces. Ceilings should permit disassembly and have sound insulation. Floor coverings should be resistant to water and chemicals, without joints and with low electrical conductivity. Normally, plastic roll flooring material or tiles with welded joints should be used.

Windows in the doors or next to them are important to provide a view into laboratories.

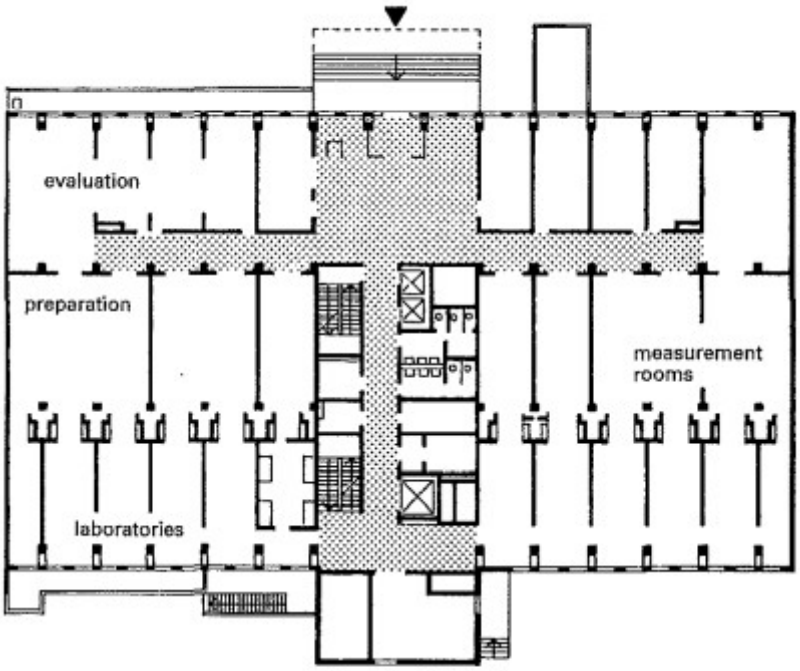
Isotope laboratories should have flat, non-porous ceiling and wall surfaces, rounded corners, be surrounded by lead and concrete, monitored waste water, and shower cubicles between laboratory and exit. Concrete containers for active residues or waste and concrete safes with lead doors etc. must be provided.

Weighing tables are part of every laboratory, and are normally installed in their own weighing room. The tables should be at the wall side of vibration-free walls.

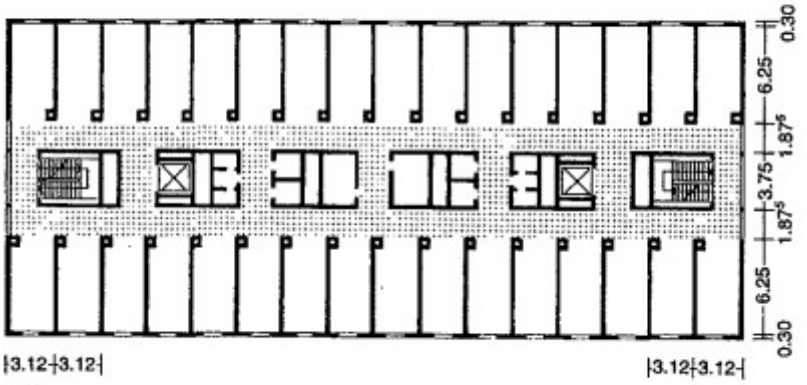
Services floors for plant are normally placed in the basement or on the top storey.



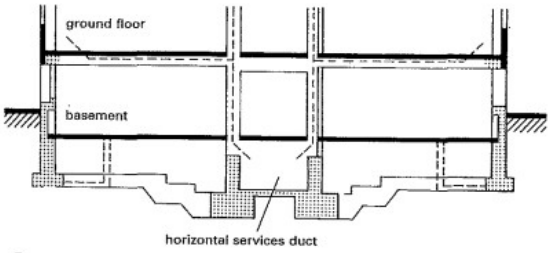
1 Part of the floor plan of cancer research centre, Heidelberg
Arch.: Heinle, Wischer u. Partner



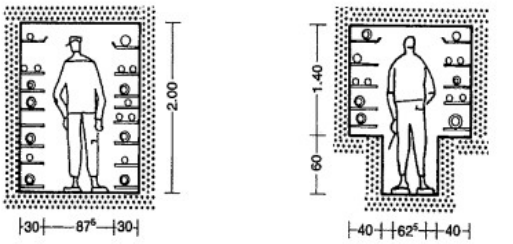
2 Analytical physics laboratory building (BASF Ludwigshafen)



3 Typical floor plan of an adaptable multi-purpose institute Arch.: W. Haake

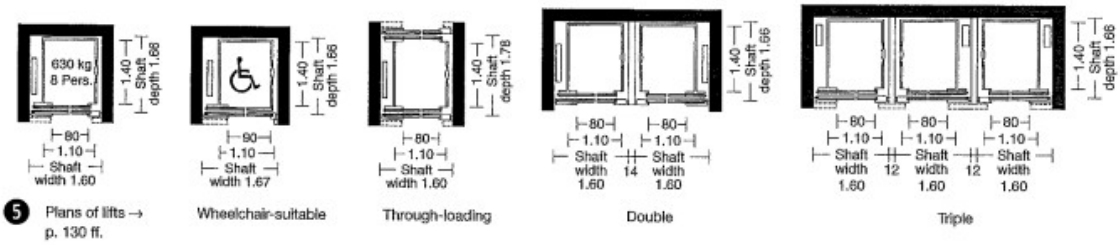


4 Cross-section of laboratory with well-placed central corridor



5 Main pipe duct (accessible): cross-section varies according to number of pipes

6.4. Lifts:

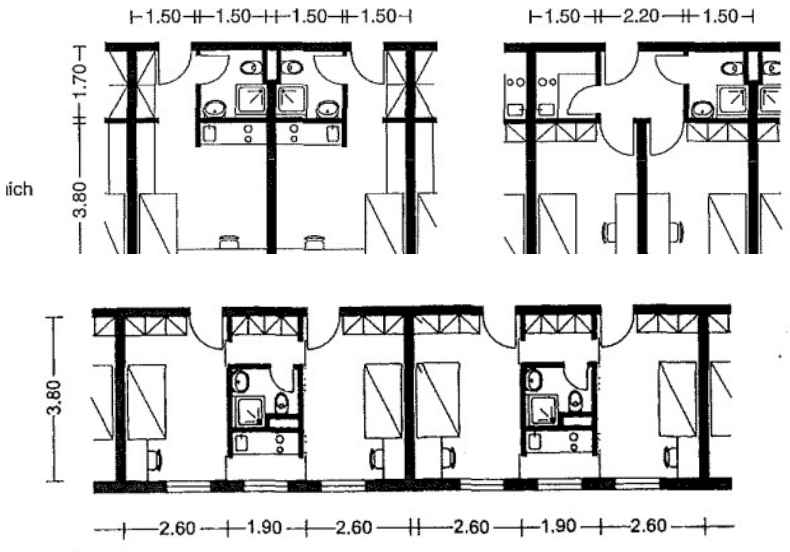


For all buildings, lifts should normally be positioned at the source of traffic flow. Provide sufficient space for waiting and queuing --+ p. 130 which must not infringe on stairs. Carefully plan the connection to the traffic routes. There are two different drive systems for lifts: I. Traction sheave drive (for cable lifts)--+ 0 2. Hydraulic lifts --+ f) - 0 Traction lifts: ideally have their drives above the shaft. The empty weight of the car and half the live load are balanced by the counterweight. Placing the drive at the top or at the bottom next to the shaft makes necessary additional pulleys, resulting in higher operating costs. The machinery and control system can be accommodated in a separate machine room or, in the case of lifts without a machine room, placed in the shaft --+ p. 134. With hydraulic lifts, a push cylinder is mostly used --+ f) - 0. The lifting cylinder can be arranged directly or indirectly. The arrangement of a direct cylinder inside a protective tube under the ground is no longer suitable because of the requirements for the protection of groundwater. The use of a pull cylinder --+ 0 B-D can be appropriate in some cases. A pull cylinder in its basic form balances a part of the weight of the car. This has even more effect with additional weights --+ 0 D, because the pump motor runs only when the load is lifted by the cylinder, while downward travel is enabled simply by opening the valve, which requires no energy and almost halves the consumption.

6.4.1. Student Residences:

Halls of residence are normally provided near colleges and universities for students and are normally built and operated in various architectural forms (20-30 units in courtyard layout or groups of open structures, large buildings with 80 or more units). They are used for the accommodation of students for the duration of their course. The size and equipping of the rooms is often very limited. Options such as single rooms, (double) flats and flat sharing groups have proved successful. The arrangement and design of the communal areas within and around the residences are decisive for their acceptance. Requirements Student flats are 'living places' and not considered as residential homes in the sense of the building regulations. The general requirements of the building regulations essentially concern residential rooms with minimum requirements for floor area (8 m2), ceiling height (2.40 m), orientation, ventilation and lighting (window area Ys of the room area), accessibility requirements (i.e. for disabled people) and escape routes (two independent escape routes from each floor, one of which is a legally essential stairway). The state guidelines for student residences set recommended dimensions for living places (approx. 12 m2 for single rooms and approx. 16 m2 for flats). In addition to this, a certain area will be required for communal use. Forms of living These can be categorised into flat sharing -> f) - 0 and individual rooms-> e- 0. When flats are shared, the communal area is of more importance, similar to a home. A group of rooms (4-8) with some functions transferred to the communal area (kitchen, bathroom) has a linear -> f) or central -> 8 type of layout. Single rooms located along a corridor with communal bathroom and kitchen form the classic (but anonymous) form of student residence. What has proved successful is the further

development of the single room as flat-> e (room with shower room and perhaps kitchenette) and the double flat -> 0 - 0 (two rooms with communal kitchen and bath).



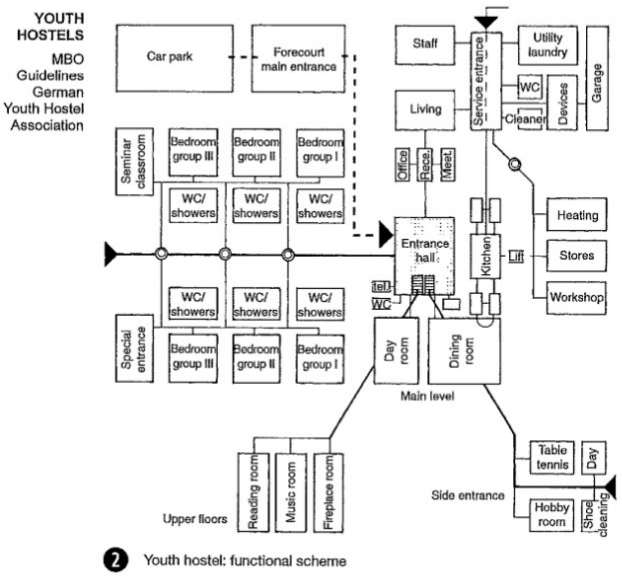
6 Double flat with communal bathroom, kitchen and cupboard zone

6.4.2. Youth Hostels:

Traditionally, youth hostels have offered reasonably priced accommodation for young people, youth groups and school classes, but the range of services of a modern youth hostel also includes meetings, courses, seminars, education of young people and adults, leisure facilities, school trips, and walking for singles and families. In rural areas, there are children's hostels (up to age 13) and youth hostels (13-17), and in towns there are youth guest houses offering tourist and cultural services. The tendency among youth hostels is towards the 3-star hotel standard --7 p. 172, with sizes of 120-160 beds. Functional areas Bedrooms in hostels consist of 4-6 (maximum 8) rooms in groups with a leader room (one bed, one folding bed as day couch), and in guest houses 2-4 bedrooms, leader/teacher accommodation 1-2 rooms with work area, family rooms with 4-6 beds; the trend is to separate rooms for parents and children. Boys and girls are separated, mostly allocated rooms starting from the head of a corridor with a number of dividing doors, which can be locked if required (for flexibility). Showers and washbasins connected to the rooms, separate WC (accessible for disabled people), lockable luggage store. Cleaning rooms on each floor and shoe store/ cleaning room. Lounge and meeting rooms: One room per 20-25 beds. Multiple dining rooms, multi-purpose areas with individual corners, cafeteria, lecture room, dining room also suitable for events, same number of places as beds, entrance hall/reception and office for the warden. Outdoor camping area (door to sanitary facilities), sports and games, parking for buses and cars, garden for the warden. Inside, separated noise zones for table tennis, hobbies and workrooms. Utility area: kitchen serving individual portions or group meals, serving trolleys, no self-service counter, utility room, staff lounge. Living areas: flat for the warden, bedrooms for staff, 12-15 m2• UK issues: Youth hostels, for financial reasons and because they are frequently located in sensitive surroundings, are often conversions of existing buildings. Consequently the UK Youth Hostels Association (YHA) is reluctant to impose definitive architectural guidelines. However, some are applied, especially regarding fire safety and space per bed.

Accommodation

1 (Traditional) bedding in youth hostels



2 Youth hostel: functional scheme

6.5. University creche:

Group room Most time in the children's daycare centre is spent here. Required floor area approx. 2.5 m2 per child. Create zones as varied as possible and design a second floor level and a stage (play-stage half-open, with a snug cave). Play decks up to a height of 1.50 m must have a handrail at least 70 em high; play decks more than 1.50 m high must have handrails min. 1.00 m high. The group room should have as short a distance as possible to the WC area. Ideally, provide direct access to the open air and align to the south.

Height recommendation	Washing facilities	WC, seat height
nursery	for every 10 children	
potty room	1, 45–60 cm	1, 20–25 cm
kindergarten	approx. for every 5 children	
potty room	1, 45–60 cm	1, 25–30 cm
after-school	approx. for every 10 children	
girls boys	1–2. 1–2 65–70 cm	1 1 30–35 cm

1 Height guidelines for washbasins and WCs

6.5.1. Auditorium:

In addition to the local building regulations, decisive for the design of theatres are the Places of Assembly Regulations of the relevant state. This is based on the Model Places of Assembly Regulations, which can vary in detail from those of a particular state! This legislation applies from 200 spectators. It should be noted that it is not the actual number of seating or standing places that counts: it is assumed that there are two spectators per m^2 in the place of assembly (for rows of seats; two spectators per running m for standing places).

Auditorium and stage/acting area

Size of auditorium: the number of people in the audience gives the required floor area. For seated spectators, assume ≧0.5 m^2/spectator. This number results from:

seat width × row spacing

	≧0.45 m^2	/seat
add ≧0.5 × ≧0.9	= 0.05	/seat
	≧0.50 → ❶	

Length of the rows of seats per aisle: 10 places → ❸ + ❺, 25 places per aisle if an exit door of 1.2 m width is available at the side per 3 or 4 rows → ❹

Exits, escape routes 1.2 m wide per 200 people → ❸ – ❺.

1% of the seats (at least two) must be accessible for wheelchair users, if possible in connection with a seat for an accompanying person.

Auditorium volume

This is determined by acoustic requirements (reverberation) → p. 221 as follows: playhouse approx. 4–5 m^3/spectator; opera house approx. 6–8 m^3/spectator. Air volumes must not be less for technical ventilation reasons, in order to avoid too rapid air changes (draughts).

Proportions of the auditorium

These are derived from the psychological awareness and angle of view of the spectator, or the requirement for a good view from all seats. Options are:

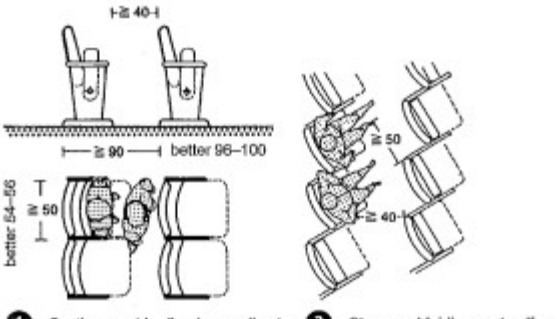
1. Good view, without moving head, but light eye movements of approx. 30°.
2. Good view with slight head movements and light eye movements of approx. 60° ❼.
3. Max. awareness angle without head movement approx. 110°, i.e. all actions in the field are 'in view'. Outside this field, there is uncertainty, because 'something' is out of view.
4. Full head and shoulder movement allows an angle of view of 360°.

Proportions of the classic auditorium

Opera, multi-purpose theatre, and traditional playhouse → ❼: distance of the furthest row from the start of the stage should not exceed: – playhouse, max. 24 m (max. distance for the recognition of facial expressions); opera, 32 m (large movements are still recognisable).

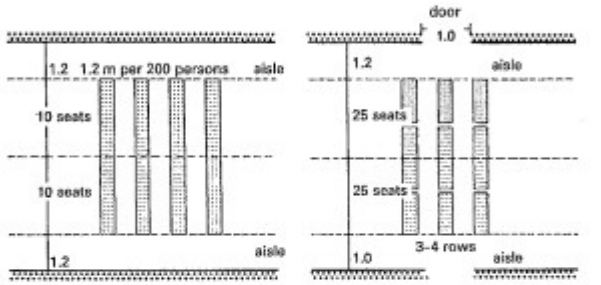
Auditorium width is determined by the spectators at the side being able to see the stage adequately → ❽. The comfortable proportions and sometimes good acoustics of the classic theatres of the 18th and 19th centuries are based on particular rules of proportion → ❾ – ❿.

In addition to the local building regulations, decisive for the design of theatres are the Places of Assembly Regulations of the relevant state. This is based on the Model Places of Assembly Regulations, which can vary in detail from those of a particular state! This legislation applies from 200 spectators. It should be noted that it is not the actual number of seating or standing places that counts: it is assumed that there are two spectators per m2 in the place of assembly (for rows of seats; two spectators per running m for standing places). Auditorium and stage/acting area Size of auditorium: the number of people in the audience gives the required floor area. For seated spectators, assume E":0.5 m2/ spectator. This number results from: seat width x row spacing add E":0.5 x E":0.9 E":0.45 m2 =0.05 E":0.50 -7 0 /seat /seat Length of the rows of seats per aisle: 10 places -7 0 + e, 25 places per aisle if an exit door of 1.2 m width is available at the side per 3 or 4 rows -7 0 Exits, escape routes 1.2 m wide per 200 people -7 0-e. 1% of the seats (at least two) must be accessible for wheelchair users, if possible in connection with a seat for an accompanying person. Auditorium volume This is determined by acoustic requirements (reverberation) -7 p. 221 as follows: playhouse approx. 4-5 m3 /spectator; opera house approx. 6-8 m3/spectator. Air volumes must not be less for technical ventilation reasons, in order to avoid too rapid air changes (draughts). Proportions of the auditorium These are derived from the psychological awareness and angle of view of the spectator, or the requirement for a good view from all seats. Options are: 1. Good view, without moving head, but light eye movements of approx. 30°. 2. Good view with slight head movements and light eye movements of approx. 60° 0. 3. Max. awareness angle without head movement approx. 110°, i.e. all actions in the field are 'in view'. Outside this field, there is uncertainty, because 'something' is out of view. 4. Full head and shoulder movement allows an angle of view of360°. Proportions of the classic auditorium Opera, multi-purpose theatre, and traditional playhouse -7 0: distance of the furthest row from the start of the stage should not exceed: - playhouse, max. 24 m (max. distance for the recognition of facial expressions); opera, 32 m (large movements are still recognisable). Auditorium width is determined by the spectators at the side being able to see the stage adequately -7 G. The comfortable proportions and sometimes good acoustics of the classic theatres of the 18th and 19th centuries are based on particular rules of proportion -7 0 - GD.



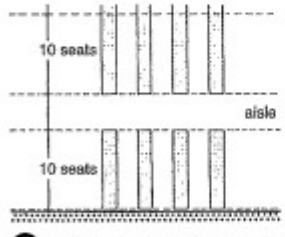
1 Seating must be fixed according to Places of Assembly Regulations. Minimum dimensions are not adequate for theatres!

2 Staggered folding seats offer freedom for elbows

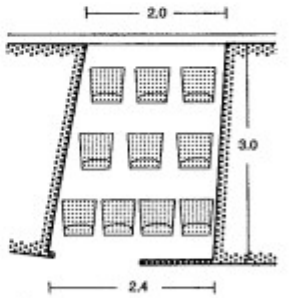


3 Row width 20 places

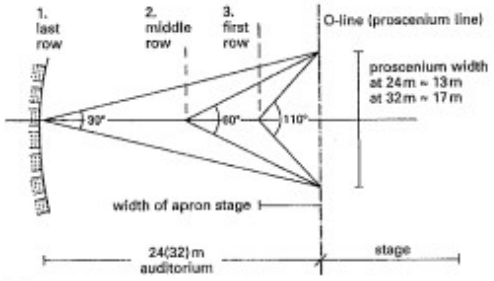
4 Row width 25 places, door needed



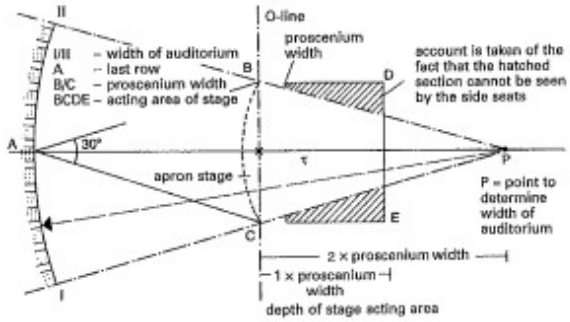
5 Row width max. 10 places, side aisle at left and right



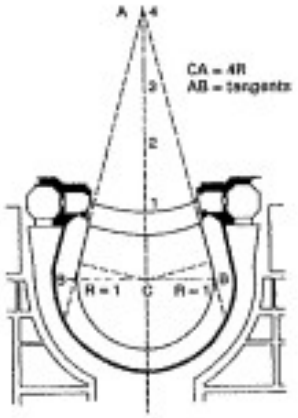
6 Boxes may have ≦20 loose chairs, or fixed seating if necessary; per person ≧0.65 m² floor area



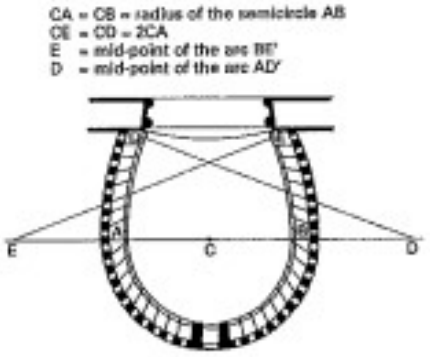
7 Proportions of traditional auditorium plan



8 Auditorium width



9 Design of auditorium's contour,
Grand Théâtre, Bordeaux
Arch.: Victor Louis 1778



10 Design of the auditorium's curve,
Teatro alla Scala, Milan.
Arch.: Piermarini

6.6. Seating

The elevation (gradient) of the seating in the auditorium is derived from the sight lines. The sight line construction applies for all places in the auditorium (stalls, but also tiers) → ❶. It can be assumed that the spectators sit sensibly and so only every second row requires full sight super-elevation (12 cm). Specialised mathematical literature addresses problems of view in the theatre, including, for example, the distribution of people's heights.

Rows of spectators should be positioned in arcs, not only for better alignment toward the stage, but also to achieve a better perception of each other (security effect) → ❹. The stepped side aisle must rise 10–19 cm and the tread must not be less than 26 cm. The floor between the seats must be on the same level as the adjacent aisle at the side.

Overall layout of the auditorium
Firstly, determine the height of the proscenium. In stalls theatres, the relationship should be:

$$\frac{\text{proscenium height } 1}{\text{proscenium width } 1.6}$$

This derives from the golden section and the physiological field of awareness, respectively → ❺. After determining the proscenium height, the ramp height, the pitch of the stalls and the volume of the room, this gives the room height. The ceiling is to be adapted for acoustic requirements. It should be the case that the noise reflected from the stage and apron is distributed evenly over the room → ❼.

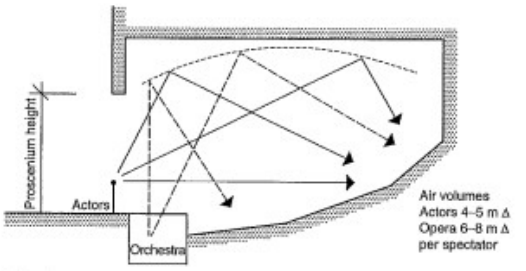
For tiers, it is important that there is also a sufficiently deep view of the stage from the uppermost level → ❻. This may render it necessary to make the proscenium higher.

Proportions of an experimental space → p. 213
These are neutral or open theatre spaces, which permit different arrangements of spectators and stage areas. This variable arrangement is achieved through:

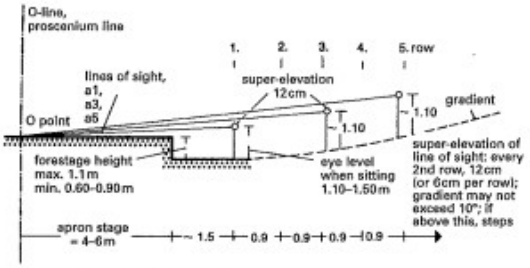
A. Mobile stage platforms and mobile stands for the audience on a fixed floor.
B. Mobile sections of floor, which consist of moveable podiums. This solution is technically more elaborate and is therefore used only in larger spaces for min. 150–450 or more people.

The simpler option A is particularly suitable for smaller theatres and for unused spaces, which normally do not have extensive space underneath. Size: up to max. 199 places, because the regulations apply from 200.

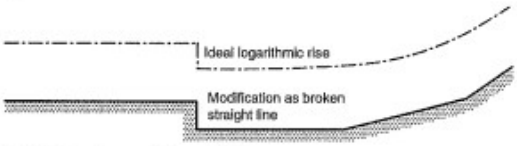
199 seats × 0.5 m² = 100 m² (2/3) + 30 m² (1/3) stage area = 130 m².



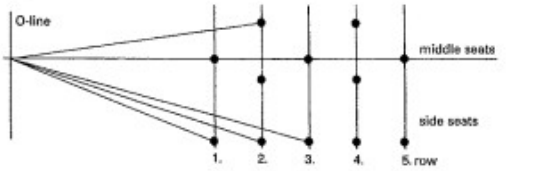
❼ Acoustics must be adapted through appropriate measures like ceiling shape or acoustic 'sails' → p. 220



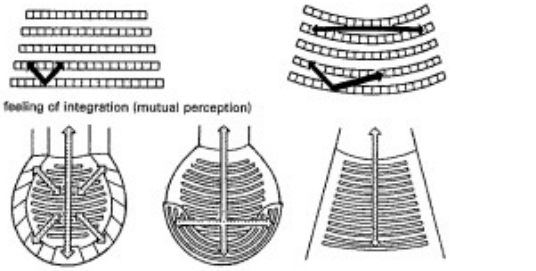
❶ Elevation of seating (gradient)



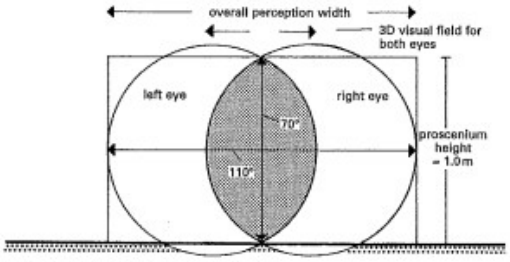
❷ Gradient curve and its modification



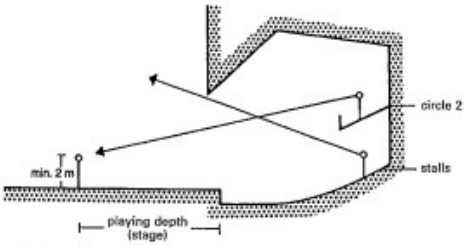
❸ Offsetting of the seats in a row is achieved through variable seat widths (0.50–0.53–0.5



❹ Contact relationship between the audience and the stage and with each other

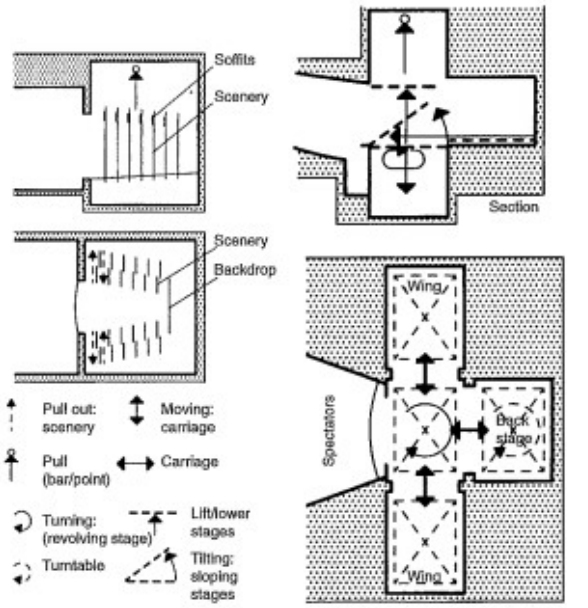


❺ Field of perception and proportions of the proscenium arch



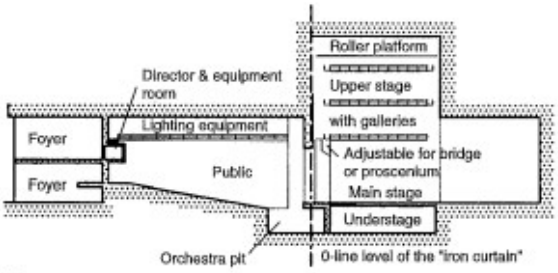
❻ Tiered theatre and view of stage

6.7. Stage

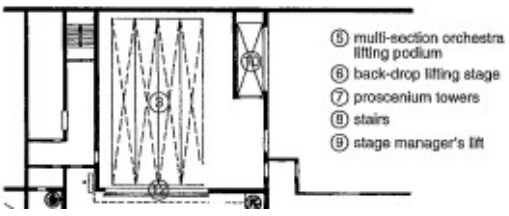


❶ Backdrop theatre: change of scene by pushing the painted scenery

❷ 'Peephole' single-room stage. Large wing and rear stage areas enable the quick changing of scenery structures



❸ System section of theatre



Scenery stage
The classical stage system of the 18th and 19th centuries had only the main stage; the scenes were changed, in little space and with uncanny speed, using sliding painted scenery. A small rear stage had the function of providing room for deeper stage perspectives → ❶.

Full stage
In order to be able to quickly change more elaborate and sculptural scenery structures, stages were supplemented by wings and under-stages of about the same size. Complete sets of scenery were mounted on wagons, lifting platforms or turntables and could be prepared with little effort during the performance → ❷.

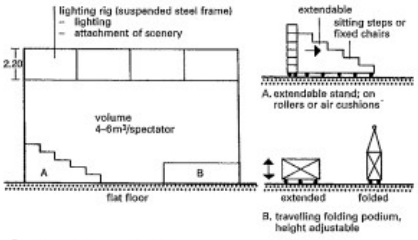
For design purposes, the technical constraints must be established early, e.g. whether a turntable on a wagon is sufficient or whether a turntable with single lifting elements or even a two-level turntable should be used.

Proportions of the stage
The proportions of the stage are developed from the sight lines in the auditorium. The stage is the area for acting and also a handling and working area. The conventional layout of a traditional full stage → ❸ – ❹.

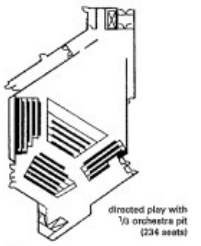
The mobile scenery surface is formed by platforms of adjustable height or through lifting platforms. The variability of form is achieved by splitting the surface into separate flats. Basic module 1 × 2 m.

Section of stage
The size of the stage space is determined by the number of scenery sets to be kept ready, which can be moved into the stage quickly by lifting or pushing. At least one rear space and one wing are usual. The height of the stage space is determined by the (iron) safety curtain, which must be able to close the fire compartment between auditorium and stage within 30 s in case of fire. It is a complete closure joined at the ends to a fire wall (F90) and no cables or scenery are permitted in the space for the safety curtain.

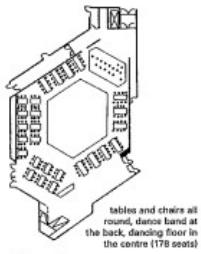
Stage direction room
Control of lighting and sound on stage, with sound mixing desk, light controls, computer connections and projection equipment → ❸.



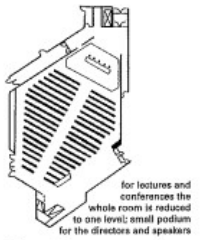
❶ Experimental theatre space



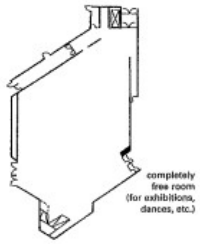
❷ Space variants, at the Münster City Theatre, Kleines Haus



❸ → ❷



❹ → ❷



❺ → ❷ Arch.: v. Hausen, Rawe, Ruhnau

Size of stage
The Places of Assembly Regulations, which apply to all venues with audiences of more than 200, differentiate two types of stage: large stage and open stage (single-room theatre).

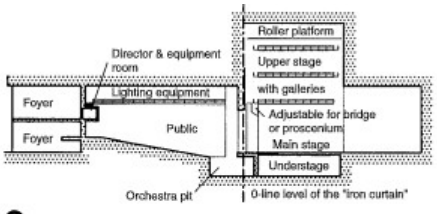
Large stage
Large stages are defined as having a stage area of more than 200 m² behind the stage opening and with an upper stage of 2.5 m height above the stage opening or an apron. The essential requirement is the fire-resistant separation of stage and auditorium. This necessitates an iron protection curtain between the stage and the auditorium in case of danger.

Open stage
Open stages are divided into those with more or less than 200 m² and those with or without sprinkler systems. The special feature of open stages is the regulations about curtains and scenery. These affect above all the operation and not the design of the open stage.

Spaces for experimental forms of theatre (black box theatres) can abolish the separation of stage and audience in various ways through differentiated design of the floor topography (mobile sections of floor or podiums) and the free distribution of audience area and stage. Example: Playhouse on the Lehniner Platz, Berlin → ❽ – ❾.

Section of the room for single-room (black box) theatres
Single rooms can make do without the technical ceiling → ❶, but manual lifting devices can be provided (battens, which are lifted into the ceiling with manual hoists). In large theatres, a smaller, more variable space is often included for experimental theatre. Examples: Podium Ulm, Arch:. Schäfer, approx. 150–200 places, 1969 → ❻ + ❼; Kleines Haus Münster, Arch:. v. Hansen, Rane, Ruhnau, 1971, 180–380 places, central field of the floor can be varied with mobile podiums → ❷ – ❺.



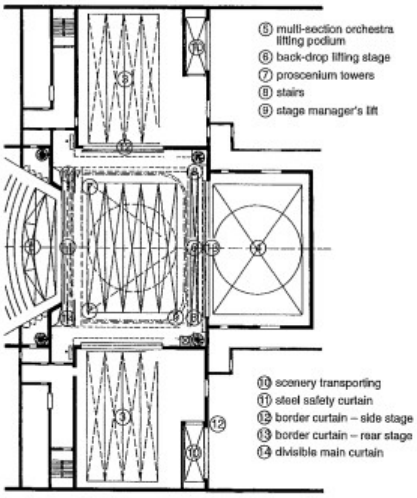


❸ System section of theatre

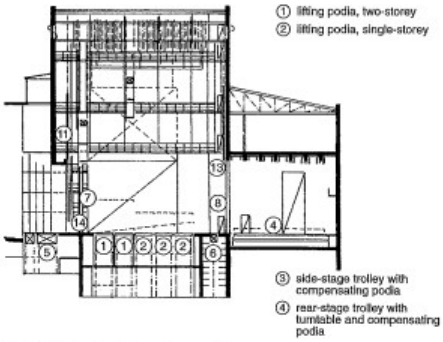
The mobile scenery surface is formed by platforms of adjustable height or through lifting platforms. The variability of form is achieved by splitting the surface into separate flats. Basic module 1 × 2 m.

Section of stage
The size of the stage space is determined by the number of scenery sets to be kept ready, which can be moved into the stage quickly by lifting or pushing. At least one rear space and one wing are usual. The height of the stage space is determined by the (iron) safety curtain, which must be able to close the fire compartment between auditorium and stage within 30 s in case of fire. It is a complete closure joined at the ends to a fire wall (F90) and no cables or scenery are permitted in the space for the safety curtain.

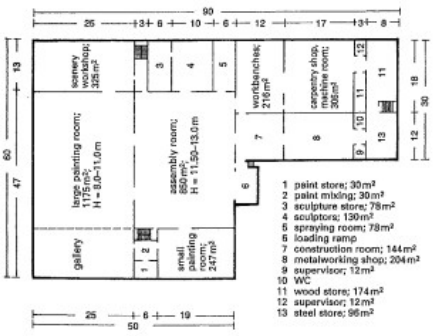
Stage direction room
Control of lighting and sound on stage, with sound mixing desk, light controls, computer connections and projection equipment → ❸.



❹ Typical plan of opera house

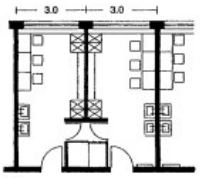


❺ Typical section of opera house → ❹

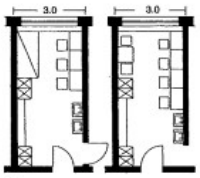


❶ Workshop building, ground floor

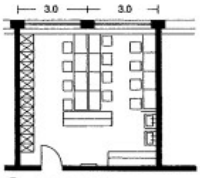
Arch. + Techn.: Biste u. Gerling



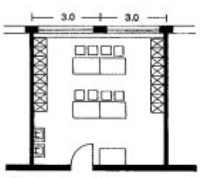
❷ Soloist dressing room ≧3.8–5 m²/person



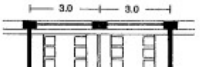
❸ Soloist dressing room ≧5 m²/person



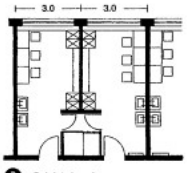
❹ Chorus dressing room ≧2.75 m²/person



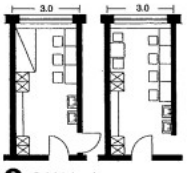
❺ Dressing and tuning-up room for orchestra players ≧2 m²/person







❷ Soloist dressing room ≧3.8–5 m²/person



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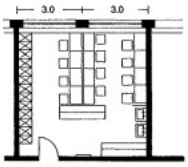

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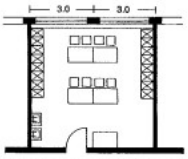
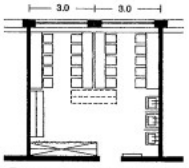
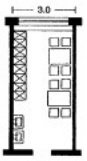


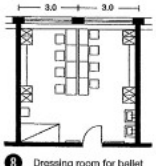
❺ Dressing and tuning-up room for orchestra players ≧2 m²/person



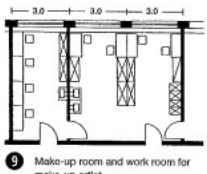
❻ Dressing room for additional chorus and/or extras ≧1.65 m²/person



❼ Changing and rest room for technical staff



❽ Dressing room for ballet group ≧4 m²/person



❾ Make-up room and work room for make-up artist

Workshops for production of scenery

The area required for scenery workshops is 4–5 times the main stage area for medium-sized theatres (theatres and multi-purpose theatres); in large opera houses or double theatres (opera and theatre), 10 times. Workshops, in or outside the building, should always be accommodated on one level. The Workplace Regulations and their technical rules and the work protection and accident prevention rules of insurers have to be taken into account in the design. In some cases, the company and collective agreements with the employees can also have an effect.

Scenery workshops are categorised as follows:

a) Painting room:

The floor area must be designed to accommodate two large backdrops or 'cycloramas' (Rundhorizonte – curved backdrops) rolled out on the floor for painting. The average size of a cyclorama is 10 × 36 m. It must be possible to sub-divide the room with a thick curtain for spraying work. Also required are underfloor heating to dry the painted backdrops; wooden floors for spreading out the canvases; a gallery from which to check the work lying on the floor. The painting room is located next to the sewing room (with a size about ¼ of the painting room) joining the pieces of material.

b) Carpenter's shop:

Divided into bench and machine rooms, it has wooden floors and an adjoining timber store for 3–10 productions.

c) Upholstery: approx. 1/10 area of painting room.

d) Metalwork: as carpenter's shop, screeded floor.

e) Sculpture workshop.

f) Workshops should be grouped round an assembly room, which serves to test-assemble the scenery and has the same floor area as the stage. The height should be proscenium plus 2 m, diameter 9–10 m.

g) Changing, washing, and rest (canteen) rooms are to be provided for technical staff, and offices for the technical management. Further workshops for sound, lighting, props and costumes, size as required (production intensity, personal equipment).

Personnel rooms

Artistic staff, stage manager, administration. Historically, personnel rooms were situated on both sides of the stage: left, ladies, right, gentlemen, although this was operationally impractical. Today, these rooms are located on one side, opposite the technical side on several floors. This includes make-up, frequently also the costume workshop, administration and stage manager.

Dressing rooms: → ❷ – ❾ typical floor plans.

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Dressing rooms: → ❷ – ❾ typical floor plans.

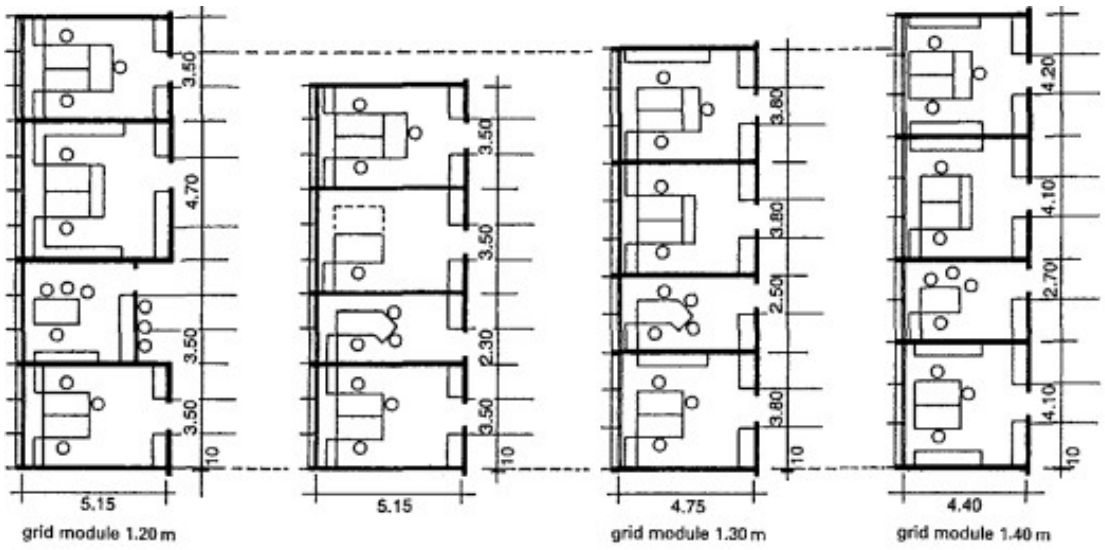
Visitors	Sanitary facilities
for 30–40 female visitors	1 WC, 1 washbasin
for 40–50 male visitors	1 WC, 2 urinals, 1 washbasin
for 1000 visitors	1 wheelchair WC, accessible
Theatre and opera performers incl. chorus, ballet and extras	
for 10 female performers	1 WC
for 15 male performers	1 WC, 2 urinals
for room for 1 soloist	1 washbasin
for dressing rooms for 2 soloists	1 washbasin, 1 shower
for the soloist dressing rooms[1] together	2 baths
for every 4 ballet, chorus member or extra[1]	2 washbasins, 1 shower
for the ballet[1]	2–4 foot washbasins
Staff of workshops etc.	
for 15 women	1 WC
for 20 men	1 WC, 2 urinals
for 4 people[1]	1 washbasin
for 5 people[1]	1 shower
for 10 people[1]	1 bath

The composition of the visitors is assumed to be 3/5 women and 2/5 men.

[1] The facilities are to be provided separately for women and men.

❿ Guidelines for sanitary facilities in theatres

6.8. Office Building:



❸ Possible uses for various window axis dimensions

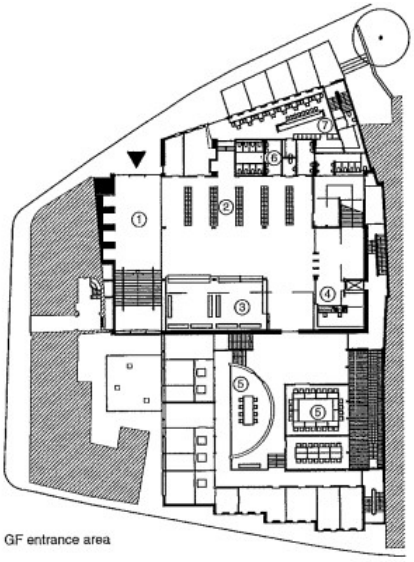
Open-plan office: A form of office developed in the 1960s and 1970s of the last century. Large-scale office landscapes with 100 or more workstations are made possible by artificial lighting and ventilation; they stand for free communication and openness. Economical cubic structures, however, have the disadvantage of high maintenance costs. This form is not very popular among users → ❸.

Group office: The experience with the open-plan layout led to the development of group offices with approx. 4–16 workstations; each office is used by a single team or department. This arrangement is preferred above all for creative, design or coordination and development activities with high internal communication needs. → ❷

Libraries:

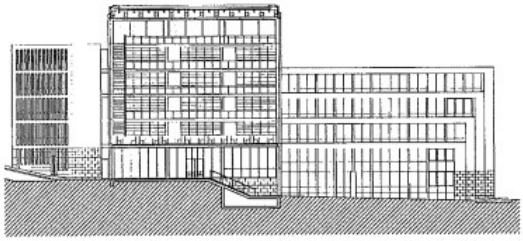
University libraries These are single- or two-storey buildings: single-storey systems are centrally administered (book processing and services) and mostly have at least a few separate user areas in branch or specialist libraries. Two-storey libraries include a central library and an (often larger) number 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.

library concept, and often also the space available in existing buildings.



