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Warangal International Convention Centre

Warangal, Telangana, India

Dec, 2025

Warangal International Convention Centre

Warangal, Telangana, India

BACHELOR OF ARCHITECTURE

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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 511, entitled "Warangal International Convention Center, Warangal, Telangana, 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: 1st – 2nd Dec, 2025

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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-511, Thesis Project.

Date: 1st – 2nd Dec, 2025

Dr. Kavita Dehalwar
Thesis Guide

CERTIFICATION OF EXAMINATION

The Bachelor of Architecture Thesis Viva-Voce examination of Mr/Ms Student Name Scholar No.211110225, was held on 1/12/2025 to 2/12/25.

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ABSTRACT

This thesis is about designing the Warangal International Convention Centre (WICC) in a way that truly works for people. The study looks at how a convention centre can support large events, exhibitions, meetings, and conferences without feeling confusing or stressful to use. Instead of using complicated words, the research focuses on understanding real moments like crowds entering, waiting in the foyer, finding signs, exploring exhibition stalls, listening to speakers, and exiting the building after an event.

The goal is to create a place where people can move easily, understand spaces clearly, and feel comfortable even when it's busy. The design approach is based on practical and common-sense ideas. It focuses on big open halls without columns, flexible spaces that can host multiple events at once, clear entrances, spacious foyers, good sound, clear stage views, and safe exits that anyone can use. It also understands that a convention centre is more than just main halls — it’s the corridors, queues, registrations, exhibitions, seating, parking, and backstage work that shape a person’s overall experience. WICC is planned as a building that serves events first and supports people naturally around them.

Since Warangal is growing fast as a city, WICC is also seen as a public hub for new opportunities. It aims to become a space for business talks, cultural meets, student events, exhibitions, public seminars, local trade fairs, and community gatherings. The project does not try to look expensive or overly designed — instead, it tries to feel open, simple, welcoming, and flexible, a building that adapts to different events and brings people together for shared experiences, ideas, and growth.

ACKNOWLEDGEMENT

The report, being the culmination of the undergraduate course in architectural studies, has been a sum-up of all the learning of the past years. First and foremost, I would like to express my deep and sincere gratitude to my subject coordinator, **Dr Kavita Dehalwar**

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Date**:** **Harshit Ray**

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PART 1. DESIGN BRIEF

Below is a comprehensive data document for the Warangal International Convention Centre (WICC) cum 3-Star Hotel @ IT Park, Manikonda, Warangal, based on the attached Project Information Memorandum (PIM), formatted in the style you provided for the Hyderabad 5-star hotel thesis. All values are drawn directly from the official RFP summary and detailed site/planning data

1.1 INTRODUCTION

In today's dynamic hospitality landscape, multi-use convention centres and integrated business hotels serve as engines for urban growth and catalysts for the regional business and tourism sectors. The Warangal International Convention Centre (WICC) cum 3-Star Hotel is envisioned as a landmark development, merging state-of-the-art meetings, incentives, conferencing, and exhibitions (MICE) infrastructure with comprehensive accommodation and entertainment facilities. This document outlines the architectural and operational vision for the project, emphasizing a synergy of elegance, functionality, and cultural relevance for Warangal.

This facility aims to be India's leading destination for conferences, business tourism, and upscale hospitality outside metropolitan centres, combining the best practices of urban planning, guest experience, and placemaking.

1.2 AIM

To design and deliver a fully functional convention centre cum business hotel in Warangal that maximizes utility and aesthetics, adheres to modern hospitality standards, and reflects the aspirations of Telangana's fast-growing urban hubs.

1.3 OBJECTIVES

- Design a convention centre and 3-star hotel that is fully responsive to the unique site conditions of Manikonda IT Park, Warangal.
- Integrate the development with the local urban context and infrastructure.
- Create a destination reflecting Warangal's rich cultural tapestry and future potential.
- Fully utilize the site's visibility, accessibility, and strategic location for regional prominence.
- Follow all applicable regulations, bylaws, and minimum development obligations as mandated in the RFP.
- Establish efficient service networks ensuring seamless operations and high hospitality standards.

1.4 SITE LOCATION

- **Project Name:** Warangal International Convention Centre (WICC) cum 3-Star Hotel

- **Location:** Sy. No. 1791/1, Manikonda (V), Warangal (U) District, Telangana, India
- **Coordinates:** Not explicitly stated; neighbouring major landmarks identified
- **Proximate Landmarks:**
    - Textile Park (immediate, across the road)
    - V City Manikonda (~3.7km)
    - Kazi pet Junction (~9km)
    - Warangal Railway Station (~20km)
    - Hyderabad City (~140km)
    - Hyderabad International Airport (~161km)
- **Primary Access:** NH 163, excellent frontage, and site visibility
- **Boundaries:** Vacant land (North/South), NH163 access road (East), Dharmas agar Canal (West)
- **Site Shape and Terrain:** Regular, mostly flat, well-contiguous

1.5 PROJECT DETAILS

- **Site Area:** ~10 acres (40,468sq.m)
- **Land Use:** Convention, business hotel, exhibition, entertainment, F&B; strictly no residential, hospital, heavy industry, petrol bunk, or hazardous activities.
- **Gross Built-Up Requirement:** Minimum 250,000sq.ft (convention + hotel + F&B; excludes required parking)
- **Project Components:**
    - **Convention Centre & Exhibition Hall:** 50,000 sq.ft (2,500 pax capacity), including meeting rooms, business centre, pre-function/circulation
        - Main convention cum exhibition (30,000sq.ft)
        - Small meeting rooms (2,000sq.ft)
        - Large meeting rooms (5,000sq.ft)
        - Business centre (5,000sq.ft)
        - Pre-function space (8,000sq.ft)
    - **Business Hotel:** 150 keys, 150,000sq.ft minimum (guest rooms and services)
    - **Entertainment and Food/Beverage:** 50,000 sq.ft
    - **Parking:** As per GO 168, adequate surface parking required
- **Permissible to Build Above Minimums** (subject to Authority approval)
- **Height/FSI:** Governed by local planning byelaws and as per Authority's development control regulation

1.6 SITE PLAN WITH DIMENSION

- The site enjoys regular geometry and contiguous layout, favouring efficient master planning.
- Exceptionally prominent road frontages on NH 163.
- Bounded by urban and open/agro-industrial land uses.

1.7 PROPOSING AGENCY

- **Nodal Agency:** Telangana State Industrial Infrastructure Corporation Limited (TSIIC)
- **Bidder Structure:** Single entity or consortium (max 3 members), with equity holding and lock-in as specified for project stability.

1.8 SITE LOCATION ON MASTER PLAN

- Plotted within the IT Park zone in Manikonda, adjacent to Textile Park, with major arterial connectivity (NH163) and ready city infrastructure.

1.9 BROAD SCOPE OF WORK

The selected developer will be responsible for design, finance, procurement, construction, operations, management, and maintenance for the following minimum obligations:

- International standard convention centre and exhibition facilities
- 3-star business hotel (minimum 150 keys)
- Entertainment and F&B areas
- Surface parking per applicable regulations
- Compliance with all environmental and urban planning norms

1.10 DETAILED LIST OF SPACES / AREA STATEMENT

Component	**Minimum Area (sq.ft)**
Convention Centre (main+meetings/FnB)	50,000
- Convention/Exhibition	30,000
- Small Meeting Rooms	2,000
- Large Meeting Rooms	5,000
- Business Centre	5,000
- Pre-function/Circulation	8,000
Business Hotel (150 keys)	150,000
Entertainment + F&B	50,000
Total Minimum Built-up	250,000
Car Parking	As per GO 168

1.11 DESIGN BRIEF

1.11.1 Site

The project site for the Warangal International Convention Centre (WICC) cum 3-Star Hotel admeasures approximately 10 acres (40,468 sq. m), regular in shape, mostly flat, with excellent frontage and visibility along NH 163, as detailed and demarcated in the masterplan.

1.11.2 Land Use

- The permitted land-use is strictly **commercial**, specifically for the construction and operation of a business hotel (minimum 3-Star category), international standard convention centre and exhibition halls, F&B, entertainment, business centre, and support services.
- The use **excludes** any development of residential units, hospitals, warehousing, heavy industry, car showrooms, automobile repair/services, petrol bunks, LPG godowns, and any trade or activity involving obnoxious, hazardous, flammable, non-compatible, or polluting substances or processes.
- Positive permitted usage includes: ballrooms, meeting rooms, business centres, retail, hotel, service apartments/dormitories (with approval), multi-level car parking, exhibition space, and cultural centres.

1.11.3 Division

- The development is to be planned as a cohesive complex, with spatial, vertical, or horizontal separation for:
    - Convention Centre & Exhibition Halls (to accommodate 2,500 pax, with main halls, meeting/business rooms, and related pre-function/circulation zones)
    - 3-Star Business Hotel (minimum 150 keys)
    - Dedicated Entertainment & F&B Areas
    - Surface Parking zones as per regulations (GO 168)
- Phasing, zoning, and connectivity between hospitality, events, and support functions must be fully integrated to maximize operational efficiency and guest experience.

1.11.4 Site Coverage and F.A.R.

- Development to be governed by prevailing Warangal urban planning regulations and TSIIC/IALA Warangal development control byelaws (no explicit FSI/FSR specified in the document—FSI as per applicable local rules).
- Minimum **built-up requirement:** 250,000 sq. ft (does not include required surface parking).
- Site coverage, block placement, and maximum permissible heights subject to Authority/NOC approvals.

1.11.5 Height

- No explicit mandatory height limit is given; buildings and built features subject to local and national planning permissions and aviation/AAI clearances if required.
- The architectural design should optimize vertical massing without exceeding area/height restrictions per local planning authority guidance.

1.11.6 No. of Storeys

- To be determined based on design and site utilization; provision to allow for efficient stacking of convention, hotel, and F&B/entertainment functions.
- Recommended: Convention and exhibition spaces on lower floors, hotel rooms on upper floors, shared support/services as per functional zoning.

1.11.7 Plinth

- Plinth height and structure to comply with regulatory flood, access, and landscaping requirements as per TSIIC and municipal norms (no exact measurement specified in RFP; adopt standard minimum 0.4m as reference if needed).

1.11.8 Parking

- Parking must be provided on surface as per GO 168 requirements—the **minimum as mandated by local building regulations**.
- Development must include clear demarcation for surface parking for all user groups—hotel guests, convention visitors, F&B patrons, and staff.
- Multi-level parking is a positive use; basement parking provisions permissible per technical feasibility and authority approval.

1.11.9 Minimum Development Obligations (MDOs)

- **MDO-1:** Within the stipulated schedule (32 months construction + 4 months for mobilization/approvals = 36 months from date of Development Agreement signing), the Developer must:
    - Complete all construction for the International Standard Convention Centre with capacity for at least 2,500 persons (including all associated exhibition, meeting, circulation, and support spaces as detailed in the RFP, totalling at least 50,000 sq. ft).
    - Complete construction and make operational a 3-Star category Business Hotel with a minimum of 150 keys (rooms) and all supporting back-of-house, administration, F&B, and recreational amenities (minimum 150,000 sq. ft).
    - Complete construction of all Entertainment and F&B zones (minimum 50,000 sq. ft).
    - Develop surface parking infrastructure according to regulatory minimums as detailed in GO 168.

- Any further spaces (service apartments, additional commercial, multi-purpose/cultural halls) to be developed only with prior approval and not to substitute any of the MDO-mandated areas.

Note: All facilities and spaces must be constructed, equipped, and made operational in accordance with terms and conditions specified in the RFP and Government of Telangana norms. All obligations must be met in entirety before the facility can commence commercial operations. Any deviation or proposed enhancement must receive explicit TSIIC/Authority approval in advance.
If you need a mapped table or block diagram for any of these zoning and area requirements, let me know!

1. https://ppl-ai-file-upload.s3.amazonaws.com/web/direct-files/attachments/85422374/625df063-8615-45a9-9e77-ffca3aeb5624/Warangal-International-Convention-Centre-WICC-cum-3-Star-Hotel-IT-Park-Madikonda-Warangal-Telangana-on-Public-Private-Partnership-PPP-Mode-under-IALA-Warangal-1-102-114.pdf

PART 2. LITERATURE STUDY

Convention is the name given to a general or formal meeting of a legislative body, social or economic group in order to provide information on a particular economic situation and in order to deliberate and consequently, establish consent on policies among the participants, usually of limited duration with set objectives but no determined frequency.

-Lawson Fred, Congress, Convention and Exhibition facilities: planning design and Management (Architectural press: London, page 9

2.1 CONVENTION CENTRE

A convention centre is a building/space designed to hold a convention, where individuals and groups gather to promote and share common interests. A convention centre in most cases is designed for the purpose of conducting meetings, rallies, or seminars. It may be adopted for specific events, such as appearances by well-known speakers or musicians. In some cases, meetings or events take place in centres or buildings not specifically designed for conventions but large enough to accommodate attendees.

Convention centres receive guests from local, national, and international markets. The various market segments that visit is dictated by the types of events that are hosted.

The term convention is widely used in much discipline. A convention word in general can be defined as

- A large formal assembly of a group with common interests, such as a political party or trade union
- The persons attending such an assembly
- an assembly of delegates of one party to select candidates for office
- an international agreement second only to a treaty in formality
- A telecommunications convention
- Any agreement, compact, or contract
- The most widely accepted or established view of what is thought to be proper behaviour, good taste etc.

Convention — a large meeting of member of profession, a political party, etc.

Centre- a place or an area where a lot of people live, a place where a lot of business and cultural activity takes place

A convention is not simply a space for looking at or listening to a performance. A successful convention for live supports the emotional exchange between the performer and the audience, and between members of audience.

Thus, conventions are usually general sessions, mostly information giving, often formed around a particular theme or subject matter of topic interest and increasingly accompanied by exhibits. In addition to need for large halls & auditoriums required for the plenary sessions, most conventions break down into smaller groups to deliberate on matter of issue.

2.2 THE MICE INDUSTRY

Mice is a type of tourism in which large groups, usually planned well in advance, are brought together for a particular purpose.

Mice is an acronym for the meetings, incentives, convention, and exhibition tourism segment.

This a therefore a business-oriented segment, involving obligatory (or non-discretionary) travel. The incentives part of mice is the odd one out — though it is related to business, as it is usually provided to employees or dealers/distributors as a reward it tends to be leisure based.