GF entrance area

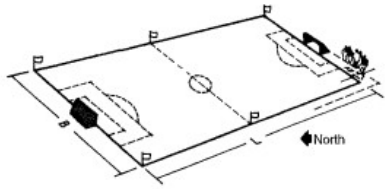
① Main entrance
② Lockers
③ Waiting area
④ Staff/supervision
⑤ Exam room
⑥ WC
⑦ Café, accessible from outside
⑧ Reading places
⑨ Bookshelves
⑩ Computer places



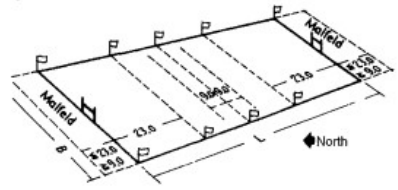
① Juridicum Halle: specialist law library, Halle University, Wittenberg

② Juridicum Halle, section Arch.: Thomas van den Valentyn, Gernot Schulz

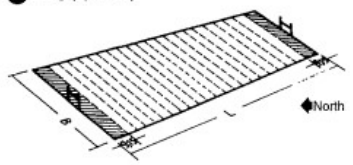
6.9. Sports facilities



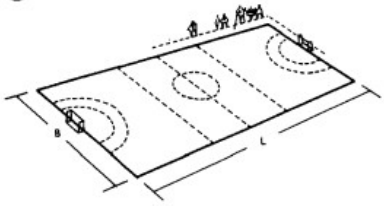
① Football



② Rugby (German)



③ American football, goals 5.50 × 3.05 m

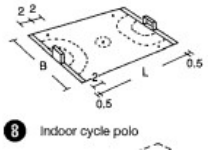


④ Handball

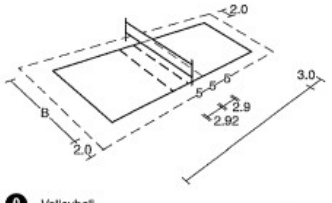
SPORTS FACILITIES

Playing Areas

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	40–91 × 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



⑧ Indoor cycle polo

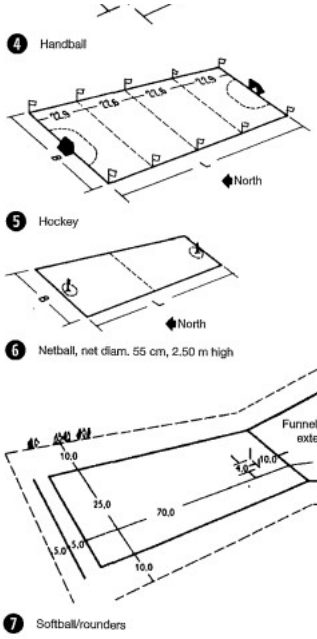


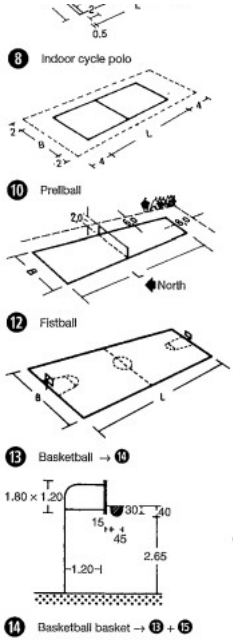
⑨ Volleyball

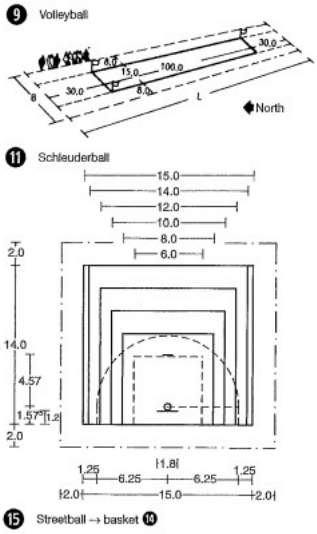


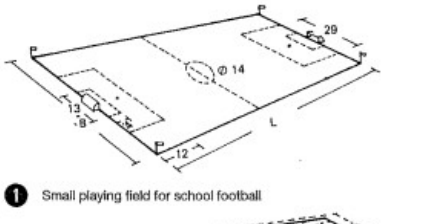
SPORTS FACILITIES

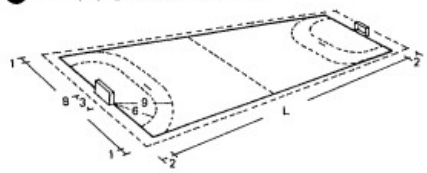
Playing areas
Athletics
Tennis
Miniature golf
Golf courses
Water sport, marinas
Water sport, rowing and canoeing
Equestrian sport
Ski jumping
Ice rinks
Roller skating rinks
Speed roller skating, skateboarding
Cyclo-cross, BMX
Shooting ranges

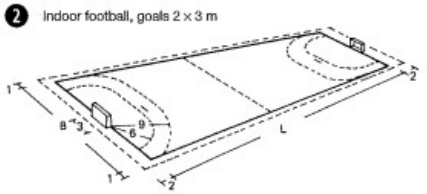


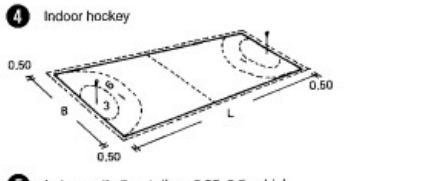


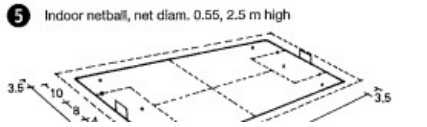










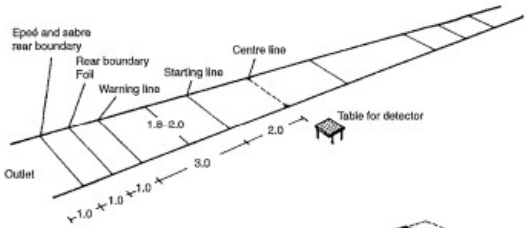


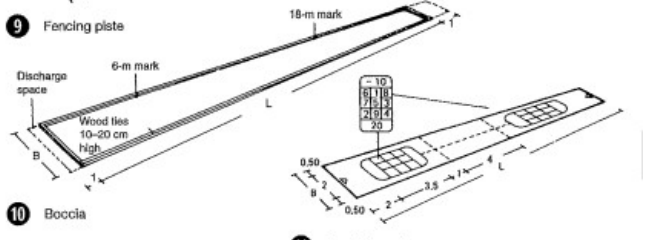
SPORTS FACILITIES

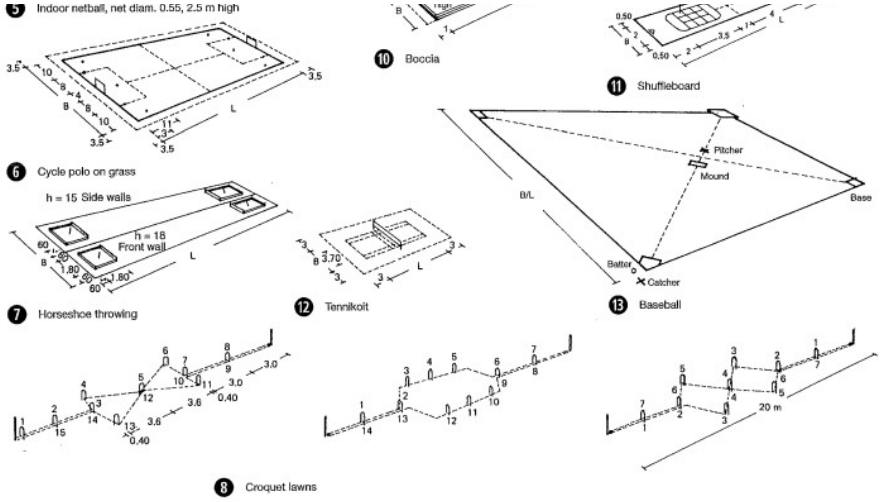
Playing Areas

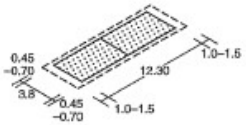
Playing area size (m)						
Game	max.		min.		Standard dimensions[1]	
	L	W	L	W	L	W
1 School football	70	40	40	20	44	22
2 Indoor football	50	25	40	20	44	22
3 Indoor handball	—	—	—	—	44	22
4 Indoor hockey	40	20	36	18	44	22
5 Indoor netball	60	25	64	27	—	—
6 Cycle polo on grass	—	—	—	—	60	40
7 Horseshoe throwing	15	3	12	3	—	—
8 Croquet	—	—	—	—	20	4
9 Fencing piste	24	2	13	1.80	—	—
10 Boccia	—	—	—	—	24	3
11 Shuffleboard	—	—	—	—	17	3
12 Tennikolt	12.20	5.50	—	—	18.20	11.50
13 Baseball	—	—	—	—	18.29	18.29

[1] including safety margin

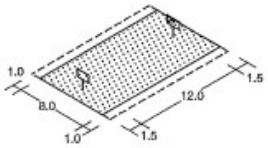




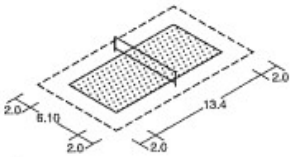




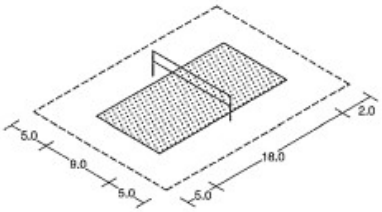
1 Beachminton



2 Beach basketball



3 Beach badminton (competitive)



4 Beach volleyball (competitive)

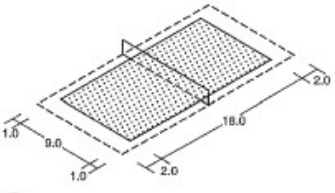
SPORTS FACILITIES

Playing Areas

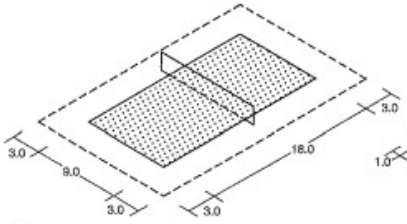
Beach sport type	Competitive sport				Leisure sport				Net	Goal/basket	Sports hall
	Size of playing area (m)	Free space around sides (m)	Free space around ends (m)	Total area (m)	Size of playing area (m)	Free space around sides (m)	Free space around ends (m)	Total area (m)	Height (m)	W = width H = height (C) = competition (m)	Clear height (m)
Volleyball	18.00 × 9.00	5.00	5.00	28.00 × 19.00	18.00 × 9.00	3.00	3.50	25.00 × 1500	2.24 F 2.43 M	—	reg >5.50 nat >7.00 int >12.50
Football ('professional')	36.00 × 28.00	1.00	2.00	40.00 × 30.00	—	—	—	—	—	W=7.32 (C) H=2.44 (C)	—
('amateur')	31.00 × 25.00	1.00	2.00	35.00 × 27.00	—	—	—	—	—	W=5.00 (C) H=2.00 (C)	—
	—	—	—	—	27.00 × 12.00	1.50	1.50	30.00 × 15.00		W=3.00 H=2.00	—
Football tennis	—	—	—	—	18.00× 9.00	1.00	2.00	22.00 × 11.00	1.30	—	—
Sepak takraw	18.00 × 9.00	2.00	2.00	22.00 × 13.00	12.00 × 6.00	2.00	2.00	16.00 × 10.00	1.10	—	—
Handball	27.00 × 12.00	3.00	3.00	33.00 × 18.00	27.00 × 12.00	1.50	1.50	30.00 × 15.00	—	W=3.00 H=2.00	—
Badminton	13.40 × 6.10	2.00	2.00	17.40 × 10.10	13.40 × 6.10	1.50 exceptionally. 0.30	2.00 exceptionally 1.30	16.40 × 10.10	1.55	—	reg >7.00 nat >7.00 int >9.00
Beachminton	12.30 × 3.80	0.45 0.70	1.00 1.50	14.30 × 4.70 15.30 × 5.20	12.80 × 3.80	0.30	0.35	13.00 4.40	1.28	—	reg >5.20 nat >6.50 Int >9.00
Basketball	12.00 (basket spacing)	—	—	—	15.00 × 8.00	1.00	—	15.00 × 10.00	—	12.00 (basket spacing)	—
Tennis (single court)	18.00 × 9.00 18.00 × 6.00	3.00 3.00	3.00 3.00	24.00 × 15.00 24.00 × 12.00	18.00 × 9.00 18.00 × 6.00	300 300	3.00 3.00	24.00 × 15.00 24.00 × 12.00	1.50 1.50	—	reg >7.00[1] nat >9.00 int >9.00
TAMbeach (single court)	24.00 × 11.00 24.00 × 7.50	1.00 1.00	2.00 2.00	28.00 × 13.00 28.00 × 9.50	18.00 × 9.00 18.00 × 6.00	1.00 1.00	2.00 2.00	22.00 × 11.00 22.00 × 8.00	2.10 to 2.15	—	—

[1] Regional leisure sport can take place from a hall height of 5.50 m

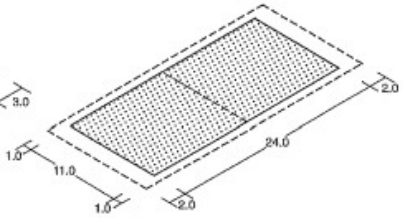
7 Dimensions of beach playing areas



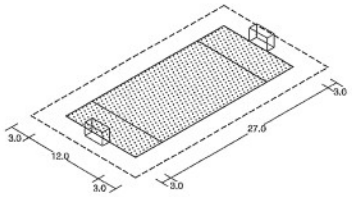
5 Beach football tennis



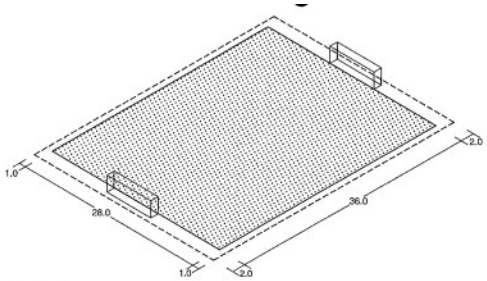
8 Beach tennis (doubles)



9 TAMbeach (competitive)



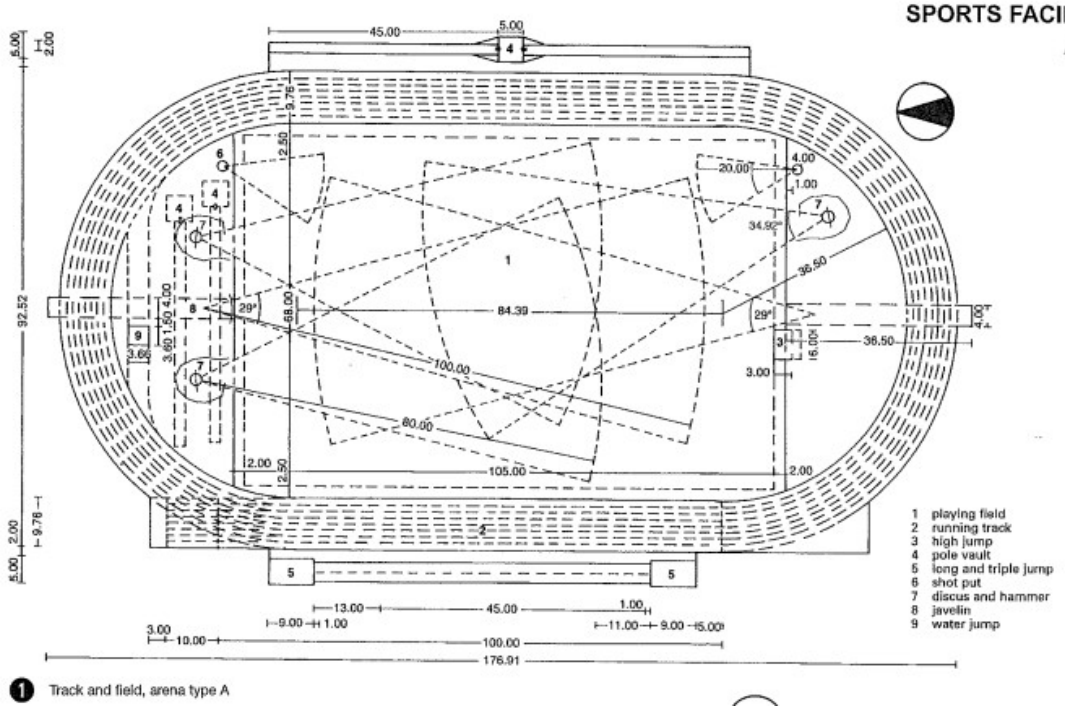
6 Beach handball (competitive)



7 Beach soccer

SPORTS FACILITIES

Athletics

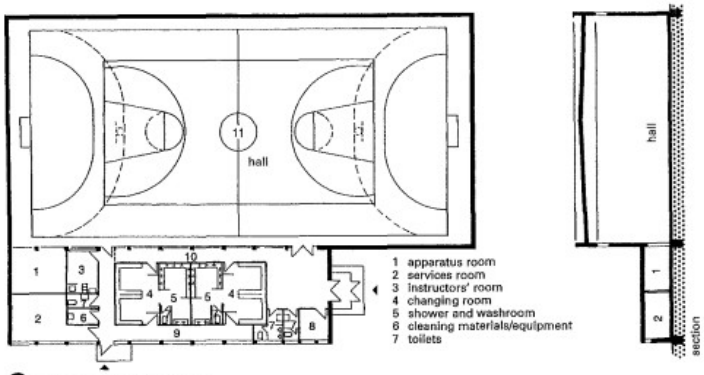


1 playing field
2 running track
3 high jump
4 pole vault
5 long and triple jump
6 shot put
7 discus and hammer
8 javelin
9 water jump

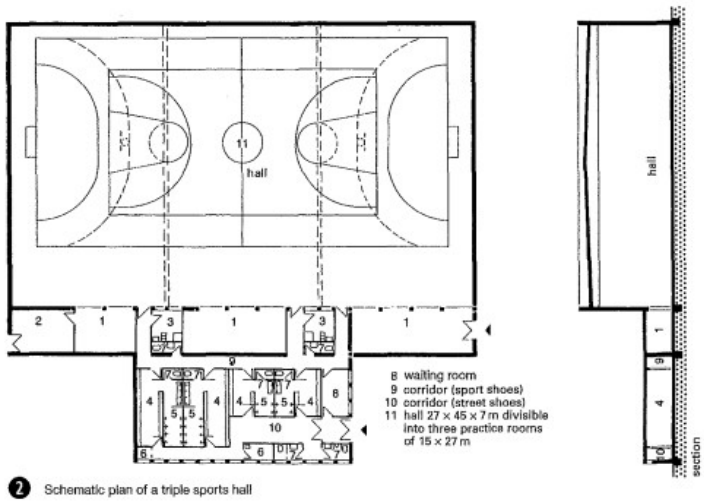
1 Track and field, arena type A

SPORTS HALLS

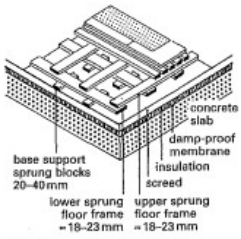
Layout, Construction



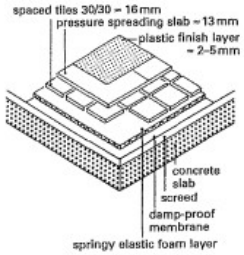
1 Schematic plan of sports hall



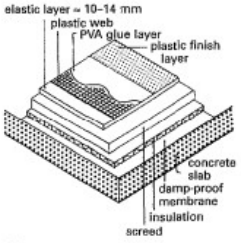
2 Schematic plan of a triple sports hall



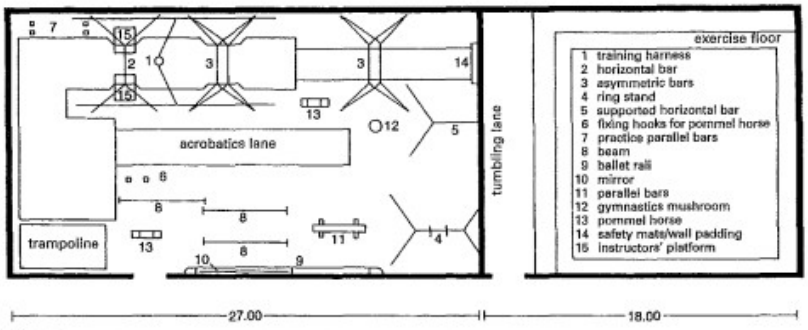
7 Sprung floor construction



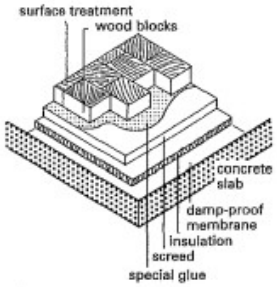
8 Flexible floor construction



9 Impact-absorbing floor construction

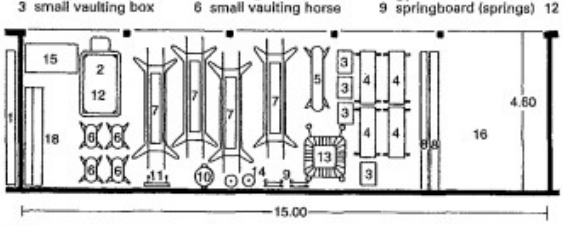


3 Gymnastic apparatus hall 15 × 27 m with floor gymnastics hall 15 × 18 m

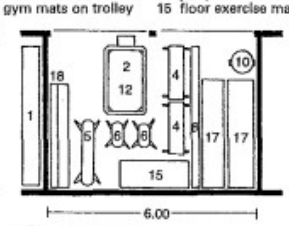


10 Construction detail for wood-block flooring – laid rectangularly with surface treatment

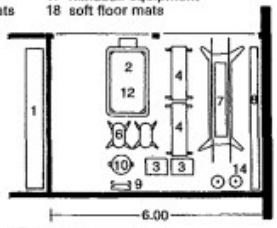
1 equipment cupboard
2 trolley
3 small vaulting box
4 large vaulting box
5 vaulting horse
6 small vaulting horse
7 parallel bars
8 gym bench
9 springboard (springs)
10 magnesia holder
11 handstand bars
12 gym mats on trolley
13 small trampoline
14 jump stands
15 floor exercise mats
16 area for additional apparatus
17 handball equipment
18 soft floor mats



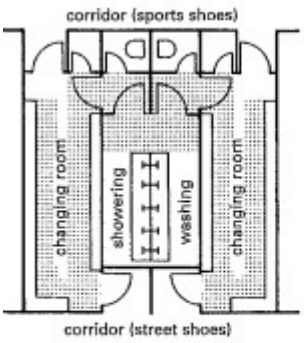
4 Arrangement plan for large equipment in the apparatus storeroom of a 15 × 27 m sports hall



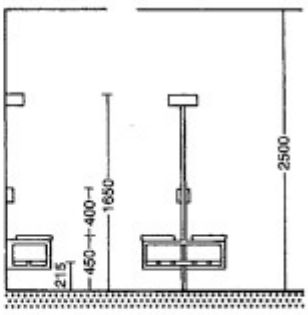
5 Equipment room



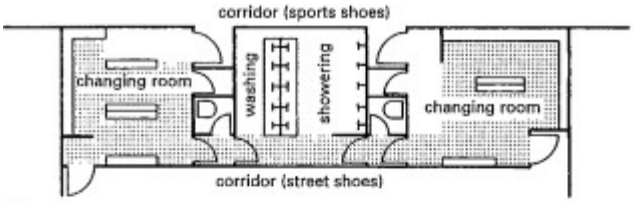
6 Equipment room



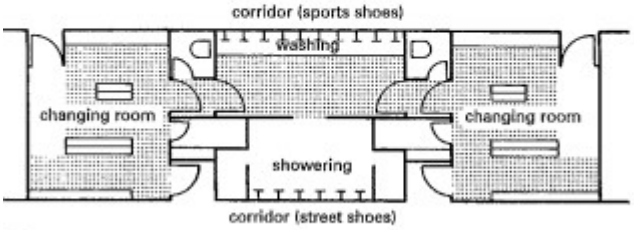
9 Example 1



10 Cloakroom seating as wall-mounted and double bench

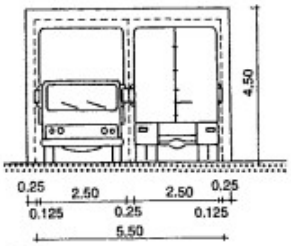


11 Example 2

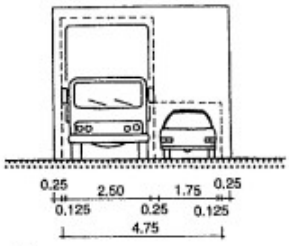


12 Example 3 Three proposed solutions for the changing and sanitary facilities (shaded: floor areas laid with PVC grid mats)

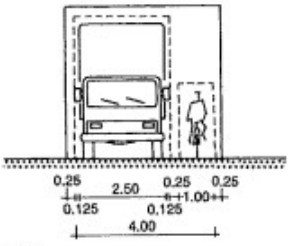
Space required at reduced speed (≦40 km/h)



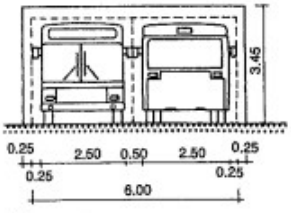
10 Truck/truck



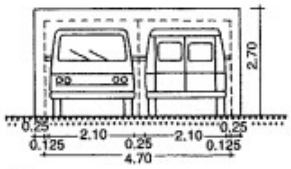
11 Truck/car



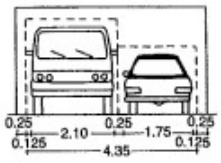
12 Truck/bicycle



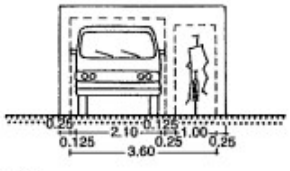
13 Bus/bus



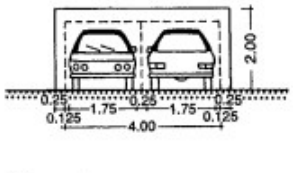
14 Van/van



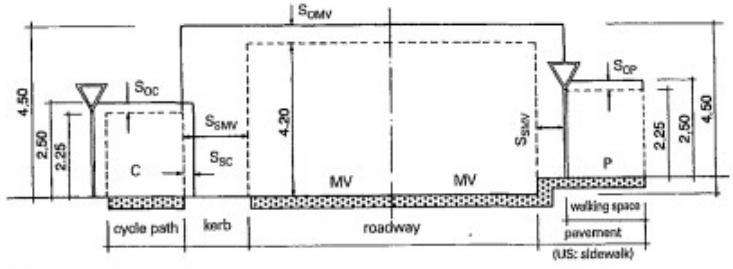
15 Van/car



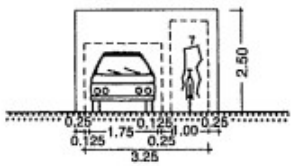
16 Van/bicycle



17 Car/car

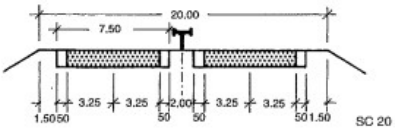


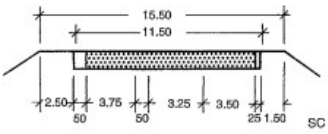
18 Dimensions of clear space/traffic space for vehicles

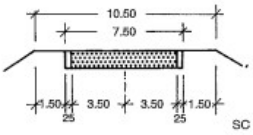


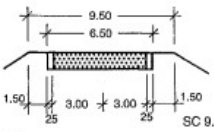
19 Car/bicycle

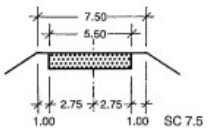
6.10. Inter Urban Road



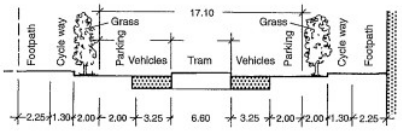




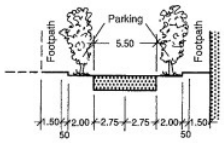




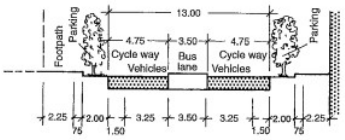
1 Standard cross-sections (SC) for roads without adjacent buildings



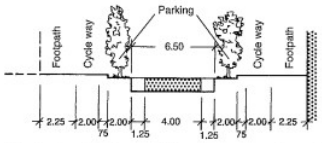
2 Pedestrian and cyclist area separated from road and parking by grass strips; tram on its own track bed



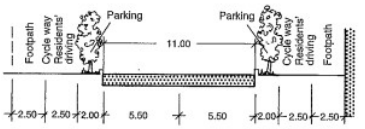
3 Feeder road, carriageway designed for encounters of trucks with reduced speed; drivable side strip in case larger vehicles meet



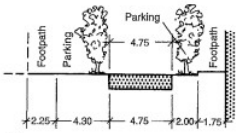
4 Cycle way near the road has advantage at crossings; bus lane in middle of road



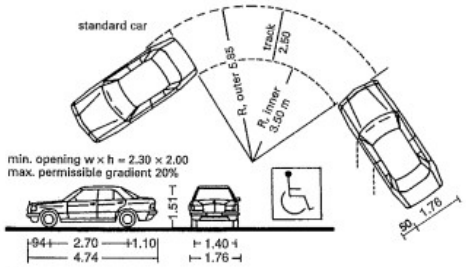
5 Feeder road, carriageway designed for encounters of cars with reduced speed; drivable side strip in case larger vehicles meet



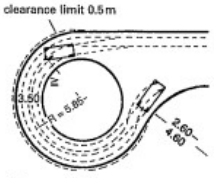
6 Extra-wide road, which can be driven in four lanes, with the parking strips physically separated from the road. They can be accessed across the lanes for cyclists and adjacent residents.



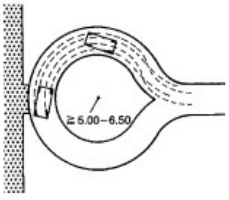
7 Road for residents, designed for the reduced speed car/truck encounter; parking strips parallel and at right angles to the road



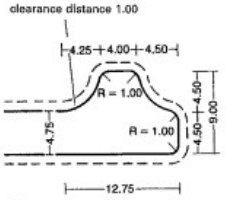
1 Standard car



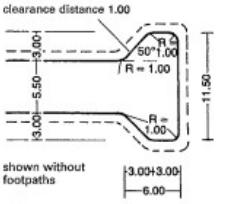
2 Turning circle of a car



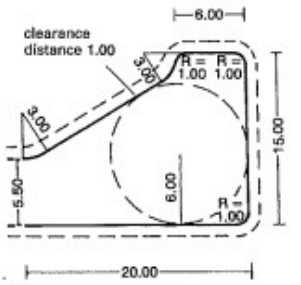
3 Entrance drive, car turning circle radius ≥5–6.50 m



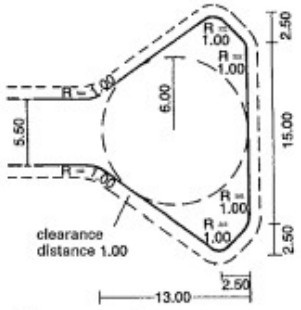
4 Hammerhead turning place for cars



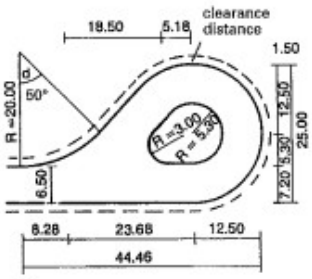
5 Hammerhead turning place for cars and HGVs up to 8 m length (refuse collection vehicle, fire engine, HGV 6 t)



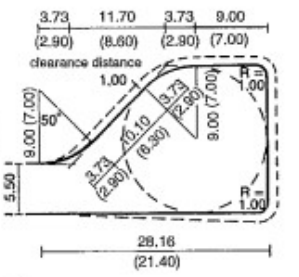
6 Turning place for HGVs up to 10 m and 22 t (3-axle refuse collection vehicle)



7 Variant of 6

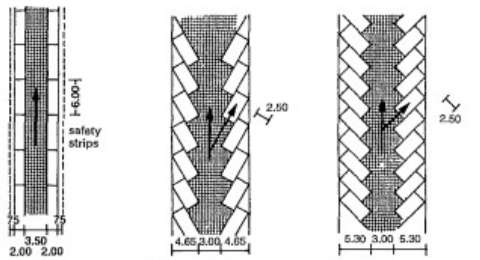


8 Turning loop for HGVs with trailer and articulated buses



9 Turning circle for 2-axle refuse collection vehicle (r = 9) or for vans (r = 7), values in brackets

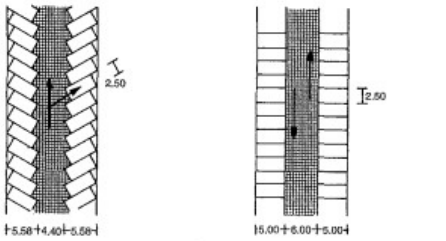
6.11. Parking



1 Parking parallel to the road

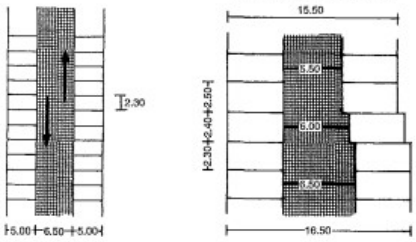
2 30° oblique parking and exiting is simple, but one-way traffic only

3 45° oblique parking, one-way traffic only



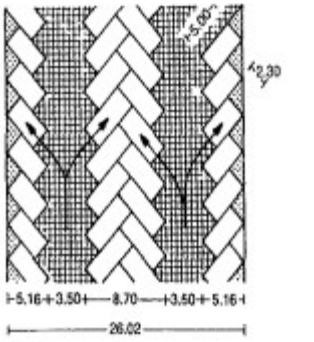
4 60° oblique parking, one-way traffic only

5 90° parking and exiting is possible in both directions. Access width 5.50 m for increased manoeuvring

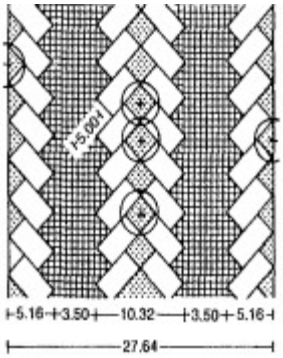


6 90° parking and exiting is possible in both directions. Parking space width 2.30 m

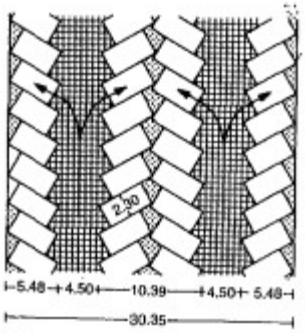
7 Parking spaces and access widths



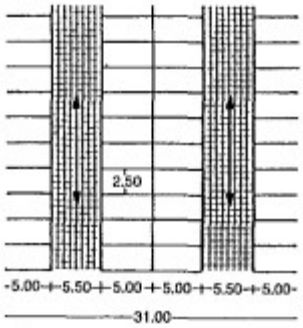
8 45° parking, one way traffic only



9 Parking, one way traffic only (leav space for planting)



10 60° parking, one way traffic only

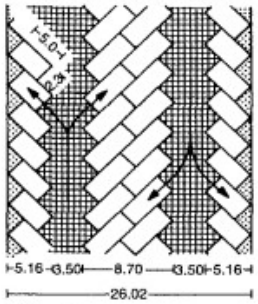


11 90° parking, access 5.50 m wide, parking space 2.50 m wide

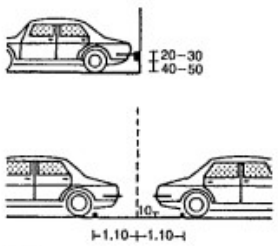
12 Space requirements

Arrangement of garage parking spaces to the access. At an angle of:	Required access width (in m) for a garage parking space width of:		
	2.30	2.40	2.50
90°	6.50	6.00	5.50
75°	5.50	5.25	5.00
60°	4.50	4.25	4.00
45°	3.50	3.25	3.00
up to 30°	3.00	3.00	3.00

13 Access width. (Parking space 2.50 m wide is standard. This value should if possible always be complied with in public areas)

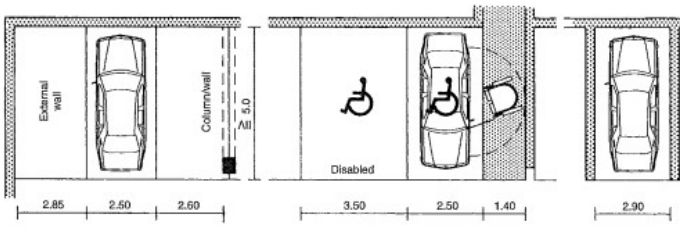


14 Oblique parking layout

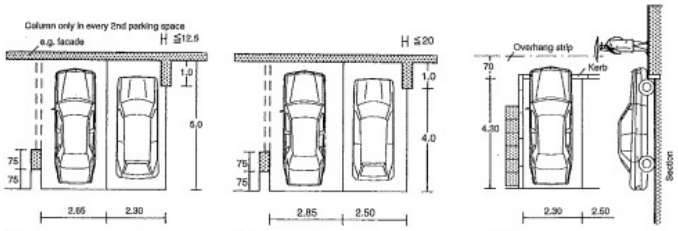


15 Transverse bumpers and impact buffers

6.11.1. Parking solutions



❶ If parking spaces are bordered by pillars or walls, then the width is increased

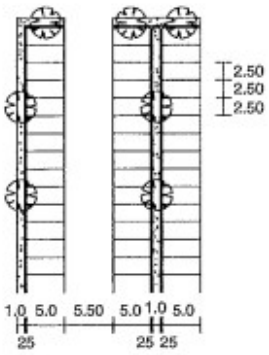


❷ Reductions are possible in private buildings

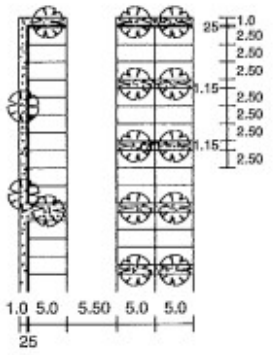
❸ Comfortable parking and exiting

❹ With kerb border

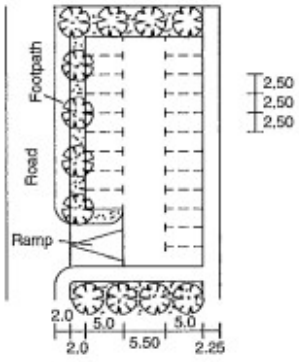
6.11.2. On surface parking



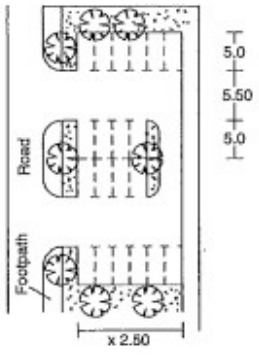
❾ Car park with planting



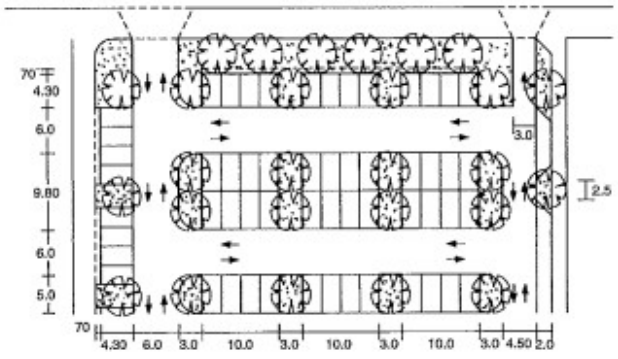
❿ Planting at right angles to the access passage



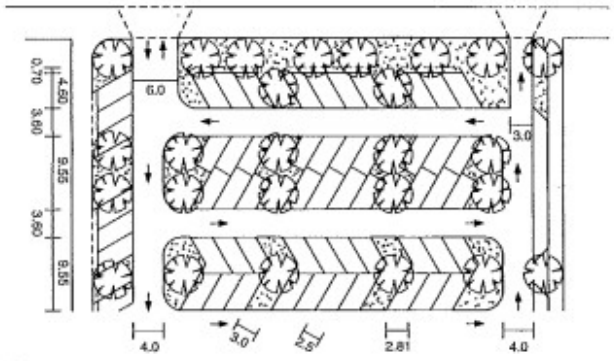
⓫ Lowered parking area → ❺ – ❻



⓬ Parking next to the road

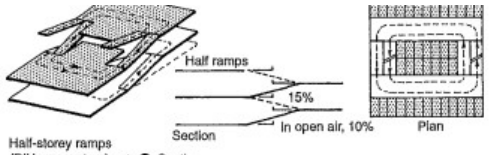


⓭ Example: car park

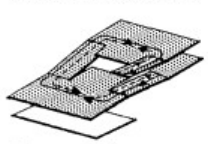


⓮ Variant: oblique layout in car park

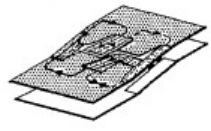
6.12. Ramps

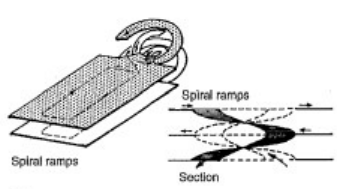


Half-storey ramps (D'Humy system) → ❾ Section



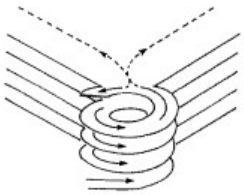
D'Humy ramp variants



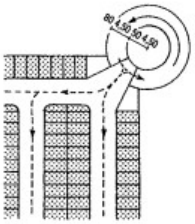


Spiral ramps

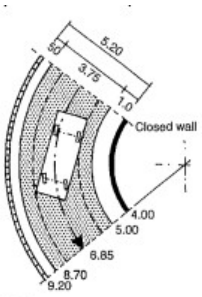
❶ Ramp systems



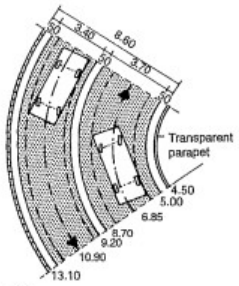
❷ Separate spiral ramp towers at the corners of the building



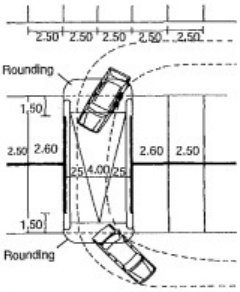
❸ Schematic plan → ❷



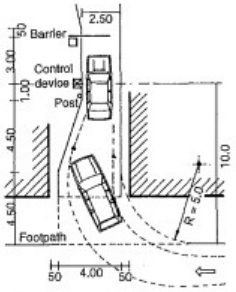
❹ Minimum ramp widths



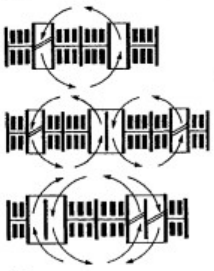
❺ Minimum ramp widths in curve with minimum radius



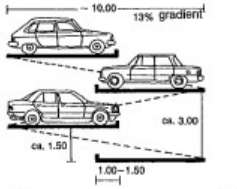
❻ Half-ramp with one-way traffic



❼ Access control

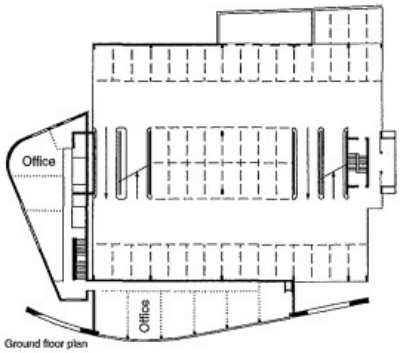


❽ Basic forms of D'Humy ramps. Ramps with 13–15% gradient



❾ Dovetailing of half-storeys → ❽

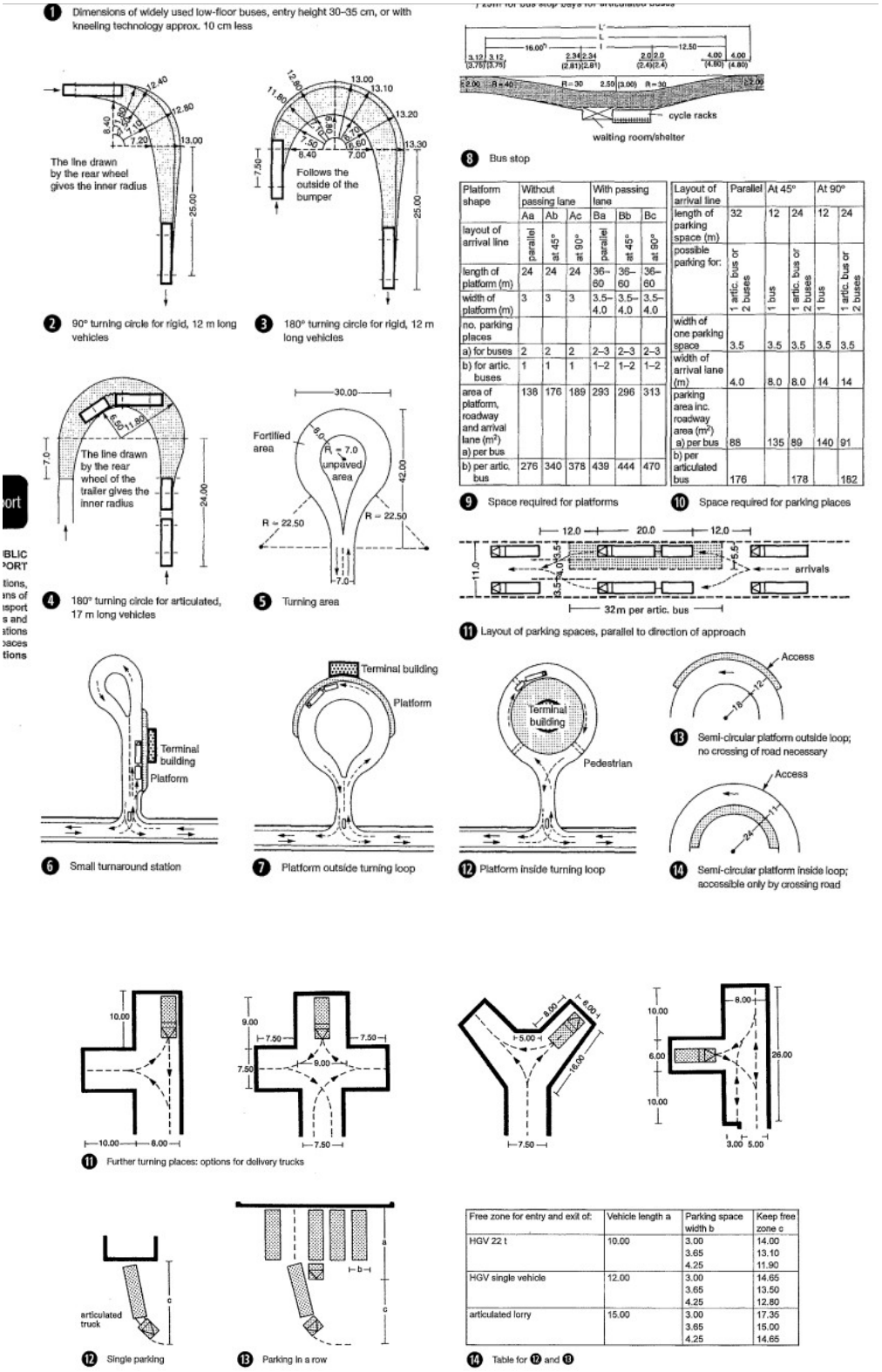




❶ Multi-storey car park with additional use: offices incorporated in the façade
Arch.: Kister Scheithauer Gross



6.13. Turning Radius

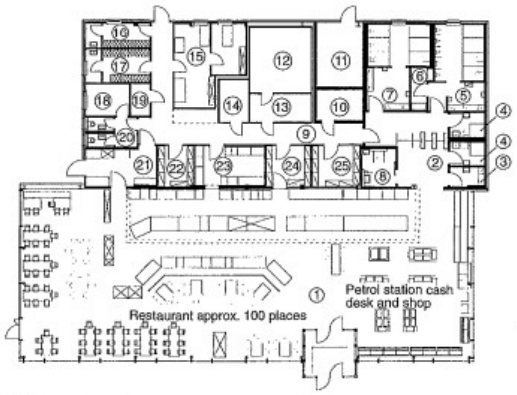


Platform shape	Without passing lane			With passing lane		
	Aa	Ab	Ac	Ba	Bb	Bc
layout of arrival line	parallel	at 45°	at 90°	parallel	at 45°	at 90°
length of platform (m)	24	24	24	36–60	36–60	36–60
width of platform (m)	3	3	3	3.5–4.0	3.5–4.0	3.5–4.0
no. parking places						
a) for buses	2	2	2	2–3	2–3	2–3
b) for artic. buses	1	1	1	1–2	1–2	1–2
area of platform, roadway and arrival lane (m²)						
a) per bus	138	176	189	293	296	313
b) per artic. bus	276	340	378	439	444	470

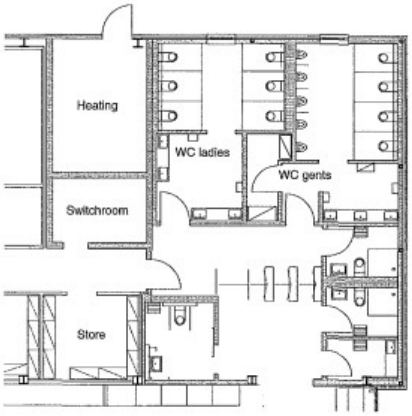
Layout of arrival line	Parallel	At 45°		At 90°	
length of parking space (m)	32	12	24	12	24
possible parking for:	1 artic. bus or 2 buses	1 bus	1 artic. bus or 2 buses	1 bus	1 artic. bus or 2 buses
width of one parking space	3.5	3.5	3.5	3.5	3.5
width of arrival lane (m)	4.0	8.0	8.0	14	14
parking area inc. roadway area (m²)					
a) per bus	88	135	89	140	91
b) per articulated bus	176		178		182

Free zone for entry and exit of:	Vehicle length a	Parking space width b	Keep free zone c
HGV 22 t	10.00	3.00	14.00
		3.65	13.10
		4.25	11.90
HGV single vehicle	12.00	3.00	14.65
		3.65	13.50
		4.25	12.80
articulated lorry	15.00	3.00	17.35
		3.65	15.00
		4.25	14.65

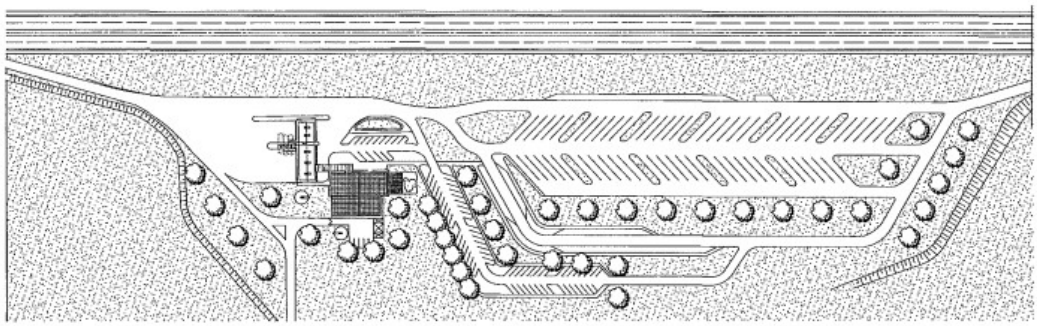
6.14. Bus station



❷ In smaller service stations, petrol supply and service areas are combined in one building



❸ Toilet facilities in service areas are leased like the other services. Charging is made possible by a turnstile



❹ Layout of a petrol and service area

Design: Autobahn Tank u. Rast AG

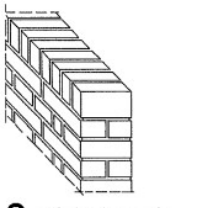
6.15. Boundary walls



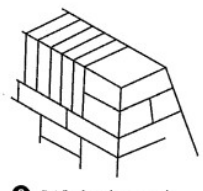
❺ Pre-cast concrete coping stones ❻ Cladding with zinc sheet (Lehr → refs)

Copings

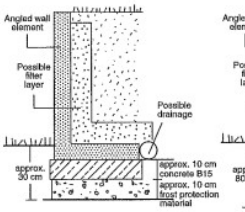
The tops of walls must be protected against rain and snow by covering them with large slabs or stones. The coping element should have a cross-fall of at least 0.5%. Longitudinal joints in the coping are not allowed and butt joints must be at right angles to the wall centre-line. A drip mould should be provided min. 3 cm outside the face of the wall → ❺ in order to keep vertically falling water off the face. For natural stone walls, copings of the same material can be used. Nailed zinc or aluminium coverings are also suitable → ❻.