Meeting coming together for a specific reason

Incentives an initiative that motivates

Conferences a meeting for consultation or discussion

Exhibitions a public display

The idea of convention centre been derived from the present scenario of rapid growth of innovation, art and cultures.

Convention centres serve to provide a location for meetings, conventions. trade shows, public shows, the arts, and local interests.

- Typology commercial
- Use public

2.3 USER GROUPS

Broadly classified into 3 major types.

2.4 THE DELEGATES

- These are the group of people who form the major part of the convention centre.
- People from both national and international backgrounds are a part of this user group.

2.5 THE EXHIBITORS

- They are the reason for the delegates to attend various conventions and exhibitions.
- People from all over the country gather to promote their respective event.
- The exhibitors may also be craftsmen who are allowed to setup temporary shops.

2.6 THE STAFF

- These people form the background of the convention
- The building must cater to their needs along with catering to the direct users of the building.

2.7 HISTORICAL BACKGROUND

Convention centres and exhibition spaces evolved from the open-air amphitheatres of the Greek agoras and roman forums, which were initially intended for large commercial fair. The first convention centres can trace back to mid-19th century Britain. Commonly known as exhibition halls, the centres were designed to bring together people to discuss and explore their mutual interest of a subject. These imposing Victorian buildings Often covered several and Were mufti-functional lecture halls, libraries, galleries, theatres, and exhibition areas.

2.7.1 THE CRYSTAL PALACE. HYDE PARK

Among the first historical convention centres constructed was the crystal in London Hyde Park. Providing 92ß) m2 of exhibition space, the building was erected in 1851 to house the great exhibition a grand show case of modern industrial technology and design. Organized by prince albert and inventor Henry Cole, the great exhibition was an international platform for world powers to demonstrate their technological and cultural achievements, Although countries all around the world could contribute, British exhibits - from working machinery to scientific and surgical instruments - took centre stage, promoting British position as a great industrial power, In 1854 the crystal palace was dismantled and re-built in Sydenham, an area Of south London which by association known as crystal palace. Ravaged by fire in 1936, the building was eventually pulled down.

2.7.2 BINGLEY HALL. BIRMINGHAM

Another key convention centre in British history is Bingley Hall, Birmingham. Constructed in 1850 from surplus steels used to build Euston station, the exhibition hall boasted over an acre of exhibition space and was by ten entrances.

Hall was a primary meeting and exhibition space and before it succumbed to fire in 1984, hosted several key events, including cattle shows, concerts and boxing matches. It was also the centre for British prime minister gladstone's political rally in November 1888. In Bingley hall's place now stands Birmingham’s international convention centre (icc) opened in 1991, the icc is a major exhibition centre comprising ten halls which can accommodate up to 8,000 visitors. The site also houses symphony hall, a 2,000-seat concert hall, alongside shops and cafes.

2.7.3 DEDICATED CONFERENCE CENTERS

Born out of the need for dedicated meeting spaces away from the traditional corporate environment, a new breed of meeting venue has emerged in the last few decades the purpose-built conference centre. These multi-functional buildings are designed to maximize attendees’ productivity and concentration by offering a dedicated learning environment in high quality private surroundings. Facilities typically include self-contained conference buildings, break-out rooms, exhibition spaces, dedicated dining rooms and social areas. For added comfort and convenience today’s purpose-built conference centres usually provide on-site overnight accommodation, leisure facilities and free parking. Lane end conference centre was one of the first purpose-built conference centres in the UK. It opened its doors

in 1969 and today it boasts five distinct buildings each with a dedicated conference suite, lounge, bar, dining room and several dedicated bedrooms for residential events.

2.8 IMPORTANCE OF CONVENTION CENTERS IN INDIA

In the last decade or so, India has seen year-on-year growth in tourist arrivals. Meetings and conference market segment has been identified as one of the new growth market segments by many analysts. India will soon be competing with the best of the international markets in many industries including meeting and exhibition industry by attracting business arising from international summits, accords and conventions.

The most important point that drives business for a convention centre is the availability of hotels and other supporting facilities like recreational areas, retail outlets and establishments in the market. Other key points in defang business drivers for convention centres is the basic infrastructure that a destination has to Offer in terms of affordability, safety, ease of transport, etc. A major portion of events related to entertainment, leisure and sporting events are also determined by the availability in the market of other exhibition and entertainment facilities.

2.9 MICE TOURISM IN INDIA

2.9.1 History

- Meetings in ancient times were discussions of communal interests.
- Cities acted as focal points.
- It was ideally a space meant "to bring together".

2.9.2 Development over the past century

- The industrialization of the late 19tM to early 20tM century increased the need for business.
- There were also meetings on political, religious, and recreational issues.
- Associations also began to include annual meetings.

2.9.3 The convention industry began in 1950s

- An expansion in governments organizations.
- A growth in multinational corporations and agencies
- Developments in association interests, professional and pressure groups.

2.9.4 Reasons for mice

people who attend mice activities are mainly there for

- **Stimulation**: getting new ideas.
- **Networking**: meeting with others- colleagues, customers, buyers, and people who
- Share the same interests.
- **Continuing their Education**: learning new skills and furthering their education.
- **Product update**: finding out about new products that are available.
- **Spread new information**: transmitting new concepts and ideas.
- **Strategic planning**: collective brainstorming for the future.
- The heart of mice is communication
- **Initial considerations for mice**
- Determining the and capacity of existing venues for meetings, conferences, and exhibitions.
- Determining the use of these venues,
- Establishing expected future demand for these venues.
- Determining the adequacy of existing venues to meet this expected demand.
- Outlining any serious design faults with existing venues.

2.10 UNDERSTANDING CONVENTIONS

A convention is a gathering of individuals who meet at an arranged place and time to discuss or engage in some common interest.

Conventions are often planned and co-ordinated by professional meetings and convention planners, generally by the staff of the convention's hosting company.

TYPES

— **TRADE CONVENTIONS:** it typically lays on a particular industry or industry segment, and feature keynote speakers, vendor displays, and other information and activities of interests to the event organizers and attendee,

— **PROFESSIONAL CONVENTIONS**: they focus on issues of concern to the profession and advancements in the profession. Such conventions are generally organized by societies dedicated to promotion of the topic of interest.

— **FAN CONVENTIONS**: they usually feature displays, shows, and sales based on pop culture and guest celebrities.

— **SEMINARS**: they are meetings organized to inform a group of people at a specific topic or to teach a specific skill. Expert speakers and teachers are usually invited to speak on various topics.

— **SOCIO EVENTS**: a large gathering organized to celebrate major life events and religious ceremonies. Common social events include: anniversaries, weddings, and birthdays.

— **TRADE SHOWS/ EXHIBITIONS**: they are an opportunity for companies to exhibit some of their latest as well yet to be released prototypes to journalists as well as others in the industry.

2.11 TYPES OF CONVENTIONS

Convention centres are expansive venues designed to host events such as conferences, trade shows, and conventions. These venues vary in scale, from global to regional events, and play a vital role in stimulating local economies, promoting networking, and facilitating business and knowledge exchange.

Types	Usage	Example
Exhibition Centers	Designed for trade shows, exhibitions, and fairs with large, open spaces to accommodate booths and displays.	Pragati Maidan, New Delhi
Conference Centers	Focused on hosting meetings, conferences, seminars, and workshops with flexible meeting rooms, auditoriums, and break-out spaces.	India Habitat Centre, New Delhi
Multi-purpose Convention Centers	Versatile spaces for a range of events like conventions, exhibitions, concerts, and sporting events, customizable to different event requirements.	Bharat Mandapam, New Delhi
Specialized Convention Centers	Cater to specific industries or events, such as medical conventions or technology expos, with tailored facilities for those needs.	Bombay Exhibition Centre, Mumbai

Semi- Public Use	**Auditorium/Plenary Hall**	Performers, delegates, and local people.
	Conference Rooms	Delegates and staff
	Seminar Rooms	Delegates and staff.
	Public amenities	Delegates
Private Use	**Administrative offices**	Staff of the convention centre
Service Areas	**Parking**	Staff
	The Kitchen	Staff

	Spaces	**Users**
Public Use	**Entrance Hall**	Delegates, performers, and staff.
	Registration Centre	People taking part in various conventions
	Toilets	All occupants.
	Exhibition Halls	All occupants
	Parking	Anyone visiting Convention center.

2.12 ELEMENTS OF SPATIAL ORGANIZATION

2.12.1 ENTRANCE

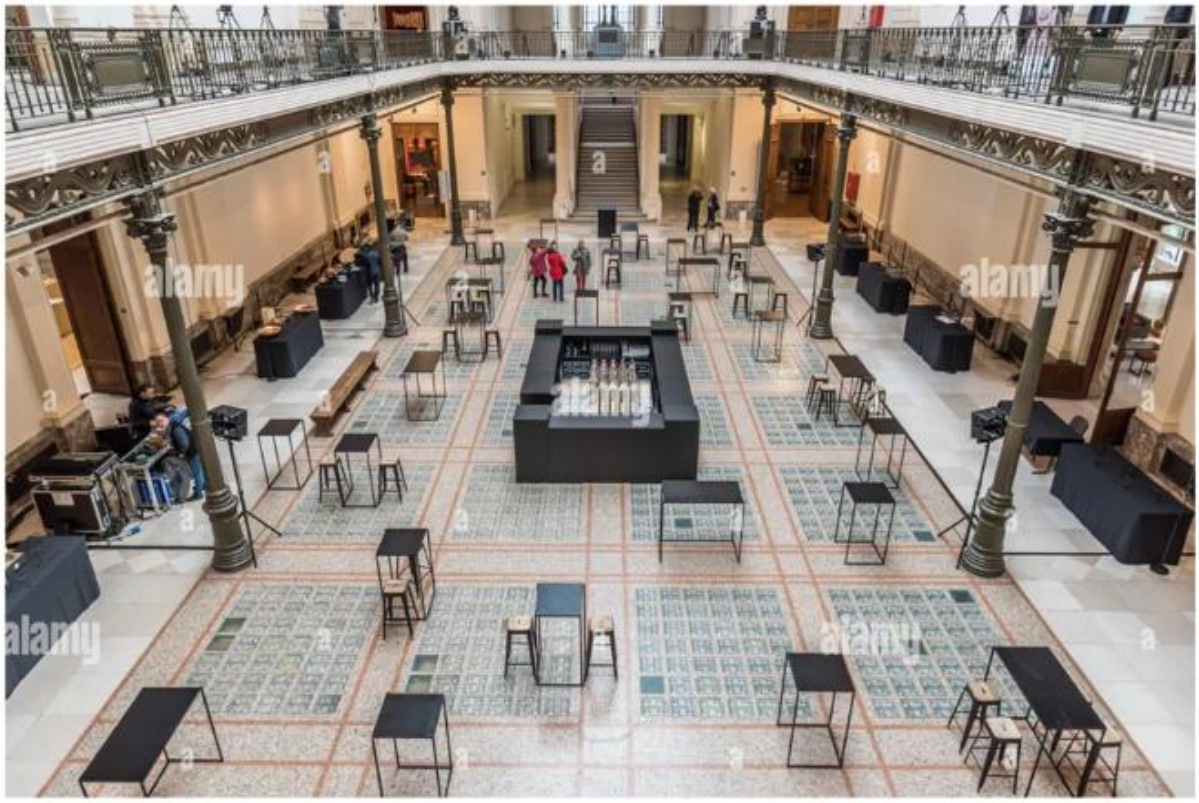
the principle of entrance should be accessible. In existing buildings, where it is not possible for the main entrance to be accessible, an alternative entrance should be provided which is accessible for all potential users. Entrance to buildings should be placed in a logical relationship within the routes that serve them and be easily noticeable from the facade. Signs should incorporate the international access symbol. Clear signs indicating the entrance should be provided, visible from all approaches to the building. Signs hanging perpendicular to the building facade can be useful. Structural supports should be clearly identifiable so that they do not present a hazard for visually impaired people



Figure 1 Elements of special organization

2.12.2 ENTRANCE FOYER (WAITING AREA, RECEPTION)

For persons requiring information services or assistance, waiting areas with loose furniture should be large enough to accommodate at least two persons using wheelchairs or scooters, in addition to other members of the public. Waiting areas with fixed seating should include enough clear space for a minimum of two persons using wheelchairs or scooters.
The reception point should be located away from the main entrance to reduce impact of external noise. Where sliding glass windows are installed, they should be able to fully open to allow audible conversation. At reception, both the receptionist's face and visitor's faces should be clearly visible and well-lit to allow lip reading.



2.12.3 TEMPORARY EXHIBITION

Temporary use of halls designed primarily for other purposes. The beauty of transient has many manifestations, whether in the artistic, natural, or spiritual realms. Each ephemeral piece elicits a precious response in the participant. Its heightened awareness of the senses occurs to capture impressions before it is too late.

The design of exhibition stand s exemplifies this temporary quality, providing intriguing displays that are at once eye catching, sophisticated, and memorable. Whether controlled or interactive, the installation featured frequently make use of all surfaces from floor to ceiling to arrest further explorations.



2.12.4 PERMANENT EXHIBITION

Exhibition facilities are provided to meet a wide range of community and commercial needs. They are used to enable visitors to see and obtain specific information about, for example, work of art, scientific discoveries, technological achievements, such as in museums and science centres and are subjects requiring more detailed examinations outside the scope. The principles and techniques involved in such displays are often also employed in the design of stands and other types of commercial exhibitions such as art, artifacts, and textiles. (Fred r. Lawson, 2000, p.99)

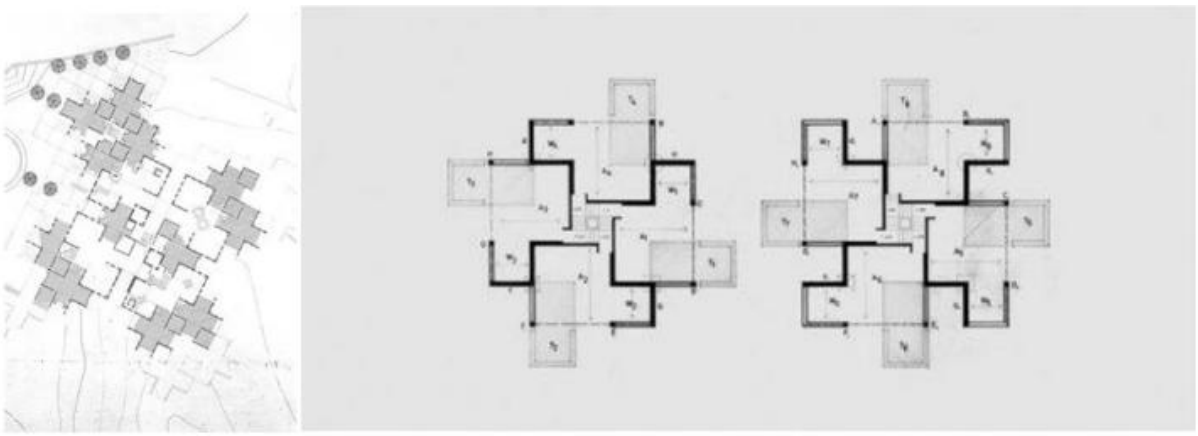


2.12.5 TYPES OF SPATIAL ORGANIZATION

Spatial design is a newly evolving design concept and methodology that combine and exceed the established concepts of architecture, interior design, landscape architecture, landscape design, public art, etc. It is radical in the way that it changes how a designer thinks about space and people. It focuses on the flow of space between interior and exterior. To put it simply, it is the holistic field that is now bringing together the other architectural and design concepts. Traditional fields of design like architecture and interior design take into consideration the factors of space and people, but spatial design takes it to a whole new level. It does so by introducing the concept of continuous principles into the whole design process. The key idea which a spatial designer will consider is space location. The flow of space is constantly changing and expanding. Ideally, spatial design should consider the flow
throughout this sequence of actions. It is this idea of sustainability of the flow of space that sets spatial design apart from other design fields.
The field of spatial design has brought in a ideal shift to the thought process of designers. Spatial designers often work alongside architects and interior designers. Their demand is picking up fast as individuals and organizations, both private and public, have started realizing the need and importance of them. Educational institutions have started offering courses in spatial design to meet the demand.

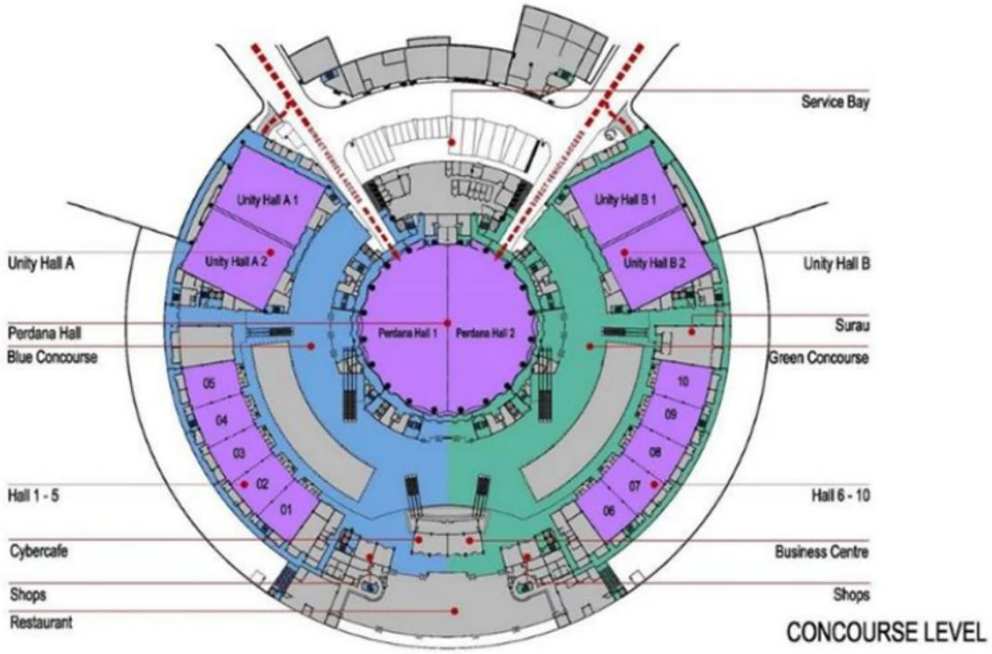
2.12.6 LINEAR ORGANIZATION

A linear organization consists essentially of a series of spaces or objects. These spaces can be directly related to one another or linked through a separate and distinct space. Spaces that are functionally or symbolically important to the organization can occur anywhere along the linear sequence and their importance articulated by size and form.



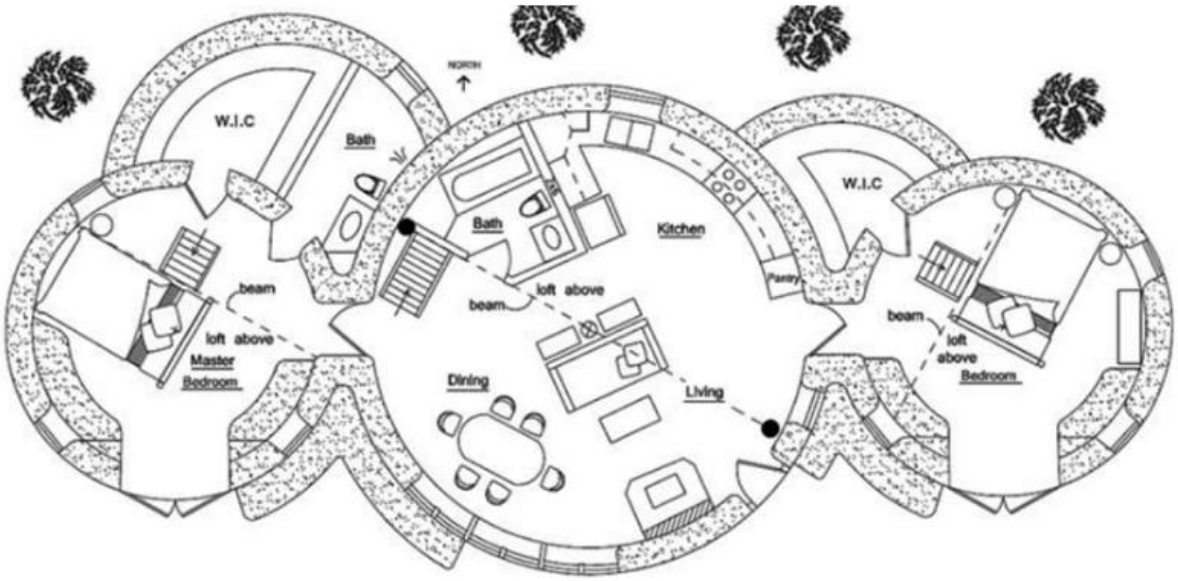
2.12.7 CENTRALIZED ORGANIZATION

A centralized organization is a stable, concentrated composition that consists of several secondary spaces grouped around a larger central space or object. The central unifying space of the organization is typically uniform in shape and large enough to gather a few secondary spaces about its form.



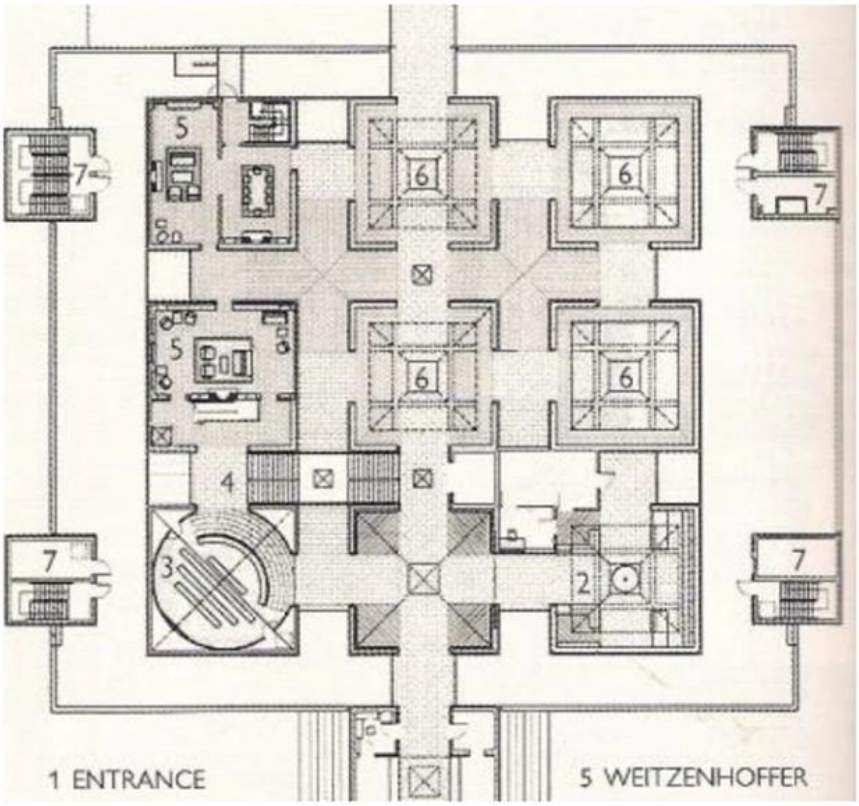
2.12.8 CLUSTERED ORGANIZATION

A clustered organization uses proximity to relate its spaces or objects to one another. Clusters can accommodate within its composition spaces that are dissimilar in size, form and function. Because the pattern does not originate from a rigid, geometric concept, the cluster is flexible and can accept growth and change easily.



2.12.9 GRID ORGANIZATION

A grid consists of forms and spaces whose positions in space and relationships with one another are regulated by a geometrical and repetitive pattern. A grid is usually created by creating by establishing a regular pattern of points that define the intersection of two parallel lines. Projected into the third dimension, the grid can be transformed into a set of repetitive, modular units of space.



2.12.10 EXHIBITION PLANNING

Every exhibition begins with a premise or rationale. This may be very simple such as " things I have collected recently" or " our product", but in most cases it is a complex story supported by scrupulous research. The premise should explain the background to the exhibition and provide a reason for including some objects and excluding others. The exhibition strategy determines how the premise will be played out in detail in each space or location. As such, it required consideration of a whole range of factor, including the content of the show, how exhibits are divided or classified and how to engage visitors with the displays. There may be some key determinants that need initial consideration; perhaps the nature of the site, the nature and size of the exhibits or the need to attract audience, but an exhibition is mostly a compromise between several factors. The exhibition strategy always responds to access and sustainability issues, and must respond to a given budget. It is not the design per se, but and approach to the design. It can often be best described through images showing the types of activities and moods the designer wishes to create, without too much detailed design information.

2.12.11 CLASSIFYING THE EXHIBITS

The drafting of an exhibition brief often involves deciding how to classify the exhibits. There are innumerable ways of doing this chronologically, alphabetically, by subject, by theme, etc just as there are for arranging books on a shelf. The designer must consider the coherence of the classification and how it will impact on the visitor experience. This kind of schema is intuitive and easily understood by most visitors, with little explanation needed.
The choice that is made is often based on assumptions about the visitors to the exhibition and which categories they will best connect with. Exhibition differ in their classifications; in museum exhibitions the content is divided into several chapters. Though opinions vary as to the total number of these, most concur that more than seven discrete areas in an exhibition would confuse most visitors. Sometimes the classification system is affected by where the exhibits are displayed; if an exhibition is housed in four rooms it would be difficult to divided its content into three subcategories.

DEVISING A PATH

Devising how exhibits are viewed sequentially in a space is a major part of the designer's task. Approaches differ: some exhibitions offer visitors a very open exploration of exhibits and some are varied prescriptive, forcing them to work their way along a predetermined path.

A) THE SINGLE PATH

A single path ensures that all visitors have similar experience and allows the exhibitor to plan their approach to them in detail, so that they encounter a succession of exhibits in a preconceived fashion. This may be important where the objective is to the build a platform of knowledge in the visitor's mind. Later exhibits will be better understood once a basic understanding has been established. This process of introduction and preparation is called 'scaffolding'. The same technique is employed by trade shows. Single path displays often involve visitor management problems and 'dwell time' needs to be strictly managed.

B) THE MULTIPLE PATH

A multiple path exhibition causes fewer traffic management problems as visitors can select alternative exhibits to engage with when a particular display is busy. This approach also allows for greater freedom, and provides visitor with the possibility of following their own interests and preoccupations. Multiple path exhibition nevertheless requires self-determined paths they still need to know where they are within the overall schema of the exhibition and its environment.

C) THE RADIAL PATTERN

The radial pattern was devised by the nineteenth-century English museologist and explorer henry Pitt river, but was never implemented. In the 1960s, the scheme was revived and new proposals were produced for the Pitt River Museum in oxford, England but, again, it was never put into practice. The radial pattern was the forerunner of the visitor journey, often used in museum exhibitions to represent the world in microcosm.

D) "STAR" EXHIBITS

Exhibitions can be arranged predominantly around outstanding objects when exhibitor wishes to engage visitors with "star" exhibits before drawing their attention to less immediately striking ones. This type of display is important when other classification systems might entail a dull visitor experience. Star exhibits have a dual role: they enliven the areas around them, and tend to draw visitors through a gallery and create a sense of expectation throughout the journey.

E) THE FAN PATTERN

The fan pattern is usually favoured for business-to-business trade fairs. This allows visitors to take in immediately all that is on display at show, and works very well for anyone who has little time and wants to see a particular stand without delay. Trade fair customers have less interest than exhibition visitors in lengthy " experiences" this applies especially when small businesses are involved and need to move quickly and directly to their area of choice. For them, a stand with everything on display visible as they approach it is often preferable. It is important to orientate trade fair strands towards their busiest approaches.

F) MAP ORIENTATION

An interactive map is often the hub of an exhibition. Visitors can consult it and follow the route through the show that it suggests. If they can go back to the map to find new ways of exploring the displays.

2.12.12 DESIGN CONSIDERATION AND GUIDELINES

Exhibition hall the exhibition spaces are intended as a combination of indoor and open-air exhibition space to create a strong relation between covered and green open spaces through thematic content. The goal is to create an integrated expositive landscape and a visitor experience that immediately establishes a positive relationship between humankind and nature, creating a bridge between the content of the event and the nature of exhibition spaces.