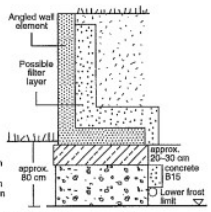
❼ Details of capping courses in brickwork (Lehr → refs)



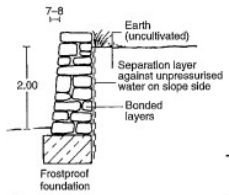
❽ Details of capping courses in natural stonework (Lehr → refs)



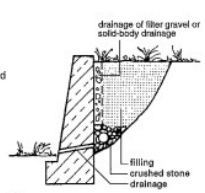
⓫ Simple foundations



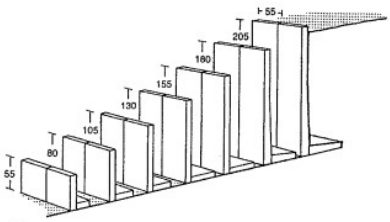
⓬ Frost-proof foundations



❾ Dry stone wall: drainage measures are necessary according to soil type

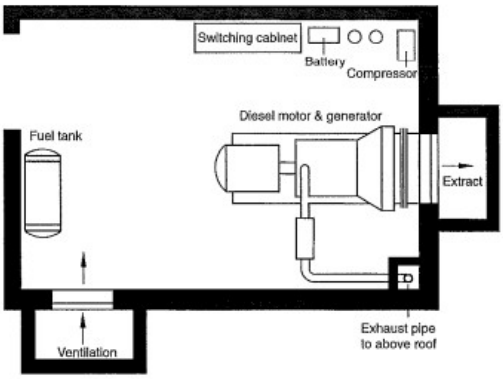


❿ Concrete retaining wall (also available as pre-cast elements) → ⓭



⓭ Retaining wall of pre-cast concrete elements, which are available as standard up to about 4.55 m high

6.16. Emergency Power Rooms



❶ Room for diesel emergency generator set with separate air supply and extraction

Emergency power supply systems (diesel generator sets)
Emergency power units are combustion motors (usually diesel) which are coupled to generators to produce electricity. They are used for a limited time in case of a power cut (and are thus not for constant power supply) and supply emergency and safety lighting, lifts and other critical usages (e.g. in operating theatres in hospitals, server rooms and industrial processes etc.). They consist of a diesel motor and a generator mounted on a base frame (e.g. steel) on a foundation with elastic supports between machine set and frame, and a starter and battery → ❶.

There are mobile (container generator sets) and permanently installed diesel generator sets including switching gear. The performance range is between 5 and 2000 kVA (kilovolt amp) according to specification.

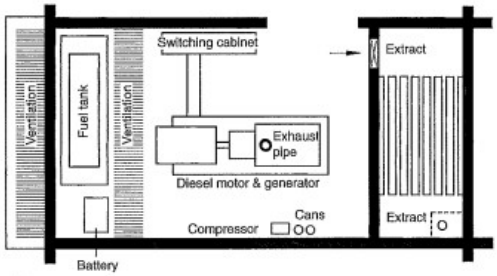
The design starts with the determination of:
– motor power
– sound insulation
– exhaust system

Generator capacity (kVa)	20–60	100–200	250–500	650–1500
Room size (m)	5.0–4.0	6.0–4.5	7.5–5.0	10.5–5.5
Room height (m)	3.0	3.5	4.0	4.0
Door width (m)	2.0–1.5	2.0–1.5	2.2–2.0	2.2–2.0

❷ Dimensions of emergency generator rooms

Emergency power rooms
The required dimensions, height and openings of the room for a generator set vary according to the power and configuration of the motor → ❸. Air supply and extraction can be through forced ventilation (shaft) → ❶. It is also possible to run the extract air together with the exhaust of the diesel motor up a vertical shaft to exit above the roof → ❸ – ❹. In this case, sufficient sound insulation should be provided with a silencer in the ductwork → ❸ – ❹. The manufacturers of the motors give information about the required quantity of air and thus the size of the supply and extract ducts.

On account of the high noise level involved in running a generator set for testing and maintenance, it is recommended not to place it near inhabited rooms which should be particularly quiet (e.g. the care rooms of a hospital). Measures should also be undertaken to keep the noise level as low as possible. Another measure is to position the frame, on which the generator and motor are mounted, on spring dampers to reduce the sound transmission into the structure.

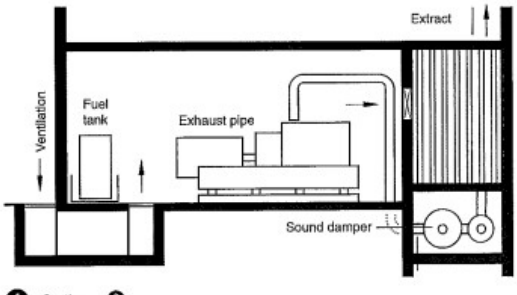


❸ Room for diesel emergency power generator with separate air supply and extraction

Uninterruptible power supply (UPS) systems
There is normally a gap of at most 15 seconds between the power cut and the switching to emergency power. UPS systems are used to continue power supply without interruption during this time. Static UPS systems are bridging battery power devices, whose batteries are constantly charged from the mains.

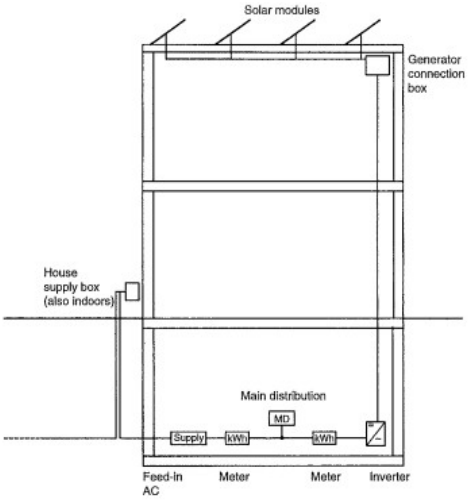
According to equipment and requirements, a UPS system should be able to protect the connected consumer from the following risks: power cuts, voltage fluctuations, voltage peaks, low voltage, excessive voltage, lightning effects/switching peaks, interference voltage and frequency fluctuations.

While UPS systems are designed to cope with a power cut of at most 30–60 minutes, diesel-powered emergency generators can supply power during much longer interruptions.



❹ Section → ❸

6.17. Solar Energy Panels



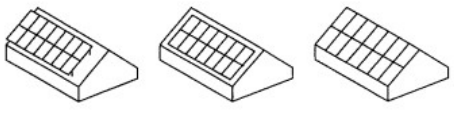
❷ Principle of a grid-connected photovoltaic system (Bohne → refs)

Most systems are connected to the grid for more cost-effective operation: the electricity coming from the solar modules is fed into the grid, which requires a separate feed-in meter.

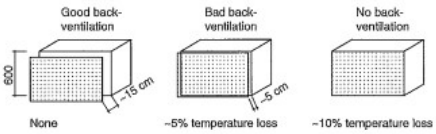
Large photovoltaic installations should be operated with changing tilt and alignment (tracking), with separate solar generators and grid feed-in equipment to achieve the optimum yield. Grid-connected systems work completely automatically without maintenance and have a lifetime of at least 20 years. Solar-generated electricity fed into the public grid is paid for over a guaranteed period as regulated in the Renewable Energy Law (EEG).

Photovoltaic elements can be integrated into the building envelope in various ways or mounted subsequently. They are designed for use in the open air and can be used as an independent part of a façade or roof. Solar cells are UV-resistant and weatherproof.

They can play an important architectural role and also fulfil other functions: sound, visual, sun and weather protection. Solar cells are mostly built on roofs, for which there are various possibilities: mounted on the roof (independently, mostly for later installation), integrated into the roof covering or forming the roof itself. The installation of photovoltaic modules in façades is also possible, in which case they should be back-ventilated in order to avoid reduction of yield → ❸ + ❹.

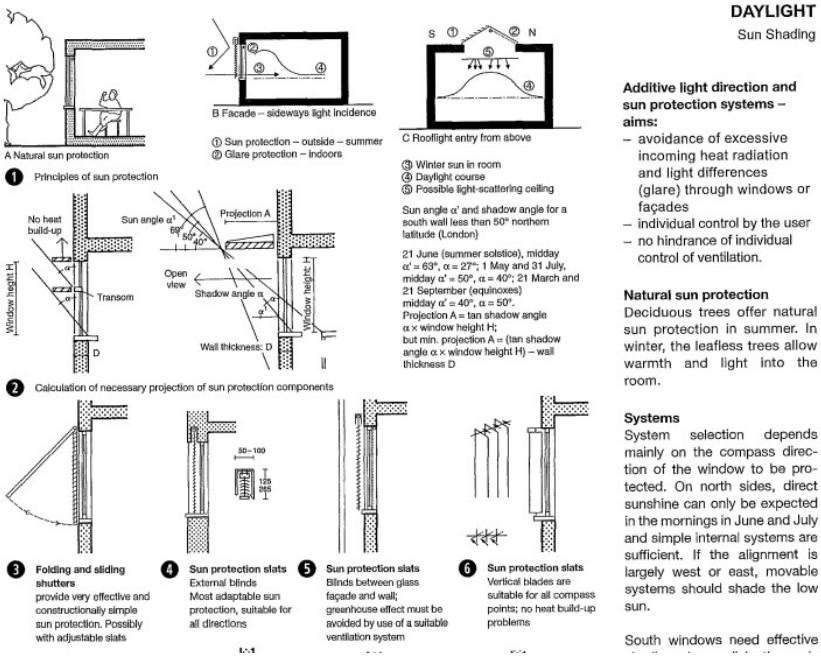


❸ Possible roof-related arrangements of photovoltaic elements



❹ Photovoltaic elements on a façade with possible yield reductions (Bohne → refs)

6.18. Sun shading



❶ Principles of sun protection

❷ Calculation of necessary projection of sun protection components

❸ **Folding and sliding shutters** provide very effective and constructionally simple sun protection. Possibly with adjustable slats

❹ **Sun protection slats** External blinds Most adaptable sun protection, suitable for all directions

❺ **Sun protection slats** Blinds between glass façade and wall; greenhouse effect must be avoided by use of a suitable ventilation system

❻ **Sun protection slats** Vertical blades are suitable for all compass points; no heat build-up problems

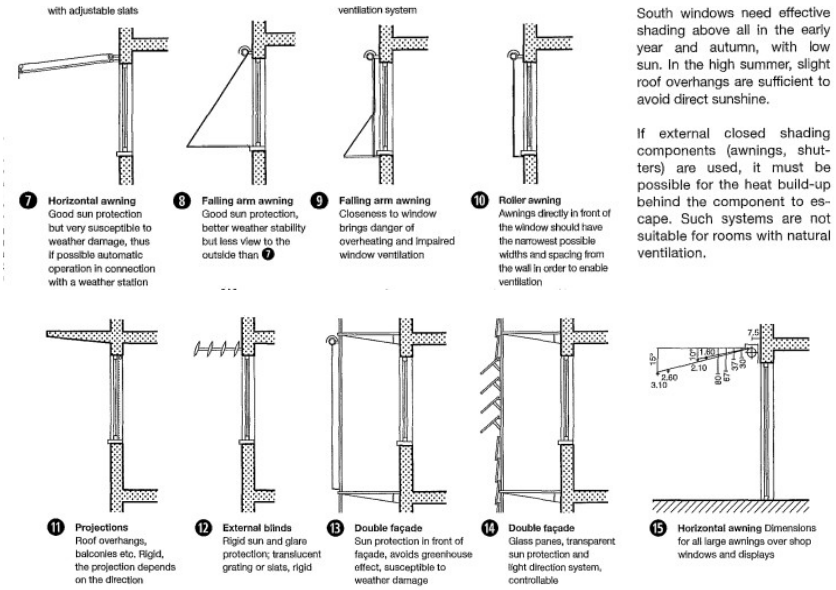
DAYLIGHT
Sun Shading

Additive light direction and sun protection systems – aims:
- avoidance of excessive incoming heat radiation and light differences (glare) through windows or façades
- individual control by the user
- no hindrance of individual control of ventilation.

Natural sun protection
Deciduous trees offer natural sun protection in summer. In winter, the leafless trees allow warmth and light into the room.

Systems
System selection depends mainly on the compass direction of the window to be protected. On north sides, direct sunshine can only be expected in the mornings in June and July and simple internal systems are sufficient. If the alignment is largely west or east, movable systems should shade the low sun.

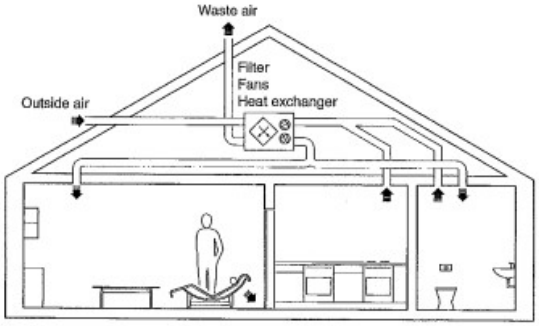
South windows need effective



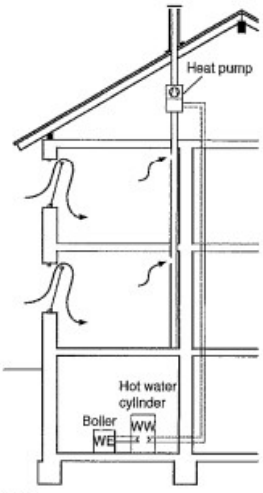
South windows need effective shading above all in the early year and autumn, with low sun. In the high summer, slight roof overhangs are sufficient to avoid direct sunshine.

If external closed shading components (awnings, shutters) are used, it must be possible for the heat build-up behind the component to escape. Such systems are not suitable for rooms with natural ventilation.

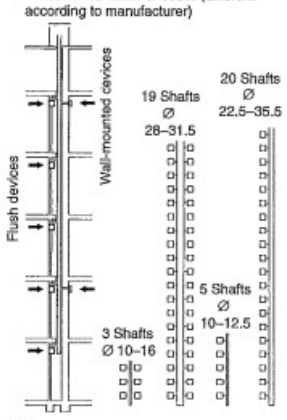
6.19. Ventilation



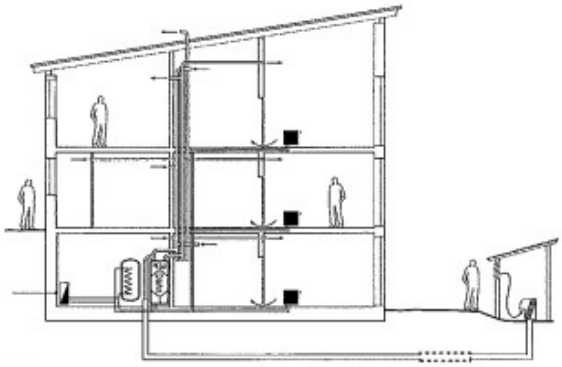
1 Centralised ventilation of a house with heat recovery. The outside air fed in to renew the inside air is filtered, then passed through a cross-flow heat exchanger, where it receives warmth from the extract air. The warmed air normally flows through a number of rooms before being extracted again. Air from kitchens and bathrooms should not be able to flow into other rooms (Wellpott, Bohne → refs)



2 Centralised air extract system with heat recovery by a heat pump and storage in a warm water buffer tank (WW). The remaining energy is supplied by a heating device (WE) (Wellpott, Bohne → refs)]



3 Single ventilation systems with common extract duct replace large batteries of shafts (Wellpott, Bohne → refs)

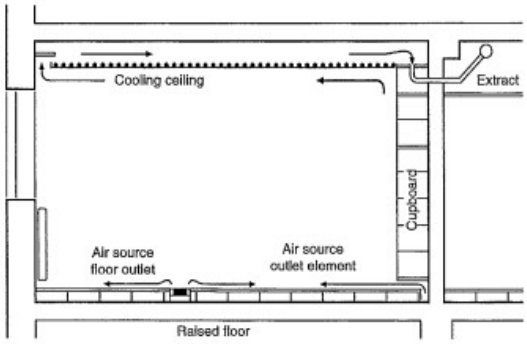


4 Controlled residential ventilation with ground-source heat exchanger: detached house (Wellpott, Bohne → refs)

	Operation min. 12 h/day[1]	Any duration of operation[2]
cooking niche	40 m³/h	60 m³/h
kitchen, background ventilation	40 m³/h	60 m³/h
kitchen, intensive ventilation	200 m³/h	200 m³/h
bathroom with/without WC	40 m³/h	60 m³/h
separate WC	20 m³/h	30 m³/h

[1] background operation
[2] demand-controlled operation

5 Scheduled flow volumes for windowless rooms, DIN 1945-5



9 Cooling systems in combination with suspended ceilings, e.g. acoustic ceilings. Installation into an existing ceiling is often possible. (Wellpott, Bohne → refs)

SITE INVENTORY

1. INTRODUCTION

Understanding the site is the foundation of any design process. A thorough site inventory enables the designer to respond sensitively to the physical, environmental, social, and infrastructural context of the location. For a campus project of this scale and vision, it becomes essential to study not just the site boundaries, but also the broader urban setting, existing conditions, and potential for integration with the surrounding environment.





2. LOCATION

The Site is located in Sector 3, Rohini, Delhi 110085. Rohini is predominantly a residential area planned for 8,50,000 population. This Scheme was planned in 1980.Rohini sub-city is divided into more than 50 Sectors of which 'Sector 3' is the biggest Sector. Sector 3 is divided into three parts:- Residential area, Institutional area, and Commercial area.

Sector-3, Rohini, situated in the **northern part of Delhi**. Rohini is a well-established sub-city under the jurisdiction of the **Delhi Development Authority (DDA)** and falls under **Planning Zone H** of the **Master Plan of Delhi-2021**. The region is characterized by a mix of residential sectors, educational institutions, healthcare facilities, and green open spaces, making it a strategically suitable location for a public university campus.

2.3. Neighborhood

Hospitals

- Jaipur Golden Hospital
- Joshi Diabetes Centre
- Faridabad Sector 21 B Vimal Hospital
- Medanta hospital

Schools/Institute

- Jims college
- Yuvashakti Model School
- Sec3 Rohini Skv School
- Crpf Camp Jharoda
- KENDRIYA VIDYALAYA
- Remal Public Senior Secondary School
- Mother Divine Public School
- Sec3 Rohini SKV School

Park

- Jheel Park

Bus Stops

- Rohini Depot 3

Famous Sub-Localities near Sector 3, Rohini

The neighbourhood is surrounded by several well-developed areas that add to its appeal. Popular areas near Sector 3 Rohini include:

- Avantika
- Deepali
- Vijay Vihar
- Mangolpuri
- Prashant Vihar

Top landmarks

- Pitampura TV Tower
- Shopping at City Centre Mall
- Avantika Udyaan

Accessibility & Urban Context

- 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

2.4. Development Controls

MPD-2021 modified upto 31/03/2017

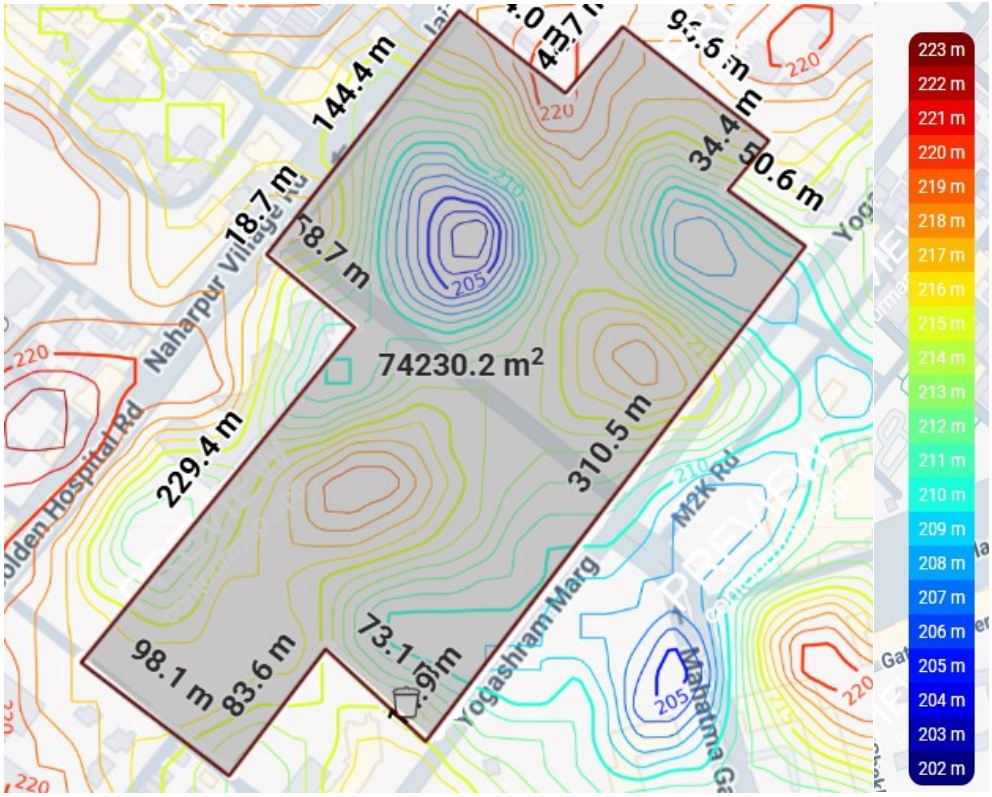
4	University Campus including International Education Centre (IEC) – Large campus (10 ha and above) will be divided into following four parts: a) Academic including Administration (45% of total land area)	30%	[1][225]	37 m	1. Parking standard @ 1.33 ECS / 100 sq m of floor area. 2. Other controls related to basements etc. are given in the Development Code chapter. 3. Landscape plan to be prepared.
	b) Residential (25% of total land area)	1. Regulations for group housing shall apply. 2. The land shall be reserved for facilities as per residential norms.			
	c) Sports and Cultural activities (15%)	10%	15	26 m	
	d) Parks and Landscape (15%)	N. A.			

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

2.5. TOPOGRAPHY



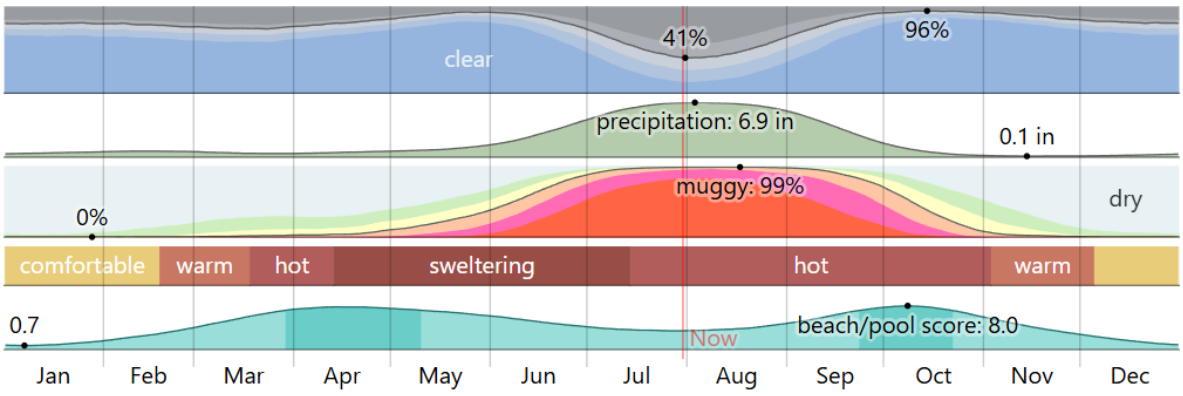
- Maximum elevation: 251 m
- Minimum elevation: 206 m
- Average elevation: 217 m

There are no existing trees on the site. The site is full of wild shrubs and grass. The topography of the site is flat. There are no levels on the site which makes it an ideal site for the project.

2.6. CLIMATE ANALYSIS

Climate and Average Weather Year Round in New Delhi

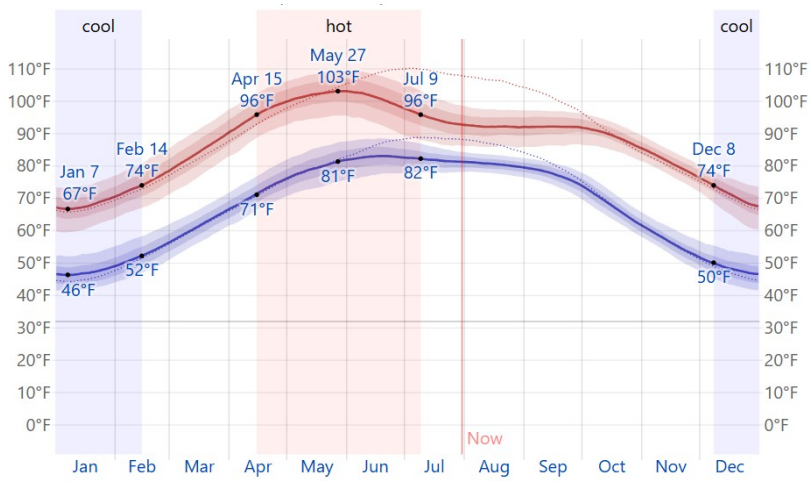
In New Delhi, the wet season is hot, oppressive, and partly cloudy and the dry season is warm and mostly clear. Over the course of the year, the temperature typically varies from 46°F to 103°F and is rarely below 42°F or above 110°F.



2.6.1. Average Temperature in New Delhi

The hot season lasts for 2.8 months, from April 15 to July 9, with an average daily high temperature above 96°F. The hottest month of the year in New Delhi is June, with an average high of 101°F and low of 83°F.

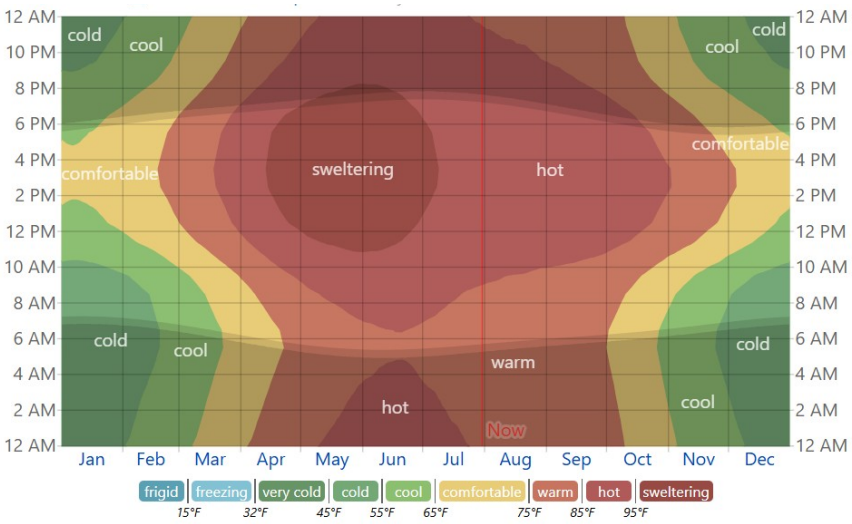
The cool season lasts for 2.2 months, from December 8 to February 14, with an average daily high temperature below 74°F. The coldest month of the year in New Delhi is January, with an average low of 47°F and high of 68°F.



The daily average high (red line) and low (blue line) temperature, with 25th to 75th and 10th to 90th percentile bands. The thin dotted lines are the corresponding average perceived temperatures.

Average	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
High	68°F	74°F	85°F	96°F	102°F	101°F	95°F	92°F	92°F	89°F	81°F	71°F
Temp.	56°F	63°F	73°F	84°F	91°F	92°F	88°F	86°F	84°F	78°F	67°F	58°F
Low	47°F	53°F	62°F	72°F	80°F	83°F	82°F	80°F	77°F	67°F	56°F	48°F

The figure below shows a compact characterization of the entire year of hourly average temperatures. The horizontal axis is the day of the year, the vertical axis is the hour of the day, and the color is the average temperature for that hour and day.



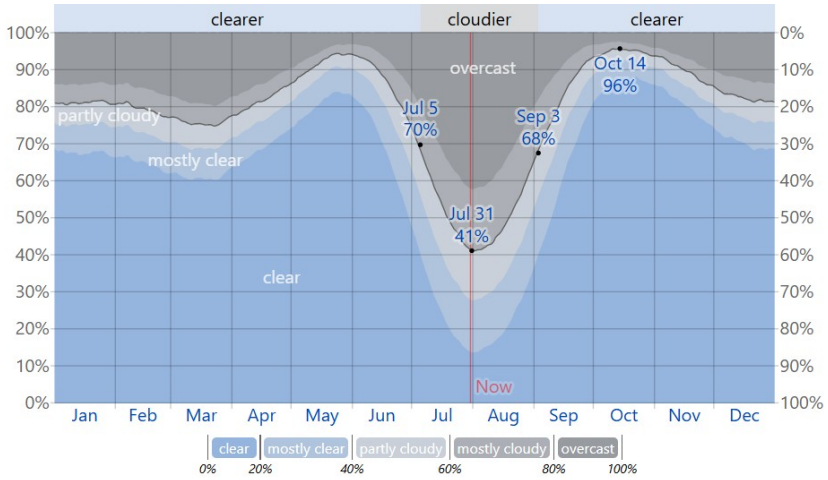
The average hourly temperature, color coded into bands. The shaded overlays indicate night and civil twilight.

2.6.2. Clouds

In New Delhi, the average percentage of the sky covered by clouds experiences extreme seasonal variation over the course of the year.

The clearer part of the year in New Delhi begins around September 3 and lasts for 10 months, ending around July 5.The clearest month of the year in New Delhi is October, during which on average the sky is clear, mostly clear, or partly cloudy 95% of the time.

The cloudier part of the year begins around July 5 and lasts for 1.9 months, ending around September 3.The cloudiest month of the year in New Delhi is August, during which on average the sky is overcast or mostly cloudy 50% of the time.



The percentage of time spent in each cloud cover band, categorized by the percentage of the sky covered by clouds.

Fraction	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cloudier	19%	21%	24%	18%	8%	14%	46%	50%	17%	5%	10%	18%
Clearer	81%	79%	76%	82%	92%	86%	54%	50%	83%	95%	90%	82%

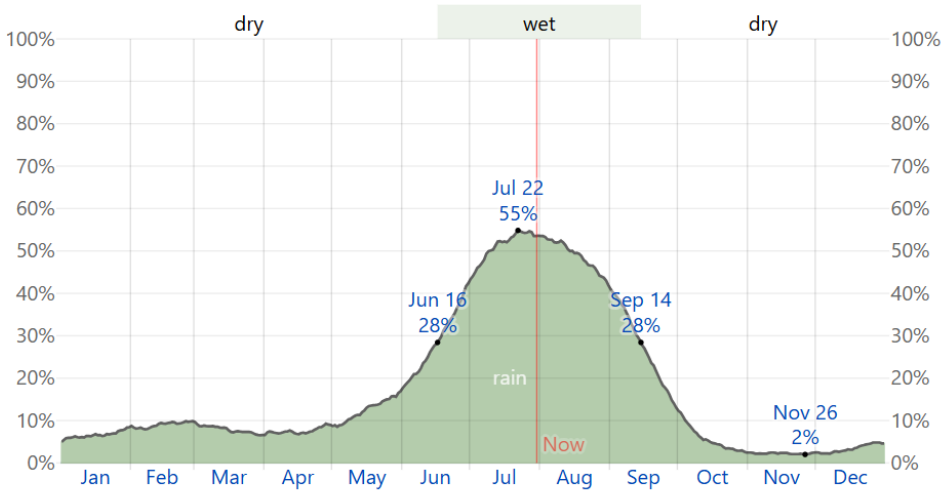
2.6.3. Precipitation

A wet day is one with at least 0.04 inches of liquid or liquid-equivalent precipitation. The chance of wet days in New Delhi varies very significantly throughout the year.

The wetter season lasts 2.9 months, from June 16 to September 14, with a greater than 28% chance of a given day being a wet day. The month with the most wet days in New Delhi is July, with an average of 16.0 days with at least 0.04 inches of precipitation.

The drier season lasts 9.1 months, from September 14 to June 16. The month with the fewest wet days in New Delhi is November, with an average of 0.7 days with at least 0.04 inches of precipitation.

Among wet days, we distinguish between those that experience rain alone, snow alone, or a mixture of the two. The month with the most days of rain alone in New Delhi is July, with an average of 16.0 days. Based on this categorization, the most common form of precipitation throughout the year is rain alone, with a peak probability of 55% on July 22.



The percentage of days in which various types of precipitation are observed, excluding trace quantities: rain alone, snow alone, and mixed (both rain and snow fell in the same day).

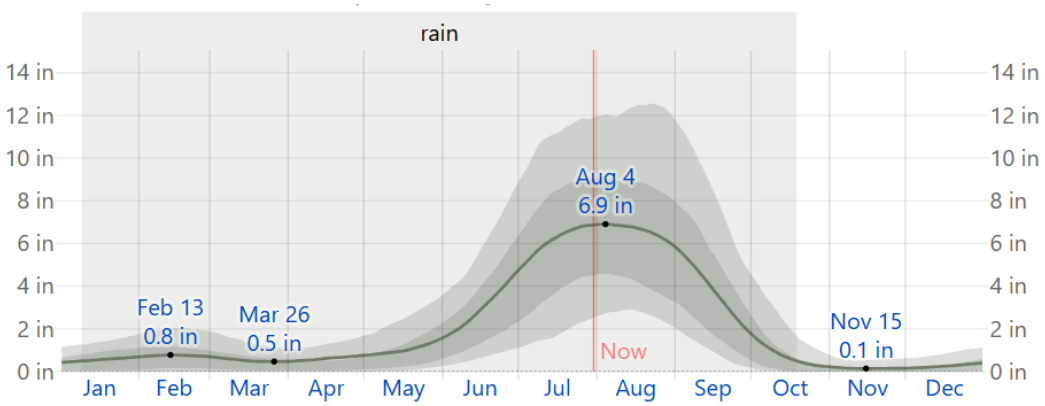
Days of	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rain	2.1d	2.5d	2.4d	2.3d	4.0d	8.8d	16.0d	15.1d	7.9d	1.7d	0.7d	1.1d

2.6.4. Rainfall

To show variation within the months and not just the monthly totals, we show the rainfall accumulated over a sliding 31-day period centered around each day of the year. New Delhi experiences extreme seasonal variation in monthly rainfall.

The rainy period of the year lasts for 9.3 months, from January 9 to October 19, with a sliding 31-day rainfall of at least 0.5 inches. The month with the most rain in New Delhi is August, with an average rainfall of 6.7 inches.

The rainless period of the year lasts for 2.7 months, from October 19 to January 9. The month with the least rain in New Delhi is November, with an average rainfall of 0.1 inches.



The average rainfall (solid line) accumulated over the course of a sliding 31-day period centered on the day in question, with 25th to 75th and 10th to 90th percentile bands. The thin dotted line is the corresponding average snowfall.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall	0.6″	0.8″	0.5″	0.6″	1.0″	2.8″	6.3″	6.7″	3.9″	0.6″	0.1″	0.3″

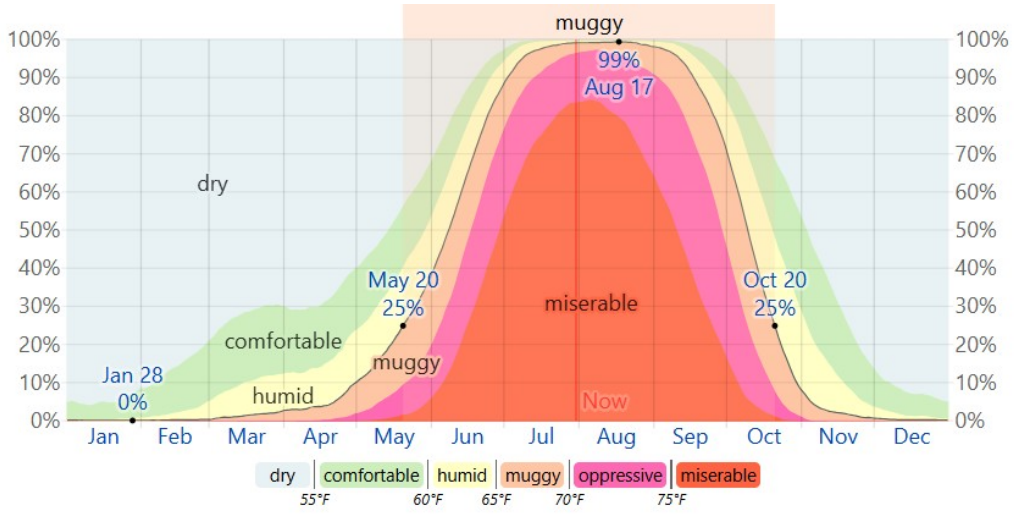
2.6.5. Humidity

We base the humidity comfort level on the dew point, as it determines whether perspiration will evaporate from the skin, thereby cooling the body. Lower dew points feel drier and higher dew points feel more humid. Unlike temperature, which typically varies significantly between night and day, dew point tends to change more slowly, so while the temperature may drop at night, a muggy day is typically followed by a muggy night.

New Delhi experiences extreme seasonal variation in the perceived humidity.

The muggier period of the year lasts for 5.0 months, from May 20 to October 20, during which time the comfort level is muggy, oppressive, or miserable at least 25% of the time. The month with the most muggy days in New Delhi is August, with 30.7 days that are muggy or worse.

The month with the fewest muggy days in New Delhi is January, with 0.0 days that are muggy or worse



The percentage of time spent at various humidity comfort levels, categorized by dew point.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Muggy days	0.0d	0.1d	0.4d	1.5d	7.1d	19.8d	30.0d	30.7d	26.5d	10.5d	0.7d	0.1d

2.6.6. Wind

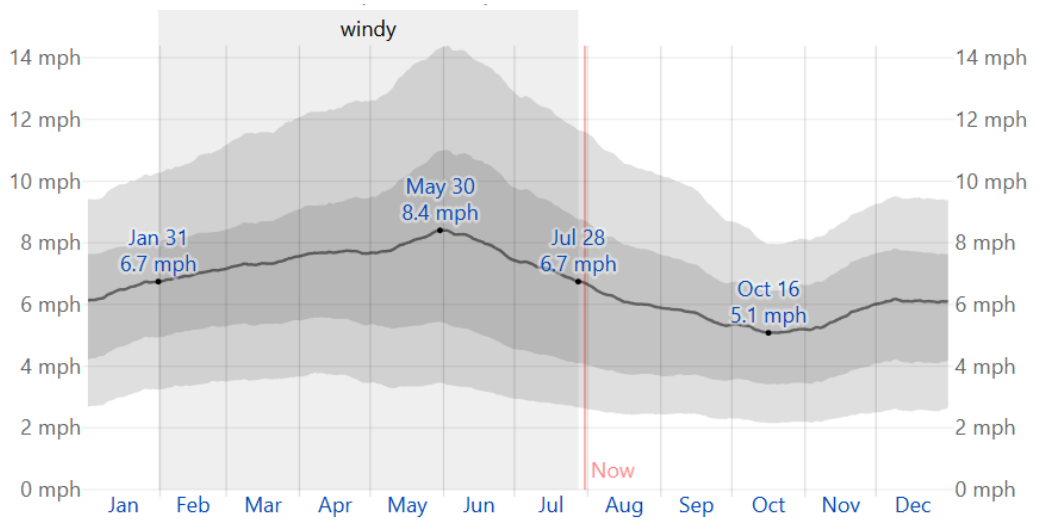
This section discusses the wide-area hourly average wind vector (speed and direction) at 10 meters above the ground. The wind experienced at any given location is highly dependent on local topography and other factors, and instantaneous wind speed and direction vary more widely than hourly averages.

The average hourly wind speed in New Delhi experiences significant seasonal variation over the course of the year.

The windier part of the year lasts for 5.9 months, from January 31 to July 28, with average wind speeds of more than 6.7 miles per hour. The windiest month of the year in New Delhi is May, with an average hourly wind speed of 8.0 miles per hour.

The calmer time of year lasts for 6.1 months, from July 28 to January 31. The calmest month of the year in New Delhi is October, with an average hourly wind speed of 5.2 miles per hour.

Average Wind Speed in Delhi



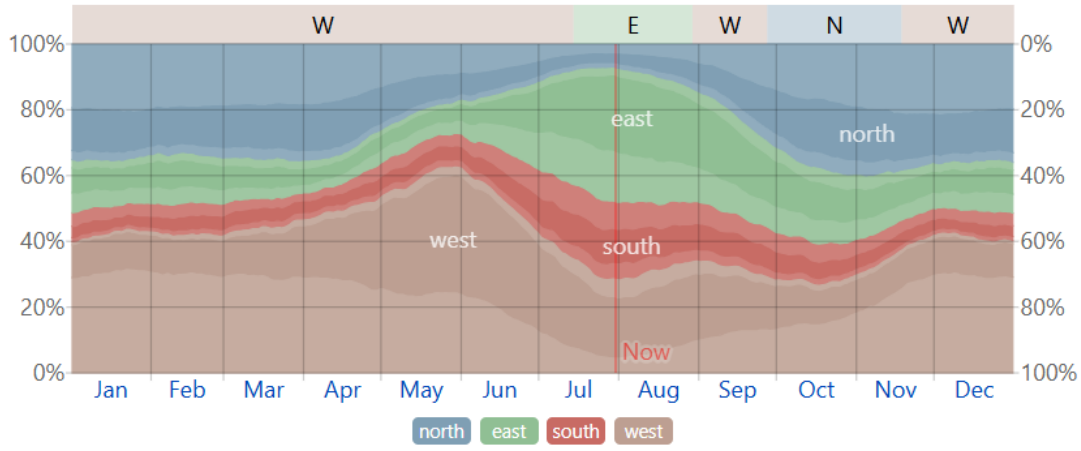
The average of mean hourly wind speeds (dark gray line), with 25th to 75th and 10th to 90th percentile bands.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind Speed (mph)	6.5	7.0	7.4	7.7	8.0	8.0	7.1	6.1	5.6	5.2	5.6	6.1

2.6.7. Wind Direction

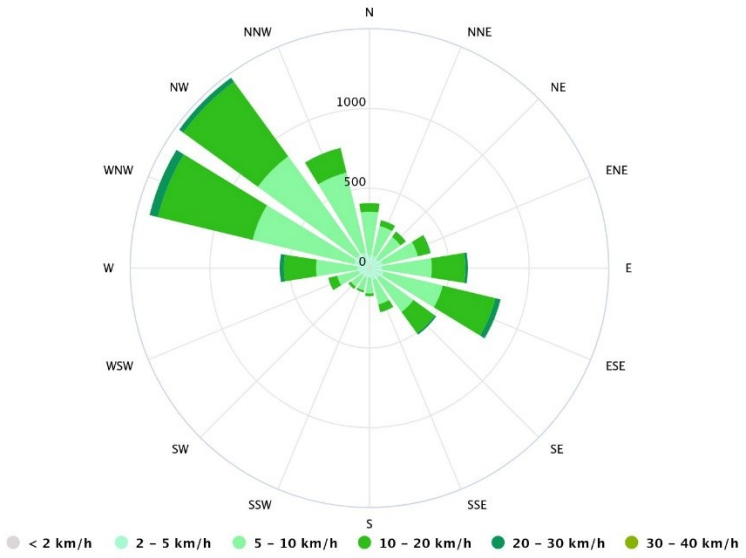
The predominant average hourly wind direction in New Delhi varies throughout the year.