The exhibition hall provides optimal conditions for

- Trade fairs
- Exhibits
- Conventions
- Events and galas

An exhibition hall can be

- Open-air exhibition space
- Covered exhibition space

2.12.13 OPEN-AIR EXHIBITION SPACE

The landscape design shall be developed in keeping with the theme and with the participant's approach to it. Like architecture, the landscape shall also help to tell intriguing stories about the pleasures of the table, delightful scents or strange and curious stories related to food cultivation and processing. The landscape must document the most advanced research in the field of food production and the transformation of agricultural products. Countries will showcase their capabilities in food production, the biodiversity of their products, and their agricultural and food supply chains.



2.12.14 OPEN SPACES

A minimum of 30% of each lot must be dedicated to open areas and greenery. Excluding lot setbacks, the open-air exhibition space represents around 50% of each lot, where it is possible to build:

- Structures used for plants ensuring soil permeability (e.g. trellises, pergolas, garden structures, planters).

- Landscaping structure (e.g. structures used to retain soil or other materials, pools, exhibition
- structures, art works).

2.12.15 COVERED EXHIBITION SPACE



Covered exhibition spaces are buildings or enclosed structures containing exhibition areas or other spaces, including all overhanging upper floors or balconies. Participants may decide to build more than one level within the covered part of the exhibition space, based on their individual needs.

2.13 HOTELS

- A Hotel is a building where people stay for a short duration and pay for all the services provided to them.
- The amenities of hotel ranges from simple mattress facility to meals, swimming pools, gym, and various other recreational activities.
- Depending on the services, amenities, themes etc hotels are categorized.

2.13.1 TYPES OF HOTELS

AIRPORT HOTELS-

- They are located near the airport.
- Hotel owned courtesy vans often transport guests. between the hotel and the airport.
-

COMMERCIAL HOTELS-

- These hotels are in downtown or business district areas that are convenient and of interest to their target markets.
- And cater primarily to the business traveller.

2.13.2 MOTELS

Motels are normally economical and they provide comfortable bedrooms that's motorists prefer to stay on their way for a night rest

CONFERRENCE HOTELS-

- The conference hotels which often contain full sized luxury facilities with full service
- accommodation and amenities.
- These hotels may be referred to as major conference centre hotels, flagship hotels, destination
- hotels.

BANQUET HOTELS-

- These are very small and very expensive hotels and mainly cater for elite class.
- Though the hotels is small but still it has a greater number of restaurants.
- Each one is decorated keeping in view a theme and the food served.

SUITE HOTELS-

- The all — suite concept a new addition to the hotels industry.
- These suites provide living room, bedroom, kitchen etc.

COMPARITIVE ANALYSIS (CATEGORIES IN HOTEL)

FACILITIES AND SERVICES	1*	2*	3*	4*	5*/5*D
MIN. SIZE OF GUEST ROOMS (SQM)	11	11	12	13	18
AC % OF ROOMS	25%	25%	50%	100%	100%
MIN. SIZE OF BATHROOM (SQM)	2.7	2.7	3.3	3.3	4.1
FOOD AND BEVERAGES	MIN- 1 DINING	MIN- 1 DINING	MULTI-CUISINE RESTAURANT	MULTI-CUISINE RESTAURANT	MULTI-CUISINE RESTAURANT
STAFF REST ROOMS	DESIRABLE	DESIRABLE	NECESSARY	NECESSARY	NECESSARY
LAUNDRY	DESIRABLE	DESIRABLE	DESIRABLE	DESIRABLE	NECESSARY
HEALTH & FITNESS FACILITY	DESIRABLE	DESIRABLE	DESIRABLE	DESIRABLE	NECESSARY
KIOSK/UTILITY SHOP	DESIRABLE	DESIRABLE	DESIRABLE	DESIRABLE	NECESSARY
SWIMMING POOL	DESIRABLE	DESIRABLE	DESIRABLE	DESIRABLE	NECESSARY

PUBLIC AREAS	PRIVATE AREAS(STAFF)	PRIVATE AREAS(GUEST)	SEMI PRIVATE
LOBBY + RECEPTION	ADMINISTRATION OFFICE	SINGLE BEDROOM	BANQUET
RESTAURANTS	ACCOUNTS OFFICE	DOUBLE BEDROOM	DINING HALL
SHOPS + RETAIL STORE	TECHNICAL/MECHANICAL ROOMS	DELUXE BEDROOM	MULTIPURPOSE HALL
LOUNGE + BAR	BEDROOMS	SUITE BEDROOM	
CLOAK ROOM	LAUNDRY + STORAGE	STEAM ROOMS + SPA	
PARKING	KITCHEN + STORAGE	LOUNGE + BAR	
RECREATIONAL AREAS(OUTDOOR)	CONTROL ROOM	READING	
BANQUET	WASTE DISPOSAL	RECREATIONAL AREAS (SWIMMING POOL, PARKS)	
	LOCKERS + WASHROOMS		
	PANTRY		

2.14 COMPONENTS OF THE PROJECT

2.14.1 Exhibition spaces

In its broadest sense, an exhibition is a display, show or demonstration of something of beauty, value, or particular interest to a targeted audience.

Exhibition halls should have the space, freedom, and flexibility to create an exhibition environment. In any exhibition halls, proper considerations should be given to the movement of people and to the moving pattern.

On the other hand, outdoor exhibition spaces are usually located to immediate vicinity of the exhibition halls. Outdoor exhibition areas can be developed as a flat ground or as an amphitheatre.

2.14.2 Conference Spaces or Auditorium Halls

Conference halls or Auditoriums are mainly allocated in the
exhibition spaces to hold conferences and/or seminar during the exhibition period. Proper attention must be provided in designing entry and exit routes.

2.15.3 Multipurpose Halls

Multipurpose Halls can be used for conferences, exhibitions, meetings,
symposiums and several other events. Multipurpose Halls can also be used as Banquet and/or Event Halls and sometimes also as Galleries.
Other Important spaces of a Convention Centre include:
• Recreational Spaces.
• Gallery
• Restaurants.
• Administrative Spaces.
• Parking Spaces.
• Landscaped Areas.

2.15 MAJOR DESIGN CONSIDERATIONS

2.15.1 Access and Entrance

Separate access is required for visitors, staff, goods and service vehicles and emergency requirements. It is usually desirable to provide alternative entry for public which is independent from that used by conference visitors. This not only facilitates management and security but also enables two or congress events or exhibitions to be run independently in parallel.

• Easily identifiable entrance and exit, and clear external signage, which may need to be illuminated.

• Sufficient unloading/loading space to accommodate multiple events.

• Level ground floor with loading docks of sufficient size for all services including client vehicles. Large coach drops off and collection points adjacent to main entrance, with sufficient turning space and height, accessible under cover.

• Doors of sufficient width and height or demountable/retractable walls to permit truck access (trucks delivering exhibit and staging equipment pose problems).

• Floor loadings to permit truck access.

• Easily identifiable and weather protected entrance and reception area for attendees. Clearly identified disabled access.

• In larger venues, security systems and monitoring at loading docks. Separate entry for venue staff.

• Storage space (for several days) for pre-congress consignments including exhibitors' displays materials.

2.15.2 Access for the disabled

• Specific provisions include allocation of parking spaces, identification of routes, provision of ramps, toilets and facilities designed for wheelchair and other disabled users in each main area

2.15.3 Parking

• Coach parking bays off street.
• Sufficient undercover parking for attendees.
• All parking, including venue staff parking, should be secure. Direct access to venue lobby.
• Clear directions for exiting car park.
• Parking requirements for cars and other vehicles will depend on some extent on the proximity and conditions for use of alternative facilities, such as municipal car parks, as well as on the availability of public transport.

2.15.4 Service vehicles:

• Plenty of space for parking while unloading/loading goods and equipment with a dedicated car park for vehicles delivering goods or equipment.
• Parking for trucks with sufficient height and turning space where staging, audio visual or other
• Long-term parking for trucks used for transporting production equipment and exhibitors' displays.

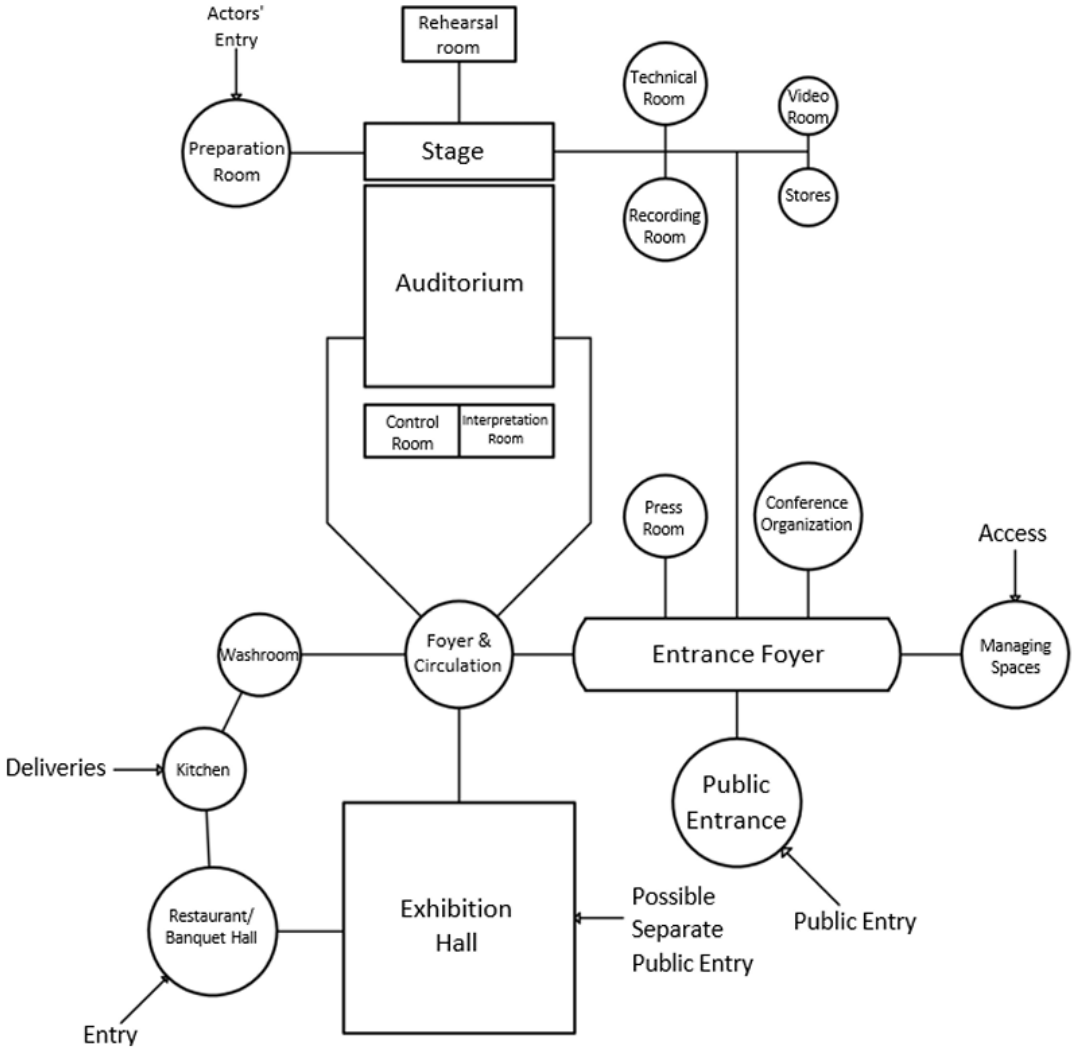
2.15.5 Horizontal and Vertical Arrangements:

• The single floor organization provides easy access among the rooms and between the conference areas and other functional elements. This plan imposes few structural or mechanical constraints, permits total freedom in the planning of the rooms, allows for access from the refreshment break areas to outdoor terraces and patios.
• Vertical stacking of auditoria and/or main halls is more economical in the use of land, and enables space below tiered floors to be more efficiently used. Unit costs of construction are higher and vertical transportation of people and goods may present difficulties.

2.15.6 Circulation

• Linear arrangement of spaces with beginning, middle and end.
LITERATURE SURVEY:
• A loop where the essentially linear storyline leads naturally back to the beginning.
• An arrangement of core and satellites where each theme or detailed treatment of a subject leads back to a central introductory or orientational areas.
• A more complex scheme combining linear, loop and core-satellite arrangement of spaces.
• Comb which refers to a circulation pattern in which there is a main circulation path and optional alcoves which a visitor may enter or bypass. equipment needs to be packed in or out within short period of time.

2.16 PUBLIC MOVEMENT PATTERN FOR THE CONVENTION CENTRES



Communication and functionality can be improved by implementing efficient circulation patterns in a convention centre. People visiting or working in a convention centre can be divided into 5 broad user categories:

2.16.1 Public flow

Dignified personalities are invited depending on the nature of the conference. It can also have relatives and public guests invited by the organization. The public guests also have access to the exhibition areas and hence these areas shall separate access to manage the public flow during peak hours efficiently

2.16.2 Delegate flow

Delegates form the most important group of users for a convention centre the parking shall lead them to the main entrance foyer which further directs them to their destination. An unobstructed delegate movement is very important.

2.16.3 VIP flow

They shall either directly lead to the dais of the main hall or shall enter through the VIP entrance which is connected to a VIP lounge.

2.16.4 Journalist flow

It includes press people. Cameraman and diplomats. They shall have direct access to the documentation centre and the TV audio of the convention centre.

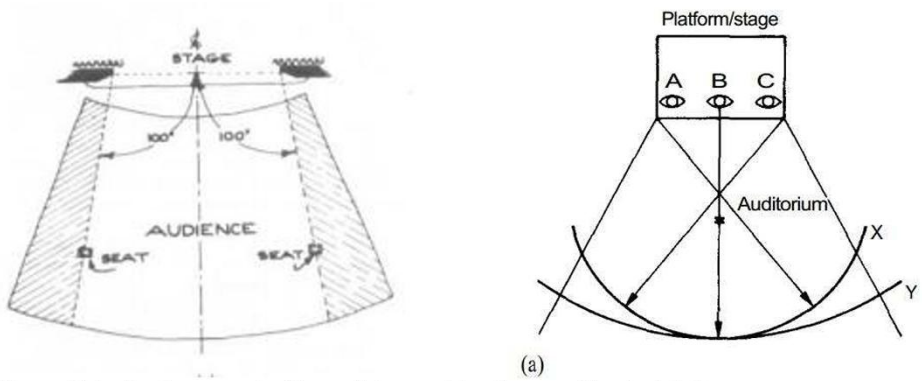
2.16.5 Staff flow

The staff can be divided into two categories namely the technical staff who are responsible for the efficient working of the convention centre while the others are the administrative staff who are exposed to the people coming to the centre. The paths are of the technical and administrative staff diverse at the staff entrance.