The wind is most often from the **east for 1.5 months**, from **July 14 to August 29**, with a peak percentage of **41% on July 30**. The wind is most often from the **west** for 4.1 weeks, **from August 29 to September 27 and for 7.9 months**, from November 18 to July 14, with a peak percentage of 34% on August 30. The wind is most often from the north for 1.7 months, from September 27 to November 18, with a peak percentage of 40% on November 4.



The percentage of hours in which the mean wind direction is from each of the four cardinal wind directions, excluding hours in which the mean wind speed is less than 1.0 mph. The lightly tinted areas at the boundaries are the percentage of hours spent in the implied intermediate directions (northeast, southeast, southwest, and northwest).

New Delhi
28.62°N, 77.21°E (211 m asl).
Model: ERA5T.



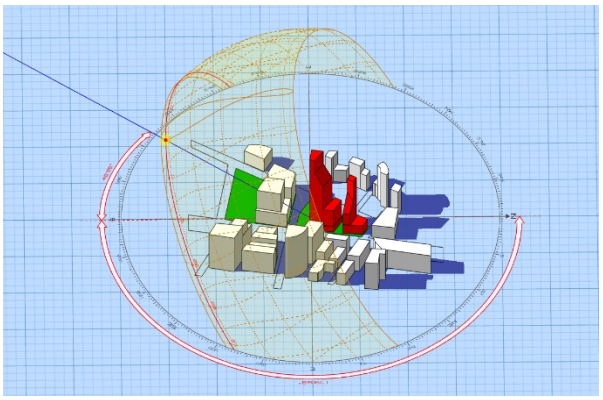
Month wise

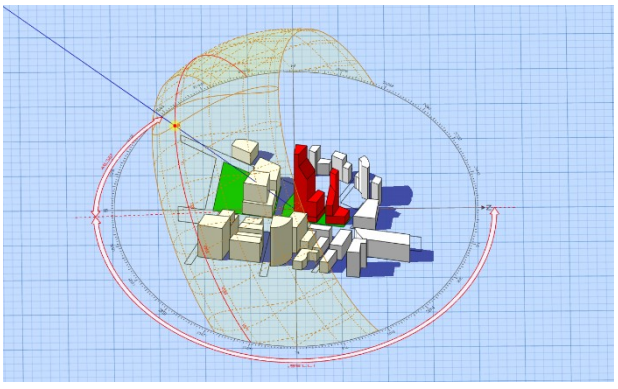
Dominant wind direction

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
W	WNW	WNW	WNW	NW	WNW	ESE	ESE	NNW	NW	WNW	W

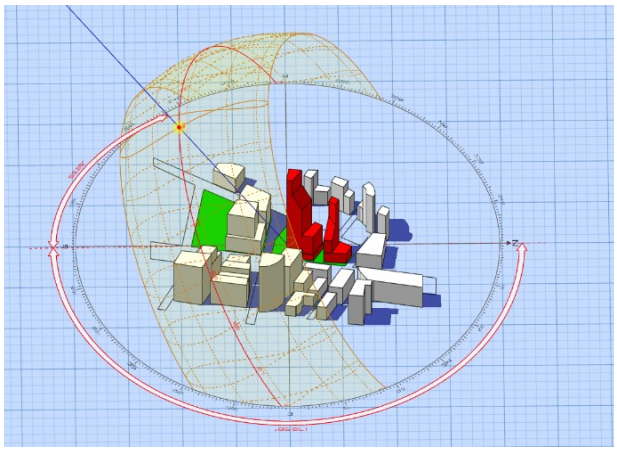
2.7. SUN PATH– Monthly Analysis

This is the average Monthly sun angle analysis at time – 12 noon.

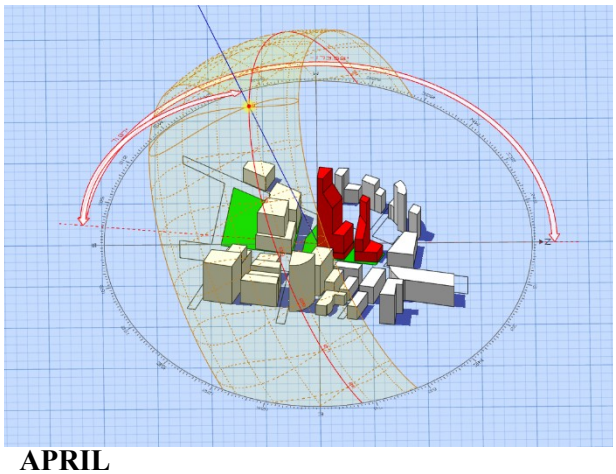




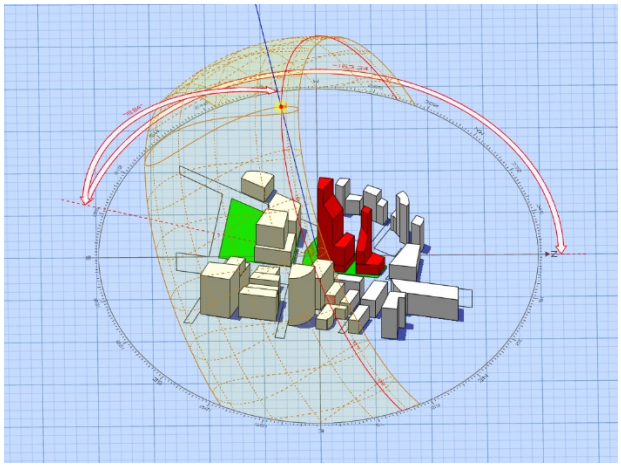
JANUARY **FEBRUARY**
Sun angle – 40.06 deg Sun angle – 48.36 deg
Azimuth Angle – 179.69 deg Azimuth Angle – 177.66 deg



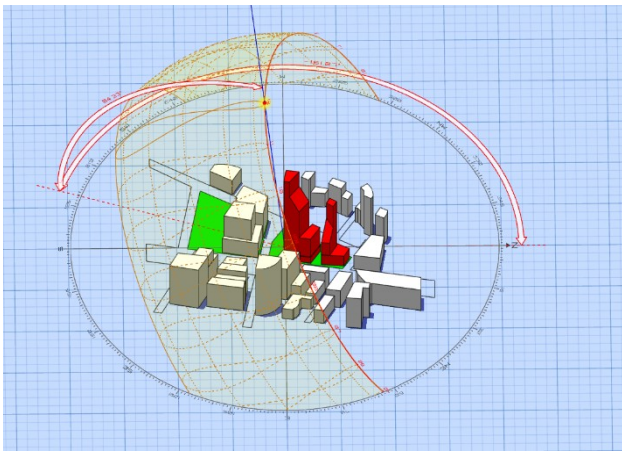
MARCH
Sun angle – 59.28 deg
Azimuth Angle – 179.58 deg



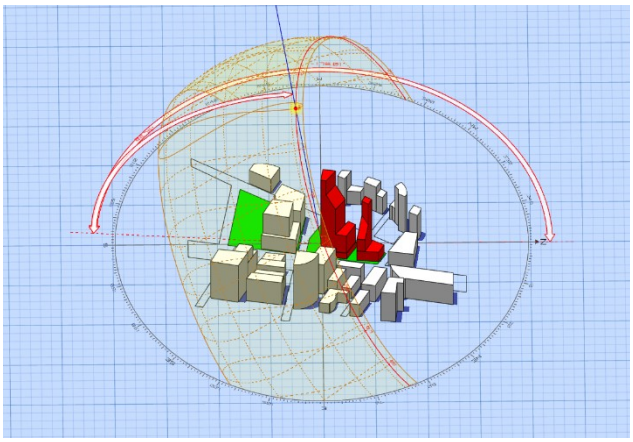
APRIL
Sun angle – 71.07 deg
Azimuth Angle – 173.65 deg



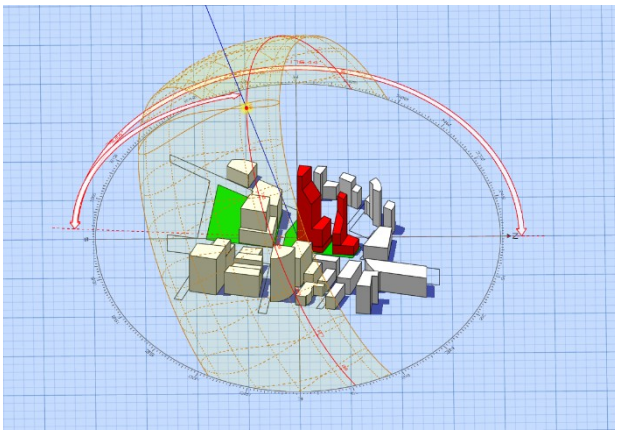
MAY
Sun angle – 79.84 deg
Azimuth Angle – 163.34 deg



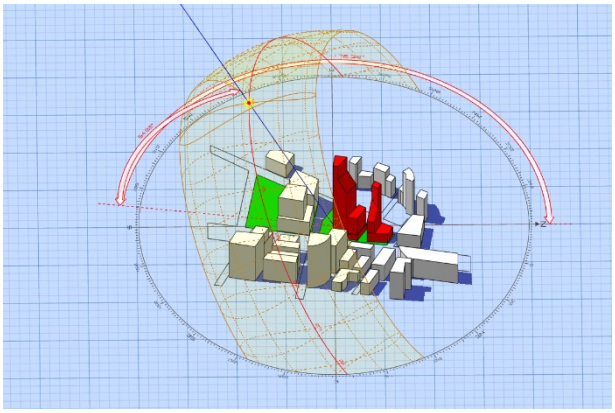
JUNE
Sun angle – 84.33 deg
Azimuth Angle – 161.27 deg



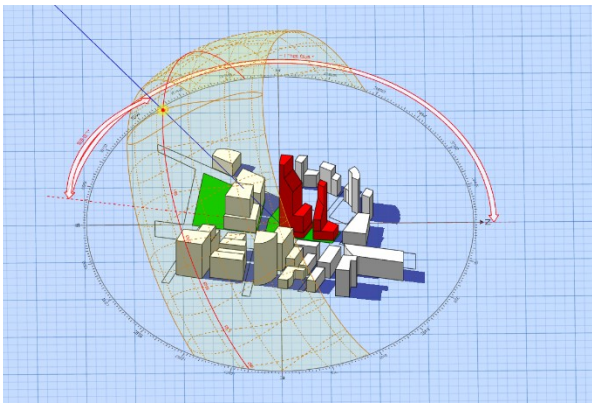
JULY
Sun angle – 82.76 deg
Azimuth Angle – 176.01 deg



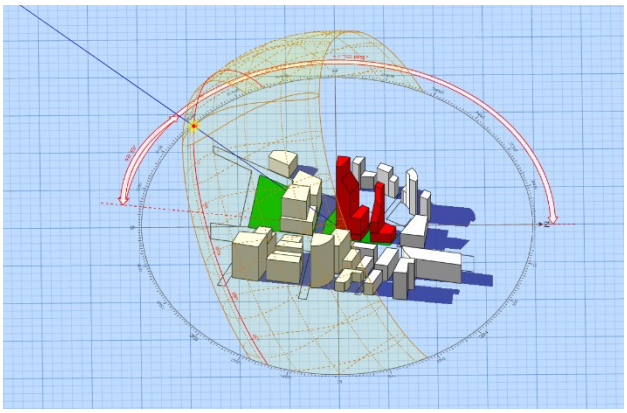
AUGUST
Sun angle – 75.24 deg
Azimuth Angle – 176.44 deg

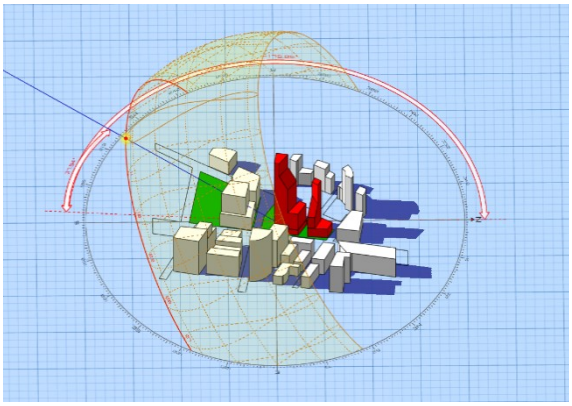


SEPTEMBER
Sun angle – 54.02 deg
Azimuth Angle – 172.32 deg



OCTOBER
Sun angle – 52.27 deg
Azimuth Angle – 170.54 deg





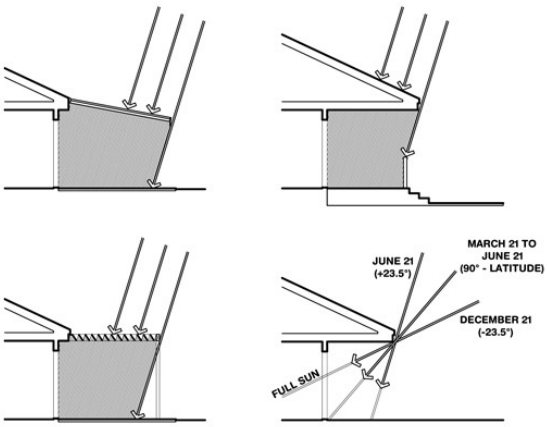
NOVEMBER
Sun angle – 42.39 deg
Azimuth Angle – 172.09 deg

DECEMBER
Sun angle – 37.94 deg
Azimuth Angle – 176.05 deg

2.7.1. Monthly Shadow Direction Analysis at 12 Noon

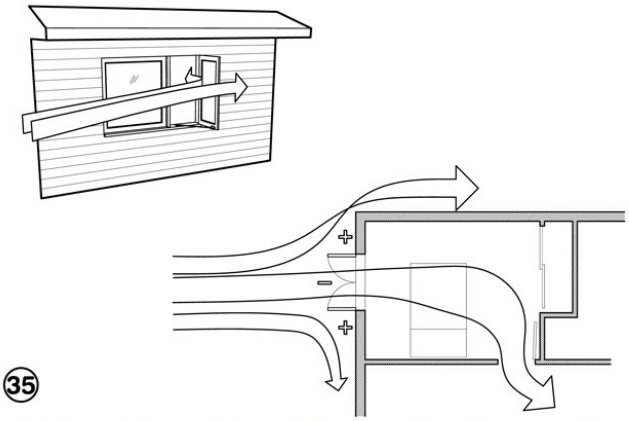
Month	Shadow Direction at 12 Noon
January	North
February	East of North
March	North
April	North-Northwest
May	Northwest
June	Northwest-North
July	North
August	North
September	North-Northwest
October	North-Northwest
November	North-Northwest
December	North

2.8. CLIMATE INFERENCES



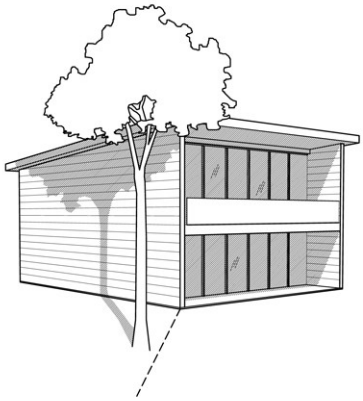
37

Window overhangs (designed for this latitude) or operable sunshades (awnings that extend in summer) can reduce or eliminate air conditioning



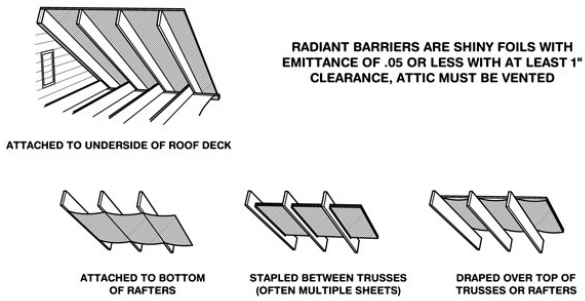
35

Good natural ventilation can reduce or eliminate air conditioning in warm weather, if windows are well shaded and oriented to prevailing breezes



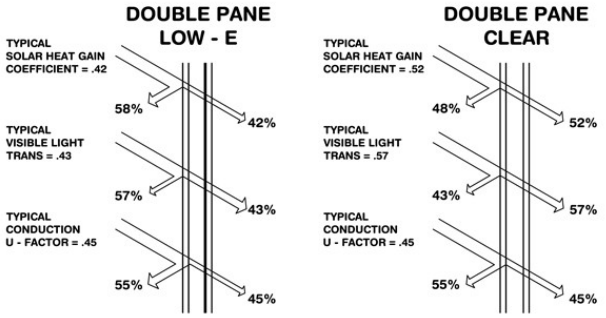
32

Minimize or eliminate west facing glazing to reduce summer and fall afternoon heat gain



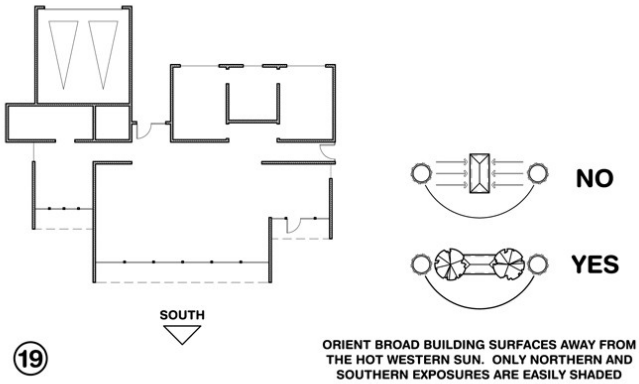
26

A radiant barrier (shiny foil) will help reduce radiated heat gain through the roof in hot climates



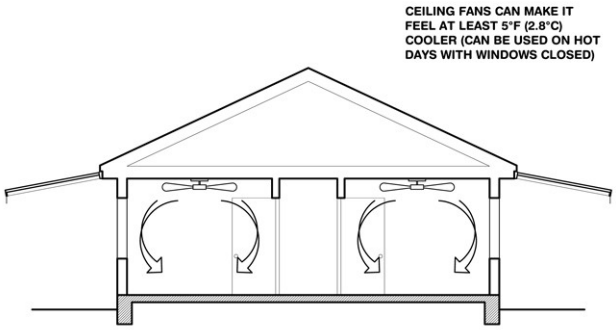
20

Provide double pane high performance glazing (Low-E) on west, north, and east, but clear on south for maximum passive solar gain



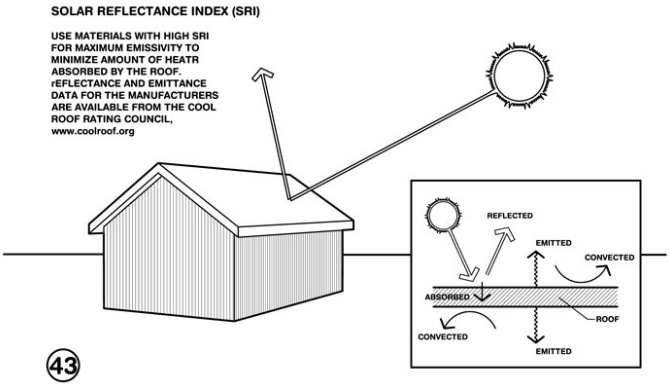
19

For passive solar heating face most of the glass area south to maximize winter sun exposure, but design overhangs to fully shade in summer



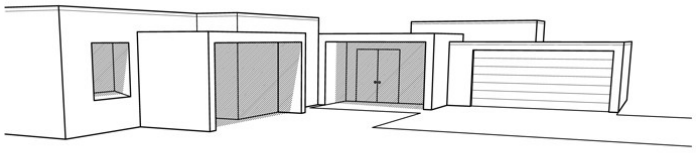
42

On hot days ceiling fans or indoor air motion can make it seem cooler by 5 degrees F (2.8C) or more, thus less air conditioning is needed



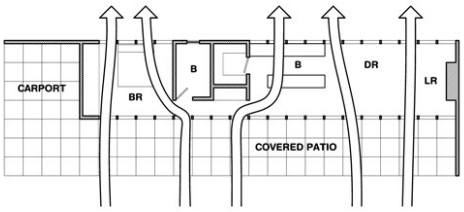
43

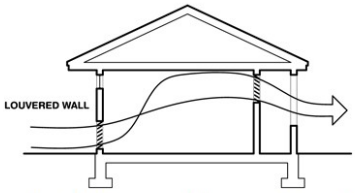
Use light colored building materials and cool roofs (with high emissivity) to minimize conducted heat gain



45

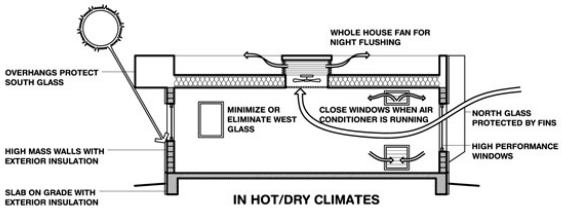
Flat roofs work well in hot dry climates (especially if light colored)



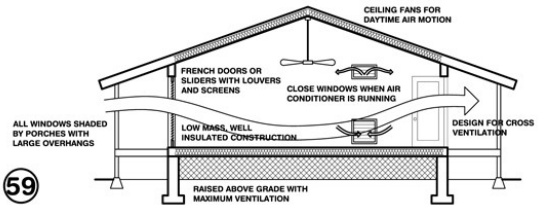


47

Use open plan interiors to promote natural cross ventilation, or use louvered doors, or instead use jump ducts if privacy is required



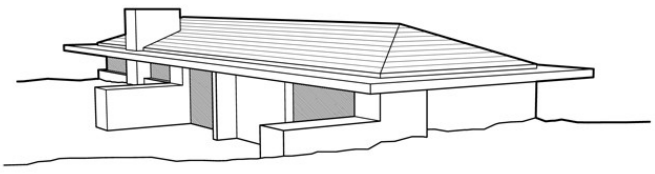
IN HOT/DRY CLIMATES



59

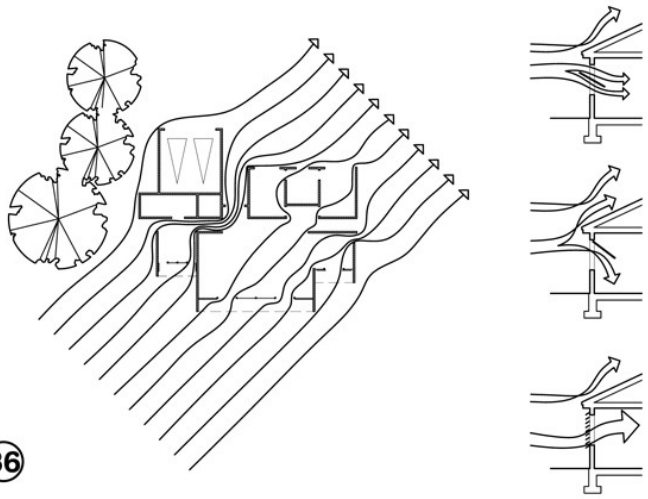
IN HOT/HUMID CLIMATES

In this climate air conditioning will always be needed, but can be greatly reduced if building design minimizes overheating



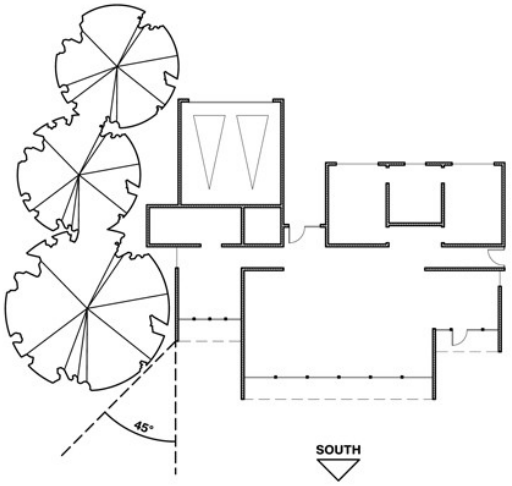
60

Earth sheltering, occupied basements, or earth tubes reduce heat loads in very hot dry climates because the earth stays near average annual temperature



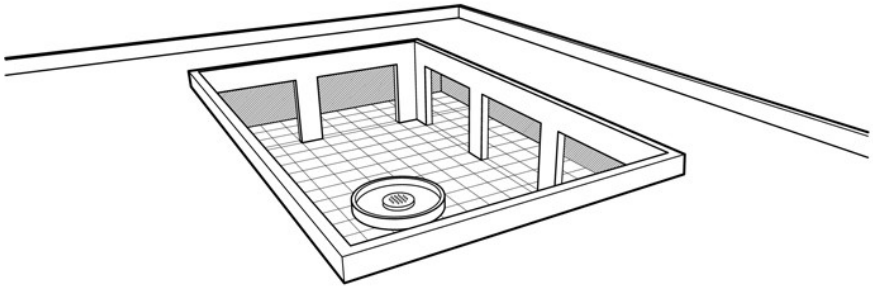
36

To facilitate cross ventilation, locate door and window openings on opposite sides of building with larger openings facing up-wind if possible



17

Use plant materials (bushes, trees, ivy-covered walls) especially on the west to minimize heat gain (if summer rains support native plant growth)

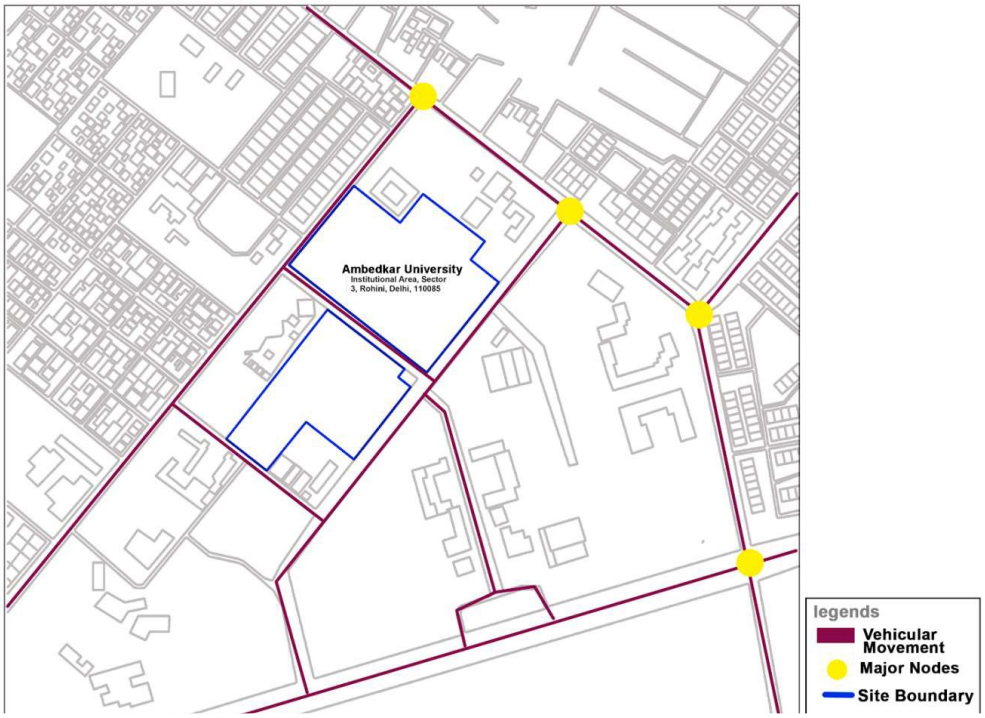


66

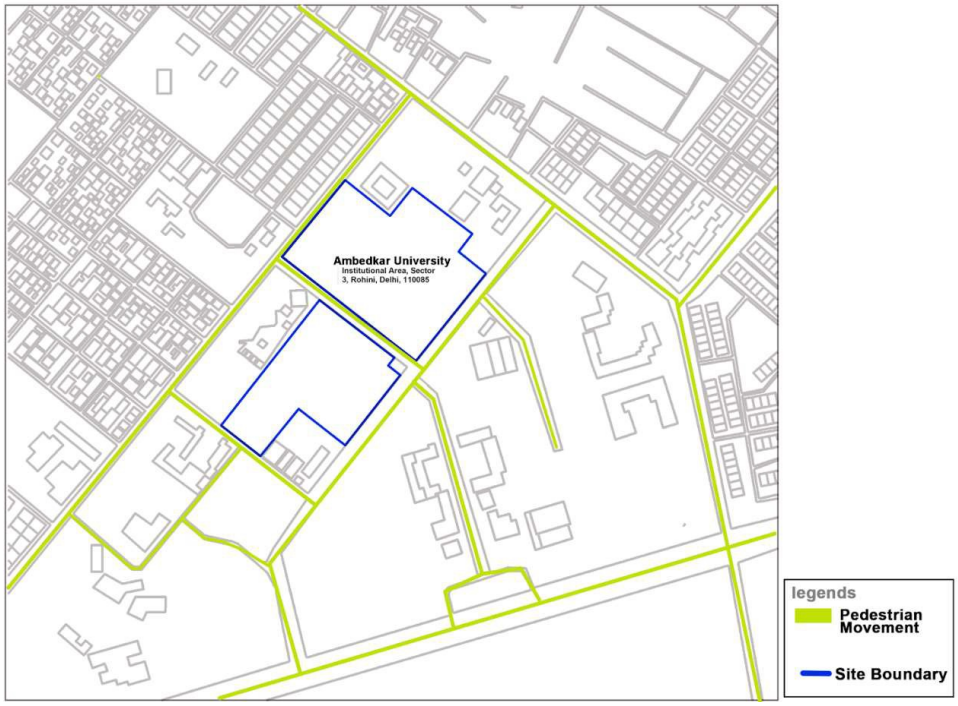
Traditional passive homes in hot windy dry climates used enclosed well shaded courtyards, with a small fountain to provide wind-protected microclimates

2.9. Traffic Study and Movement Pattern

The major vehicular movement is along the Outer Ring Road as well as the commercial area nearby the Ambedkar University. Naharpur Road is majorly used by the Police Staff as well as Jaipur Golden Hospital users (Doctors, Staff or Patients/Visitors) along with the local residents of Sector – 3. Traffic light also has its impact in ensuring smooth traffic movement.



1.Vehicular movement map



2 Pedestrian Movement map

Pedestrian movement is along the both sides of the site, local residents are the major users. Street hawkers also participate on these pedestrian walkways.

2.10. Services on the Site

- Electricity Supply Conditions: TATA Power Delhi Distribution Limited and BSES ensure that there is a regular and continuous supply of electricity throughout the day.
- Sewage Discharge Conditions: The sewerage collected through drains from the different localities is treated. Supplementary Drain carries only the treated water from Rohini and Rithala STP before it falls into the Yamuna River.
- Stormwater Management: As such, there is no provision of storm water management nearby our site and its surroundings. The collected rainwater is linked with Badli Bawana Nahar which is a major source of freshwater in Rohini.
- Water Supply Conditions: Delhi Jal Board ensures that there is a regular and continuous supply of water throughout the day.

CASE STUDIES

PHYSICAL CASE STUDIES

1. NATIONAL INSTITUTE OF FASHION TECHNOLOGY, DELHI

1.1. Institutional Overview

- **Established:** 1986 by the Ministry of Textiles, Government of India
- **Architects:** Gautam Bhatia followed by Stein Doshi & Bhalla
- **Location & Area:** Hauz Khas, Delhi; approximately 3 acres (11,650 sqm) WikipediaScribd

1.1.1. Master Plan & Spatial Organization

- Designed to resemble a **traditional Indian village square**, featuring a **central sunken courtyard ("Kund")**, open amphitheatre, terraces, bridges, and interconnected walkways Scribdwww.slideshare.net.
- **Zoning strategy:**
    - Academic blocks on one side,
    - Administration and amenities centrally located,
    - Hostel block at the rear
- Circulation separates **pedestrians inside** (around the courtyard) from **vehicular traffic** (basement parking).



1.2. CAMPUS MAP

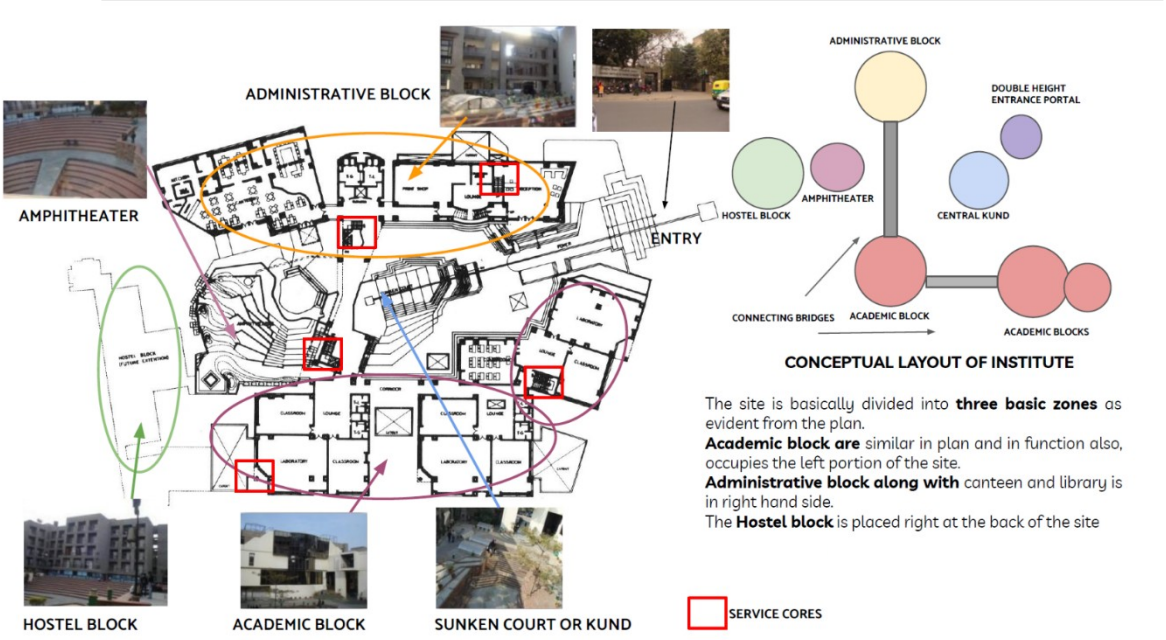


1.2.1. Orientation

The building layout is oriented along the **Northwest–Southeast (NW–SE) axis**, optimizing exposure to **sunlight and prevailing breezes**. This alignment supports passive design strategies by enabling effective solar access and natural ventilation.

Key design considerations include:

- **Building blocks follow the site geometry**, with peripheral lines aligned parallel to site boundaries.
- **Internal courtyards and block placements** are shaped around visual axes and pedestrian movement.
- Despite environmental considerations, **certain openings for light and ventilation were compromised for aesthetic goals**, potentially impacting comfort.
- **Windows in academic blocks face NW and SE**, which can result in excessive **daytime heat gain and glare**, especially during summer months.





Administrative Block

Ground Coverage=2892 Sq Mts. (25%)



Labs In The Way Due To Insufficient Space



The front court separated from amphitheatre by terraced academic wing becomes culturally appr.
and climatically comfortable outdoor space



LEGEND

- CLASSROOMS
- LABS
- ADMIN BLOCKS
- TOILETS
- CAFETERÍA
- KITCHEN
- RECEPTION
- HORZ CIRCULATION
- VERT CIRCULATION
- AMPHI + COURT
- GREEN

The irregular lines of the plot bind the irregularly growing blocks. different blocks acquire different shapes and forms depending upon the functions they are accommodating.
Permeability of the blocks, due to accessibility from all the sides makes the site totally traversed.
The building blocks are concentrated around the sunken court thus generating activity and creating lively environment.

ACADEMIC BLOCK

The whole complex forms a vibrant composition with a double height entrance to the reception
the academic blocks are connected through different systems of circulation overlooking the central court.

Double height reception with a large glazed waiting hall and this reception is overlooked through the exhibition area

Academic facilities have been provided in the areas joined together in the form of a cluster the cluster comprises of lobby lecture rooms laboratories and toilets.

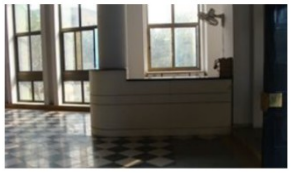


The exterior covers the activity happening inside giving privacy



LEGEND

- CLASSROOMS
- LABS



LECTURE ROOMS

Space in between the labs and toilets acts as lounge/lobby - an interaction space which is quite large enough so actual space is being used by the faculty members.

LABORATORIES



Fashion design demands extravagant gaps to handle sprawling fabric and numerous accessories they require larger tables, space for mannequins so there is a complaint of space due to increase in number of students.

1.3. Amphitheatre

The amphitheatre is primarily designed to host fashion shows, offering students a platform to stay connected with evolving trends. However, it has faced criticism for not being constructed as originally intended. The stage, which was meant to float above a water body, was altered during execution, and its orientation was changed—disregarding sun orientation—resulting in the audience and stage positions being swapped. With a seating capacity of around 300, it falls short for large events. Despite this, the space creates a lively, inward-facing bazaar atmosphere, animated by student and visitor movement and curated displays.



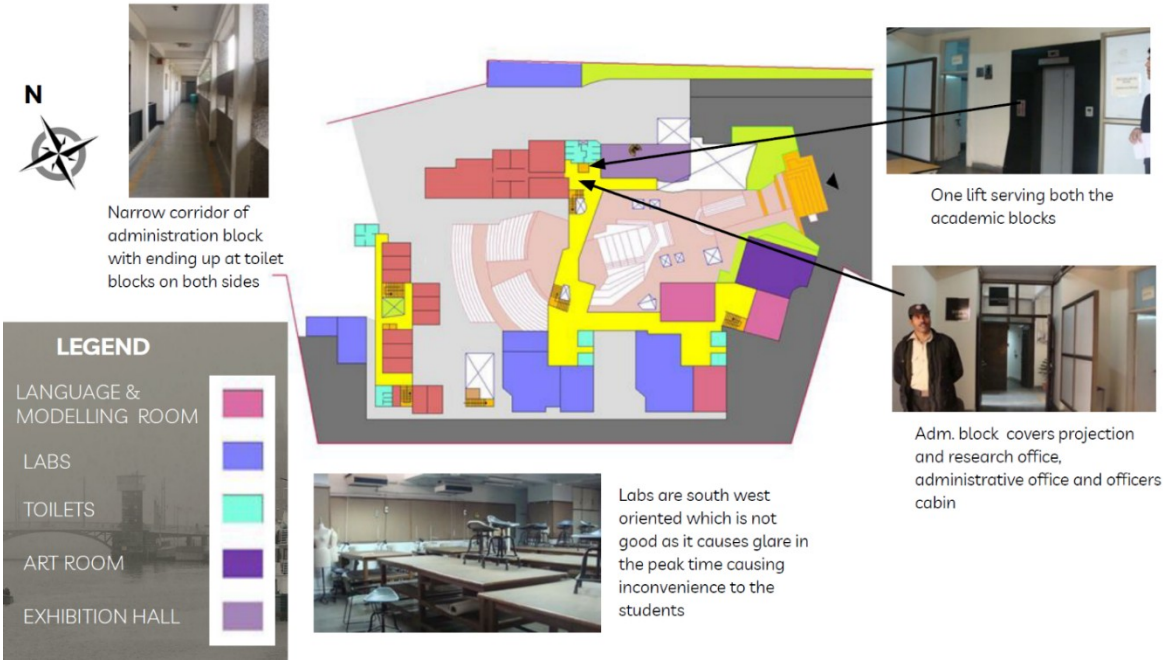




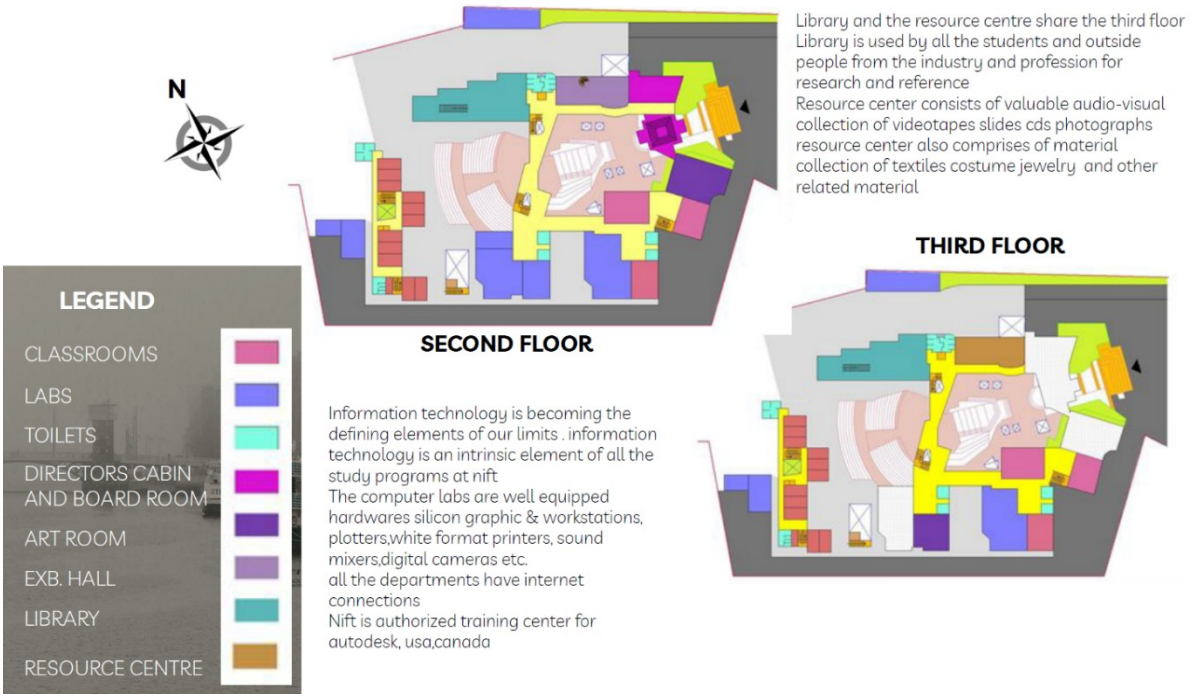


Basement is well lighted by using the skylights covered by fibre sheet which can be seen in central court.

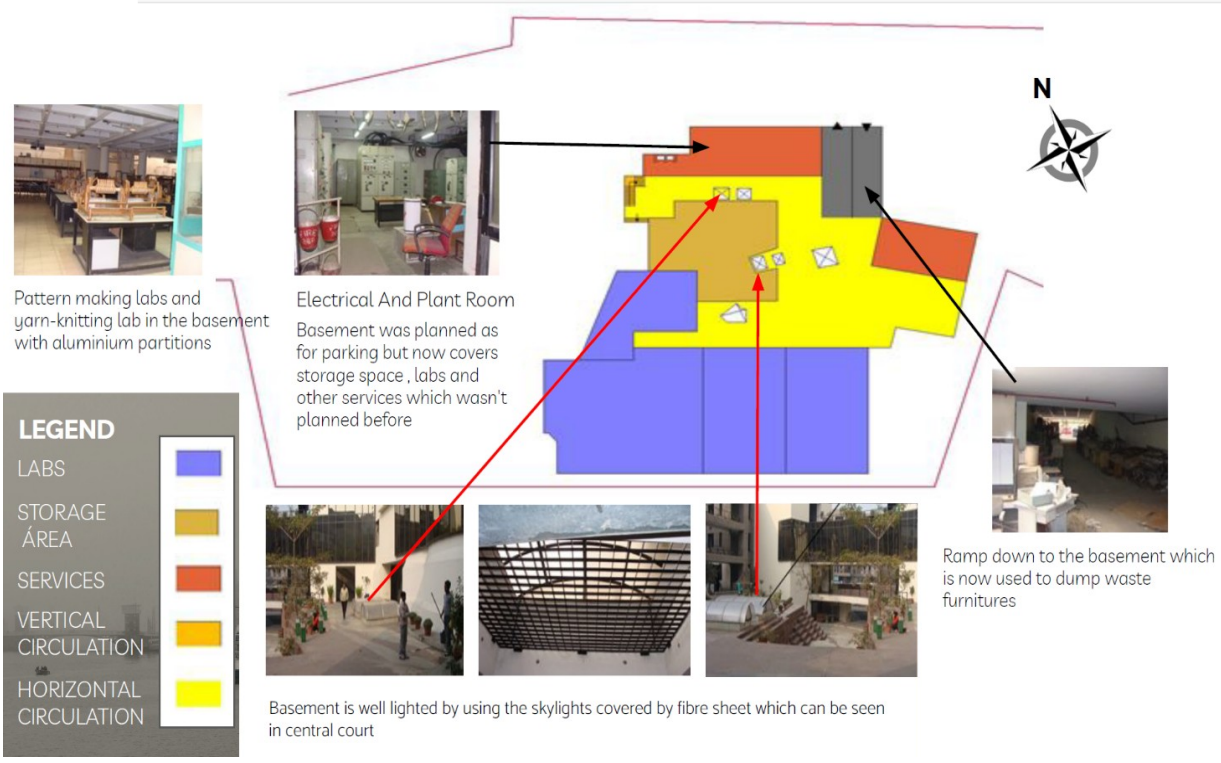
1.4. First Floor Details



1.4.1. Second and Third Floor Details



1.4.2. Basement Details



1.5. Material Palette

1. Structural System

- Reinforced concrete (RCC) frame with brick walls provides structural stability and flexibility in layout

2. Exterior Cladding & Façade

- The plinth and parts of the wall feature random rubble stone masonry, which blends with Delhi's heritage context.
- The façade is finished in grey-coloured grit aggregate with jagged grooves, creating a dynamic interplay of texture and light.
- Reflected/float glass and steel-framed screened glazing are used selectively to emphasize transparency and modernism in administrative zones.

3. Fenestration

- The project incorporates architectural jharokhas—traditional projecting windows reinterpreted in glass and steel—to create a fusion of modern expression and climatic responsiveness, though glazing to the NW–SE direction has received criticism for glare and heat gain.









1.6. Floor Finishes

- A variety of finishes demarcate different functional areas:
    - Reception: Black granite and white marble checkerboards
    - Corridors: Kota green and Jaisalmer yellow stone

- Classrooms & Labs: Plain cement finish
- Exhibition Halls: Chip flooring
- Open plaza and amphitheatre: Rough natural stone

1.7. Roofing

- Waffle slab system (1.7 m × 1.7 m modules) provides column-free interiors (~6.85 sqm) and thermal insulation through thicker roof depth

SPECIFICATION	NO.	AREA IN SQ.M	TOTAL AREA IN SQ.M
COMPUTER LAB			
AUDIOVISUAL ROOM FOR 50 PEOPLE	1	175	175
LIBRARY FOR 40,000 BOOKS	1	300	300
AUDITORIUM FOR 300 PEOPLE	1	450	450
RESIDENTIAL FACILITIES			
DORMITORY- DOUBLE ROOM	50	17.5	875
COMMON ROOMS & RECREATIONAL	1	150	150
STAFF ACCOMODATION			
CARETAKERS APARTMENT	1	85	85
STAFF QUARTERS	4	100	400
CLASSROOM – FOR 30 STUDENTS			
FASHION DESIGNING	3	20	60
GARMENT MANUFACTURING TECHNOLOGY	3	20	60
APPAREL MARKETING & MERCHANT	3	20	60

SPECIFICATION	NO.	AREA IN SQ.M	TOTAL AREA IN SQ.M
LABORATORIES			
PATTERN MAKING LAB	2	160	320
MACHINE LAB	4	160	640
ART ROOM G.M.T	2	160	320
SEMINAR ROOM 30 PEOPLE	1	120	120
DYEING WORKSHOP	1	125	125
PHOTOGRAPHY STUDIO + DARK ROOM	1	100	100
STORAGE SPACE	1	6	6
LOCKER SPACE	1	8	8
ENTRANCE HALL/ WAITING/ RECEPTION	1	100	100
EXHIBITION HALL	1	200	200
BUSINESS OFFICE	1	35	35

SPECIFICATION	NO.	AREA IN SQ.M	TOTAL AREA IN SQ.M
ADMINISTRATION			
EXECUTIVE DIRECTORS OFFICE + TOILET	1	100	100
OFFICERS CABIN	9	25	225
CONFERENCE ROOM 20 PEOPLE	1	132	132
REGISTRATION OFFICE	1	25	25
CASHIER	1		
ADMISSION OFFICE	1	50	50
PROJECT & RESEARCH	1	80	80
PANTRY	1	62	62
STAFF ROOM	1	100	100
BOARD ROOM 22 PEOPLE	1	125	125
STORE/ RECORD ROOM	1	12	12
FACULTY ROOM 22 PEOPLE	1	132	132
SITE AREA- 11,650 SQ.M			
TOTAL BUILT AREA- 13,570			
INTAKES- 300 STUDENTS			

1.8. Design Inferences from NIFT Campus – Application to AUD Campus Thesis

The following points highlight key design strategies observed at the NIFT Delhi campus and how they can be adapted and applied in the design proposal for the new Ambedkar University Delhi (AUD) campus at Sector-3, Rohini.

- **Climatic Orientation:**

  Orient buildings along NW–SE axis to maximize daylight and natural ventilation. Use recessed windows, jaalis, and shading devices for passive cooling in Delhi's semi-arid climate.

- **Campus Spine and Connectivity:**

  Introduce a central North–South pedestrian spine to connect academic blocks, admin, library, and student zones. Ensures intuitive circulation and spatial clarity.

- **Modular Academic Spaces:**

  Use modular planning for classrooms and studios. Incorporate open-plan layouts and natural lighting to support flexible, interdisciplinary learning environments.

- **Integrated Landscape Design:**

  Create landscaped courtyards between blocks for informal learning, recreation, and microclimate improvement. Encourage interaction and pause points.

- **Material Palette and Sustainability:**

  Use local, sustainable materials like fly ash bricks, lime plaster, and sandstone for reduced embodied energy, thermal comfort, and contextual identity.

- **Functional Zoning:**

Clearly zone academic, residential, admin, and public areas to improve functionality and security. Gradual transitions enhance campus experience.

2. CASE STUDY: BARKATULLAH UNIVERSITY CAMPUS, BHOPAL

2.1. Introduction

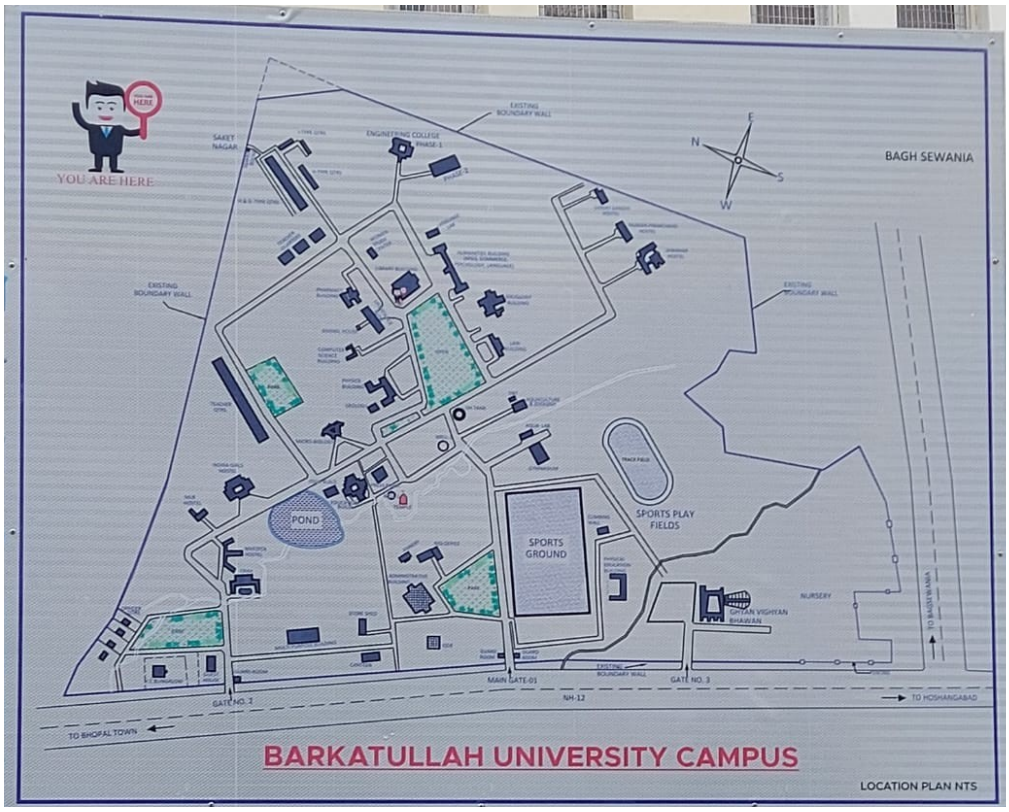
Barkatullah University, situated in Bhopal, Madhya Pradesh, serves as a significant institution in central India. Its campus layout offers valuable insights into designing educational institutions with integrated functional, academic, and administrative spaces. The campus comprises various faculties, centralized services, sports facilities, and landscaped green areas distributed within a defined boundary.



2.2. Campus Layout

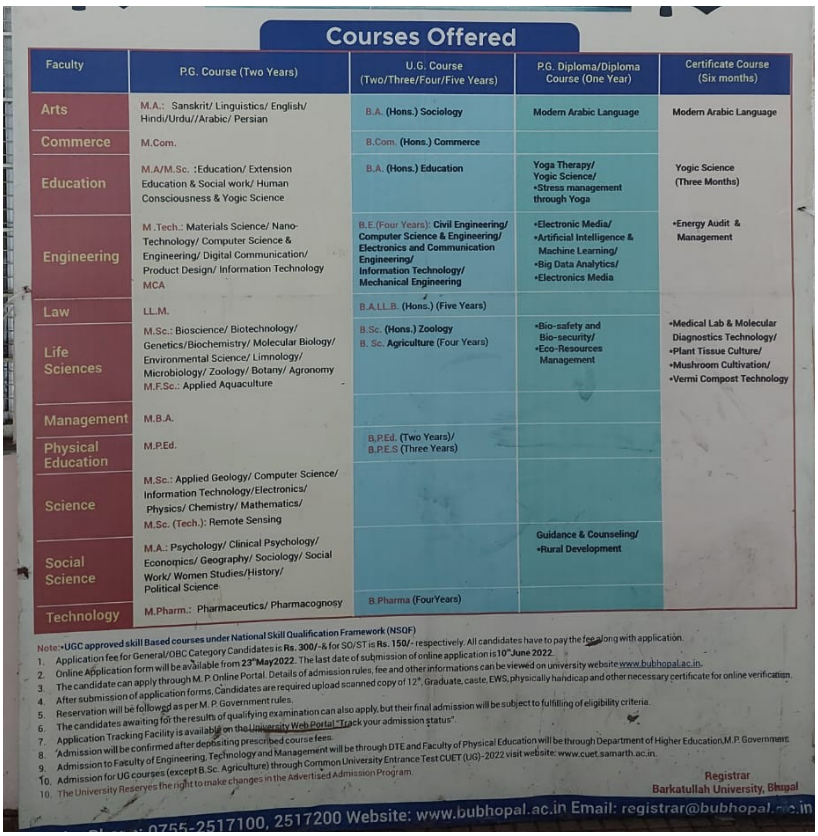
The campus features a decentralized layout with defined blocks for academics, administration, sports, and hostels. A network of roads and pedestrian pathways ensures internal connectivity. Central to the design are open green spaces and a pond, which enhance the ecological balance.

Campus map is shown below:



2.3. Academic Programs

The university supports a diverse academic structure offering UG, PG, Diploma, and Certificate courses. Faculties include Arts, Commerce, Education, Engineering, Law, Life Sciences, Management, Physical Education, Science, Social Science, and Technology. This wide spectrum demands a modular campus layout to accommodate different disciplines and user needs.



Courses Offered

Faculty	P.G. Course (Two Years)	U.G. Course (Two/Three/Four/Five Years)	P.G. Diploma/Diploma Course (One Year)	Certificate Course (Six months)
Arts	M.A.: Sanskrit/ Linguistics/ English/ Hindi/Urdu//Arabic/ Persian	B.A. (Hons.) Sociology	Modern Arabic Language	Modern Arabic Language
Commerce	M.Com.	B.Com. (Hons.) Commerce		
Education	M.A/M.Sc. :Education/ Extension Education & Social work/ Human Consciousness & Yogic Science	B.A. (Hons.) Education	Yoga Therapy/ Yogic Science/ •Stress management through Yoga	Yogic Science (Three Months)
Engineering	M.Tech.: Materials Science/ Nano-Technology/ Computer Science & Engineering/ Digital Communication/ Product Design/ Information Technology MCA	B.E.(Four Years): Civil Engineering/ Computer Science & Engineering/ Electronics and Communication Engineering/ Information Technology/ Mechanical Engineering	•Electronic Media/ •Artificial Intelligence & Machine Learning/ •Big Data Analytics/ •Electronics Media	•Energy Audit & Management
Law	LL.M.	B.A.LL.B. (Hons.) (Five Years)		
Life Sciences	M.Sc.: Bioscience/ Biotechnology/ Genetics/Biochemistry/ Molecular Biology/ Environmental Science/ Limnology/ Microbiology/ Zoology/ Botany/ Agronomy M.F.Sc.: Applied Aquaculture	B.Sc. (Hons.) Zoology B. Sc. Agriculture (Four Years)	•Bio-safety and Bio-security/ •Eco-Resources Management	•Medical Lab & Molecular Diagnostics Technology/ •Plant Tissue Culture/ •Mushroom Cultivation/ •Vermi Compost Technology
Management	M.B.A.			
Physical Education	M.P.Ed.	B.P.Ed. (Two Years)/ B.P.E.S (Three Years)		
Science	M.Sc.: Applied Geology/ Computer Science/ Information Technology/Electronics/ Physics/ Chemistry/ Mathematics/ M.Sc. (Tech.): Remote Sensing			
Social Science	M.A.: Psychology/ Clinical Psychology/ Economics/ Geography/ Sociology/ Social Work/ Women Studies/History/ Political Science		Guidance & Counseling/ •Rural Development	
Technology	M.Pharm.: Pharmaceutics/ Pharmacognosy	B.Pharma (FourYears)		

Note:•UGC approved skill Based courses under National Skill Qualification Framework (NSQF)

1. Application fee for General/OBC Category Candidates is Rs. 300/-& for SO/ST is Rs. 150/- respectively. All candidates have to pay the fee along with application.
2. Online Application form will be available from 23rd May2022. The last date of submission of online application is 10th June 2022.
3. The candidate can apply through M. P. Online Portal. Details of admission rules, fee and other informations can be viewed on university website www.bubhopal.ac.in.
4. After submission of application forms, Candidates are required upload scanned copy of 12th, Graduate, caste, EWS, physically handicap and other necessary certificate for online verification.
5. Reservation will be followed as per M. P. Government rules.
6. The candidates awaiting for the results of qualifying examination can also apply, but their final admission will be subject to fulfilling of eligibility criteria.
7. The candidates awaiting for the results of qualifying examination can also apply, but their final admission will be subject to fulfilling of eligibility criteria.
8. Application Tracking Facility is available on the University Web Portal "Track your admission status".
9. 'Admission will be confirmed after depositing prescribed course fees.
10. Admission to Faculty of Engineering, Technology and Management will be through DTE and Faculty of Physical Education will be through Department of Higher Education,M.P. Government.
11. Admission for UG courses (except B.Sc. Agriculture) through Common University Entrance Test CUET (UG)-2022 visit website: www.cuet.samarth.ac.in.
12. The University Reserves the right to make changes in the Advertised Admission Program.

Registrar
Barkatullah University, Bhopal

0755-2517100, 2517200 Website: www.bubhopal.ac.in Email: registrar@bubhopal.ac.in

2.4. Administrative Block – Satya Bhawan

The administrative block, 'Satya Bhawan,' is a multi-level facility with defined rooms for academic, administrative, and student support functions. The plan reveals a clear zoning of services by floors and open central courtyards that allow daylight and ventilation into the interiors.



3. CEPT University, Ahmedabad

Location:
CEPT University is situated within the Kasturbhai Lalbhai Campus on University Road, Navrangpura, Ahmedabad, Gujarat – 380009.
The site lies at geographical coordinates: 23°02′15″N, 72°32′59″E.
The terrain demonstrates a slight general slope towards the northwestern corner, allowing for natural surface drainage and strategic campus planning.

Connectivity:
The campus is well-connected through multiple modes of public and private transportation:

- Ahmedabad Airport: Approx. 11 km
- Ahmedabad Railway Station: Approx. 4 km
- Municipal Bus Stand: Within 300 meters
- Bus Rapid Transit (BRT) Corridor: Just 1.1 km away

These connections provide ease of access for students, faculty, staff, and visitors, supporting regional and intercity mobility.

Nearby Landmarks and Institutional Context:
The CEPT campus is located within a dense academic and institutional zone, surrounded by prestigious institutions and cultural landmarks:

- Indian Institute of Management (IIM), Ahmedabad – 3.1 km
- University of Gujarat – 1.1 km
- Amrit School of Management – 230 m
- School of Engineering and Applied Sciences – Located to the east
- M.G. Science Institute and L.M. College of Pharmacy – Located to the south
- Amadavad ni Gufa (cultural landmark and gallery) – In close proximity



Ahmedabad experiences a **Hot and Semi-Arid Climate**, classified just below the threshold for a tropical savanna climate. The city witnesses three distinct seasons: **Summer**, **Rainy (Monsoon)**, and **Winter**.

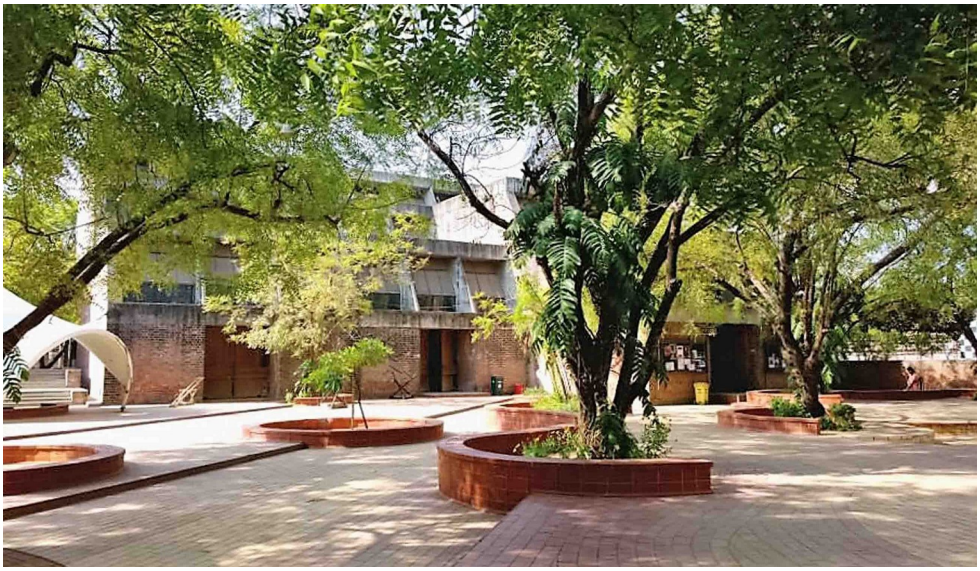
- The climate remains extremely dry for most of the year, with the exception of the monsoon period.
- Summer lasts from March to June, during which temperatures peak.
- The average maximum summer temperature is approximately 42°C.
- The average minimum temperature during this period is about 24°C.
- The southwest monsoon brings a humid climate from mid-June to mid-September, offering relief from the intense summer heat.
- During winter (November to February), the average maximum temperature is around 30°C, and the average minimum drops to approximately 13°C.
- Cold northerly winds contribute to a mild chill in January.
- The average annual rainfall is 800 mm, with maximum precipitation occurring in August, typically spread over 15 days.

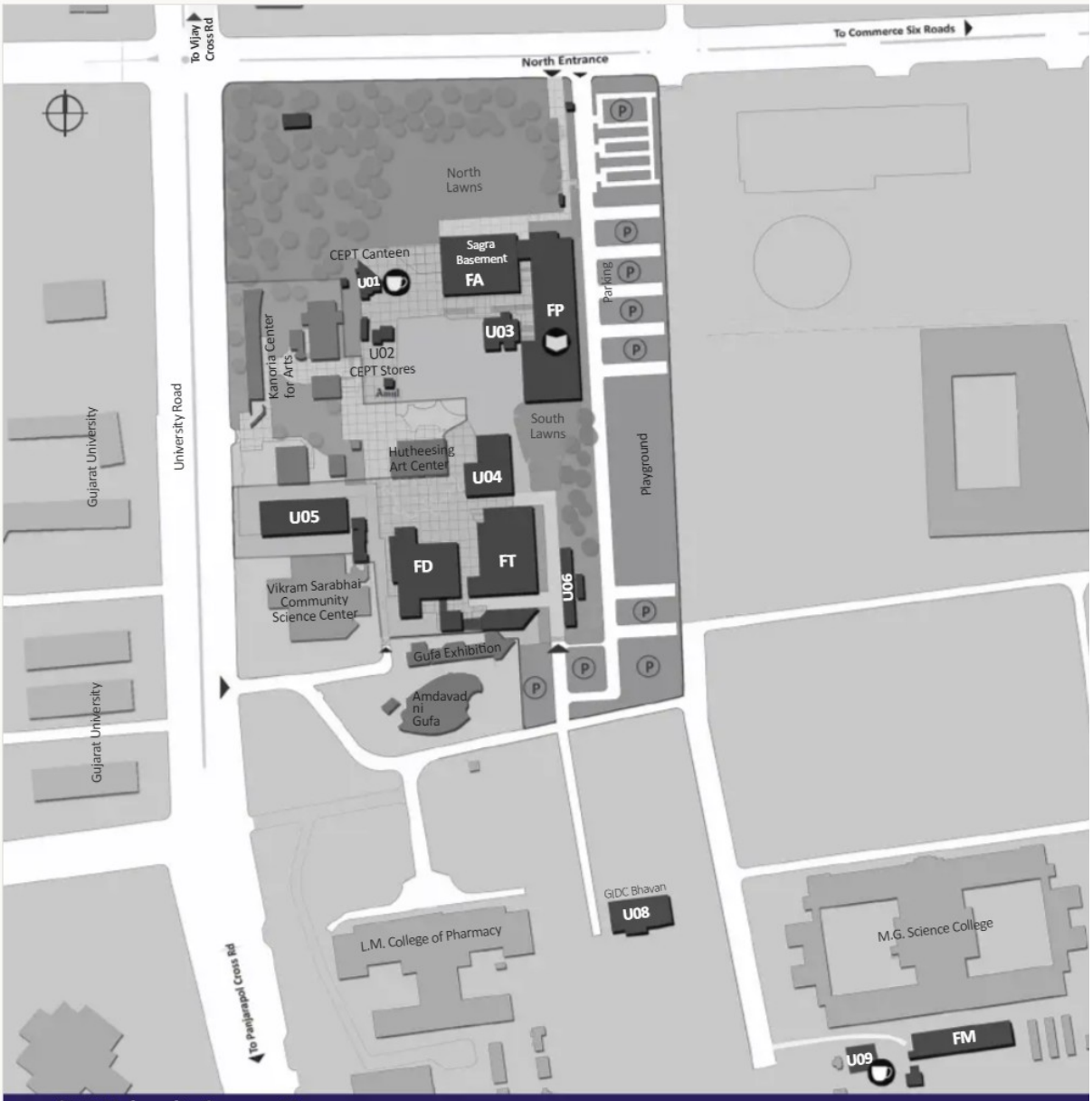
Response to climate

To mitigate excessive heat buildup on campus, CEPT University employs a scattered planning approach. This strategy incorporates small landscape patches and intermediate open spaces—such as jury courts, interaction areas, and passages—between building blocks.

- These intermediate open zones act as thermal buffers, facilitating cross ventilation and dissipating heat.

- Openings in the north ensure cooler inflow of air, while larger projections on the south façade provide shading, reducing solar gain.
- This planning not only improves thermal comfort but also enhances social interaction and flexible spatial usage.





CEPT University Campus Map

Key (This list includes the common facilities on the campus.):

FD (Faculty of Design)
- Center for Advanced Research in Building Science & Energy (CARBSE)

FM (Faculty of Management)
- Center for Urban Equity (CUE) - FM 102
- Computer Tutorial Lab - FM 202,3
- Performance Assessment System (PAS) Project Center - FM 107
- CEPT Research & Development Foundation (CRDF) - FM 201
- Faculty of Technology (FT) Project Office Center - FM 103
- Crèche - FM 106
- CEPT Cafeteria - U09

FP (Faculty of Planning)
- Administration Area - FP 223
- Auditorium - FP 103
- CEPT Computer Lab - FA 101
- Library - FP 201

FT (Faculty of Technology)
- Geomatics Computer Lab - FT 111

U01: CEPT Canteen

U02: Amul Parlor
- Stationary
- Print Shop (Siddhi)

U03: Workshop

U04 (NBO Block): University Labs

U05: Fab Lab
- Metal & Wood Workshop
- Design Innovation & Craft Resource Center (DICRC)

U06 (University Staff Office: USO)
- Help Desk
- Student Services Office (SSO)
- UG, PG, Doctoral, Diploma & Certificate and Exchange Offices
- Outreach Services Office (OSO)



To further reduce heat gain, buildings at CEPT are designed with major openings oriented towards the north. This orientation takes advantage of the diffused and soft natural light from the north, which minimizes thermal ingress while enhancing indoor daylight quality.

- Inclined windows are strategically designed to maximize the penetration of natural light without glare.
- This approach ensures well-lit interiors while reducing the reliance on artificial lighting, thus promoting energy efficiency.





These passive design strategies contribute significantly to creating a climatically responsive campus suitable for the hot and semi-arid climate of Ahmedabad.

To mitigate heat gain and improve indoor thermal comfort, **large projections are strategically placed on the south-facing façades** of the buildings at CEPT University. These overhangs:

- **Shade the building envelope** during the hottest parts of the day when solar intensity from the south is highest.
- **Minimize direct solar radiation** from entering indoor spaces, effectively reducing internal heat buildup.

This passive shading measure is especially critical in Ahmedabad's **hot and semi-arid climate**, where solar protection on southern sides significantly enhances energy performance and user comfort.

Design Philosophy Implemented

CEPT University encourages student and faculty engagement by incorporating numerous informal seating areas throughout the campus. These are strategically positioned within courtyards and plazas, creating flexible zones for discussion, reflection, and collaboration.

Additionally, the play of levels is used as a design strategy to integrate seating at varying heights and platforms. This spatial layering not only activates transitional areas but also contributes to the dynamic character of the built environment, fostering spontaneous interactions and a sense of community within the academic setting.



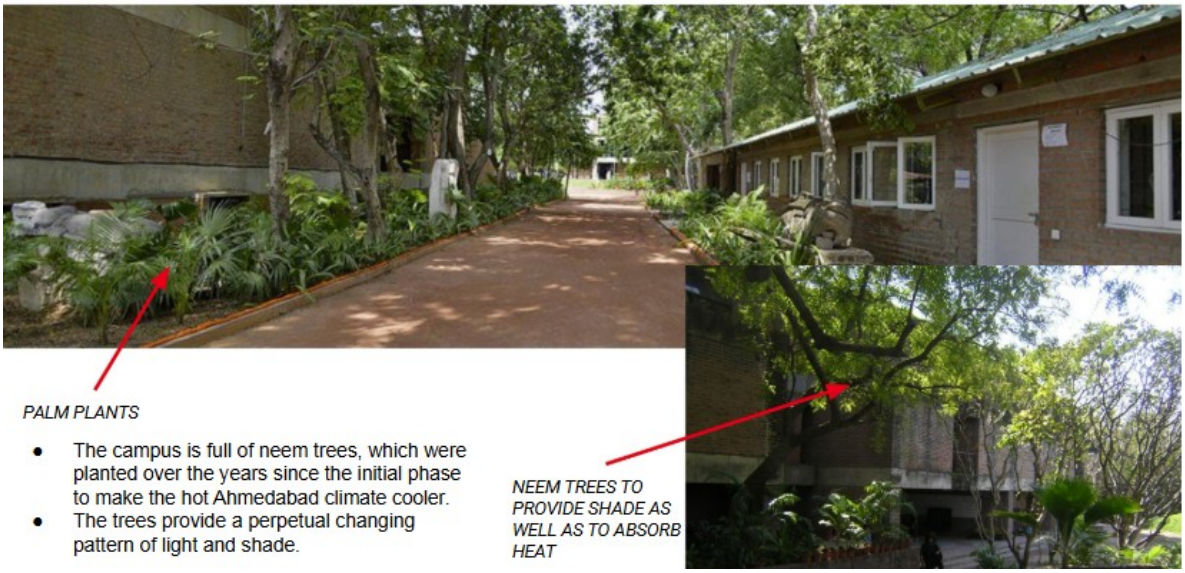
The studio interiors at CEPT University are **strategically connected to the exteriors through balconies**, fostering a strong visual and spatial connection with the outdoors. The openness also encourages **fluid interactions between indoor academic activities and the external campus environment**, promoting creativity and collaborative learning.





ARCHITECTURE DEPARTMENT SOUTH VIEW

Landscaping



- The campus is full of neem trees, which were planted over the years since the initial phase to make the hot Ahmedabad climate cooler.
- The trees provide a perpetual changing pattern of light and shade.



Inferences

- **Climatic Responsiveness**

The campus effectively addresses Ahmedabad's hot and dry climate through shaded walkways, open courtyards, and passive ventilation, creating comfortable microclimates throughout the site.

- **Open and Non-Hierarchical Planning**

CEPT's layout avoids rigid zoning and hierarchy, instead promoting fluid movement and informal interactions among students, faculty, and visitors across disciplines.

- **Flexible Learning Environments**

Studios and classrooms are designed to be adaptive and reconfigurable, supporting changing academic needs, project-based learning, and collaborative activities.

- **Seamless Indoor-Outdoor Integration**

The design blurs boundaries between built spaces and nature, using semi-open corridors, landscaped courtyards, and spill-out areas that foster interaction and visual openness.

- **Material Expression and Honesty**

The use of exposed brick, concrete, and locally sourced materials reflects a raw and honest architectural expression while celebrating regional craftsmanship and sustainability.

- **Human-Centric Scale and Comfort**

Built forms respect human proportions, offering shaded seating areas, visual porosity, and comfortable circulation paths that encourage people to linger, meet, and engage.

- **Landscape as a Core Element**

Green spaces are not just decorative but integral to the spatial experience, offering visual relief, improving microclimate, and encouraging relaxation and interaction.

3.3. Design Inferences for Thesis Application

• Use of a central open space or courtyard in the admin block helps enhance natural light and cross ventilation.

• Decentralized layout allows functional segregation while maintaining connectivity through internal roads and green buffers.

• Diverse academic offerings indicate the need for adaptable building typologies and modular planning.

• Provision of green spaces like ponds and gardens supports environmental sustainability and student well-being.

• Clear wayfinding, visible in the zoning and directional signage, improves navigation across large campuses.

• Admin services spread across floors with a mix of confidential and public spaces can be replicated in layered institutional setups.

CASE STUDIES (DESK APPRAISAL)

4. AZIM PREMJI UNIVERSITY, BENGALURU, INDIA

Located on the outskirts of Bengaluru, the adopted design sets out to redefine the educational landscape of the country and is an integral component of a national strategy for improving primary education in India.

The architectural marvel is spread across a 36-hectare site with modules ranging from Academic and Residential Buildings to Recreational spaces, all synergetically designed to articulate a kinetic experience that enhances curiosity in the young inhabitants. The planning of the campus adopts a mix of linear and organic compositions. Its spatial layout evokes a sense of stately emotion and follows a formal segregation of spaces, which aids in the holistic inclusion of various segments of design such as its landscapes, interiors, structural, utilities and services.



4.1. Institutional Vision & Academic Alignment

- Founded in **2010** by the Azim Premji Foundation with a mission toward **equity, social justice, and sustainability** Designyatra+12Wikipedia+12MasterEdu+12.
- Offers undergraduate and postgraduate programs in **development, education, law and policy, humanities, economics**, akin to AUD's schools WikipediaMasterEdu.

4.2. Campus Layout & Spatial Organisation

- Spread across approximately **36 hectares (90 acres)** at Sarjapur-Attibele Road, Bengaluru Designyatra+7Azim Premji University+7Wikipedia+7.
- Designed by **CCBA (Christopher Benninger Associates)** with an emphasis on a **pedestrian-focused central spine**, separating vehicular traffic to the periphery for enhanced safety and walkability RTF | Rethinking The Future+3CCBA Designs+3Designyatra+3.
- Academic buildings arranged in modular clusters, connected through **arcades and courtyard-based plazas**, supporting informal interaction and wayfinding Wikipedia+13CCBA Designs+13Wikipedia+13.

4.3. Building Typologies & Residences

- Facilities include a **Welcome Centre**, academic blocks, laboratories, library, auditorium, seminar halls, and large-scale **Universal Hostels** (40-storey towers accommodating ~3,000 students each) Wheree+7Surfaces Reporter+7Wikipedia+7.
- Built space: ~2.6 million sq.ft by the end of Phase I; projected full capacity ~20,000 students, with ~16,000 living on campus

1. Building Typologies

Typology	Function & Design Approach
Academic Blocks	Modular clusters for classrooms, labs, seminar rooms, and faculty spaces; connected by arcades.
Library	Central academic resource with open-plan reading zones, archives, and digital support spaces.
Auditorium & Seminar Halls	Multiple formats for events (small discussion rooms to large halls); shared by schools.
Welcome Centre	Orientation, information desk, and visitor lobby; serves as the threshold to the campus.
Administrative Block	Contains registrar office, finance, academic affairs, and HR cells.
Recreational Spaces	Indoor sports hall, music/art studios, fitness rooms, and open-air amphitheatre.
Food Courts & Cafeterias	Clustered near hostel zones and academic areas; designed as informal gathering nodes.

2. Residences / Hostels

Feature	Description
Universal Hostels	High-rise, mixed-use towers (~40 floors) accommodating ~3,000 students each.
Room Types	Mix of single, double, and accessible rooms; attached toilets; well-lit with cross ventilation.
Shared Facilities	Study lounges, TV/common rooms, kitchenettes, laundry zones, and vending areas.
Safety & Access	RFID entry, CCTV, 24/7 warden presence, gender-sensitive policies, dedicated accessible rooms.
Recreational Integration	Landscaped terraces and balconies, visual connection to courtyards and social spaces.
Proximity to Academics	Designed within walking distance of core academic and food zones.



4.4. Classroom Layout & Interior – Azim Premji University (APU)

4.4.1. Classroom Features

- **Flexible Furniture**: Lightweight chairs and tables allow reconfiguration for group discussions, seminars, or lecture formats.
- **Natural Light & Ventilation**: Large windows provide abundant daylight, reducing reliance on artificial lighting and promoting ventilation Azim Premji University+14Azim Premji University+14Shiksha+14.
- **Tech-Enabled Spaces**: Smart boards/projectors, Wi-Fi access, and well-planned acoustics support interactive pedagogy and multimedia presentations .

4.4.2. Spatial Configuration

Based on architectural descriptions and campus plans:

- **Academic blocks** are arranged in **curved modules** around internal plazas and arcades. Classrooms are clustered along these paths for easy access and visual connectivity Wikipedia+7Abirpothi+7libraryarchives.azimpremjiuniversity.edu.in+7.
- Seminar halls with capacities of around **250–500 seats** are embedded within academic blocks, adjoining open courtyards and common areas CCBA Designs+11Abirpothi+11Wikipedia+11.
- The **Welcome Centre** and lecture clusters serve as focal nodes along a central pedestrian spine, enhancing wayfinding and campus coherence







4.5. Inferences:

- Exposed concrete – similar building skin as of other Western architects like Kahn & Corbusier.
- Charles inherited India's strict hierarchical & divisive geometries from the romanticised era of the Garden City.
- A method of urban planning in the late 1800s in which self-contained communities are surrounded by "greenbelts".
- Master plan is organised as a central pedestrian-based civic structure that connects most parts of the campus.
- Charles made sure the campus remains pedestrian-friendly & the traffic zones along the periphery of the site.
- In response to Bangalore's water challenges, Benninger has integrated waterbodies to best harvest the resource within the site.
- academic, residential (hostels), faculty housing, admin, and recreation are placed in distinct but interlinked zones, improving circulation and noise control.
- Academic blocks are arranged along a central pedestrian spine, ensuring accessibility, orientation clarity, and visual connectivity across departments.
- The design avoids rigid boundaries by creating semi-open courtyards, verandahs, and shaded walkways, blending indoor and outdoor spaces for a breathable campus fabric.

5. ASHOKA UNIVERSITY, SONIPAT, HARYANA

5.1. INTRODUCTION

Ashoka University is named after Emperor Ashoka (c. 304 – 232 BC) who represents India's highest values and ideals. Emperor Ashoka's *dhamma* revolved around liberal thought and education. Having personally undergone a self-transformation, Emperor Ashoka went on to spread his ideas far and wide across Asia.

Drawing from Emperor Ashoka's life of learning and transformation, Ashoka University provides a holistic education that is liberal, multidisciplinary, and interdisciplinary, offering a diverse and inclusive space for its students to think deeply and critically, learn across disciplinary boundaries, express themselves creatively, and communicate with meaning to cause impact and change. Students are encouraged to explore ideas, engage in research, and focus on values and ideals of the highest order to experience self-transformation within the duration of their education and henceforth.

The expanding universe of multidisciplinary education is depicted through an intersection of arcs that reflect the creation and synthesis of diverse knowledge as portrayed in the Ashoka University logo.

Ashoka University is a pioneer in its focus on providing a liberal education at par with the best in the world. The aim at Ashoka is to help students become well-rounded individuals who can think critically about issues from multiple perspectives, communicate effectively, and become leaders with a

commitment to public service. An Ashoka education carries a strong emphasis on foundational knowledge, thorough academic research based on rigorous pedagogy, and hands-on experience with real-world challenges. The 2800 plus students on campus, drawn from 28 states and over 287 cities in India and 21 other countries, receive a world-class interdisciplinary education through undergraduate and post-graduate programmes led by internationally renowned faculty.



5.2. Campus Facilities

Ashoka's purely residential campus is spread over 25 acres in Rajiv Gandhi Education City, Sonepat, Haryana. The WiFi-enabled classrooms are equipped with a state-of-the-art audio-visual system including projectors, smartboards, recording facilities, etc. These classrooms range from 25-seater rooms for seminars and tutorials to 240-seater lecture halls for guest speakers, performances and town-hall sessions. Students also have access to online resources and state-of-the-art IT infrastructure to support their educational endeavors.

5.2.1. Transport

Ashoka University facilitates commute through a shuttle service through Tempo Travellers – available for students, staff and visitors – to and from Jahangirpuri Metro Station and Ashoka University Campus, as per the approved and announced schedule. Our primary objective is to provide safe, comfortable and efficient transport facility to our students.

5.2.2. Medical Services & Guidelines

- Ashoka University has its own 16 bedded Infirmary set-up for primary healthcare. Infirmary is located at the Sports Complex and provides free of cost First Aid and medical assistance, to the students, faculty and staff, round the clock.
- The infirmary is well equipped and manned by our medical partner Blue Circle Medi Services Pvt. Ltd since inception of Ashoka.

- Well-qualified and experienced Resident Doctors run OPD hours in the infirmary as per the prescribed schedule.
- The cost of prescribed medicines and medical tests shall be borne by the patient.
- All students of the University are covered under an insurance of INR 1 Lac applicable upon hospitalization of 24 hours or more.
- Ashoka has tie-ups with Max hospital on Pan India basis and locally with FIMS and Tulip hospital, in case higher intervention is needed.
- 24×7 Infirmary emergency helpline numbers – 8199977073, 8199977075, 0130-2300550
- The Campus is equipped with a 24X7 ambulance. Ambulance assistance would be provided only in case of any medical emergency and need for hospitalization. On such occasions the matter is reported to concerned authorities immediately by the nursing staff. Nurse would accompany the student only during admission and discharge and on an exceptional case to case basis to the nearest hospital / nursing home.

5.2.3. Amphitheater

Ashoka University has 2 open amphitheaters located in front of AC-01 and AC-02 buildings. They are used for cultural activities like music, theatre, talks, poetry reading, documentary screening, various language festivals, art competitions, and many other activities.

5.2.4. Dr. Reddy's Auditorium

Dr. Reddy’s Auditorium is the primary auditorium at Ashoka University, located on the 3rd Floor of AC-01. With approximately 400 seats, it is the university’s largest auditorium and hosts special lectures, concerts, performances, and university ceremonies including the annual student inductions, and inaugurations.

5.2.5. Spaces and classrooms

Ashoka University has a total of 90 classrooms and 12 teaching and research labs across the 4 Academic blocks. Classrooms differ in size and facilities that assist in delivering lectures and discussion sessions according to the lecturer’s requirements.

5.3. Sustainability at Ashoka

5.3.1. Integrated Design for Sustainable Living

Sustainability is not just a buzzword for us; it’s ingrained in our design philosophy. Buildings on our campus are a testament to design thinking that incorporates outdoor corridors, natural ventilation in common areas, “jaali” sunshades, and other passive features. These elements harmoniously merge with technologically advanced building systems to create a living and learning environment that respects nature.



5.3.2. Rainwater Harvesting: Nurturing Groundwater

To combat water scarcity, we have implemented 15 rainwater harvesting pits strategically placed across the campus. Regular maintenance ensures these pits effectively recharge groundwater, and each pit includes a chamber for silt removal. By allowing rainwater to seep into the ground, we actively contribute to maintaining groundwater levels.

5.3.3. Campus Composting Facility: Turning Waste into Useful products

Our dedicated composting facility transforms organic waste into nutrient-rich compost. With a capacity of 500kg/day, the facility supports sustainable waste management. The composting process, with a quick turnaround time of 10 days, ensures efficient recycling of organic materials to our nursery as compost contributing to a circular economy.



5.3.4. On-site Nursery: Cultivating Greenery

Enhancing the natural beauty of our campus, our skilled team of gardeners manages an on-site nursery with more than 900 potted plants, which helps beautify the campus and improve indoor air quality. In-house propagation of plants in the nursery helps replace mortality. Propagated plants are distributed among students and staff to encourage affection for plants. Annually, we grow around 6000+ plants, enriching the campus environment and promoting biodiversity.

5.3.5. Sewage Treatment Plants: Harnessing Water Responsibly

Ashoka University operates two sewage treatment plants with capacities of 100KLD and 300KLD. These plants utilize advanced Moving Bed Biofilm Reactor (MBBR) technology to treat wastewater to the standards set by the Central Pollution Control Board. Treated water is repurposed for irrigation, cleaning solar panels, and future plans include extending its use for toilet flushing and construction activities.

5.3.6. Empowering Campus Life with Solar Energy

With solar panels strategically placed on car park rooftops, the campus aim to make sustainability a seamless part of your daily life on campus. Beyond the environmental benefits, solar-powered facilities contribute to a cleaner and more resilient energy infrastructure, fostering a sense of responsibility and empowerment within our community. In our quest for sustainability, we have explored rooftops and offsite solar farms to further enhance our renewable energy capacity.

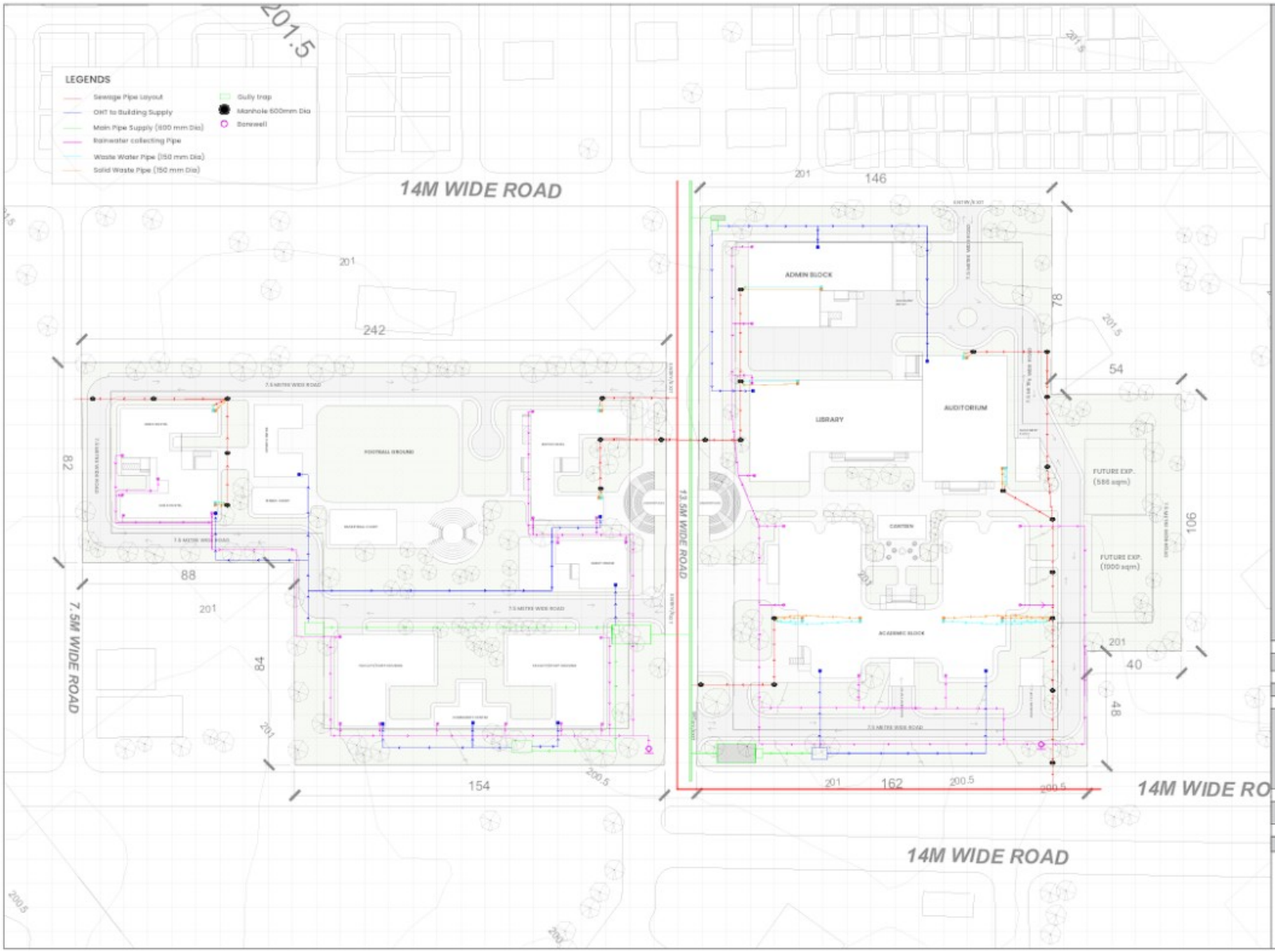


5.4. INFERENCES

- Spatial Integration: Avoid strict zoning; instead, interweave academic, residential, and social spaces around a central organizing spine to enhance interaction.
- Central Green Space: Introduce a central plaza or open green forum surrounded by major public buildings to serve as a vibrant node for congregation and recreation.
- Climate-Responsive Design: Employ jaali screens, shaded corridors, and courtyards to mitigate heat and optimize natural light and airflow, aligned to Delhi's semi-arid climate.
- Social Microspaces: Design smaller clusters of courtyards and shaded nooks across academic and residential areas to create informal meeting points and promote interaction.
- Material Palette: Use locally available materials like Dholpur sandstone or exposed brick to create visual warmth, reduce costs, and echo regional character.
- Sustainability: Incorporate decentralized solar energy systems, bio-waste processing, and rainwater harvesting integrated into campus infrastructure.

5.5. SHEETS

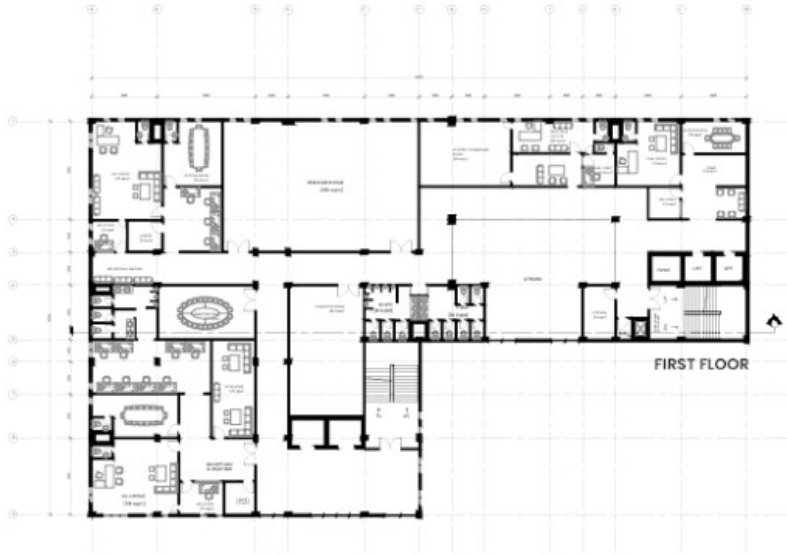

SITE PLAN
PROJECT TOPIC
INSTITUTE CAMPUS DESIGN
SC-ALE
1:300
SHEET NO.
0
SUBMITTED BY
THESIS GUIDE
DR.YOGESH GARG SIR
N
14M WIDE ROAD
14M WIDE ROAD
13.5M WIDE ROAD
7.5M WIDE ROAD
AUDITORIUM
LIBRARY
ADMIN BLOCK
CANTEEN
ACADEMIC BLOCK
FOOTBALL GROUND
FUTURE EXP. (588 sqm)
FUTURE EXP. (1000 sqm)
106
54
40
48
78
146
162
154
242
84
88
82



SITE SERVICES

PROJECT TOPIC	INSTITUTE CAMPUS DESIGN
SCALE	1:700
SHEET NO.	04
SUBMITTED BY	ANUSHKA YADAV 20902008
THESIS GUIDE	Dr. YOGESH GARG SIR





ADMIN FLOOR PLANS

PROJECT TOPIC

INSTITUTE CAMPUS DESIGN

SCALE

1 : 200

SHEET NO.