2.17 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.



(a)

Fire, within the time required by safety considerations and by legislation.

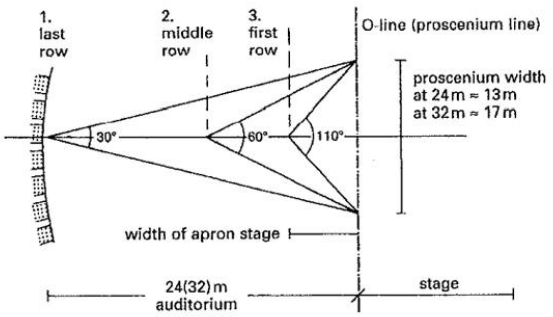
2.17.1 Audience requirements

Every member of the audience should be able to see and hear clearly whatever is happening on every 9part 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:

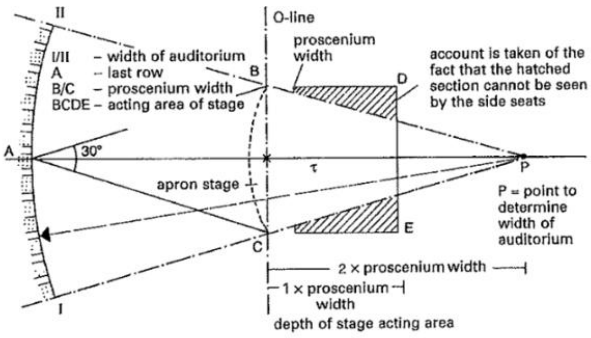
1. Good view, without moving head, but light eye movements of approx. 30°.

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.



7 Proportions of traditional auditorium plan

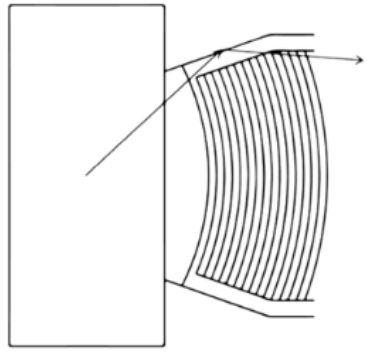


8 Auditorium width

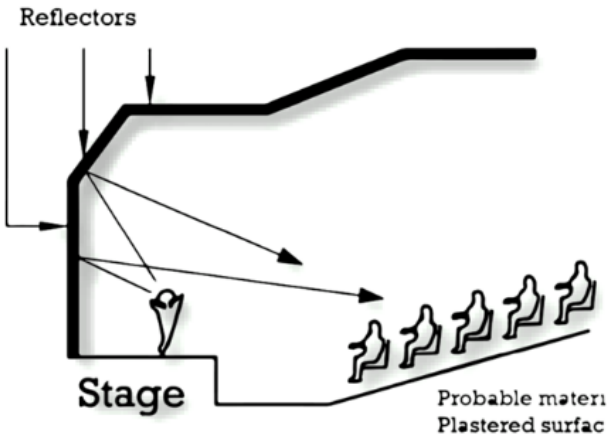
4. Full head and shoulder movement allows an angle of view of 360°.

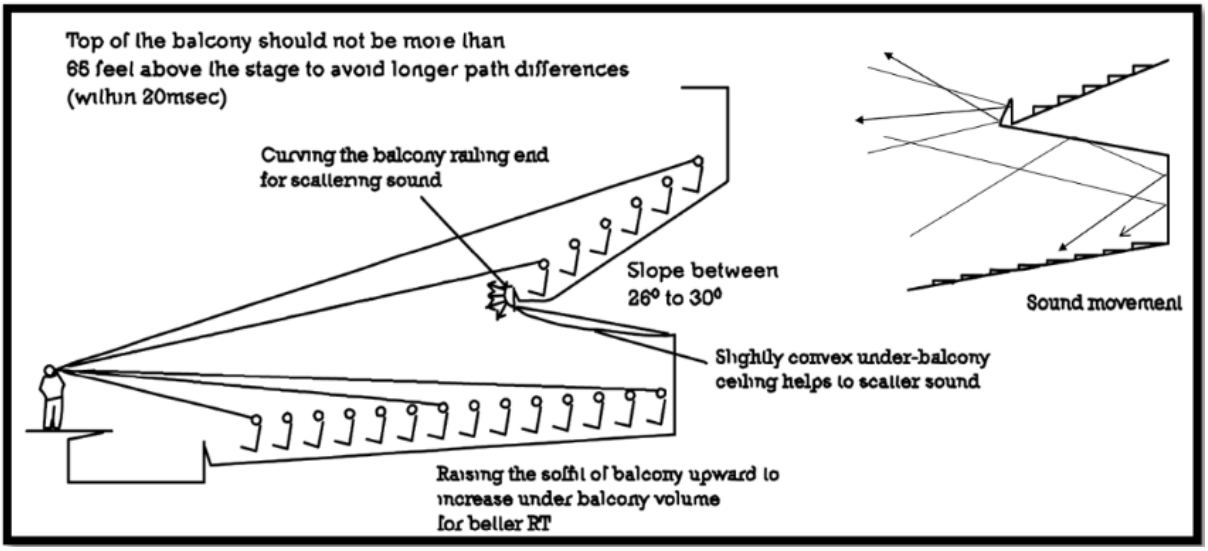
Proportions of the classic auditorium Opera, multi-purpose theatre, and traditional playhouse -7 0: distance of the furthest row from the start of the stage should not exceed: -
Playhouse, max. 24 m (max. distance for the recognition of facial expressions);
Opera, 32 m (large movements are still recognisable). Auditorium width is determined by the spectators at the side being able to see the stage adequately -8.

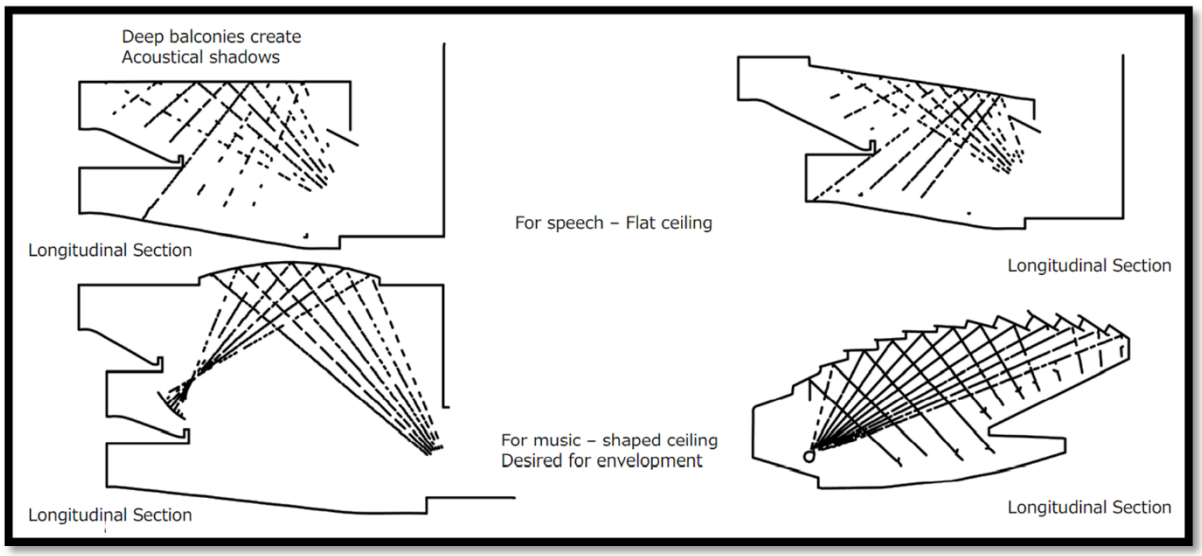
The theatre situation is fundamentally one of the relationships between the performers and the audience. The audience wants to hear and see the show without distraction and in comfort and safety, as stated, but its ultimate objective in attending the show is to receive the utmost sensory stimulation toward the maximum emotional and intellectual experience.

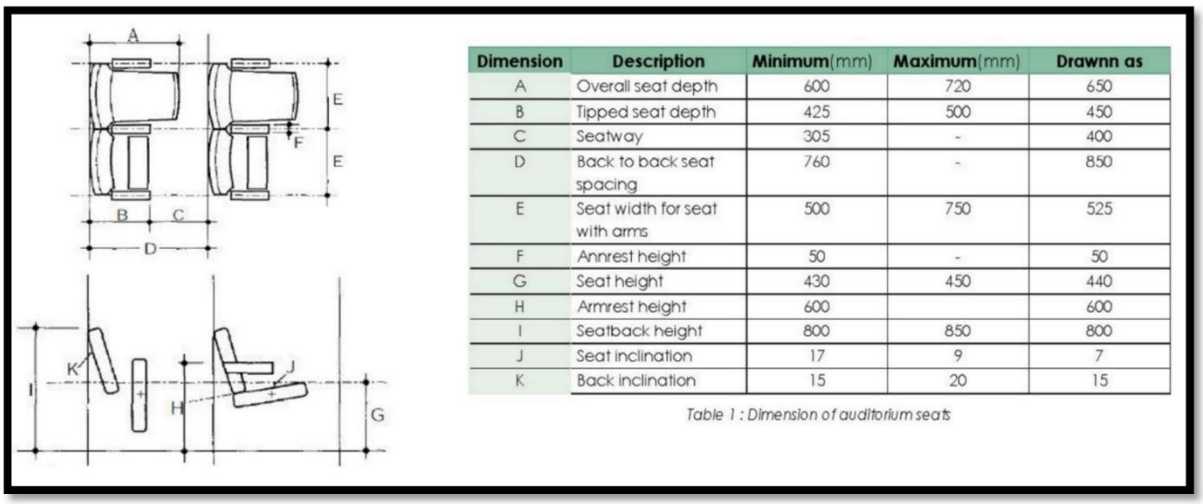


Angled side wall allows better side wall reflection







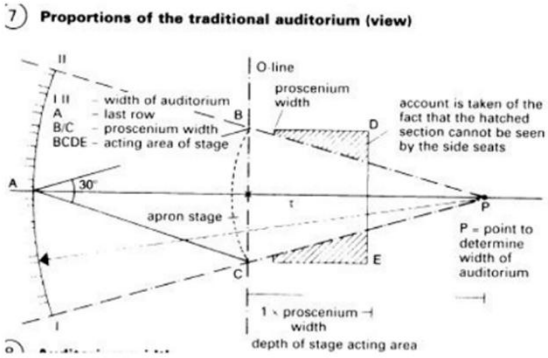


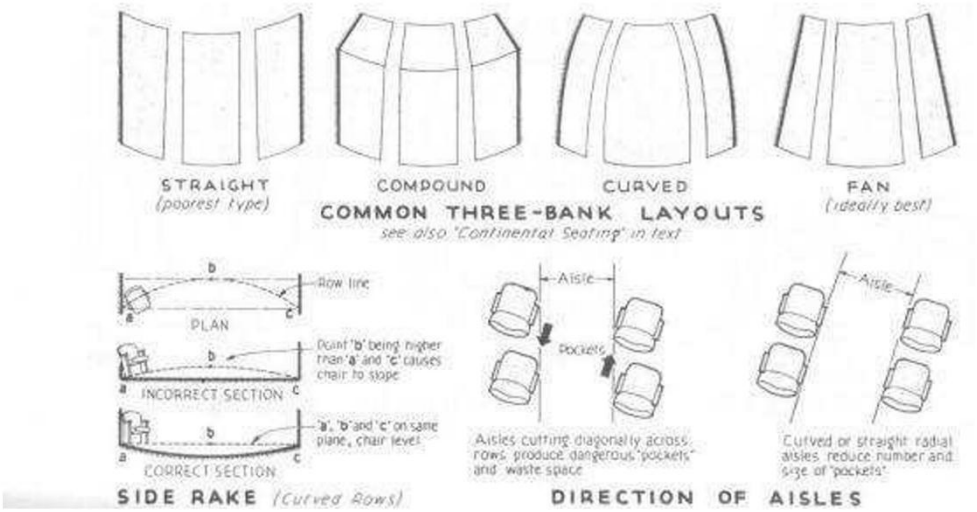
Dimension	Description	Minimum(mm)	Maximum(mm)	Drawnn as
A	Overall seat depth	600	720	650
B	Tipped seat depth	425	500	450
C	Seatway	305	-	400
D	Back to back seat spacing	760	-	850
E	Seat width for seat with arms	500	750	525
F	Annrest height	50	-	50
G	Seat height	430	450	440
H	Armrest height	600		600
I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

Table 1 : Dimension of auditorium seats

Visual Limitations

- For drama= 20m
- For Opera= 30m
- For dance= 20m
- For conference = 20m





2.17.2 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 imperilled.

• 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

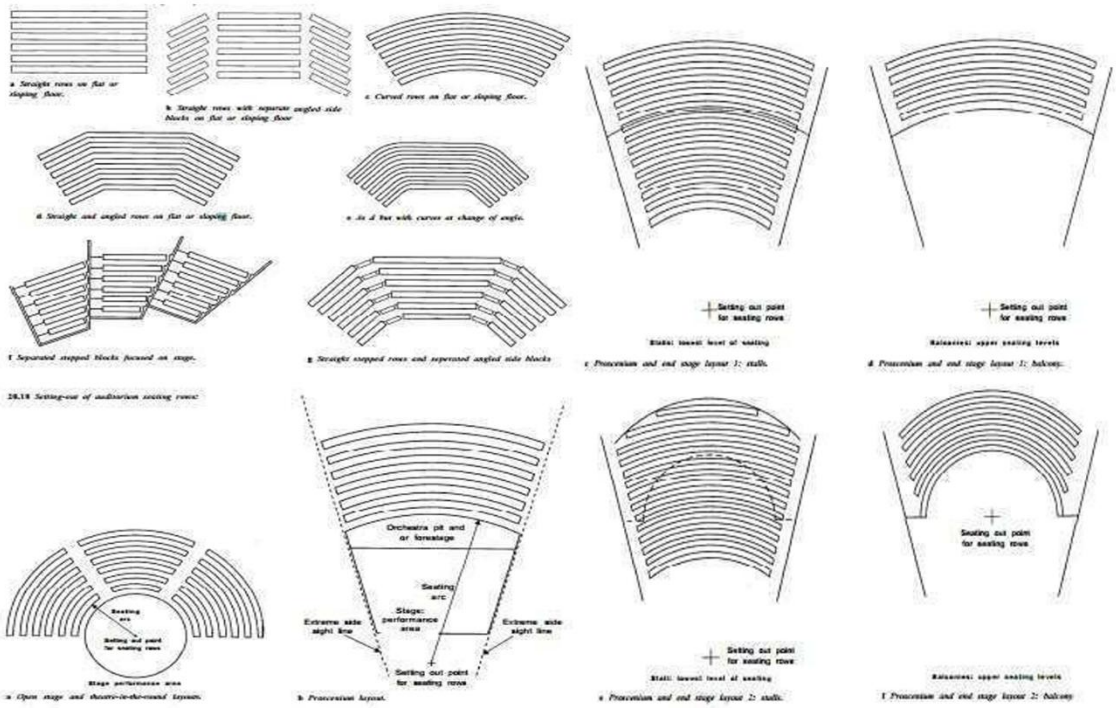
• Angle of inclination = 15-20 degree

• 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



2.17.3 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.