05

SUBMITTED BY

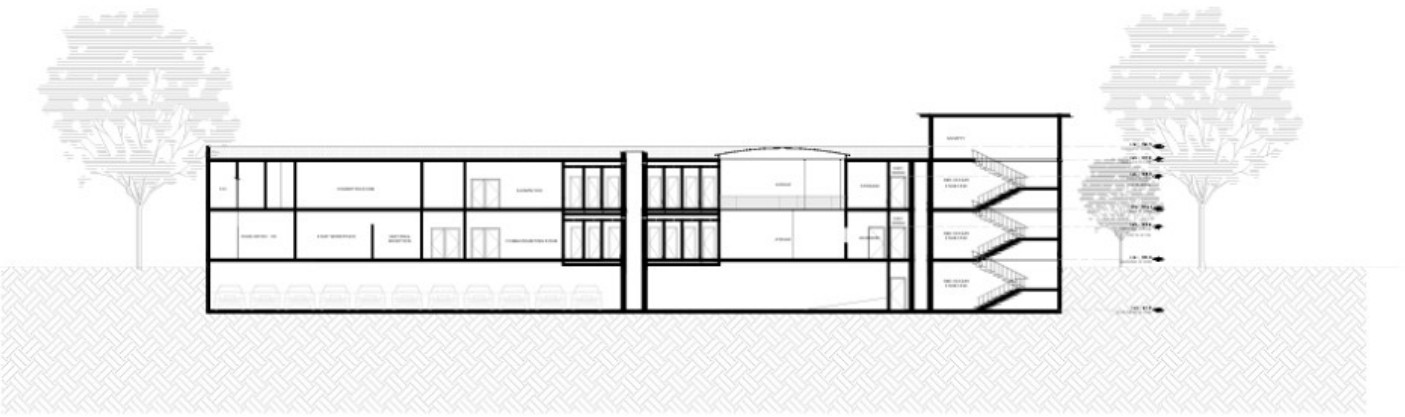
ANUSHKA YADAV
21110220

THESIS GUIDE

Dr. YOGESH GARG SIR

N

ADMIN SECTION



PROJECT TOPIC

INSTITUTE CAMPUS DESIGN

SCALE

1:150

SHEET NO.

06

SUBMITTED BY

ANUSHKA YADAV
2001006

THESIS GUIDE

Dr. YOGESH GARG SIR

N

BOYS HOSTEL PLANS

PROJECT TOPIC
SCALE
1:350
SHEET NO.
16
SUBMITTED BY
THESIS GUIDE

GIRLS HOSTEL PLANS



GROUND FLOOR



TYPICAL FLOOR PLAN
(1st FLOOR till 9th FLOOR)

PROJECT TOPIC
INSTITUTE CAMPUS DESIGN

SCALE
1:300

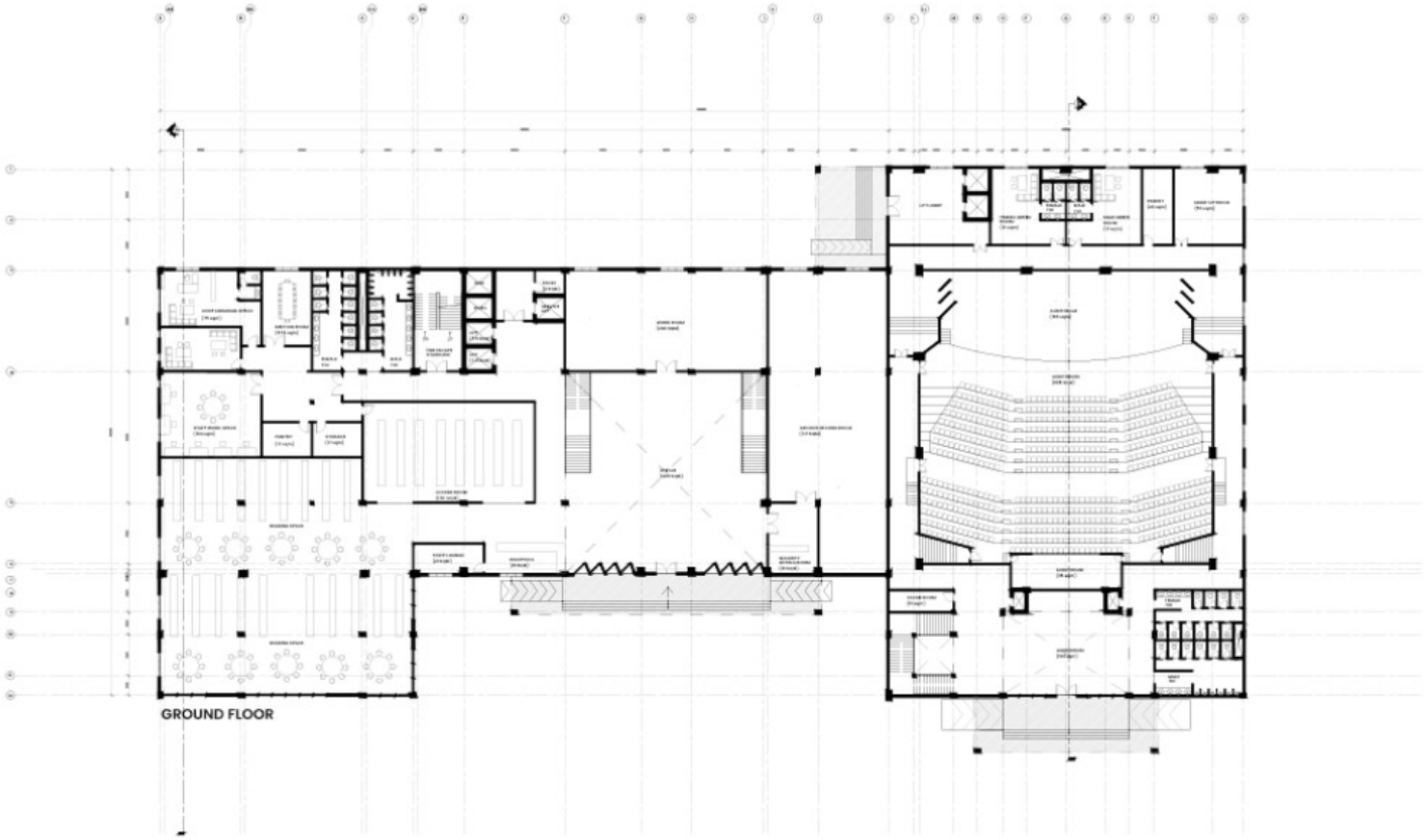
SHEET NO.
17

SUBMITTED BY
ANUSHKA YADAV
21113008

THESIS GUIDE
Dr. YOGESH GARG SIR

N

LIBRARY & AUDITORIUM PLANS



GROUND FLOOR

PROJECT TOPIC
INSTITUTE CAMPUS DESIGN

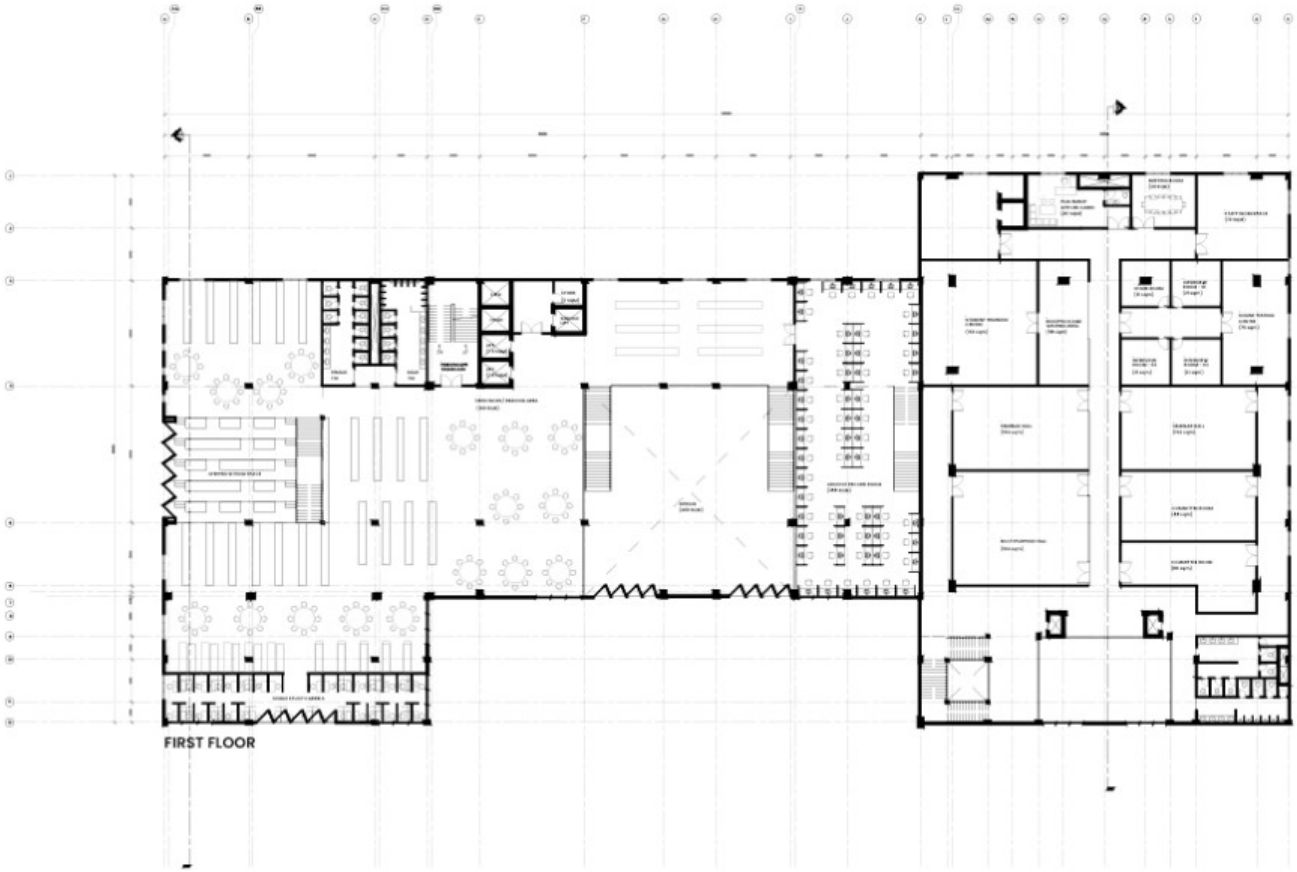
SCALE
1:200

SHEET NO.
07

SUBMITTED BY
ANUSHKA YADAV
20102308

THESIS GUIDE
Dr. YOGESH GARG SIR

LIBRARY & AUDITORIUM PLANS



FIRST FLOOR

PROJECT TOPIC
INSTITUTE CAMPUS DESIGN

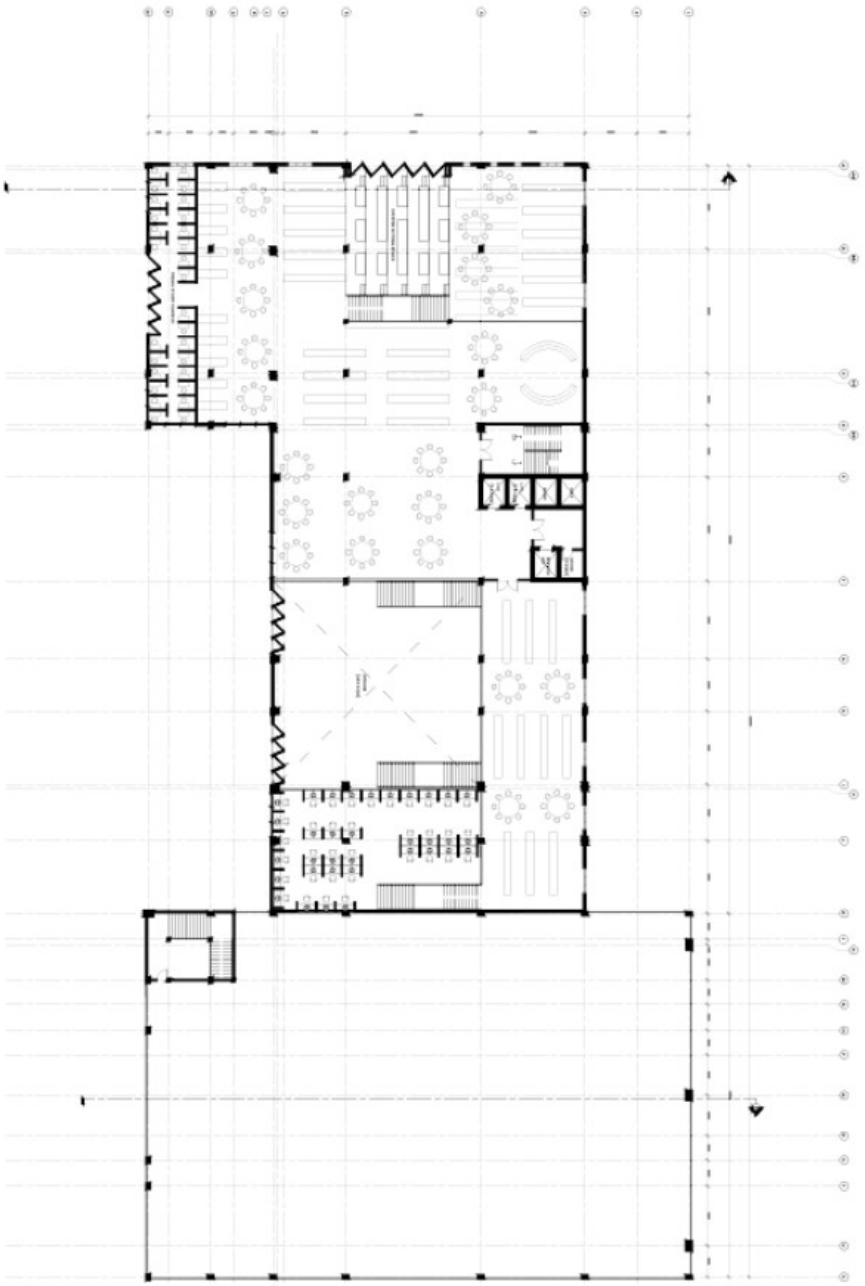
SCALE
1:100

SHEET NO.
08

SUBMITTED BY
ANUSHKA YADAV
20113030

THESIS GUIDE
Dr. YOGESH GARG SIR

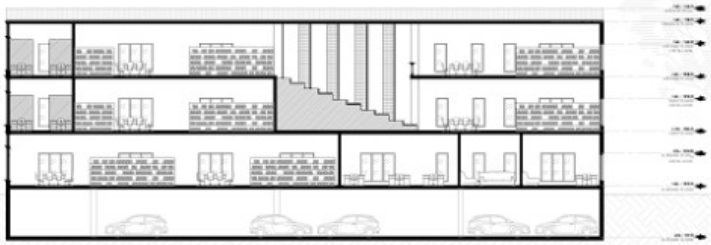
N



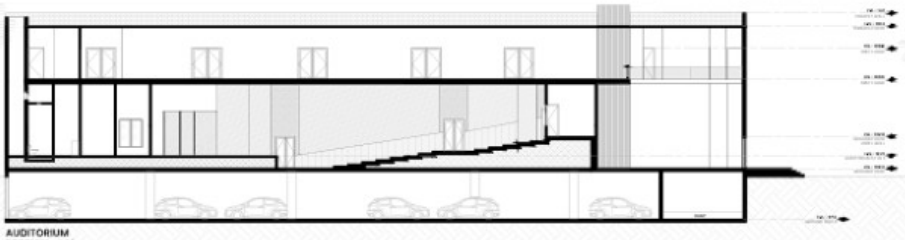
LIBRARY & AUDITORIUM PLANS

PROJECT TOPIC
INSTRUCTOR EXAMPLE
ESSAY
SCALE
1:200
SHEET NO.
09
SUBMITTED BY
ANDREW FARAY
2019008
THESIS GUIDE
DECEMBER 03 2019

LIBRARY & AUDITORIUM SECTIONS



LIBRARY
SECTION - AA'



AUDITORIUM
SECTION - AA'

PROJECT TOPIC
INSTITUTE CAMPUS DESIGN

SCALE
1 : 150

SHEET NO.
10

SUBMITTED BY
ANUSHKA YADAV
20010308

THESIS GUIDE
Dr. YOGESH GARG SIR

N

PROJECT NAME - Institute Campus Design
Ambedkar University, Delhi
LOCATION - Sector 3, Rohini, New Delhi India
DEVELOPMENT AUTHORITY - PWD, Delhi



SITE DETAILS

S.NO	DESCRIPTION	VALUE
1	SITE AREA (IN ACRES)	13.000 SQM
2	FAR	0.25
3	MAX BUILTUP	134,250 SQM
4	GROUND COVERAGE	35%
5	FRONT SET BACKS	15 M
6	REAR AND SIDE SET BACKS	12 M
7	MAX HEIGHT	37 M
8	MAX HEIGHT SPORT AND CULTURAL	25 M
9	INSTITUTIONAL BUILTUP (70%)	60,000 SQM
10	RESIDENTIAL BUILTUP (30%)	48,000 SQM
11	BASEMENT, PARKING & SERVICE	3,000 SQM

CLIMATE

In New Delhi, the wet season is hot, oppressive, and partly cloudy and the dry season is warm and mostly clear. Over the course of the year, the temperature typically varies from 7.7°C to 40°C and is rarely below 5.5°C or above 43°C.

RAINFALL

The rainless period of the year lasts for 7.7 months, from October 16 to January 6. The month with the least rain in New Delhi is November, with an average rainfall of 0.1 inches.

HUMIDITY

The muggy season in New Delhi lasts from May 20 to October 20, with August being the most muggy (about 31 muggy days) and January the least muggy.

TEMPERATURE

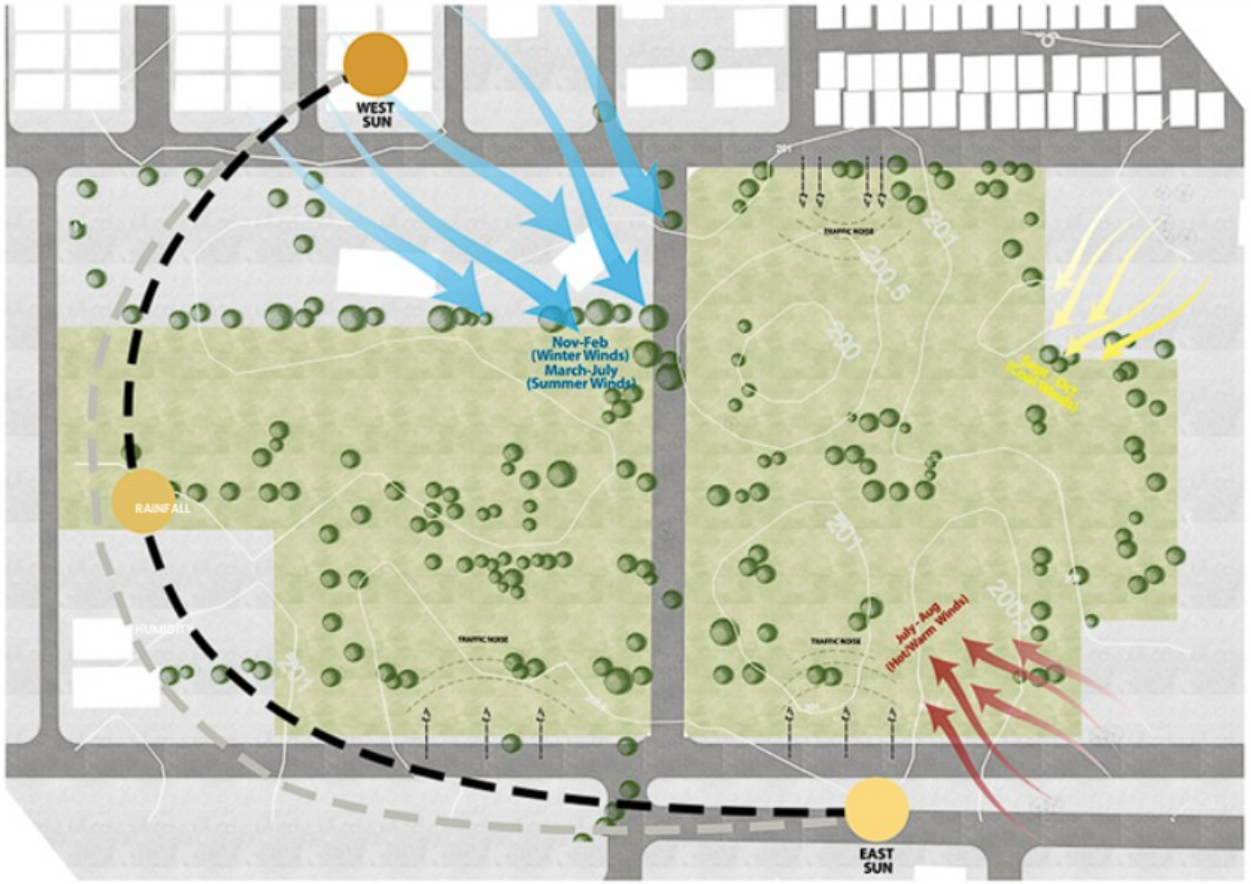
Delhi has very hot summers peaking in June and cool winters peaking in January.

WIND SPEED AND DIRECTION

Delhi is windier from February to July (strongest in May, ~8 mph) and calmer from August to January (calmest in October, ~5 mph), with winds mostly coming from the west (Nov-July), east (July-Aug), and north (Sep-Nov).

SOIL TYPE

Sandy loam to sandy clay loam
- Sandy loam has moderate bearing capacity (higher than pure sand, lower than stiff clay).



SITE ANALYSIS

S

STRENGHTS
- The site has a good blend of commercial spaces and public transport.
- The site lies in the heart of a major residential district.
- Shape and the immediate context of the site posed no hinderer in design exploration.

W

WEAKNESS
- Absence of any other major educational campus in the precinct.
- Strong residential context, makes it a challenge to develop a brand new identity of the design.

O

OPPORTUNITIES
- Neighbouring retail and commercial building add to the increased value of the site.
- The residential land-use and its supporting facilities cater to the families residing in the campus.

T

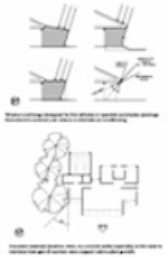
THREATS
- Upcoming metro adjacent to the site might tranform the location into a major retail location.



SITE PROXIMITY

Accessibility & Urban Context
- 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

CLIMATE INFERENCES



PROJECT TOPIC	INSTITUTE CAMPUS DESIGN
SCALE	1: 800
SHEET NO.	01

SUBMITTED BY
ANUSHKA YADAV
21110208

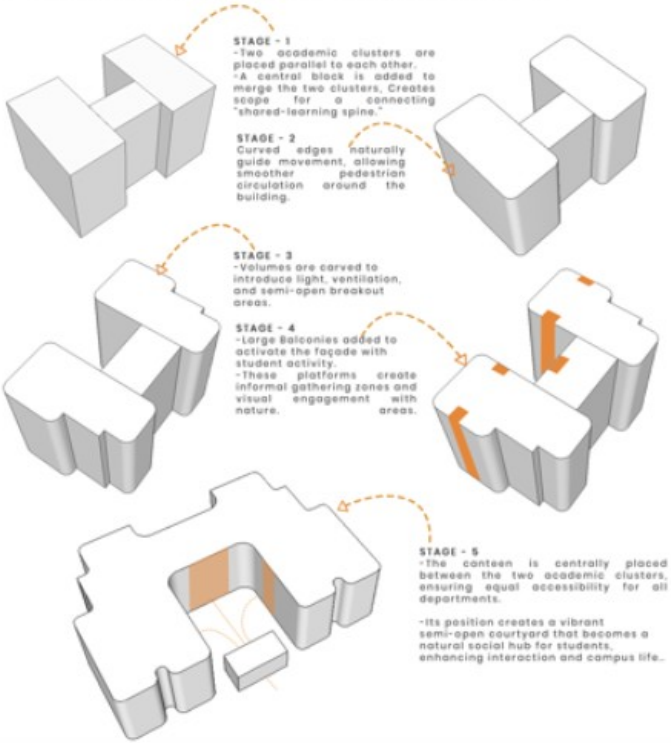
THESIS GUIDE
Dr. YOGESH GARG SIR

SITE PLANNING



-The site naturally gets split into two parts because a major public road passes through the centre.
-I utilized this natural separation by placing academic & administrative functions on one side for easy public access.
-The opposite side is used for residential and recreational zones, ensuring privacy, safety, and a calm living environment.

FORM DEVELOPMENT FOR ACADEMIC



STAGE - 1
-Two academic clusters are placed parallel to each other.
-A central block is added to merge the two clusters, Creates scope for a connecting "shared-learning spine."

STAGE - 2
Curved edges naturally guide movement, allowing smoother pedestrian circulation around the building.

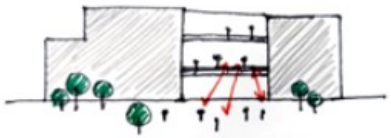
STAGE - 3
-Volumes are carved to introduce light, ventilation, and semi-open breakout areas.

STAGE - 4
-Large Balconies added to activate the façade with student activity.
-These platforms create informal gathering zones and visual engagement with nature. areas.

STAGE - 5
-The canteen is centrally placed between the two academic clusters, ensuring equal accessibility for all departments.

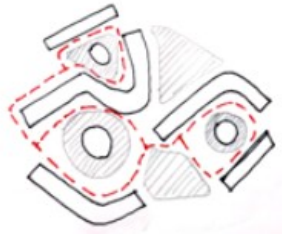
-Its position creates a vibrant semi-open courtyard that becomes a natural social hub for students, enhancing interaction and campus life..

CASE STUDY INSIGHTS



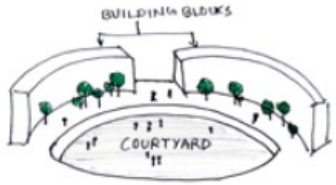
CEPT UNIVERSITY, AHEMDABAD

- fluid interactions between indoor academic activities and the external campus environment, promoting creativity and collaborative learning.



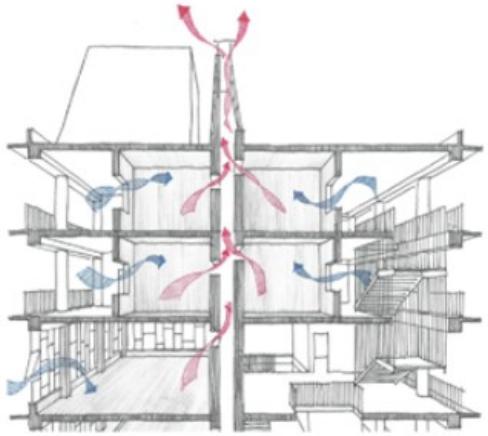
AZIM PREMJI UNIVERSITY, BANGLORE

- fluid interactions between indoor academic activities and the external campus environment, promoting creativity and collaborative learning. -Keeping the inside of the campus pedestrian friendly, and the vehicular road are planned accross the buildings, so that there is no coinciding of pedestrian pathways and roadways.



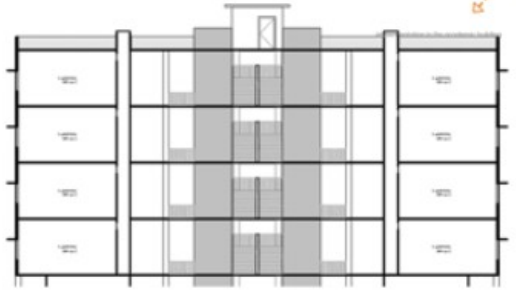
NIFT, DELHI

- Landscaped courtyards between blocks for informal learning, recreation, and microclimate improvement. Encourage interaction and pause points.



AVASARA ACADEMY, PUNE

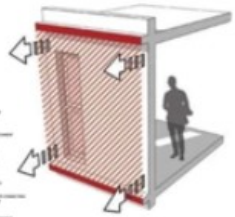
- The design uses a central ventilation shaft that pulls warm air upward (stack effect), helping to naturally cool the building.
- The rising hot air escapes through the roof-level vents, reducing indoor heat buildup and lowering dependence on mechanical cooling.



DESIGN STRATEGIS FOR HEAT REDUCTION

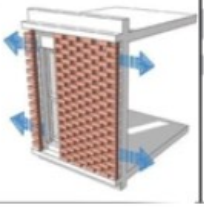


-Incorporating Bioswales in open area like pedestrain pathways, surface parkings and Courtyards.
-landscaped drainage channel designed to slow down, filter, and absorb stormwater runoff instead of letting it rush directly into drains.



The skin wall is a traditional brick jali screen with the stratchar course staggered at every alternate course creating the play of mass and void. The support structure for the jali screen was extended beyond the dimensions of a brick, resulting in the jali screen being placed away from the external walls. This air cavity acts as a 'Thermal Break'.

The support structure for the skin cladding is an extension of the concrete slab at every level, a 200mm projected concrete nib.



CONCEPT AND CASE STUDY

PROJECT TOPIC
INSTITUTE CAMPUS DESIGN
SCALE
SHEET NO.
02
SUBMITTED BY
ANUSHKA YADAV
21010208
THESIS GUIDE
Dr. YOGESH GARG SIR

SITE ANALYSIS

PROJECT NAME –Institute Campus Design
Ambedkar University, Delhi
LOCATION –Sector 3, Rohini, New Delhi India
DEVELOPMENT AUTHORITY –PWD, Delhi



SITE DETAILS

S.NO	DESCRIPTION	VALUE
1	SITE AREA (18 ACRES)	73,000 SQM
2	FAR	2.25
3	MAX BUILTUP	1,64,250 SQM
4	GROUND COVERAGE	35%
5	FRONT SET BACKS	15 M
6	REAR AND SIDE SET BACKS	12 M
7	MAX HEIGHT	37 M
8	MAX HEIGHT SPORT AND CULTURAL	26 M
9	INSTITUTIONAL BUILTUP (70%)	90,000 SQM
10	RESIDENTIAL BUILTUP (30%)	46,000 SQM
11	BASEMENT, PARKING & SERVICE	31,680 SQM

CLIMATE

In New Delhi, the wet season is hot, oppressive, and partly cloudy and the dry season is warm and mostly clear. Over the course of the year, the temperature typically varies from 7.7°C to 40°C and is rarely below 5.5°C or above 43°C.

RAINFALL

The rainless period of the year lasts for 2.7 months, from October 19 to January 9. The month with the least rain in New Delhi is November, with an average rainfall of 0.1 inches.

HUMIDITY

The muggy season in New Delhi lasts from May 20 to October 20, with August being the most humid (about 31 muggy days) and January the least muggy.

TEMPERATURE

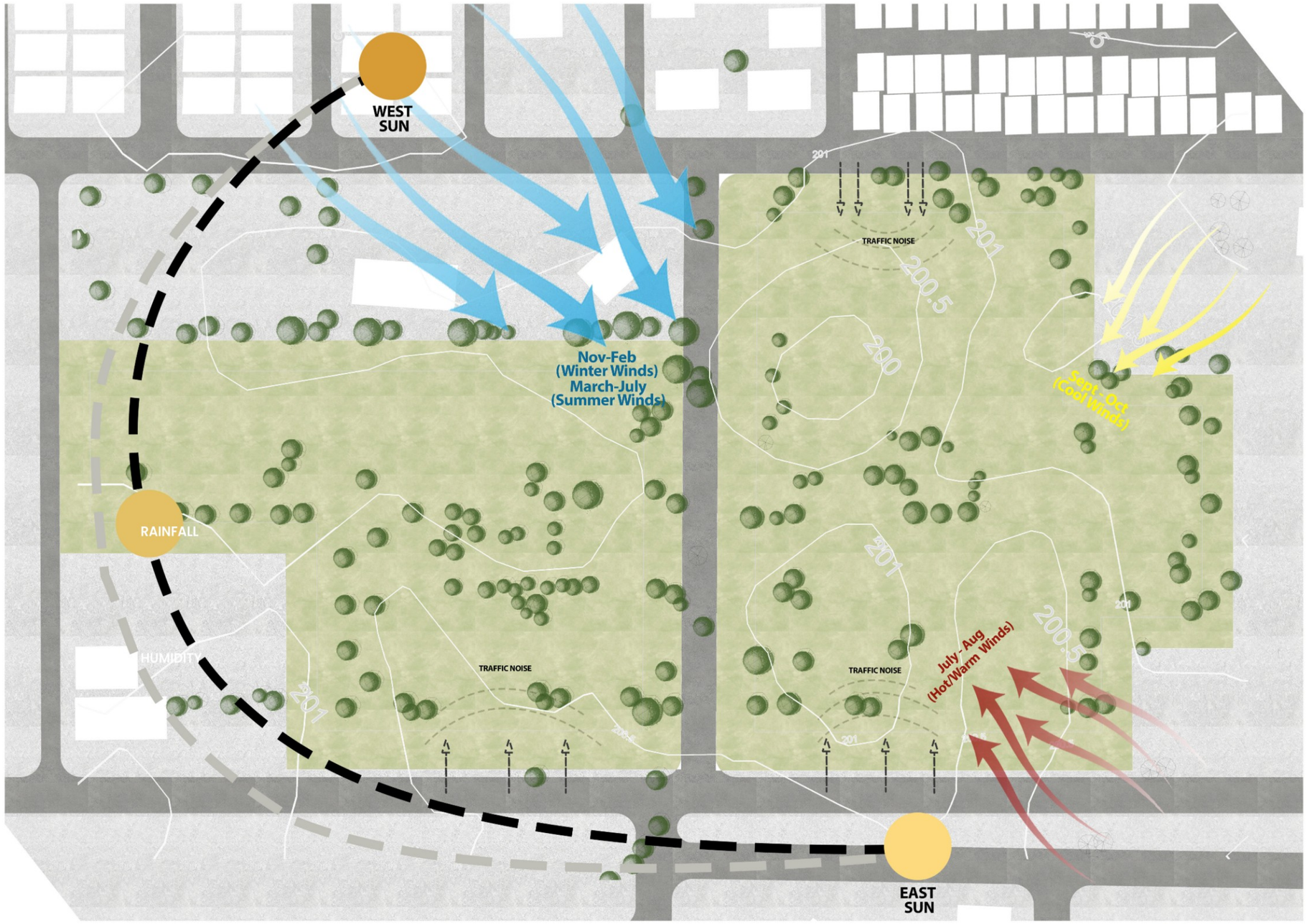
Delhi has very hot summers peaking in June and cool winters peaking in January.

WIND SPEED AND DIRECTION

Delhi is windier from **February to July** (strongest in May, ~8 mph) and calmer from August to January (calmest in October, ~5 mph), with winds mostly coming from the west (Nov–July), east (July–Aug), and north (Sep–Nov).

SOIL TYPE

Sandy loam to sandy clay loam
• Sandy loam has moderate bearing capacity (higher than pure sand, lower than stiff clay).



SWOT

S — STRENGHTS
• The site has a good blend of commercial spaces and public transport.
• The site lies in the heart of a major residential district.
• Shape and the immediate context of the site posed no hinderer in design exploration.

W — WEAKNESS
• Abscence of any other major educational campus in the precinct.
• Strong residential context makes it a challenge to develop a brand new identity of the design.

O — OPPORTUNITIES
• Neighbouring retail and commercial building add to the increased value of the site.
• The residential land-use and its supporting facilities cater to the families residing in the campus.

T — THREATS
• Upcoming metro adjacent to the site might tranform the location into a major retail location.



SITE PROXIMITY

Accessibility & Urban Context
• 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
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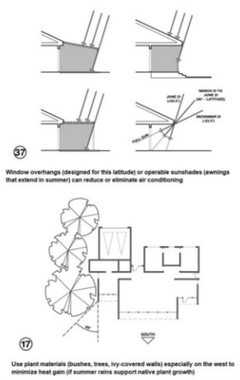
CLIMATE INFERENCES



PROJECT TOPIC
INSTITUTE CAMPUS DESIGN
SCALE
1 : 800
SHEET NO.
01

SUBMITTED BY
ANUSHKA YADAV
211110208
THESIS GUIDE
Dr. YOGESH GARG SIR

SITE PLANNING



-The site naturally gets split into two parts because a major public road passes through the centre.
-I utilized this natural separation by placing academic & administrative functions on one side for easy public access.
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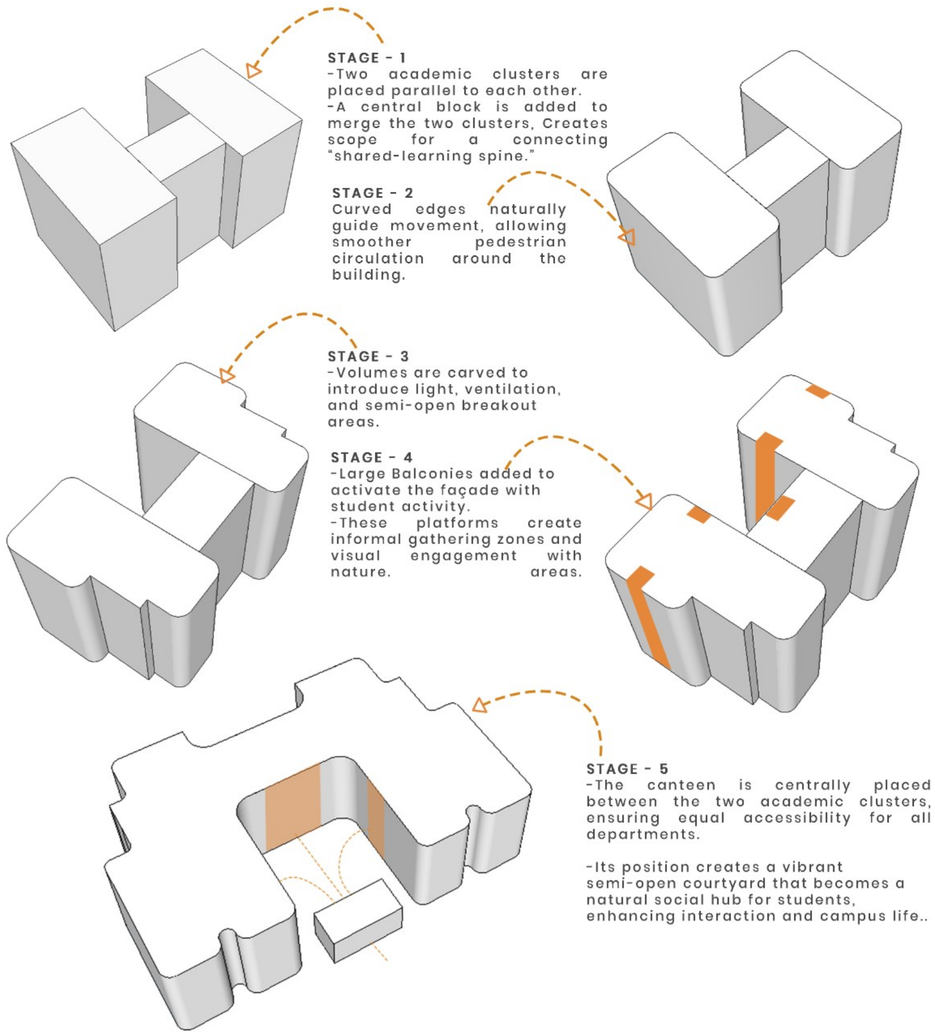
FORM DEVELOPMENT FOR ACADEMIC



STAGE - 1
-Two academic clusters are placed parallel to each other.
-A central block is added to merge the two clusters, Creates scope for a connecting "shared-learning spine."

STAGE - 2
Curved edges naturally guide movement, allowing smoother pedestrian circulation around the building.

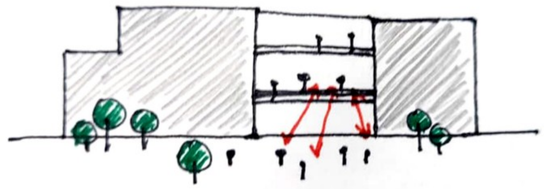
STAGE - 3
-Volumes are carved to introduce light, ventilation, and semi-open breakout areas.

STAGE - 4
-Large Balconies added to activate the façade with student activity.
-These platforms create informal gathering zones and visual engagement with nature. areas.

STAGE - 5
-The canteen is centrally placed between the two academic clusters, ensuring equal accessibility for all departments.

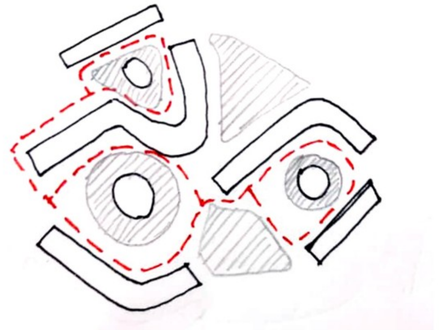
-Its position creates a vibrant semi-open courtyard that becomes a natural social hub for students, enhancing interaction and campus life..

CASE STUDY INSIGHTS



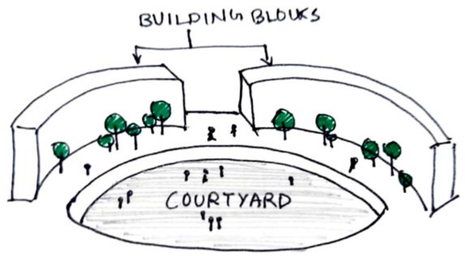
CEPT UNIVERSITY, AHEMDABAD

- fluid interactions between indoor academic activities and the external campus environment, promoting creativity and collaborative learning.



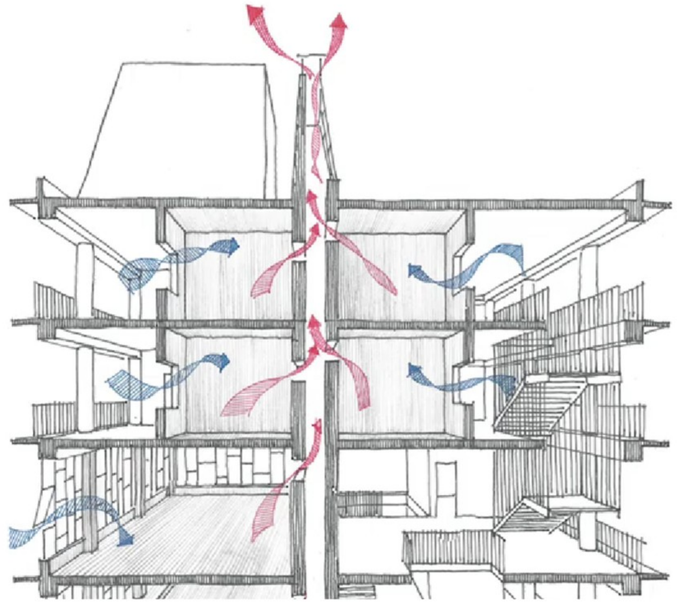
AZIM PREMJI UNIVERSITY, BANGLORE

- fluid interactions between indoor academic activities and the external campus environment, promoting creativity and collaborative learning.
-Keeping the inside of the campus pedestrian fiendly, and the vehicular road are planned accross the buildings, so that there is no coinciding of pedestrian pathways and roadways.



NIFT, DELHI

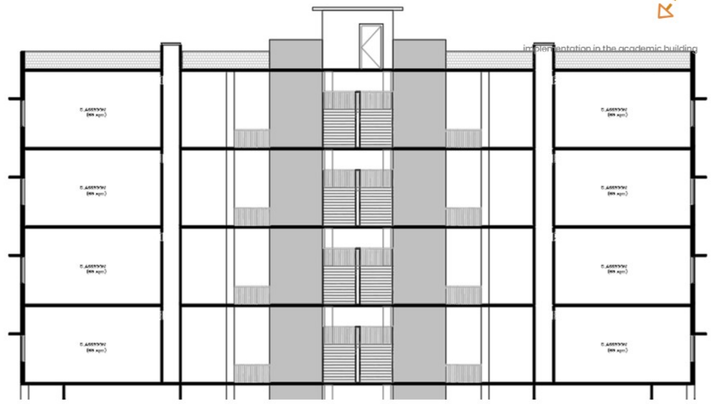
- Landscaped courtyards between blocks for informal learning, recreation, and microclimate improvement. Encourage interaction and pause points.



section of avasara academy building

AVASARA ACADEMY, PUNE

- The design uses a central ventilation shaft that pulls warm air upward (stack effect), helping to naturally cool the building.
- The rising hot air escapes through the roof-level vents, reducing indoor heat buildup and lowering dependence on mechanical cooling.

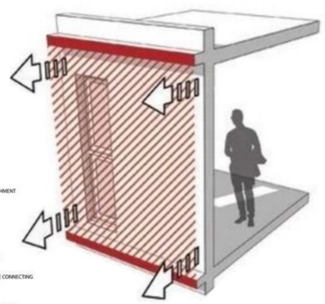


interpretation in the academic building

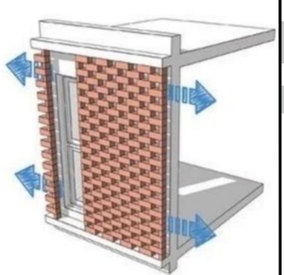
DESIGN STRATEGIS FOR HEAT REDUCTION



-Incorporating Bioswales in open area like pedestrain pathways, surface parkings and Courtyards.
-landscaped drainage channel designed to slow down, filter, and absorb stormwater runoff instead of letting it rush directly into drains.



The support structure for the skin cladding is an extension of the concrete slab at every level, a 200mm projected concrete nib.



The skin wall is a traditional brick jali screen with the stretcher course staggered at every alternate course creating the play of mass and void. The support structure for the jali screen was extended beyond the dimensions of a brick, resulting in the jali screen being placed away from the external walls. This air cavity acts as a 'Thermal Break'.

CONCEPT AND CASE STUDY

PROJECT TOPIC
INSTITUTE CAMPUS DESIGN
SCALE
SHEET NO.
02
SUBMITTED BY
ANUSHKA YADAV
211110208
THESIS GUIDE
Dr. YOGESH GARG SIR

SITE PLAN

14M WIDE ROAD

146

242

ENTRY/EXIT

7.5 METRE WIDE ROAD

ADMIN BLOCK

BASEMENT ENTRY

78

LIBRARY

AUDITORIUM

54

BASEMENT EXIT

FUTURE EXP. (586 sqm)

GIRLS HOSTEL

SPORT CENTRE

FOOTBALL GROUND

BOYS HOSTEL

82

UNDERPASS

13.5M WIDE ROAD

GIRLS HOSTEL

TENNIS COURT

BASKETBALL COURT

GUEST HOUSE

CANTEEN

106

FUTURE EXP. (1000 sqm)

88

7.5M WIDE ROAD

84

FACULTY/STAFF HOUSING

FACULTY/STAFF HOUSING

COMMUNITY CENTRE

ACADEMIC BLOCK

40

48

154

162

14M WIDE ROAD

PROJECT TOPIC

INSTITUTE CAMPUS DESIGN

SCALE

1 : 800

SHEET NO.

0

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THESIS GUIDE

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Thesis Project Type	Institute Campus Design (Ambedkar University Delhi)
Site Area	73000 sqm
Site Location	Sector-03 Rohini, Delhi India
Total Permissible Built up Area	1,67,680 Sqm.
F.A.R	2.25
Ground Coverage	25 %
Ground Coverage Area	17,818 sqm
Building Foot Print Area	
Admin Block	1500 sqm
Library	2468 sqm
Auditorium	1400 sqm
Academic Block	4481 sqm
Guest House	500 sqm
Boys Hostel	1076 sqm
Girls Hostel	1308 sqm
Sports Complex	500 sqm
Faculty Housing	1160 sqm
Community Centre	3425 sqm
Hardscaped and softscaped area	
Hardscape area	20,795.73 sqm
Percentage total site area	28 %
Softscape area	28,563.73 sqm
Percentage total site area	39 %

ADMIN FLOOR PLANS





PROJECT TOPIC

INSTITUTE CAMPUS DESIGN

SCALE

1 : 200

SHEET NO.

05

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SITE SERVICES

LEGENDS

- Sewage Pipe Layout
- OHT to Building Supply
- Main Pipe Supply (600 mm Dia)
- Rainwater collecting Pipe
- Waste Water Pipe (150 mm Dia)
- Solid Waste Pipe (150 mm Dia)
- Gully trap
- Manhole 600mm Dia
- Borewell

14M WIDE ROAD

7.5M WIDE ROAD

13.5M WIDE ROAD

14M WIDE ROAD

14M WIDE ROAD

ADMIN BLOCK

LIBRARY

AUDITORIUM

CANTEEN

ACADEMIC BLOCK

FUTURE EXP. (586 sqm)

FUTURE EXP. (1000 sqm)

FOOTBALL GROUND

BASKETBALL COURT

TENNIS COURT

GIRLS HOSTEL

BOYS HOSTEL

GUEST HOUSE

FACULTY/STAFF HOUSING

FACULTY/STAFF HOUSING

COMMUNITY CENTRE

SPORT CENTRE

UNDERPASS

UNDERPASS

7.5 METRE WIDE ROAD

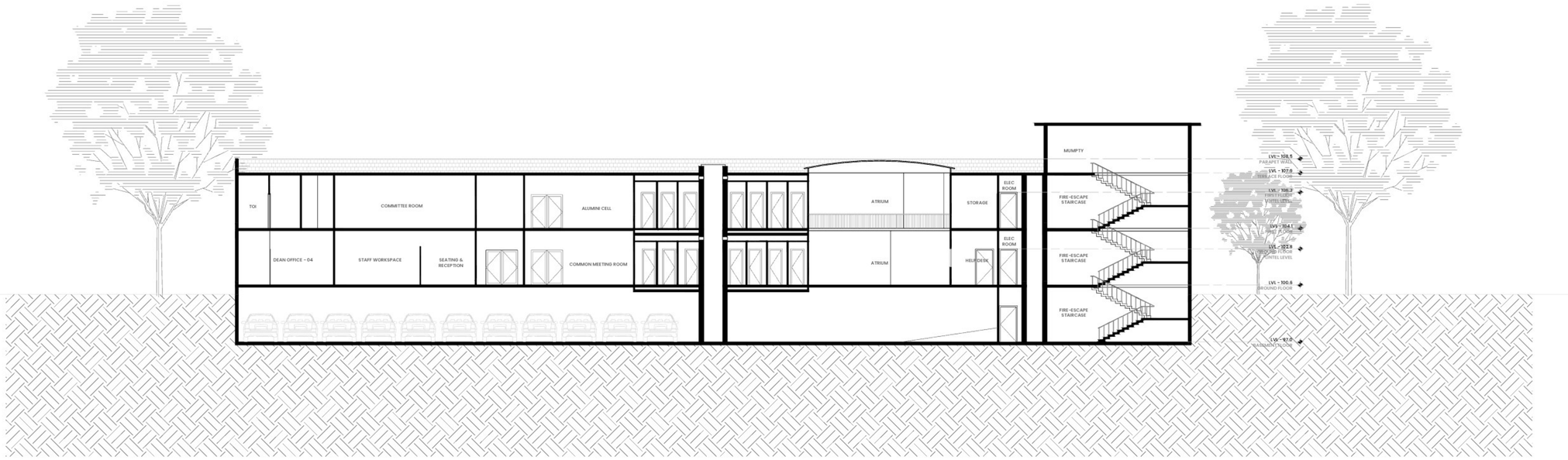
ENTRY/EXIT

BASEMENT ENTRY

BASEMENT EXIT

PROJECT TOPIC	INSTITUTE CAMPUS DESIGN
SCALE	1 : 700
SHEET NO.	04
SUBMITTED BY	ANUSHKA YADAV 211110208
THESIS GUIDE	Dr. YOGESH GARG SIR

ADMIN SECTION



PROJECT TOPIC

INSTITUTE CAMPUS DESIGN

SCALE

1 : 150

SHEET NO.

06

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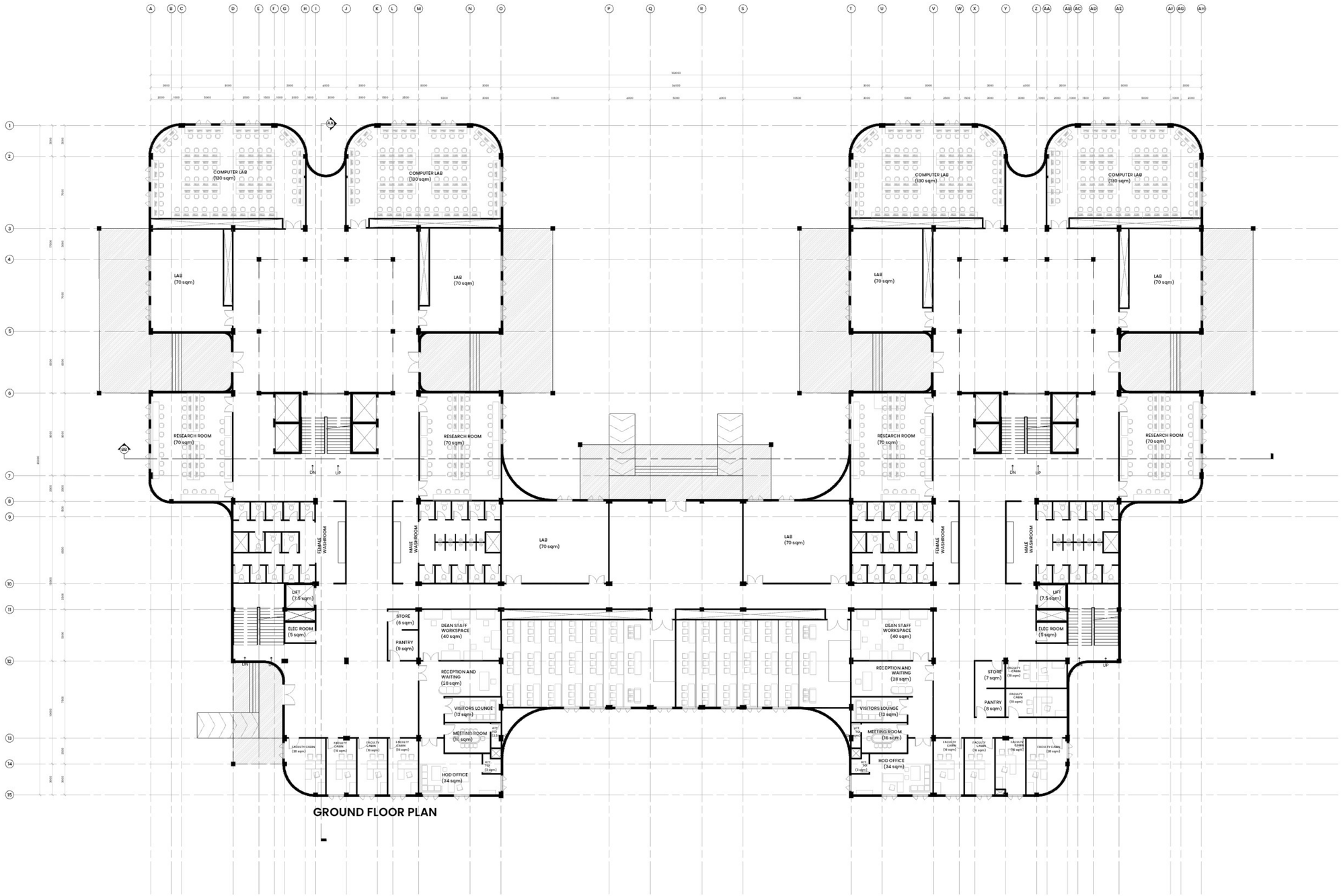

GROUND FLOOR PLAN

ACADEMIC FLOOR PLANS

PROJECT TOPIC

INSTITUTE CAMPUS DESIGN

SCALE

1 : 150

SHEET NO.

11

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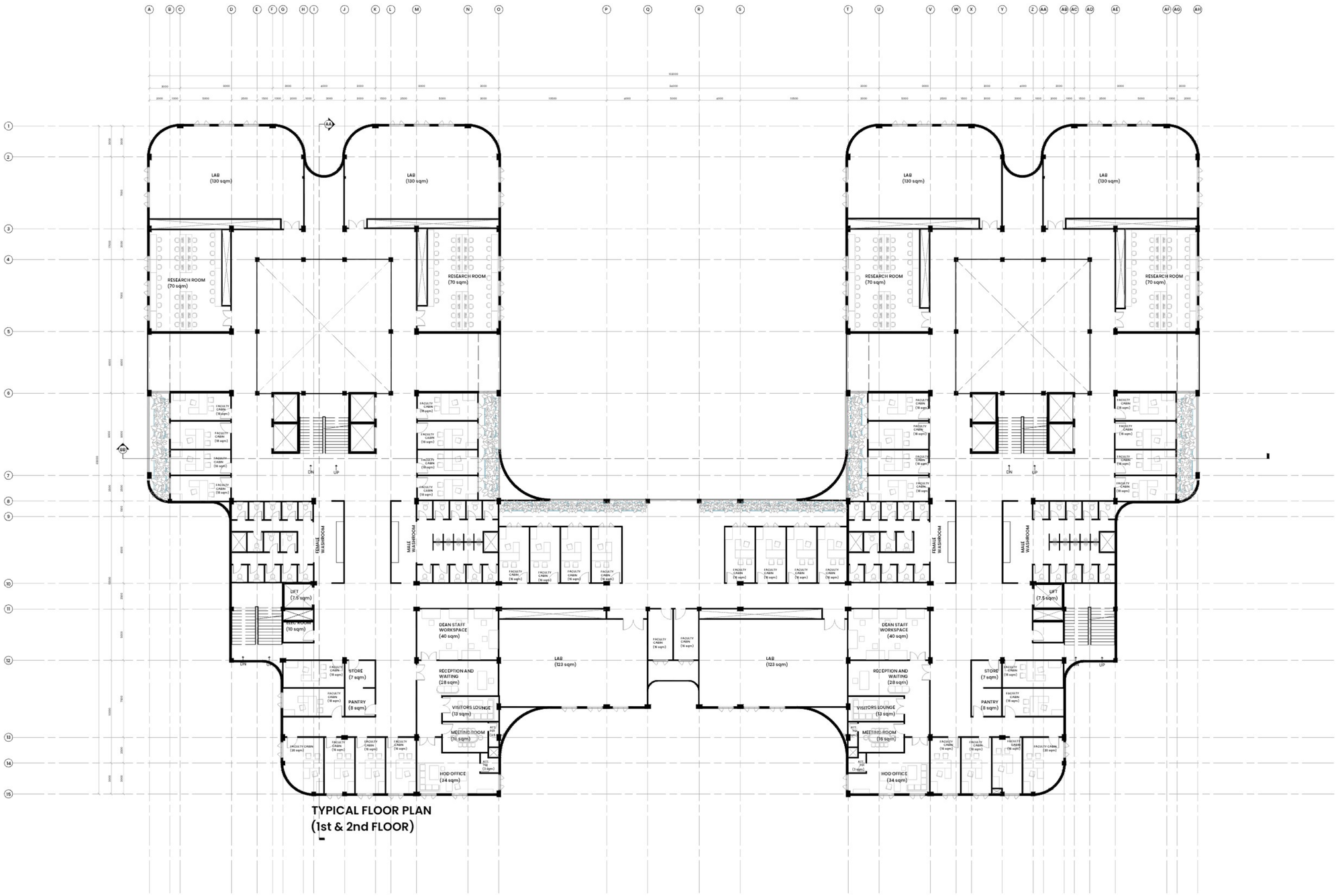

TYPICAL FLOOR PLAN
(1st & 2nd FLOOR)

ACADEMIC FLOOR PLANS

PROJECT TOPIC

INSTITUTE CAMPUS DESIGN

SCALE

1 : 200

SHEET NO.

12

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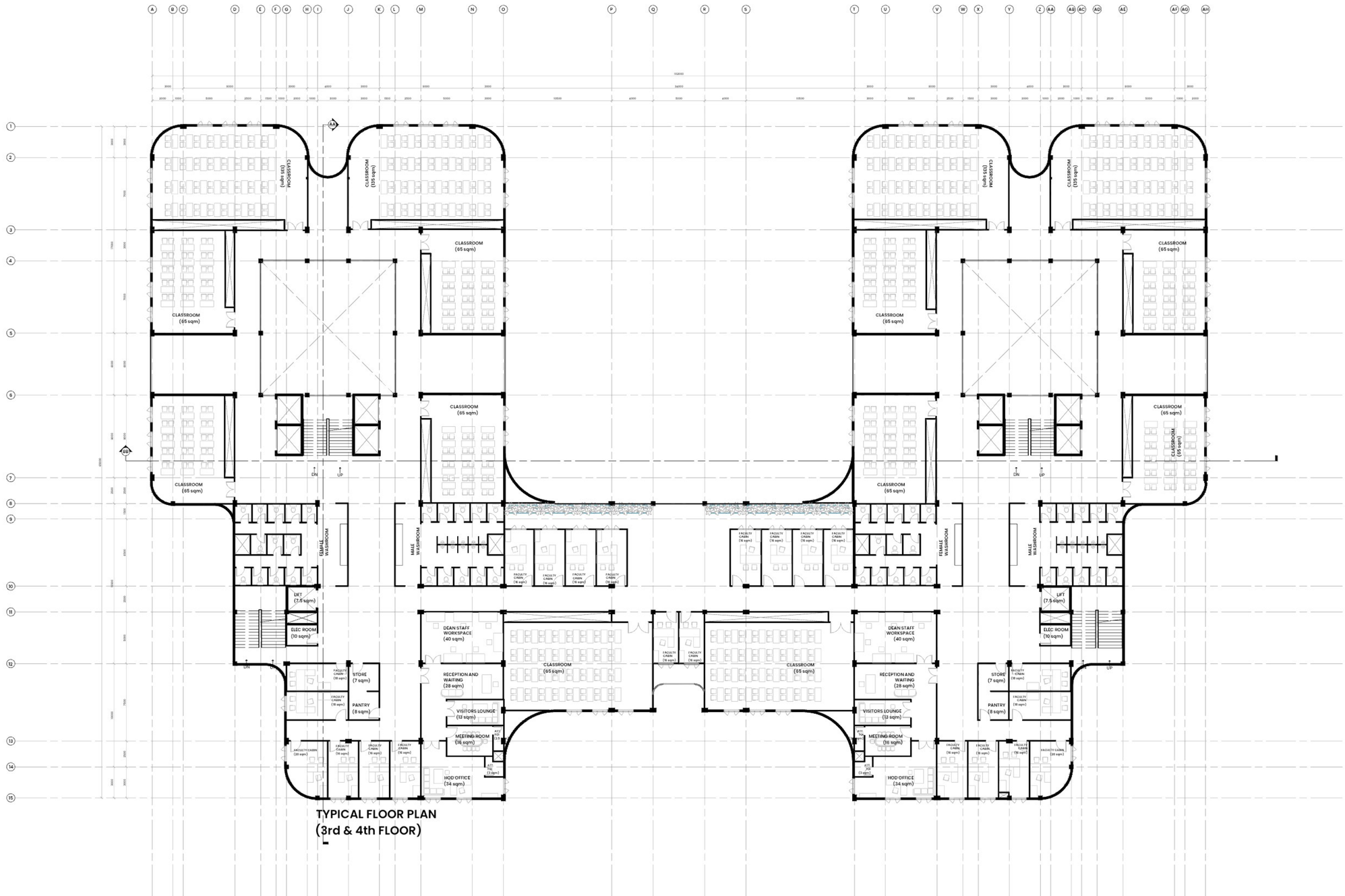
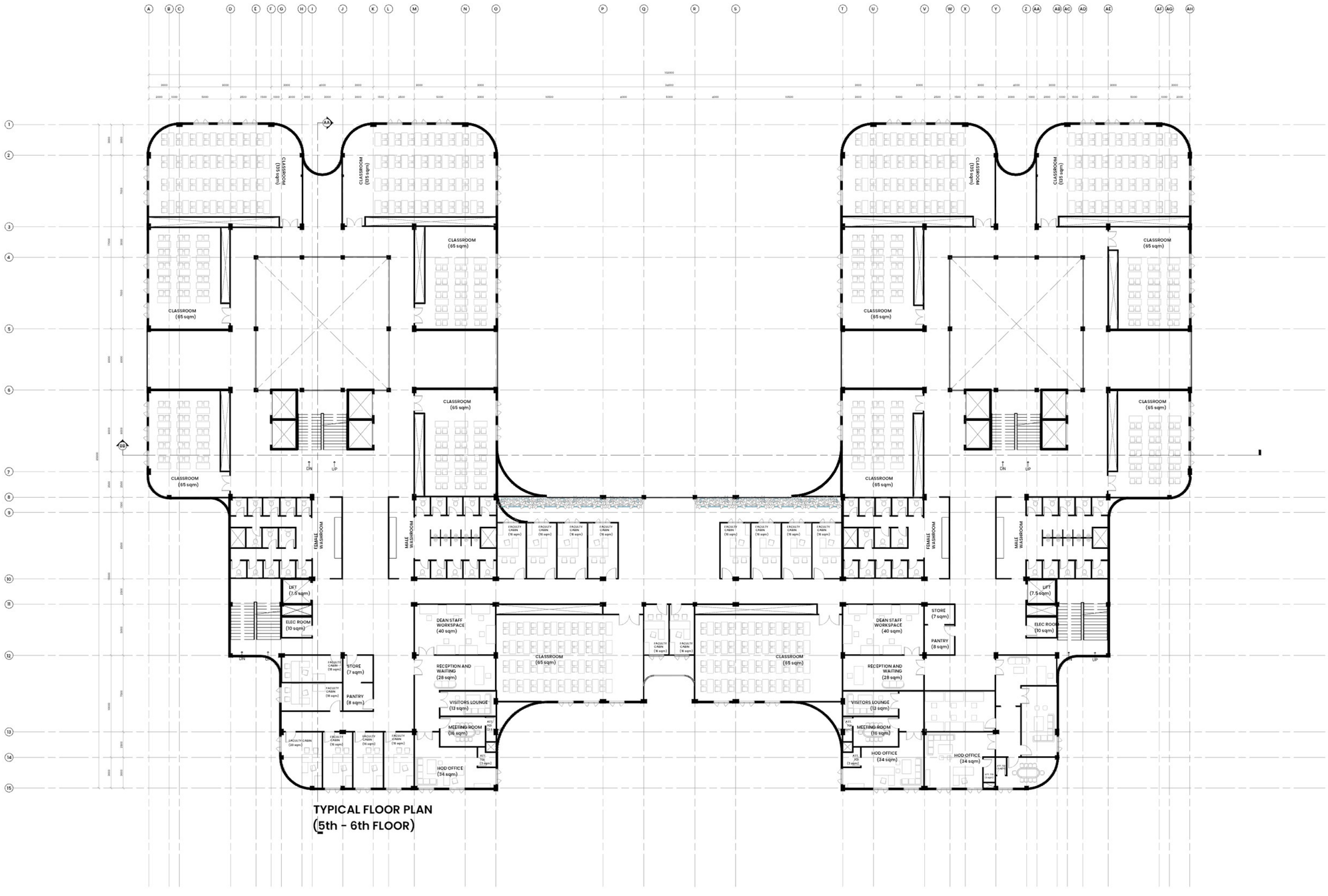

CLASSROOM (65 sqm)
CLASSROOM (65 sqm)
CLASSROOM (65 sqm)



TYPICAL FLOOR PLAN
(5th - 6th FLOOR)

ACADEMIC FLOOR PLANS

PROJECT TOPIC
INSTITUTE CAMPUS DESIGN

SCALE
1 : 200

SHEET NO.
14

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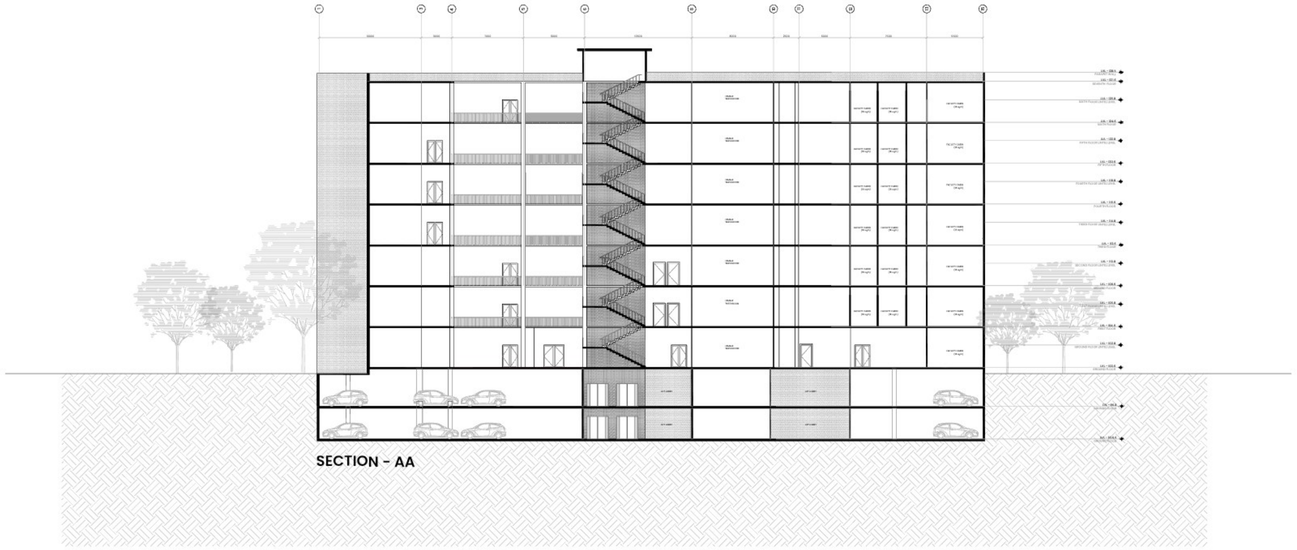
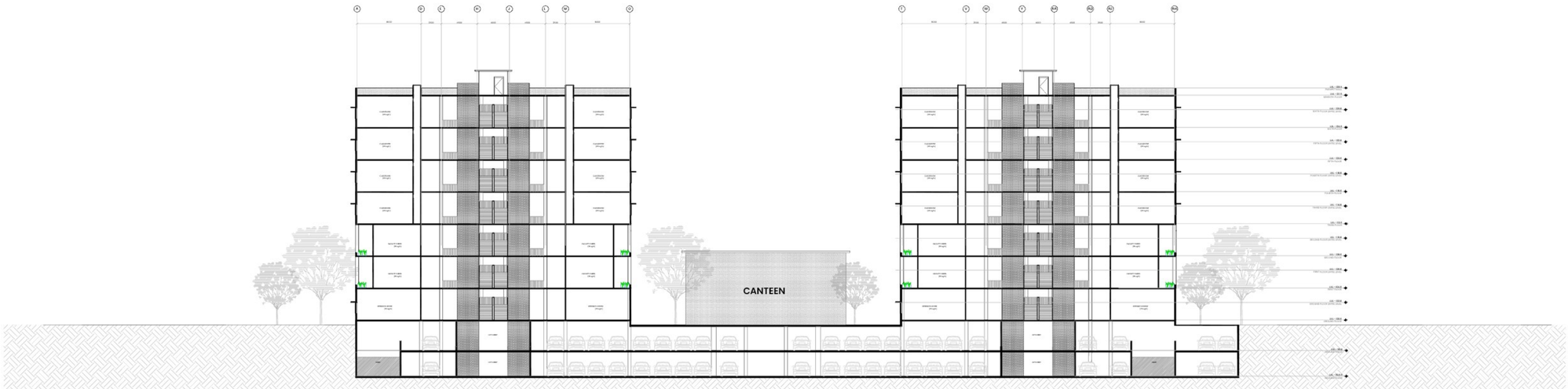


SECTION - AA



SECTION - BB

ACADEMIC SECTIONS

PROJECT TOPIC

INSTITUTE CAMPUS DESIGN

SCALE

1 : 300

SHEET NO.

15

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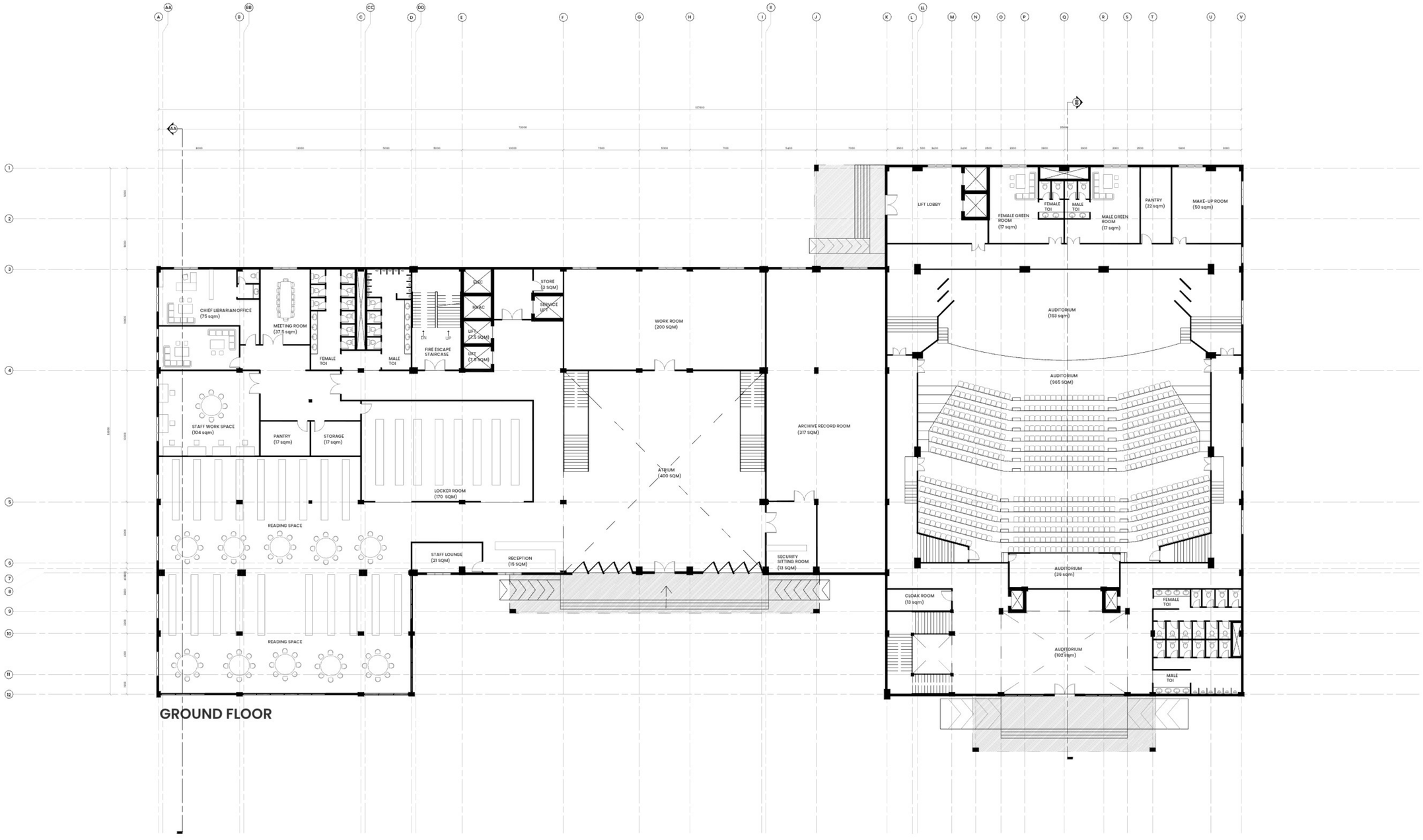

GROUND FLOOR

LIBRARY & AUDITORIUM PLANS

PROJECT TOPIC

INSTITUTE CAMPUS DESIGN

SCALE

1 : 200

SHEET NO.

07

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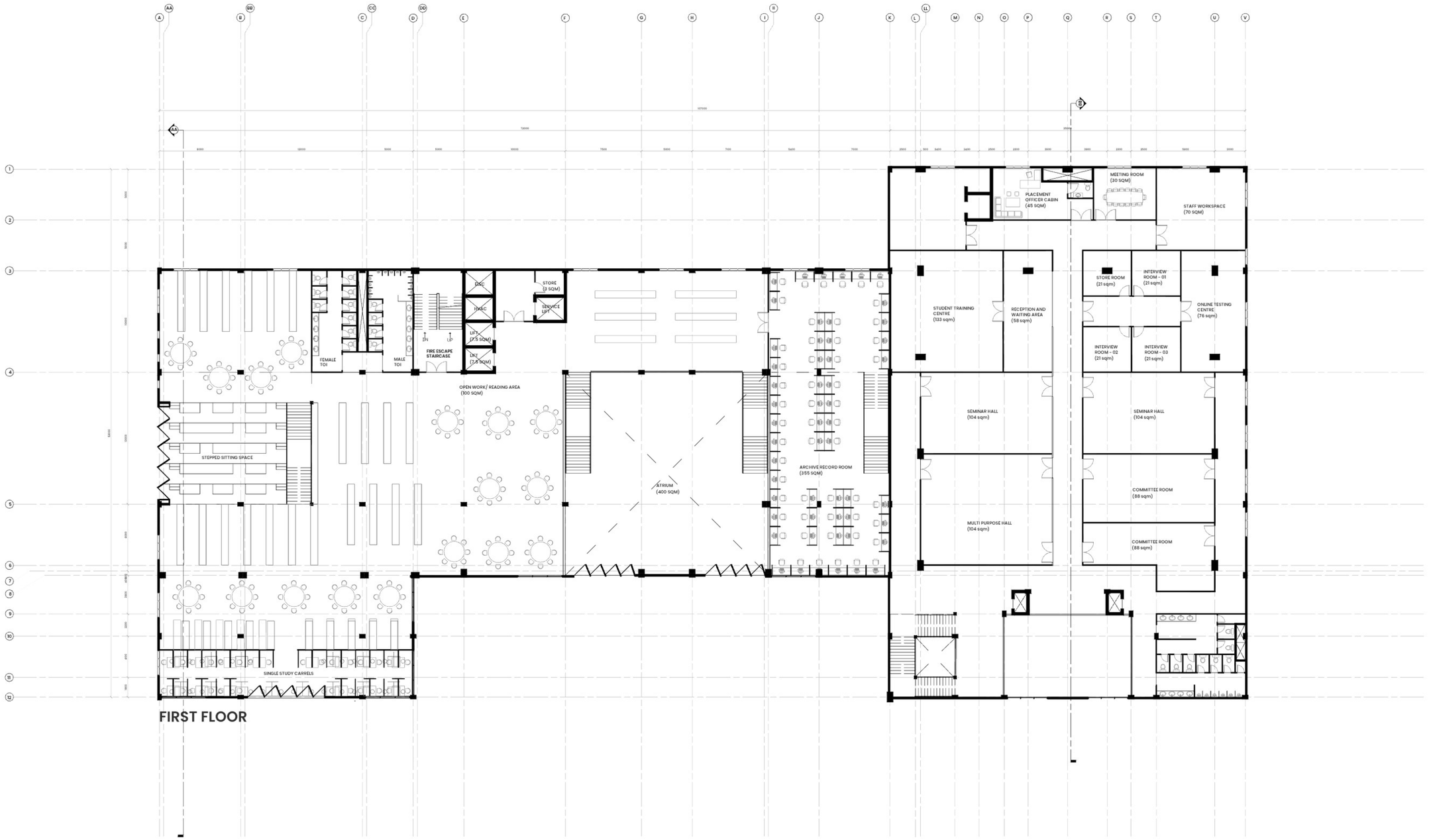

FIRST FLOOR

LIBRARY & AUDITORIUM PLANS

PROJECT TOPIC

INSTITUTE CAMPUS DESIGN

SCALE

1 : 200

SHEET NO.

08

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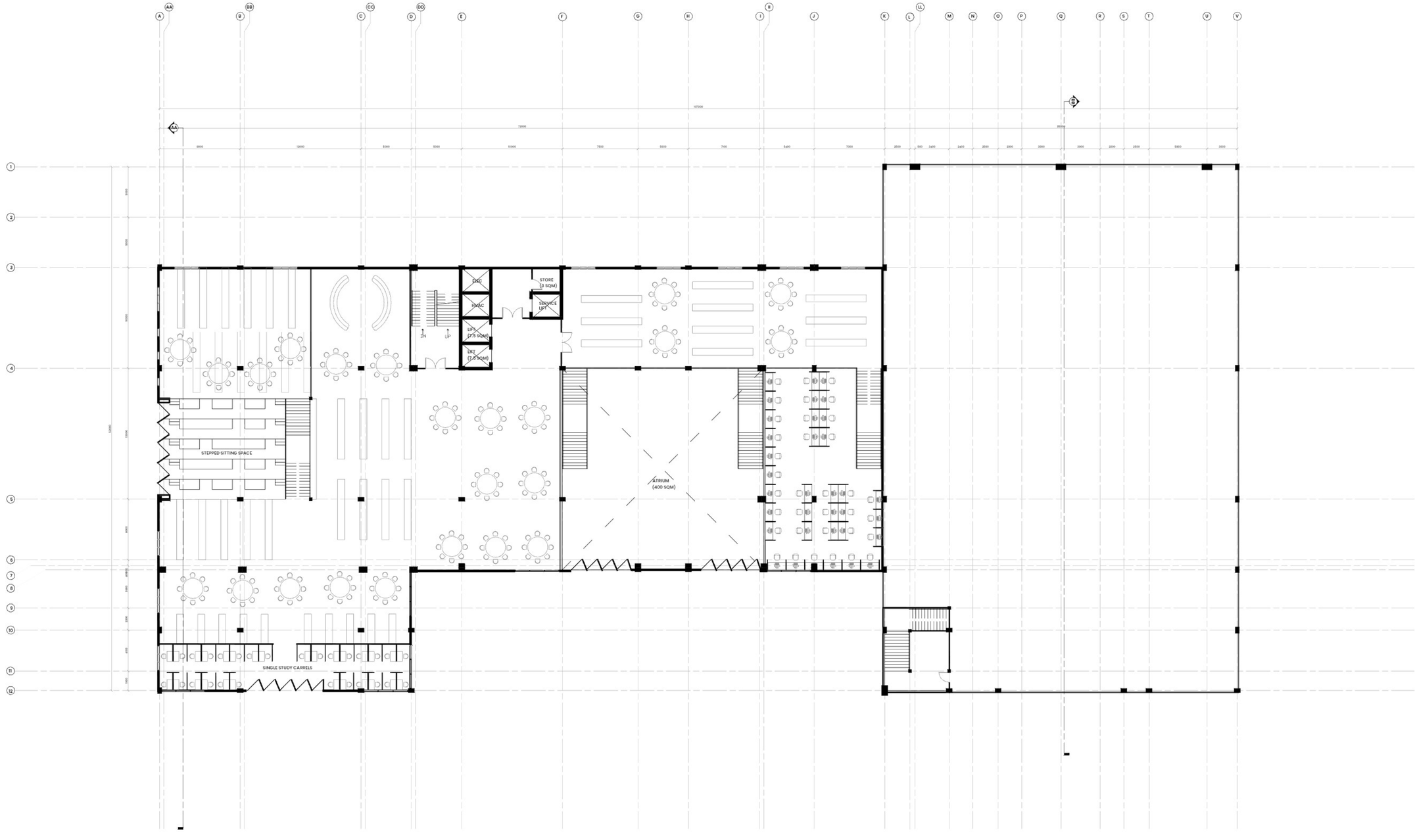

LIBRARY & AUDITORIUM PLANS

PROJECT TOPIC

INSTITUTE CAMPUS DESIGN

SCALE

1 : 200

SHEET NO.

09

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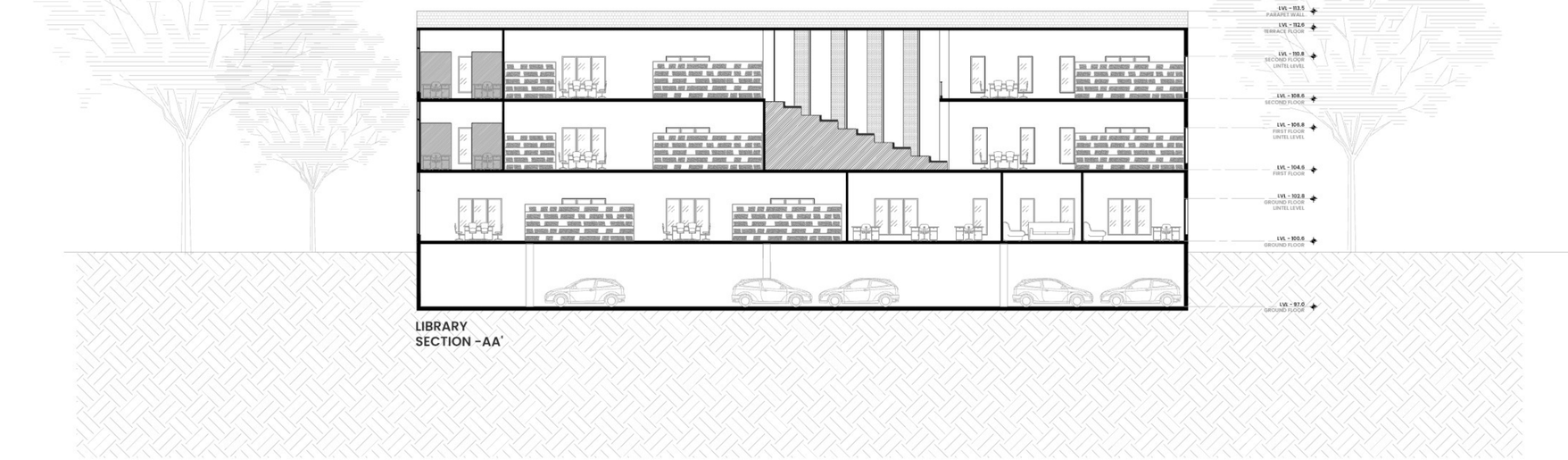
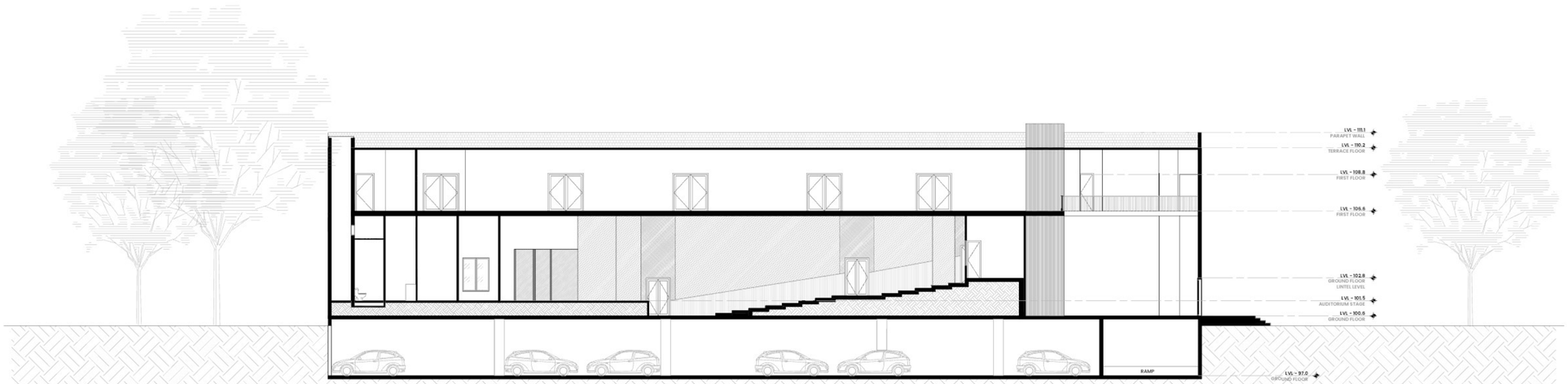


LIBRARY
SECTION -AA'



AUDITORIUM
SECTION -AA'

LIBRARY & AUDITORIUM SECTIONS

PROJECT TOPIC

INSTITUTE CAMPUS DESIGN

SCALE

1 : 150

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10

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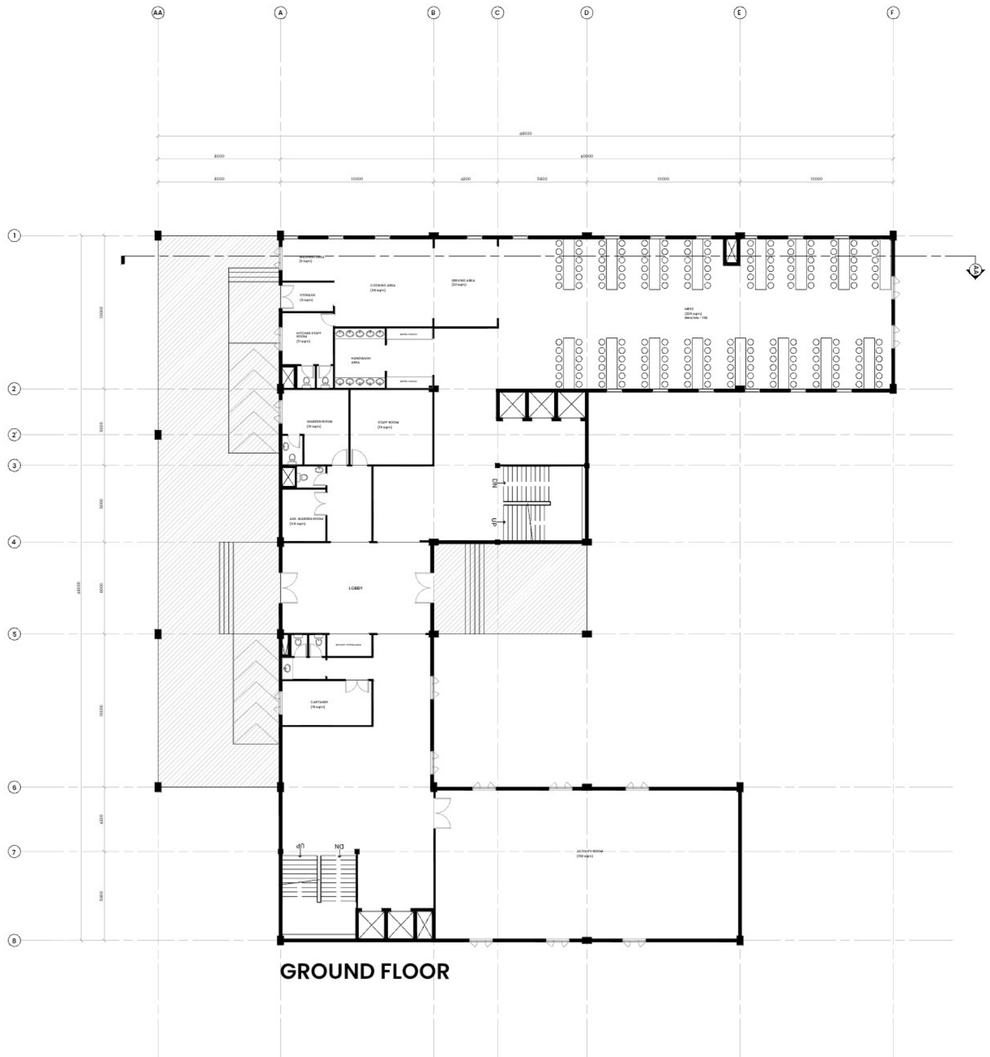
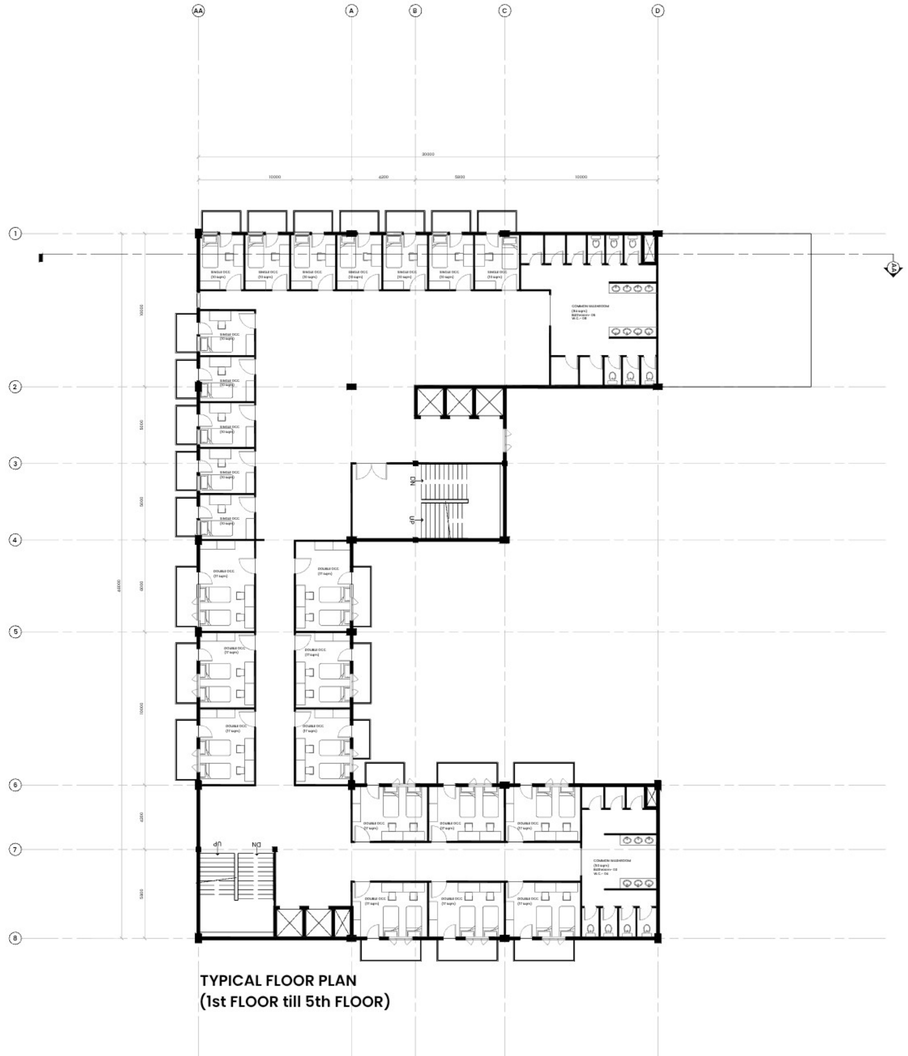
BOYS HOSTEL PLANS



GROUND FLOOR



TYPICAL FLOOR PLAN
(1st FLOOR till 5th FLOOR)

PROJECT TOPIC

INSTITUTE CAMPUS DESIGN

SCALE

1 : 200

SHEET NO.