2.17.4 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 m² and 3.05 m².

2.17.5 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

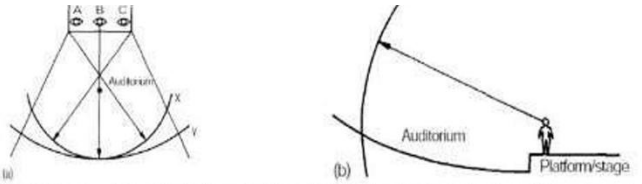


Figure 5: Visual and aural limitations: (a) Plan: for a performer at centre stage B there is an arc Y beyond which visual and aural perceptions are impaired. However, for performers nearer the sides of the stage at A and C produce more restrictive curves X. (b) Section: Similarly, visual and aural limits in section also set an arc centred on the performer.

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

2.17.6 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.

2.17.7 Sightlines

Horizontal sightlines

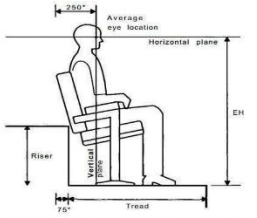
It is obtained from spectator's psychological perception & viewing angle.

- Good view without head movement= 30 degree
- Good view with head movement = 60 degree
- Maximum perception angle = 110 degree
- With full head & shoulder movement= 360 degree

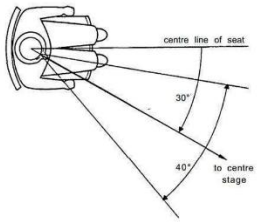
So, fan shape less than 100 degree is preferable due to Sightlines & Acoustic reason in Auditorium.

2.17.8 Vertical sightlines

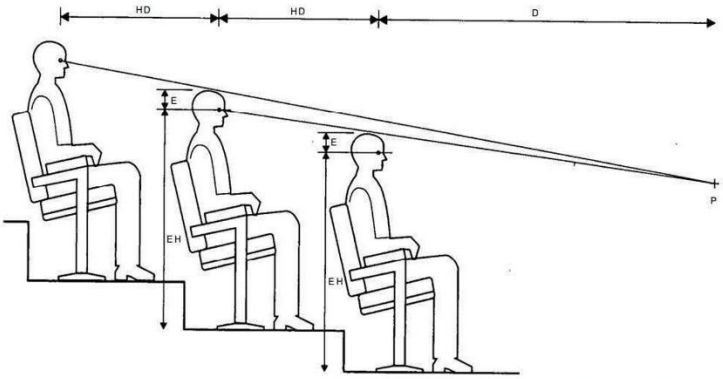
The longitudinal section is a parabolic stepped floor as a theoretical rake produced by the sightline calculation. This gives every member of the audience similar viewing conditions. This may be reduced to a single angle or series of angles when applied as described the rake will also be steep. This is satisfactory for a single tier of seating with no balconies and is especially appropriate for open-stage formats.



20.22 *Position of eye in relation to seat and stepped floor. Dimensions vary according to upholstery thickness, and inclinations of both seat and back. Working dimensions are starred **



20.25 a *The maximum comfortable amount the head can be turned from the seat centreline is 30°.*



20.21 *Graphic representation of vertical sightlines, P lowest and nearest point on stage clearly visible by audience, HD horizontal distance between eyes in successive audience rows, EH average audience eye height above floor, E height between eye and top of head, D distance from eye of person in front row to P*

2.17.9 Writing surface

Conference use may require a writing surface for note-taking. The writing surface may be: A tablet fixed to each seat, 20.10 A fixed table with fixed pivoting or sliding seat, 20.13.

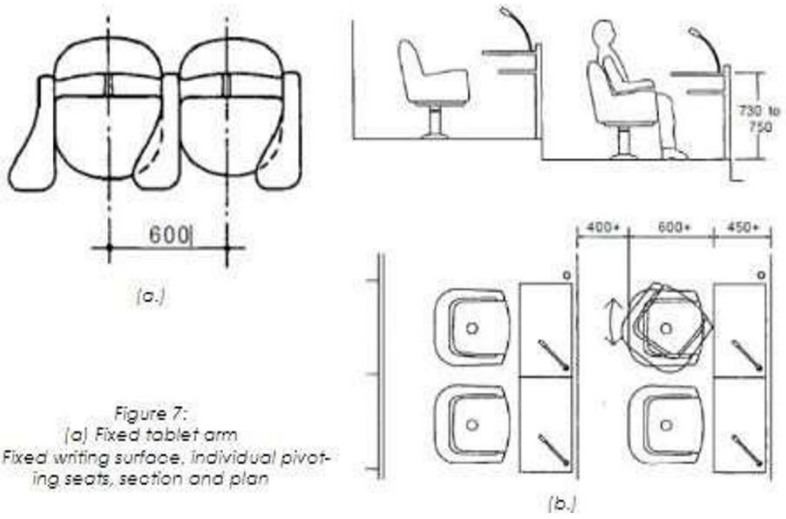
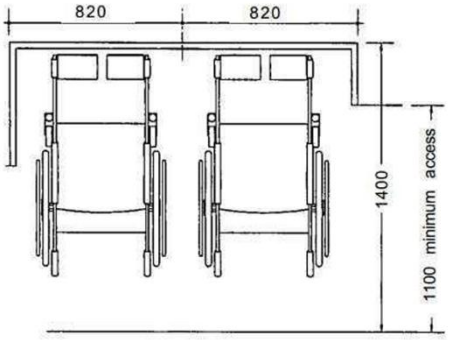


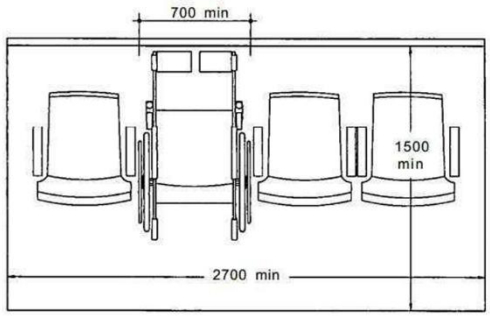
Figure 7:
(a) Fixed tablet arm
(b) Fixed writing surface, individual pivoting seats, section and plan

2.17.10 Wheelchair location

Regulations require a minimum of six places for wheelchair users, or 1/100th of the audience capacity, whichever if the greater. Their location as discrete areas can be at the rear, front, side or within the seating; Wheelchairs can be centrally positioned by forming a bay off a cross-gangway.



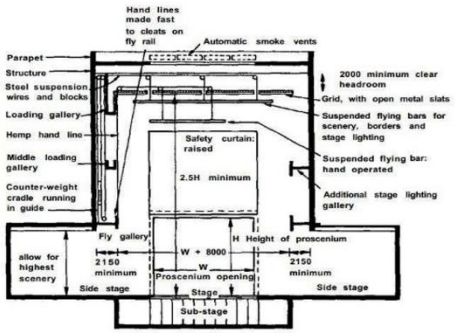
20.27 *Designated wheelchair area, required dimensions*



20.28 *Plan of a box designed for a wheelchair plus loose chairs*

2.17.11 Fly tower

Where there is a space dedicated for use as a stage, then it is essential to provide this with means of suspension overhead. This suspension to be used for both scenic and lighting instruments. The grid above the stage from where the suspensions come should provide clear walking space above the personnel to move about over the floor area. The received wisdom is to place the pulleys supporting the suspension bridge at high points.



20.50 *Section showing double-purchase flying system and side stages*

Other spaces

Changing Room requirements

- It should have discrete access
- Be equipped with secure hanging space
- Have mirrors with good lighting over vanity tables have separate toilets & showers
- Have audio/video feed from performance areas Be equipped with phones and power outlets

Rehearsal Rooms

- Enclosed space without natural light closes to the dressing room
- Sound system, Lighting
- There should be at least one stage for the rehearsal of performances

Storage room
• 20-25% of playing area

Workshops for making scenery
• Should be exclude from main hall due to fire & limited space options
• 4-5 times the area of main stage

Technical utilities
• Transformer room
• Medium & low voltage switch room Power batteries
• HVAC plants
• Fire sprinkler system

Cloakrooms
• Minimum 4m2 per 100 people

2.18 FREQUENCY AND FLEXIBILITY OF CHANGE

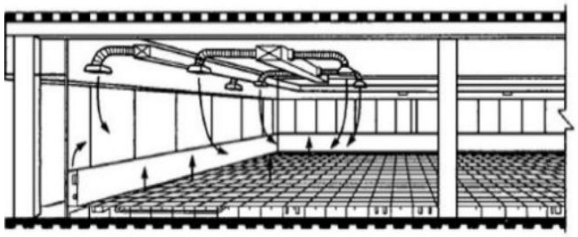
Another key feature of sustainability is recycling. Buildings are relatively permanent, while the organisations and activities within them are continuously changing. Flexibility is hence very important for a building to be used to its maximum potential Frequency of change depicts the flexibility expected. To allow for maximum flexibility, different time scales of building briefing and design can be distinguished into separate functions off.

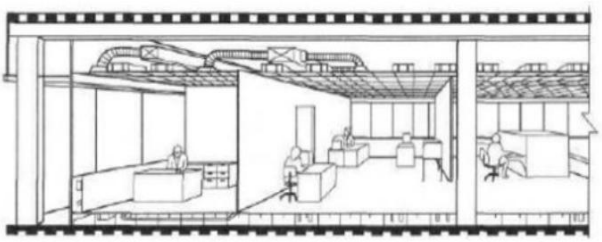
Building shell: The structure and enclosure of the building lasting 50- 75 years, while the functions within change many times over. The ability of the shell to allow for change 1s reflected in the depth of space, location of cores, floor-to-floor height to allow capacity for services, and the floor plate configuration.

Building services: The heating, ventilation, and cabling infrastructure of a building, which have a life span of 15 years or less before the technology, becomes obsolescent.

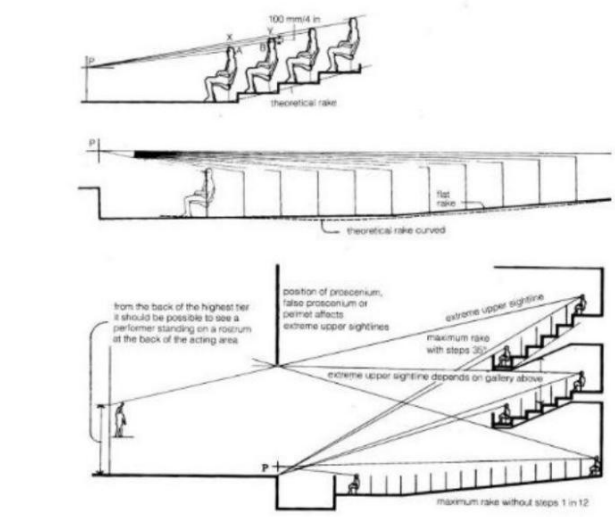
Scenery: The fitting- out components of a building, such as ceilings, lighting, finishes which adapt a building to a specific organisation's requirements. The life span of a fit-out is between 5 and 7 years.

Setting: The day-to- day re-arrangement of the furniture and equipment to meet changing needs.

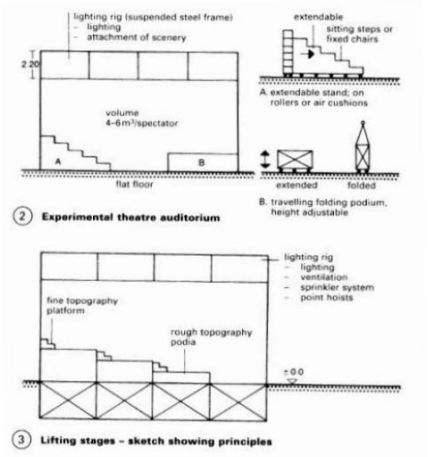




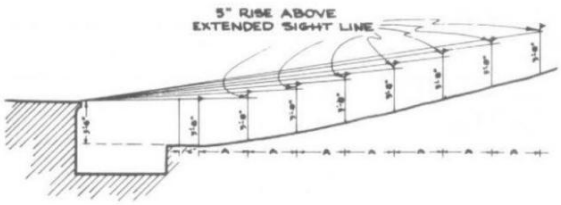
Visual Standards



Seating angle is not uniform. It is determined by the viewing angle of audience members. [Source: Neufert]



Flexible seating in a blackbox theatre. Either the levels can module to become seating or it can remain flat, employing removable seats and chairs - arranged specific to the event. [Source: Neufert]



The viewing angle determines the auditorium width and wings division on the stage. [Source: Neufert]

Outdoor performing area

• Slope of seating should not be less than 12 Degrees.
• Wind direction is towards the audience from the stage.
• Backstage wall should be made reflective and broken into convex shaped surface.
• Depending on the ambient noise level of the site, orientation, layout and structural design should be arranged to provide necessary noise reduction so that the background noise level of not more than 40 to 45 dB

Shape - When the cavea of the theatre is modelled as sloped surfaces the theatre will resemble the shape of an inverse cone. This shape will tend to direct most of the reflections towards the open sky and therefore the energy will dissipate quickly leaving few late reflections. Curved or bowl-shaped, both behind the stage and behind the audience, creating an area which echoes or amplifies sound, making the amphitheatre ideal for musical or theatrical performances. Overall shape should be flat in plan; however, if it is desired to be concave. In order to begin planning a new facility one must have some general idea of potential audience size. It should be broken into convex surfaces which in either case should be of at least 90 to 180 m width.

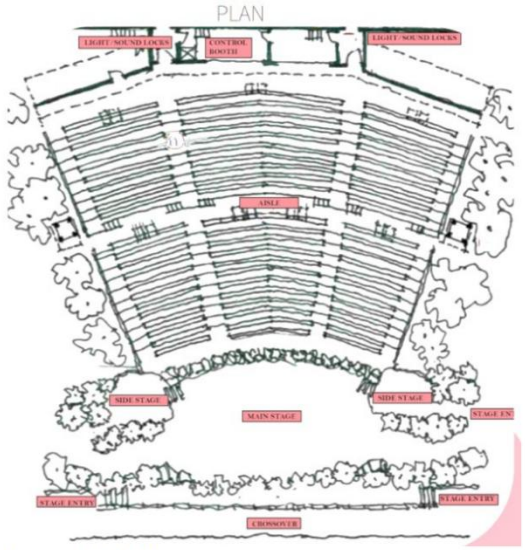
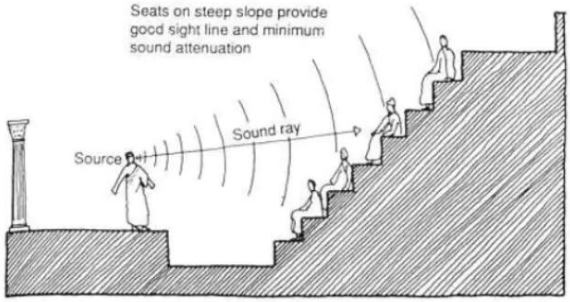
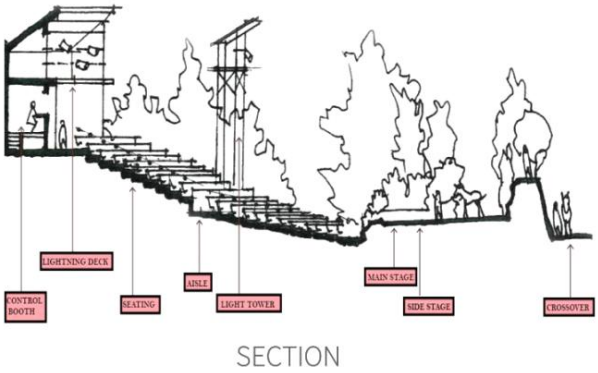


Figure 2 OAT Plan

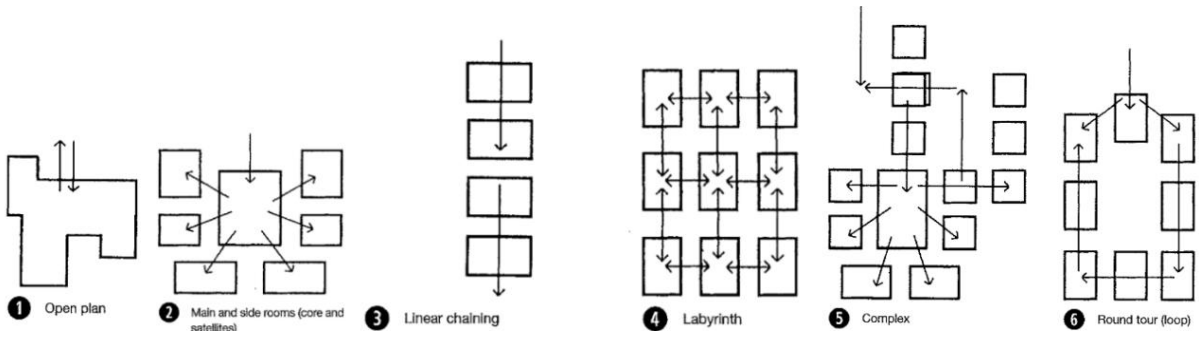




2.19 EXHIBITION GALLERIES

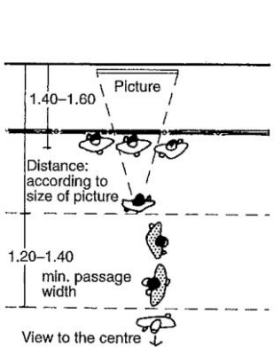
An Exhibition is an organized presentation and display of a selection of items. In practice, exhibitions usually occur within museums, galleries and exhibition halls, and World's Fairs. Exhibitions can include many things such as art in both major museums and smaller galleries, interpretive exhibitions, natural history museums and history museums, and varieties such as more commercially focused exhibitions and trade fairs.

Basic types of layouts

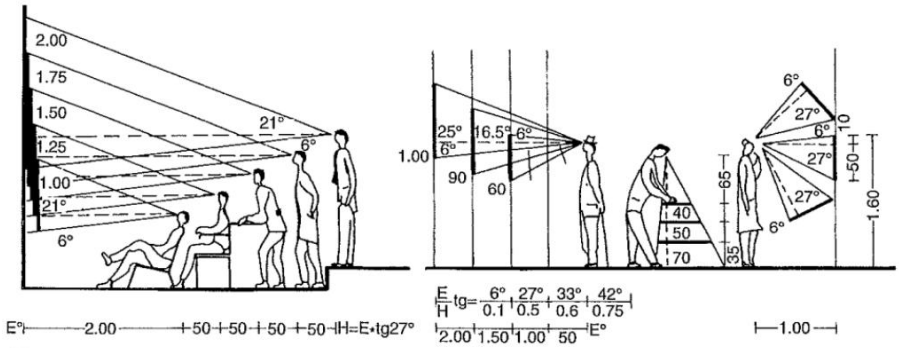


Types of gallery layout

The size and height of the display and store rooms depend on the dimensions of the works and the extent of the collection, but the minimum height is 4 m clear.



9 Pictures on the wall: viewing and traffic



11 Field of view: height, size and distance

2.20 TOILETS

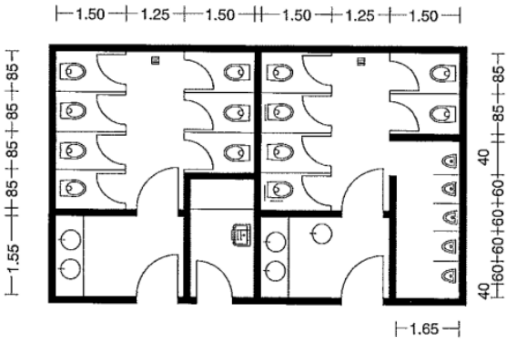
Table 4 Art Galleries, Libraries and Museums
(*Clause* 4.2.5.1)

Sl No.	Fixtures	Public		Staff	
		Males	Females	Males	Females
(1)	(2)	(3)	(4)	(5)	(6)
i)	Water closets	1 per 200 up to 400 Over 400 add at 1 per 250 or part thereof	1 per 100 up to 200 Over 200 add at 1 per 150 or part thereof	1 for up to 15 2 for 16 to 35	1 for up to 12 2 for 13 to 25
ii)	Ablution tap	One in each water closet	One in each water closet	One in each water closet	One in each water closet
		1 water tap with draining arrangements shall be provided for every 50 persons or part thereof in the vicinity of water closets and urinals			
iii)	Urinals	1 per 50	—	Nil up to 6 1 per 7 to 20 2 per 21 to 45	—
iv)	Wash basins	1 for every 200 or part thereof. For over 400, add at 1 per 250 persons or part thereof	1 for every 200 or part thereof. For over 200, add at 1 per 150 persons or part thereof	1 for up to 15 2 for 16 to 35	1 for up to 12 2 for 13 to 25
v)	Drinking water fountain	1 per 100 persons or part thereof			
vi)	Cleaner's sink	1 per floor (Minimum)			
vii)	Showers/bathing rooms	As per requirements			

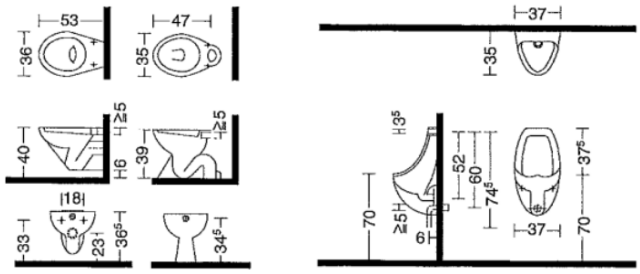
NOTES
1 Some WCs may be Indian style, if desired.
2 Male population may be assumed as two-third and female population as one-third.

Toilet facilities should not contain more than 10 WC cubicles and 10 urinals.

With natural ventilation, the minimum ventilation sections are: with window ventilation on one side 1700 cm2 /us, 1000 cm2/urinal.



9 Toilet facilities for 100 women and men (example)



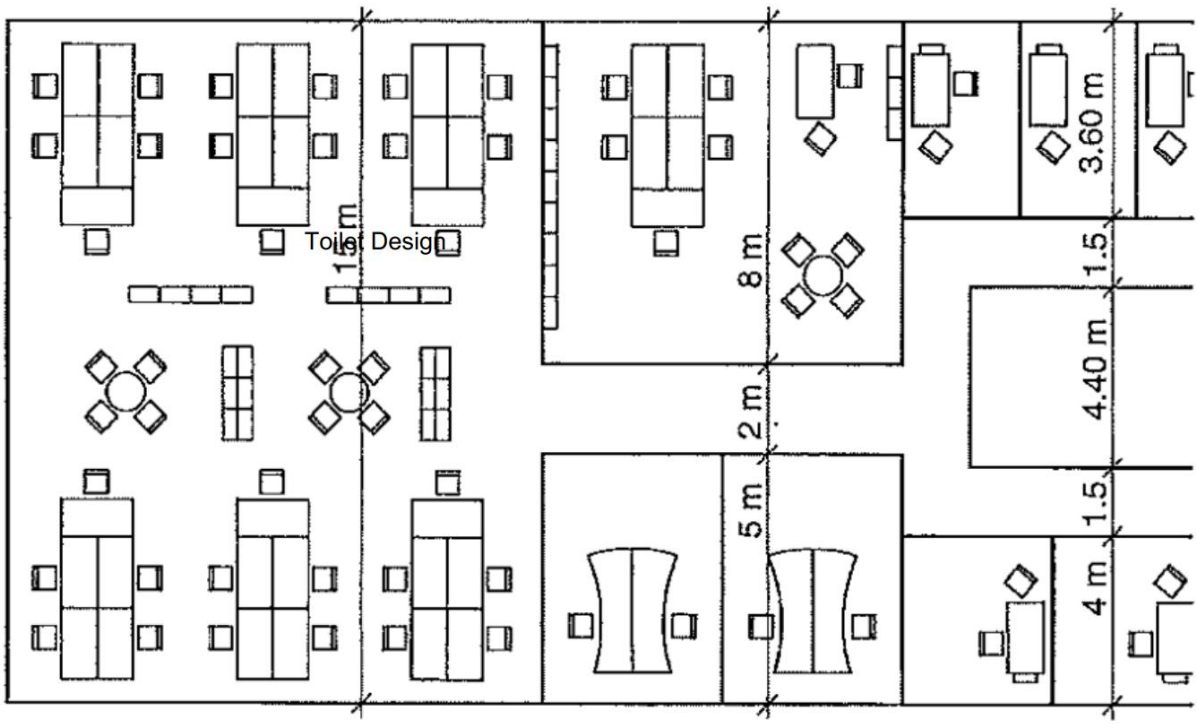
11 WC: wall-mounted – floor-mounted

Urinal

Toilet Design

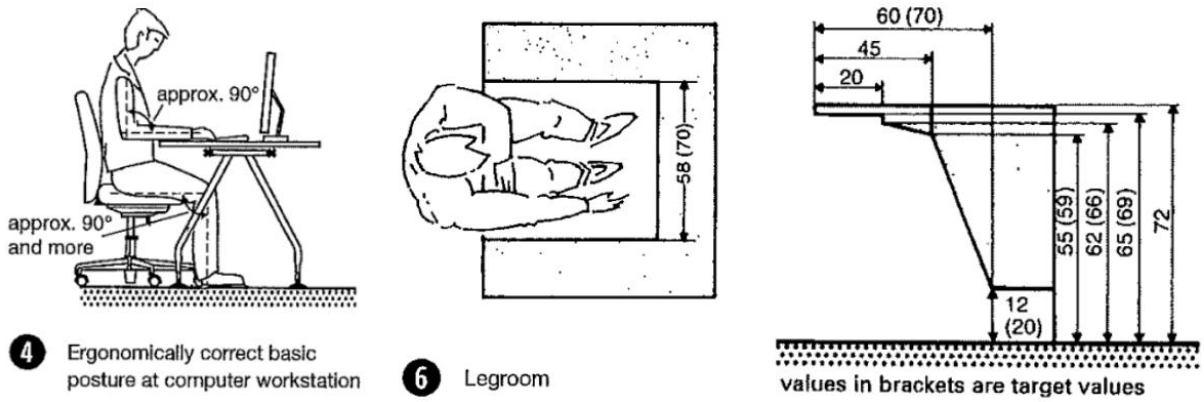
2.21 ADMIN

Administrative Offices: May be private or semi-private acoustically and/or visually.
The office's form and thus its room layout are part of a system influenced by activity, procedural organisation, and IT technology and company culture. The building structure and design of rooms can have a significant influence on the use.