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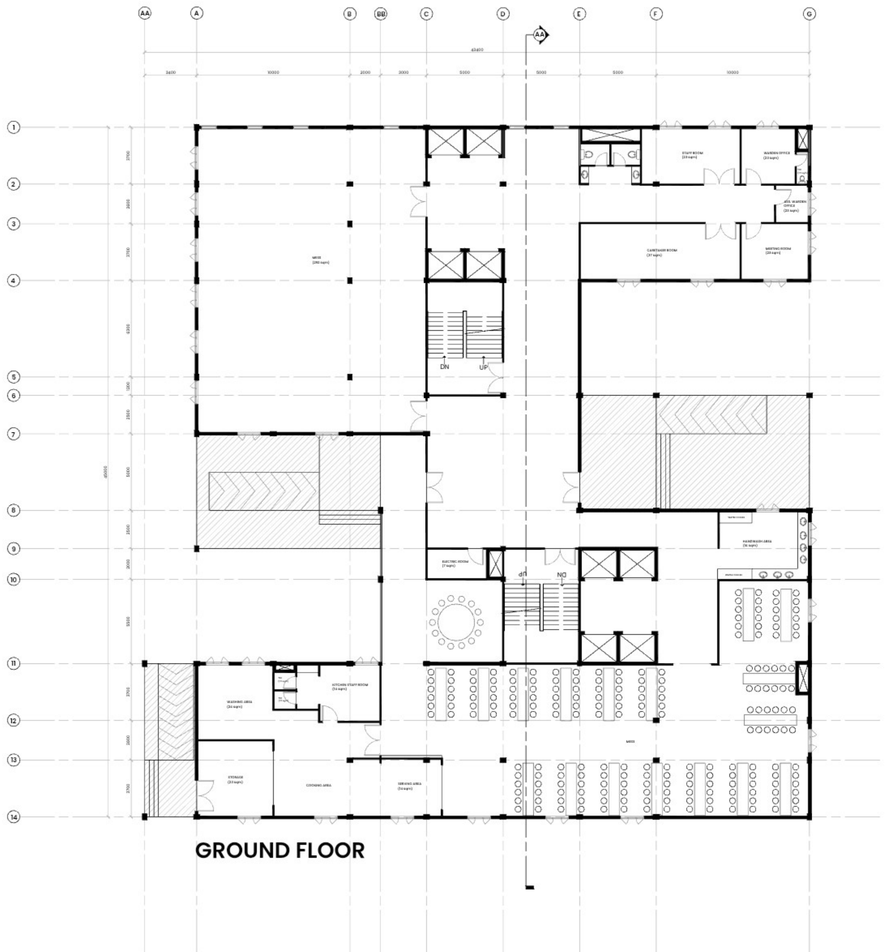
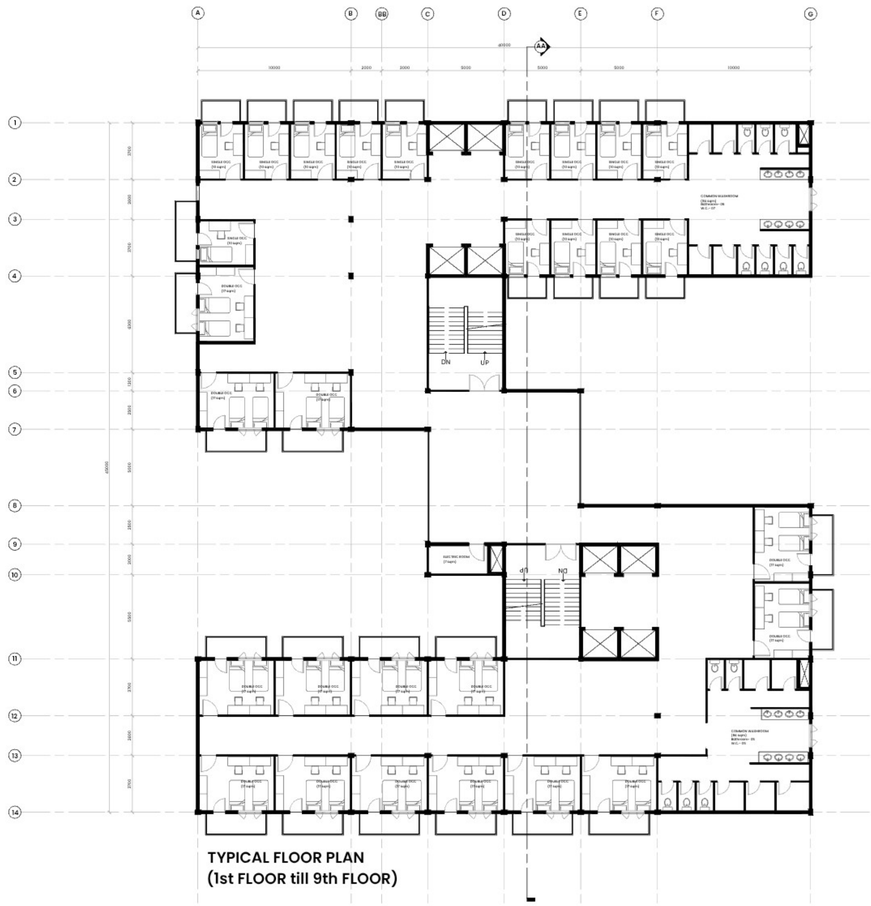


GROUND FLOOR



TYPICAL FLOOR PLAN
(1st FLOOR till 9th FLOOR)

GIRLS HOSTEL PLANS

PROJECT TOPIC

INSTITUTE CAMPUS DESIGN

SCALE

1 : 200

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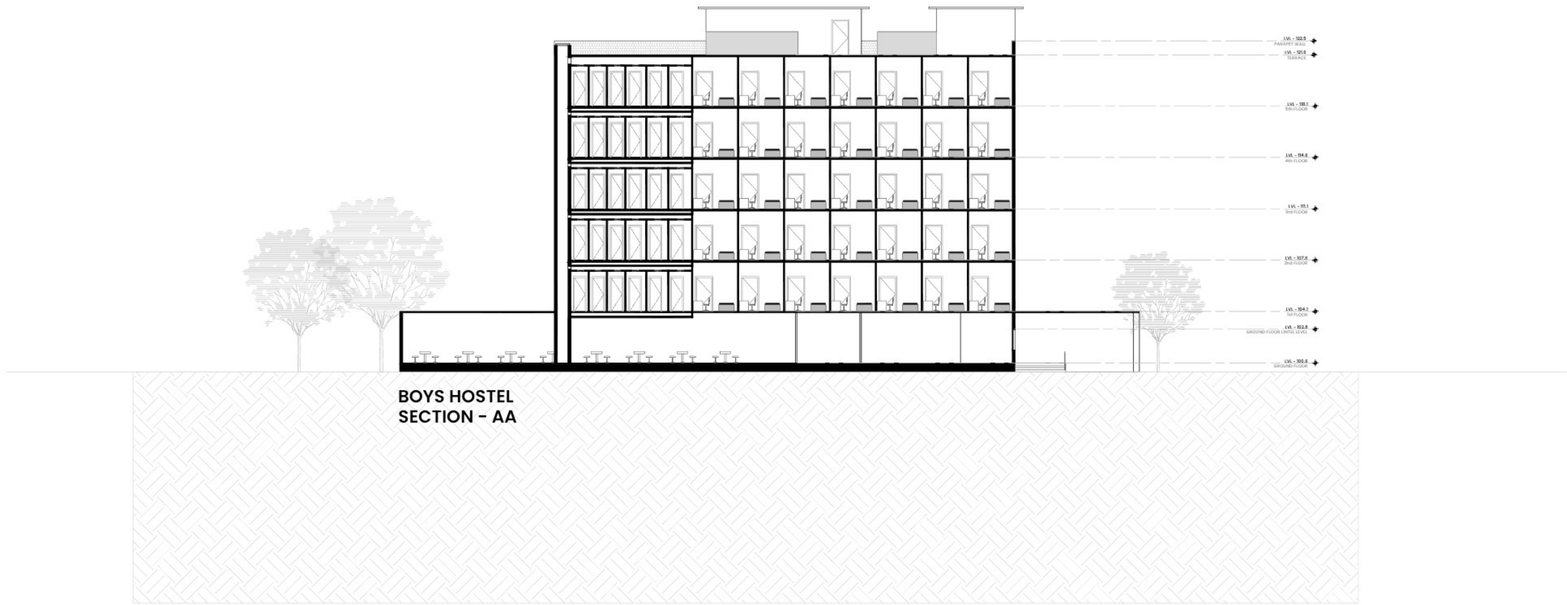
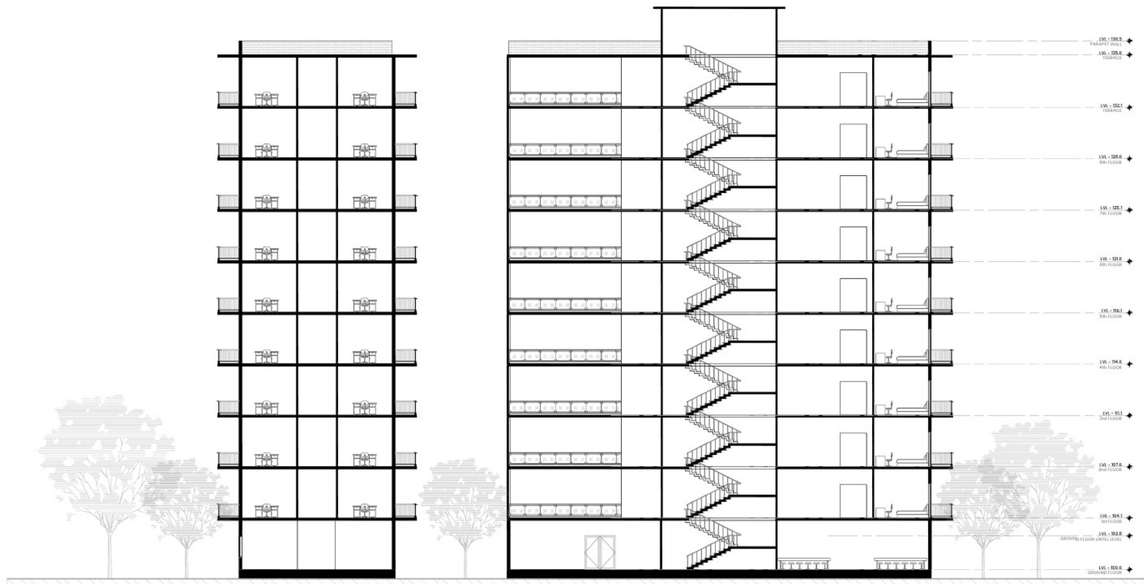
HOSTEL SECTIONS



BOYS HOSTEL
SECTION - AA



GIRLS HOSTEL
SECTION - AA

PROJECT TOPIC

INSTITUTE CAMPUS DESIGN

SCALE

1 : 200

SHEET NO.

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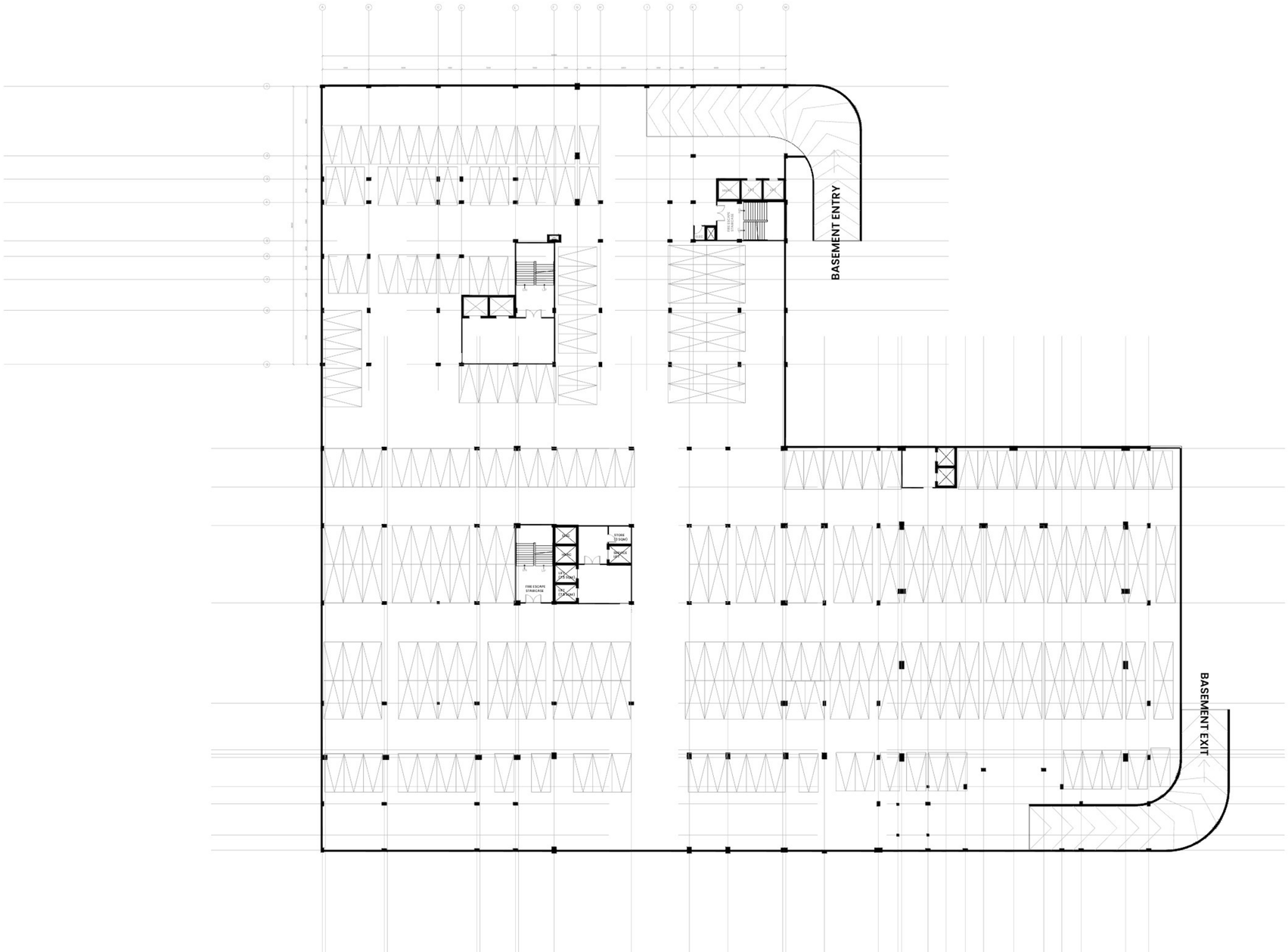

ACADEMIC BASEMENT

PROJECT TOPIC

INSTITUTE CAMPUS DESIGN

SCALE

1 : 300

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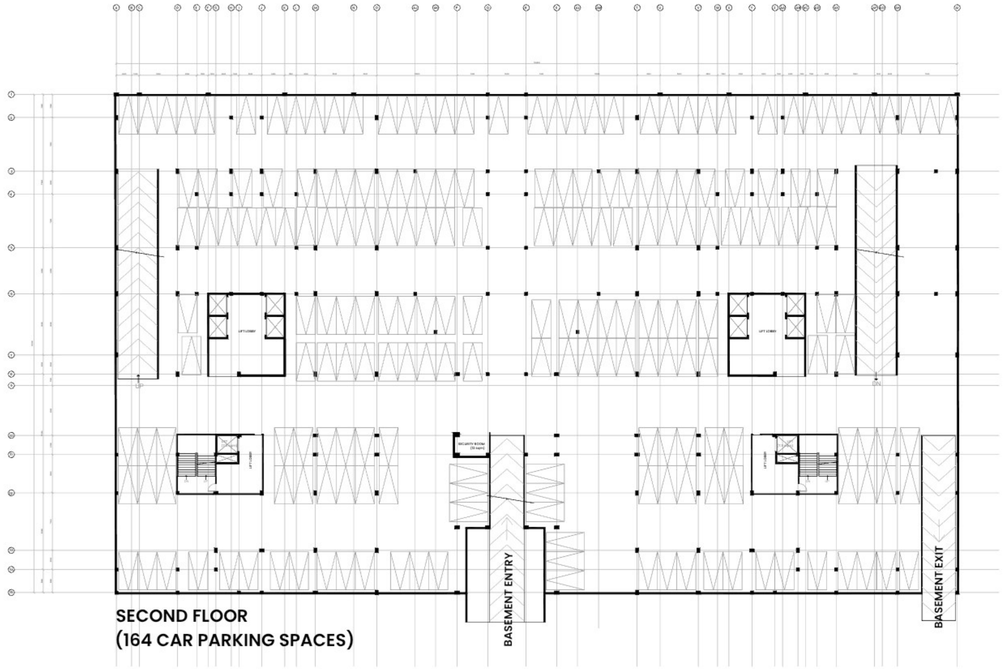
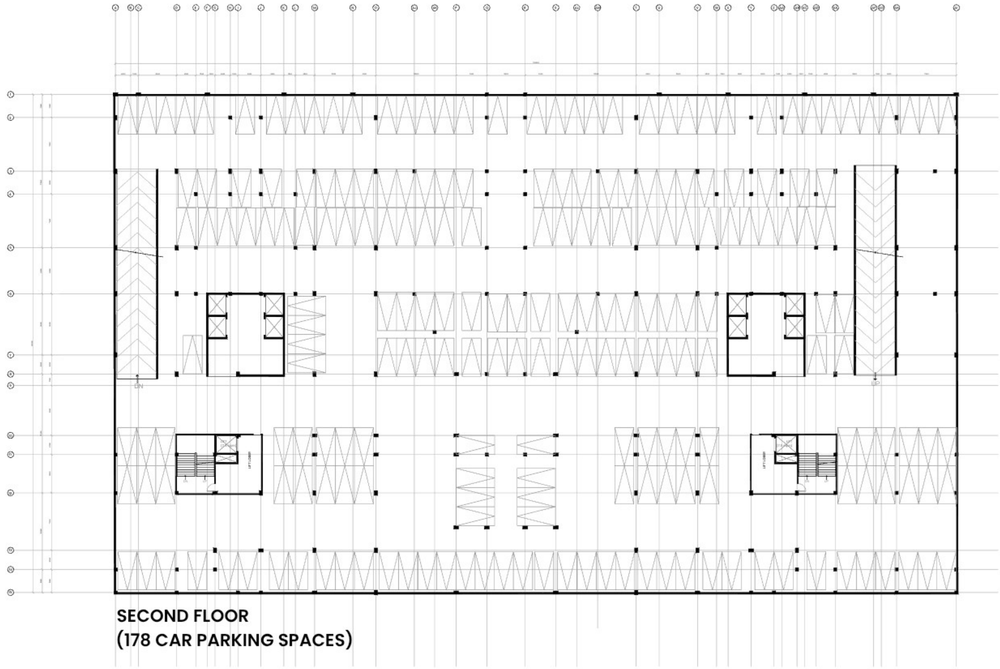


SECOND FLOOR
(164 CAR PARKING SPACES)



SECOND FLOOR
(178 CAR PARKING SPACES)

0m 10m 20m 40m

ACADEMIC BASEMENT

PROJECT TOPIC
INSTITUTE CAMPUS DESIGN

SCALE
1 : 400

SHEET NO.
14

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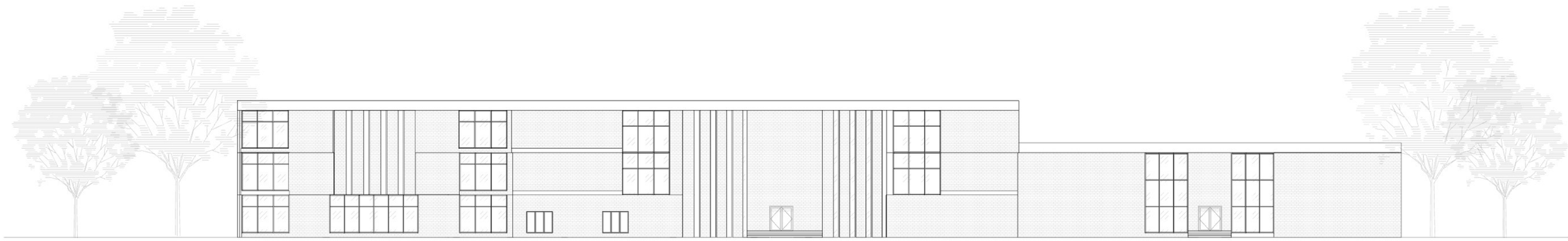
ELEVATIONS



LIBRARY ELEVATION



ADMIN ELEVATION

PROJECT TOPIC

INSTITUTE CAMPUS DESIGN

SCALE

1 : 200

SHEET NO.

19

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ELEVATIONS



ACADEMIC ELEVATION - 01



PROJECT TOPIC

INSTITUTE CAMPUS DESIGN

SCALE

1 : 200

SHEET NO.

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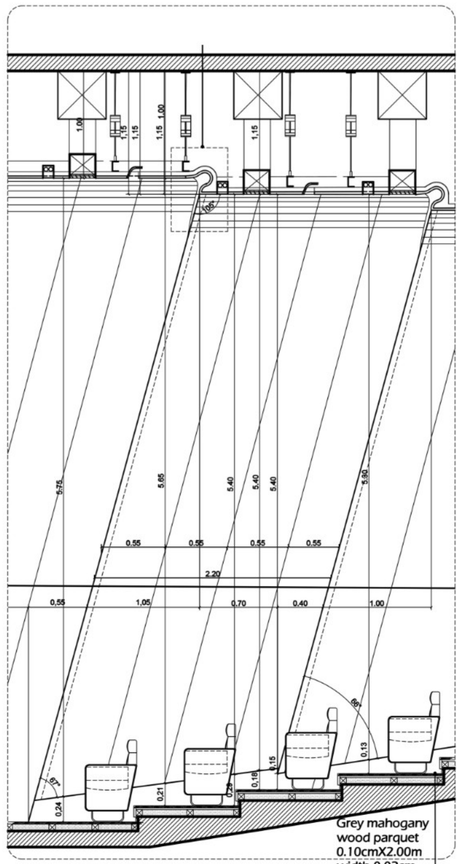
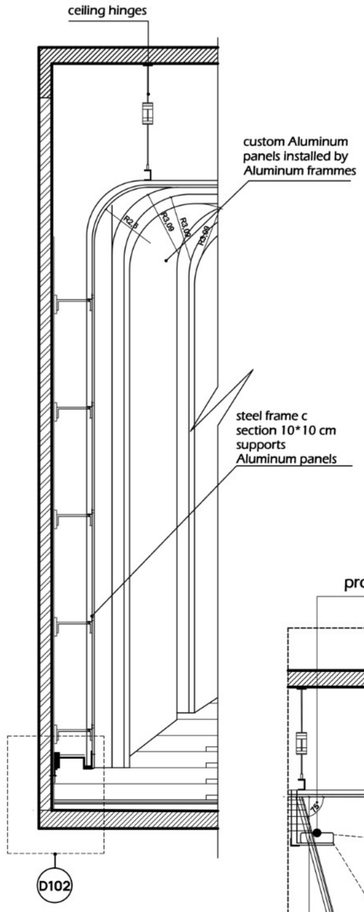
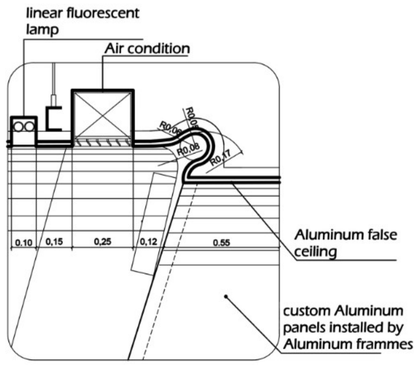
AUDITORIUM WORKING DRAWING



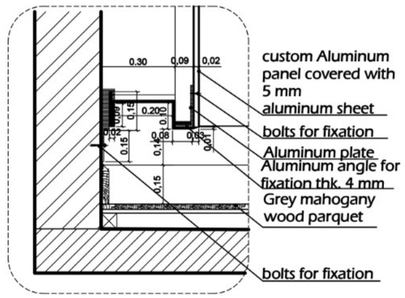
MIDDLE STRIP ELEVATION
SCALE- 1:20



SIDE AISLE ELEVATION
SCALE- 1:20



D101
scale 1:10



D102
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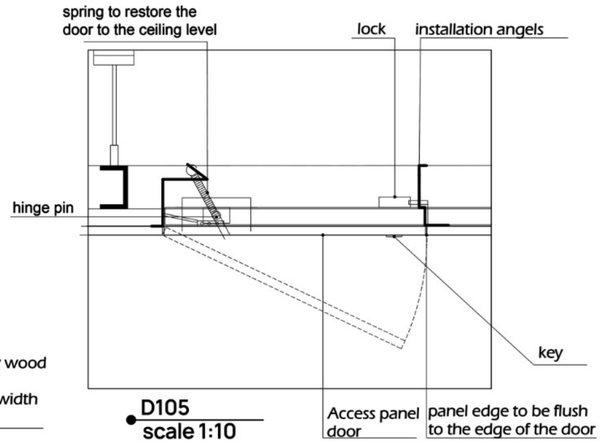

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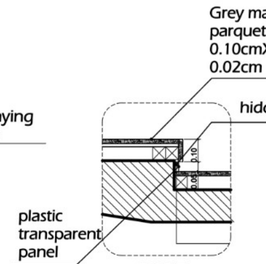

D103
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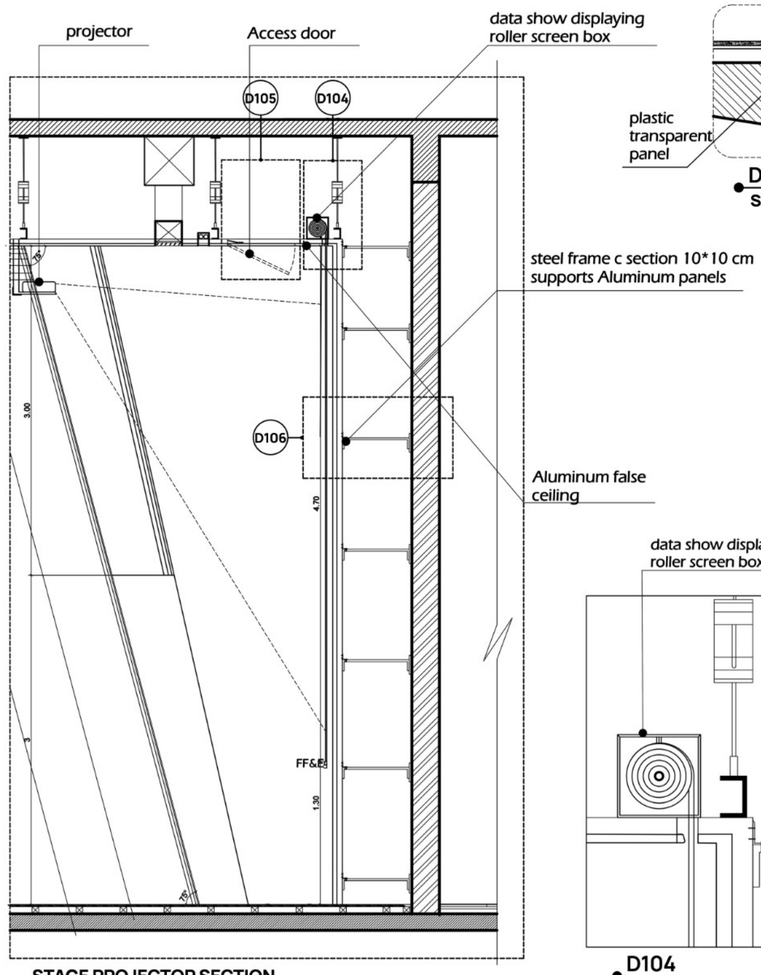
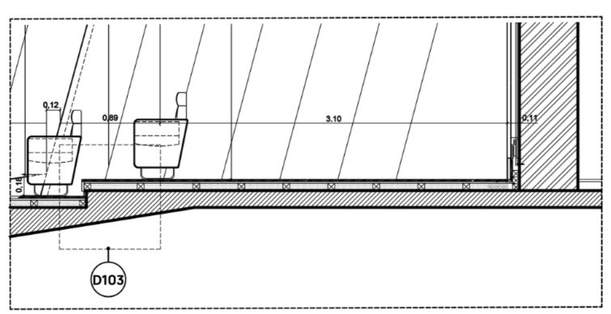
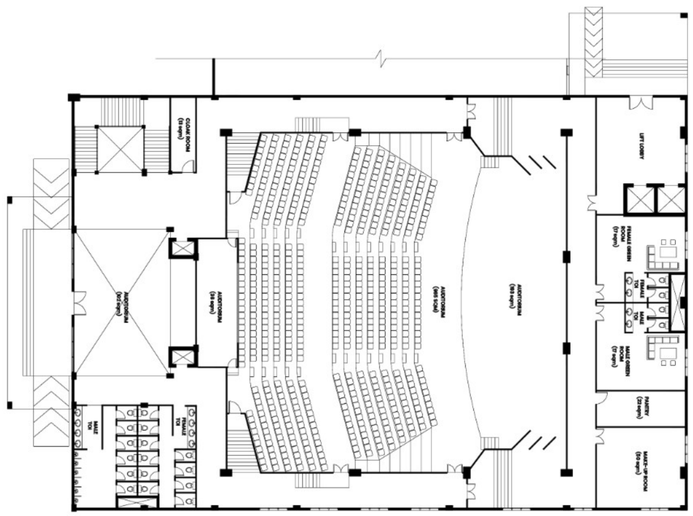


STAGE PROJECTOR SECTION
SCALE- 1:20

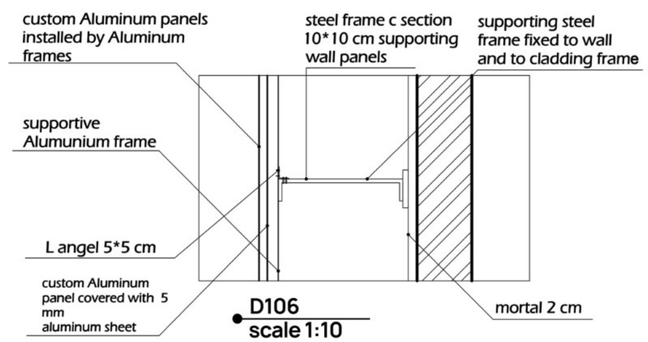


LAST STRIP ELEVATION
SCALE- 1:20



AUDITORIUM PLAN

D104
scale 1:10



D106
scale 1:10

PROJECT TOPIC
INSTITUTE CAMPUS DESIGN
SCALE
1 : 800
SHEET NO.
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THESIS GUIDE
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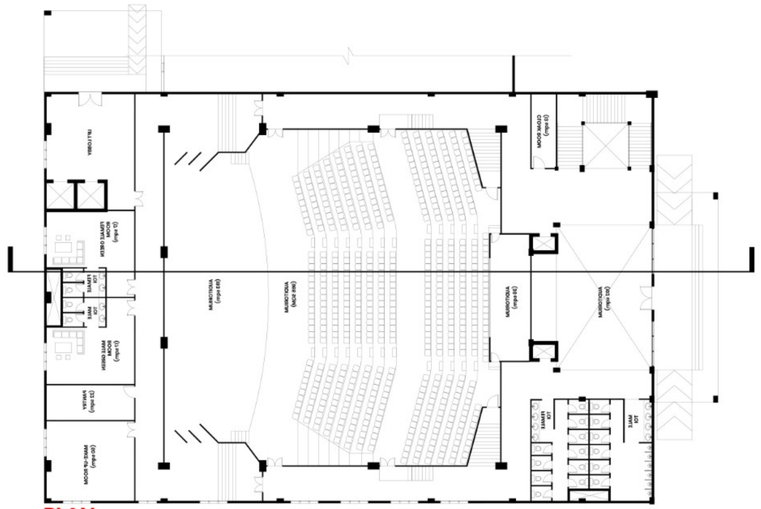
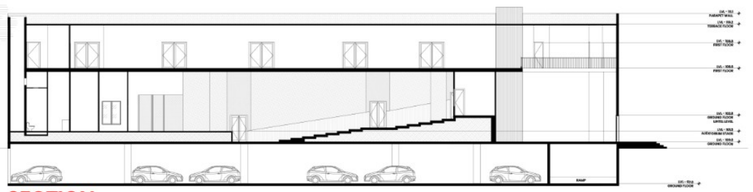
AUDITORIUM ACOUSTICS

PLAN



SECTION



Acoustics in architecture is the study and application of sound control within built spaces to achieve the desired auditory experience. It focuses on the transmission, reflection, absorption, diffusion, and insulation of sound to enhance speech clarity, music quality, and listening comfort. In auditorium design, architectural acoustics ensures uniform sound distribution, minimizes echoes and reverberation, and prevents noise intrusion, creating an environment that supports clear communication and immersive performance experiences.

CALCULATIONS

Treatment Type	*Area Covered (m2)**	*Absorption Coefficient*	*Added Absorption*
Wall Acoustic	150	0.9	135 sabins
Roof Acoustic	200	0.9	180 sabins
Carpeting (aisles + circulation)	200	0.3	60 sabins
Total Added	–	–	**375 sabins**

Parameter	*RT60 Value*
Current RT60	1.54 s
Required RT60	1.0 – 1.2 s
Attained RT60 after treatment (wall cladding + roof cladding + carpeting)	1.10 – 1.20 s

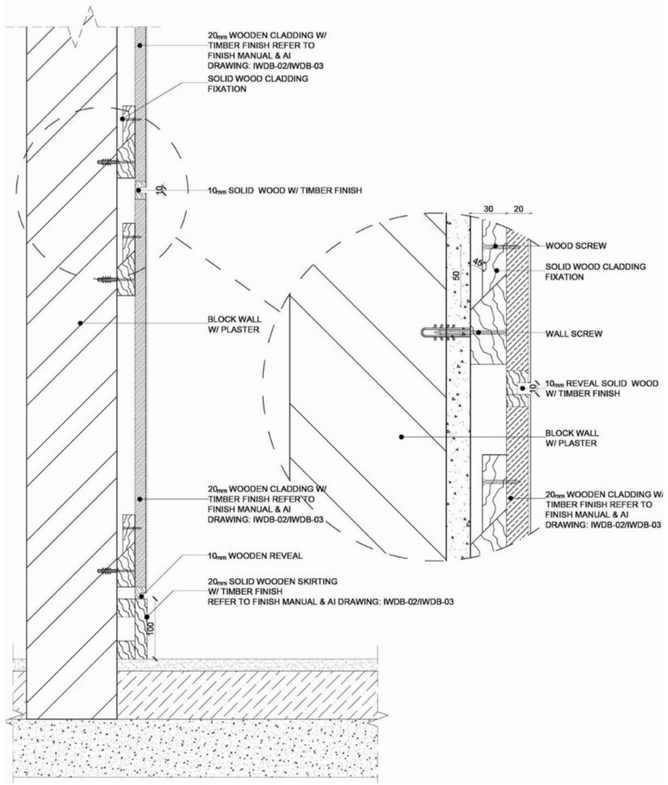
Attained RT After Acoustic Treatment Calculation

- Treatments: Wall acoustic cladding + roof acoustic panels + carpeting
- Added absorption from treatments: ≈ +300 to +360 sabins
- New total absorption ≈ 1200–1300 sabins
- RT60 Formula (Sabine's):

  RT60 = (0.161 x Volume) / Total Absorption (sabins)
- Attained RT60 after treatment: ≈ 1.10 – 1.20 seconds

The plan successfully brings the reverberation time down from a high 1.54 s to the required range of 1.0 – 1.2 s using high-absorption materials on the walls and roof.

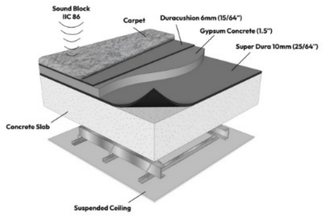
WALL CLADDING



Wooden Acoustic Wall Cladding in Short

- **Acoustic Finish:** The visible timber finish acts as an acoustic panel (absorber or diffuser) to control reflections, minimize echo, and ensure clear sound distribution within the auditorium.
- **Detailed Design:** The use of solid wood components (skirting and reveals) ensures a secure and aesthetically pleasing finish while contributing to the overall acoustic performance.

FLOORING

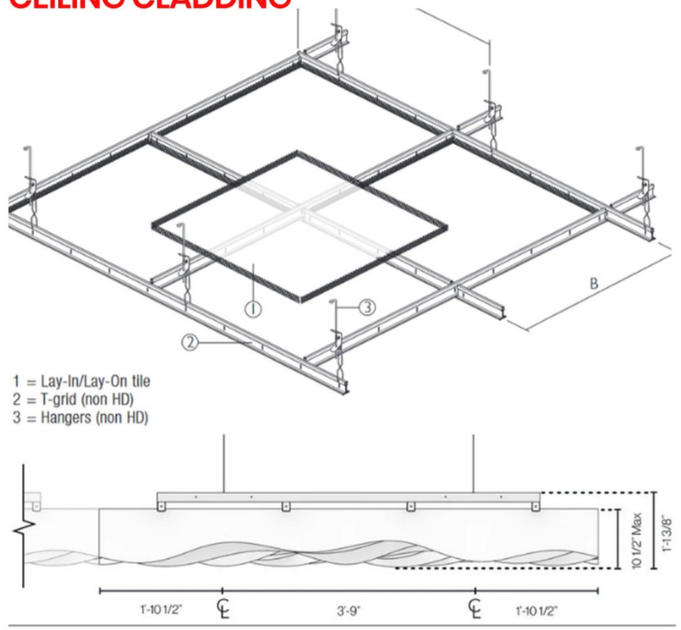


Floating Floor System in Short

This system is a multi-layered floor designed for acoustic isolation in auditoriums.

- **Mechanism:** It decouples the final carpet/surface from the structural slab using rubber acoustic mats.
- **Result:** Prevents foot traffic noise and vibrations from transferring to spaces below, enhancing overall soundproofing.

CEILING CLADDING

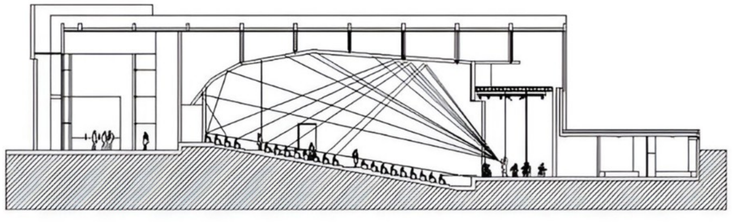


Suspended Acoustic Ceiling System

This diagram shows a standard suspended T-grid system with lay-in acoustic tiles, creating a plenum (air space) below the structural ceiling.

- **Function:** The system is vital for controlling reverberation and echoes in an auditorium.
- **Key Feature:** The adjustable suspension depth (up to $10-1/2") forms a crucial air gap, which significantly boosts the sound absorption performance of the acoustic tiles.

CEILING CLADDING



Acoustic Reflectors (Sound Canopies)

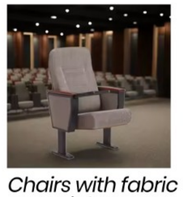
Large, rigid, angular, or curved panels ("Curved panels," "Laminated panels") suspended from ceilings/walls.

- **Primary Function:** To strategically reflect sound energy (especially from the stage) back down toward the audience.
- **Key Action:** They redirect sound waves that would otherwise be lost upwards, ensuring even distribution of sound.
- **Acoustic Goal:** Crucial for improving speech intelligibility, enhancing loudness, and adding warmth to musical performances in large auditoriums.

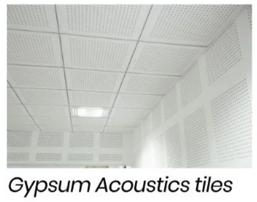
MATERIALS



Perforated Metal/Wood panels backed by air cavity



Chairs with fabric material



Gypsum Acoustics tiles



Fabric Carpet



Wooden Stage

PROJECT TOPIC

INSTITUTE CAMPUS DESIGN

SCALE

1 : 800

SHEET NO.

0

SUBMITTED BY

ANUSHKA YADAV
211110208

THESIS GUIDE

Dr. YOGESH GARG SIR



SITE SECTION

0m 5m 10m 20m

SITE VEGETATION

EXISTING VEGETATION



NEEM TREE
(EVERGREEN)
FOLIAGE - 7-9 METRE



MANGO TREE
(EVERGREEN)
FOLIAGE - 8-12 METRE



KADAM TREE
(EVERGREEN)
FOLIAGE - 1-2 METRE



JAMUN TREE
(EVERGREEN)
FOLIAGE -8 METRE



PEEPAL TREE
(EVERGREEN)
FOLIAGE -11 METRE



ASHOKA TREE
(EVERGREEN)
FOLIAGE - 3-4 METRE

ADDED VEGETATION



BOUGANVILLIA TREE
(EVERGREEN)
FOLIAGE - 6 METRE



TIPUNA TIPU TREE
(EVERGREEN)
FOLIAGE - 9-11 METRE



TABUIA ROSEA TREE
(EVERGREEN)
FOLIAGE -6-8 METRE



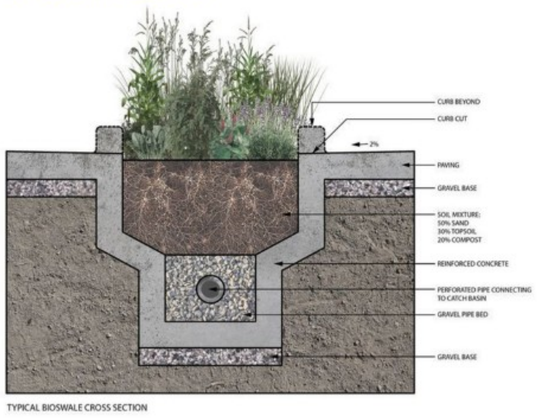
SYMBOL FOR ALREADY PLANTED TREES ON SITE



SYMBOL FOR ADDITIONAL PLANTED TREES ON SITE

LANDSCAPED FEATURES IN SITE

BIOSWALES



TYPICAL BIOSWALE CROSS SECTION



TYPICAL BIOSWALE LONG SECTION

A bioswale is a shallow, vegetated, engineered channel designed to collect, convey, filter, and infiltrate stormwater runoff, often replacing traditional concrete gutters.

MECHANISM

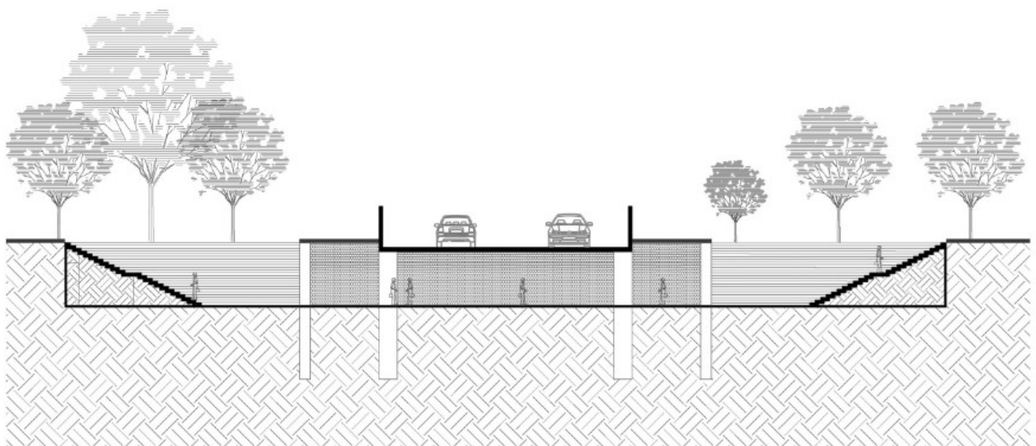
The vegetation and gentle slopes reduce the velocity of stormwater runoff, preventing erosion and increasing the time the water spends in the channel.

- Plants and an engineered soil/media mixture trap sediments and debris (physical filtering) as the water passes through.

EFFECTIVENESS

- Provides a natural, green solution (Low Impact Development) that enhances the urban landscape and helps combat the urban heat island effect.

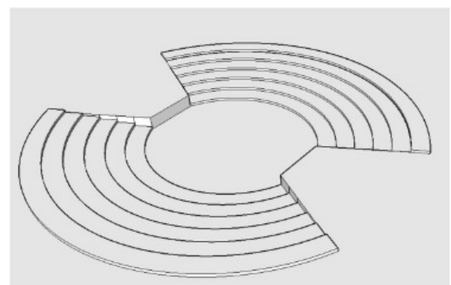
UNDERPASS



Creates a direct, uninterrupted pedestrian connection between the two segmented parts of the site, significantly improving overall site accessibility.

- Establishes a dedicated, safe pedestrian zone, encouraging walking and promoting a healthier, more cohesive site community.
- Offers a sheltered and covered route, ensuring comfortable passage for users regardless of harsh weather conditions (rain, sun, or high wind).

OPEN AIR THEATRE



Functions as a multi-purpose social and academic hub, ideal for informal gatherings, open-air lectures, or spontaneous performances and club meetings.

- Green Integration: The tiered steps can be lined with integrated planting or turf treads to serve as a transitional, green space blending hardscape with the surrounding softscape.

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PROJECT TOPIC	INSTITUTE CAMPUS DESIGN
SCALE	1 : 800
SHEET NO.	10
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LANDSCAPE (ELECTIVE)







3D VIEWS

PROJECT TOPIC
INSTITUTE CAMPUS DESIGN

SCALE
1 : 800

SHEET NO.
21

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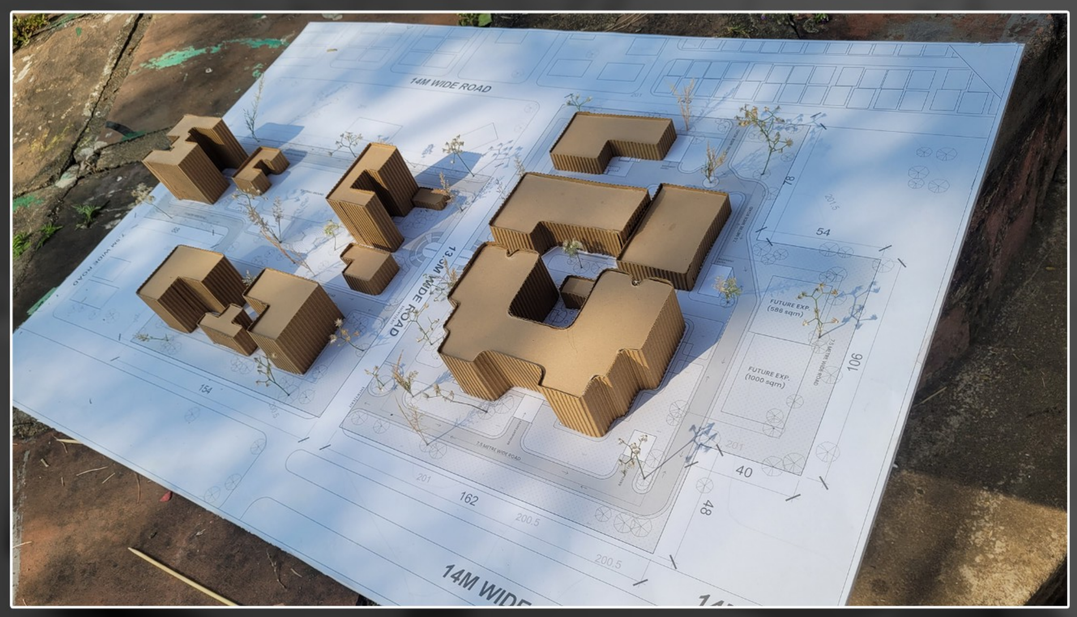
14M WIDE ROAD
13.5M WIDE ROAD
54
106
FUTURE EXP. (586 sqm)
FUTURE EXP. (1000 sqm)
40
48
162
200.5
14M WIDE


13.5M WIDE ROAD
78
54
106
40
48
FUTURE EXP. (586 sqm)




14M WIDE ROAD
13.5M WIDE ROAD
7.5M WIDE ROAD
146
242
88
84
154
162
200.5
54
40
48
100
FUTURE EXP. (586 sqm)
FUTURE EXP. (1000 sqm)
FOOTBALL GROUND
TENNIS COURT
7.5 METRE WIDE ROAD