6 Possible arrangements of various office depths in a 15 m wide plan

2.22 Workplace Seating layout



4 Ergonomically correct basic posture at computer workstation

6 Legroom

2.23 RESTAURANT

Different space standards required for waiter and diner are:

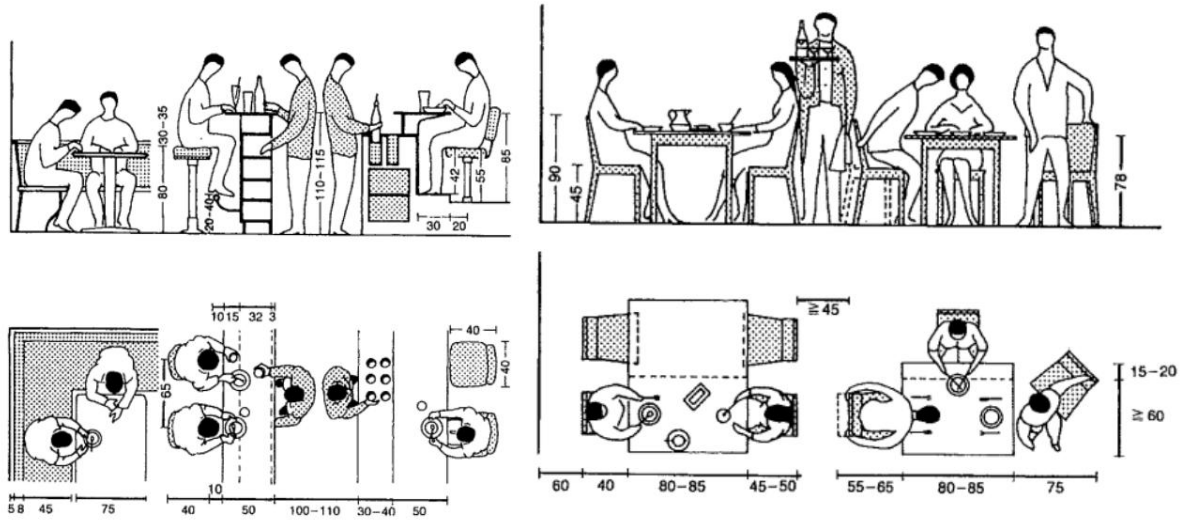


Figure ***3 Space standards for restaurants***

2.24 Seating layout

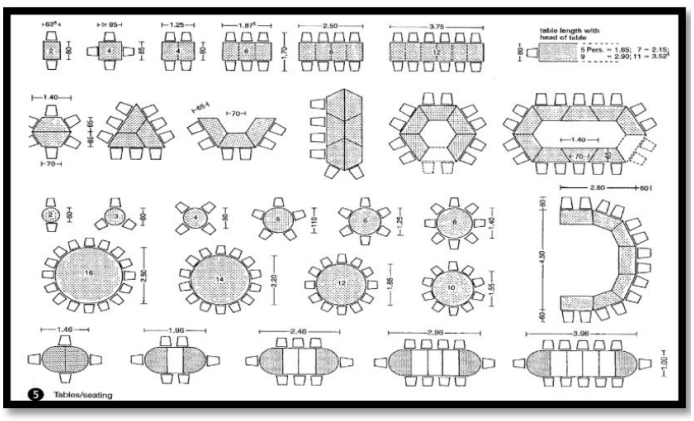
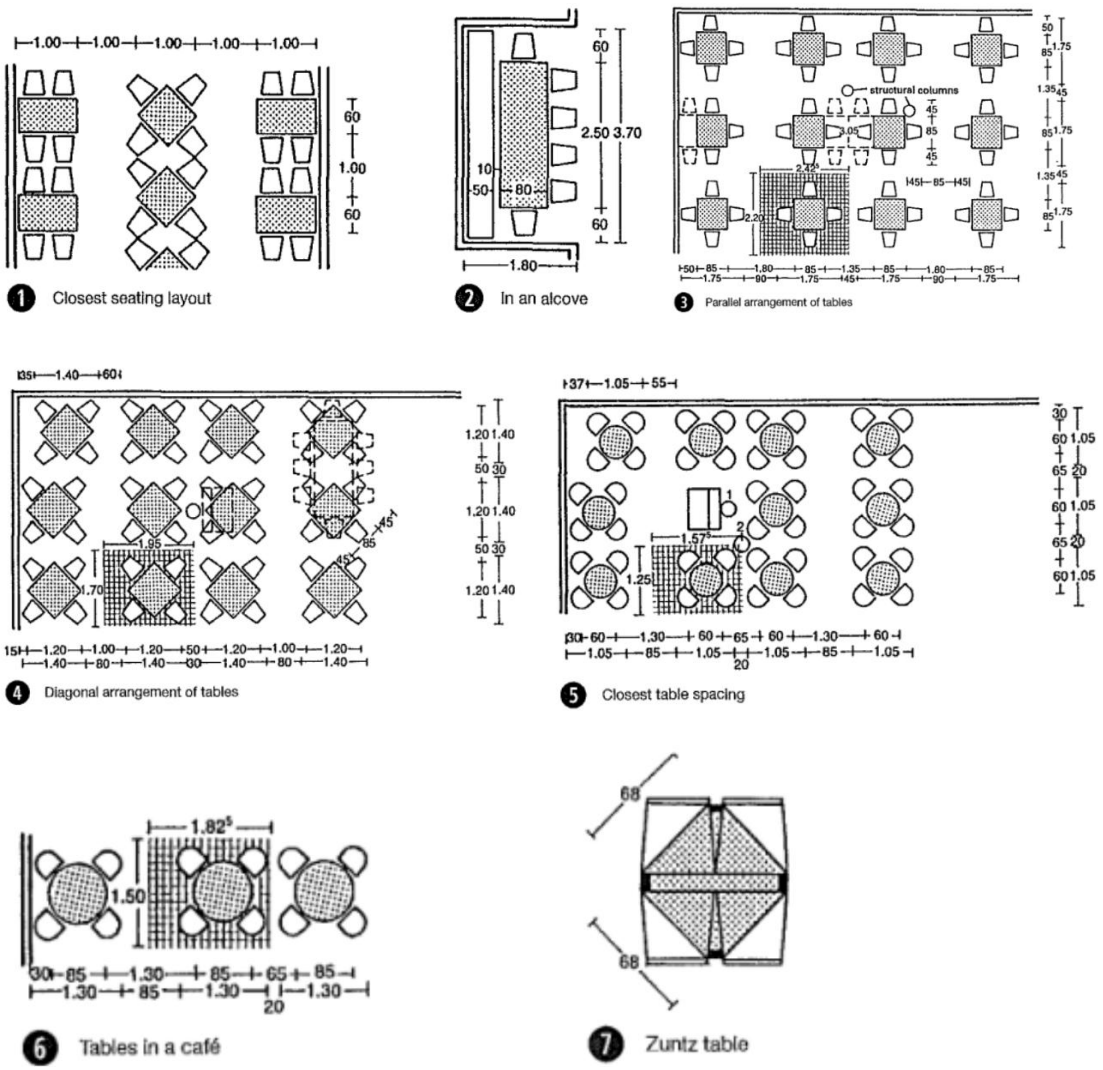


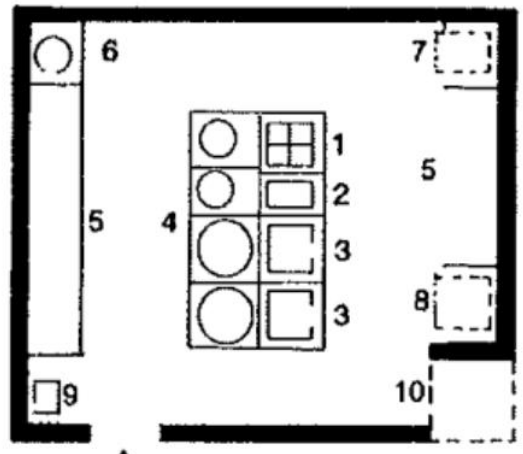
Figure ***4 Seating Layout***

2.25 Restaurant layout

The different layouts of restaurant are:

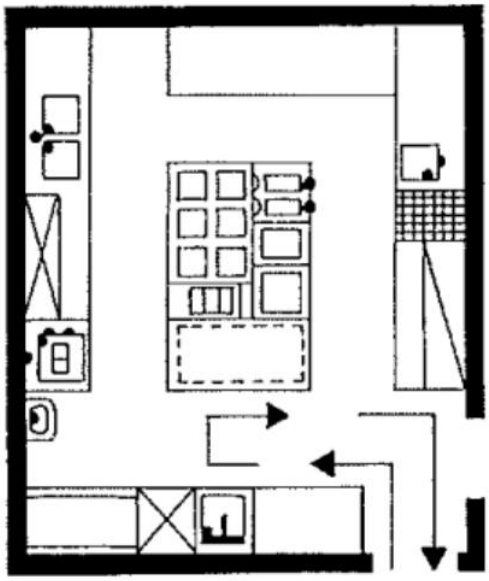


2.26 Restaurant Kitchen



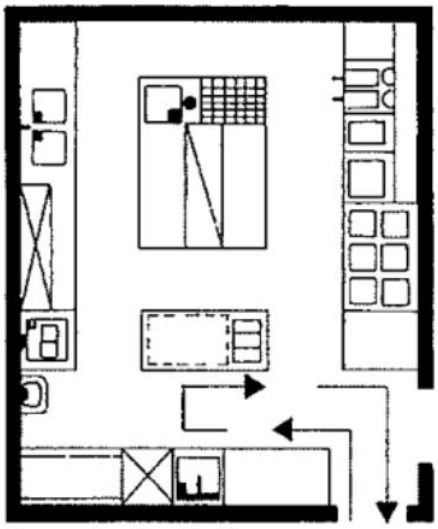
1 cooker
2 deep fat fryer
3 griddle
4 water boiler
5 work surface
6 cooker
7 double-deck oven
8 convectomat
9 hand basin
10 storage area

1 Basic organisation of the hot kitchen → 2 – 3



1. production in block

2 Kitchen for restaurant with 60–100 places



2. production in line

2.27 RECEPTION AND WAITING

In convention centres, 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.

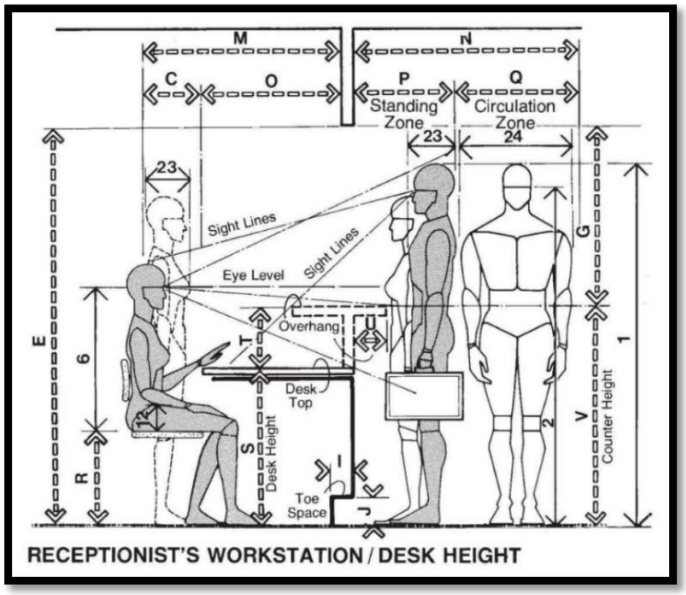
• Lighting: Adequate natural and artificial lighting for comfort and ambiance.

• Acoustics: Sound-absorbing materials to reduce noise.

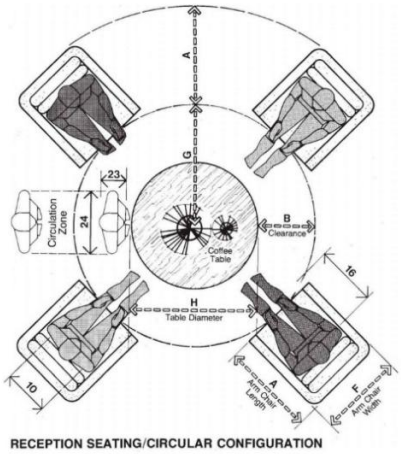
• Signage: Clear, visible signs for navigation.

• Furniture: Ergonomic and durable seating.

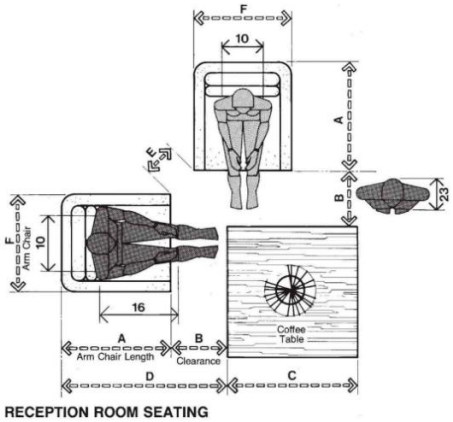
• Technology: Integration of digital screens for information and entertainment.



	in	cm
A	40–48	101.6–121.9
B	24 min.	61.0 min.
C	18	45.7
D	22–30	55.9–76.2
E	78 min.	198.1 min.
F	24–27	61.0–68.6
G	36–39	91.4–99.1
H	8–9	20.3–22.9
I	2–4	5.1–10.2
J	4	10.2
K	44–48	111.8–121.9
L	34 min.	86.4 min.
M	44–48	111.8–121.9
N	54	137.2
O	26–30	66.0–76.2
P	24	61.0
Q	30	76.2
R	15–18	38.1–45.7
S	29–30	73.7–76.2
T	10–12	25.4–30.5
U	6–9	15.2–22.9
V	39–42	99.1–106.7



RECEPTION SEATING/CIRCULAR CONFIGURATION



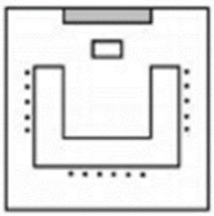
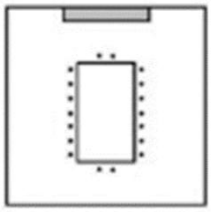
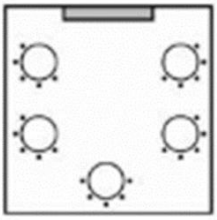
RECEPTION ROOM SEATING

	in	cm
A	28–32	71.1–81.3
B	15–18	38.1–45.7
C	30–48	76.2–121.9
D	43–50	109.2–127.0
E	9–12	22.9–30.5
F	28–36	71.1–91.4
G	33–42	83.8–106.7
H	36–48	91.4–121.9

2.28 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.

2.29 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.	

2.29 Space Standards

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

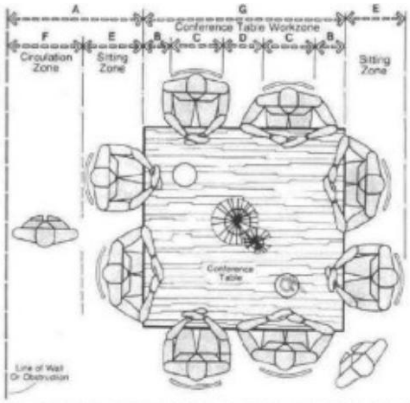
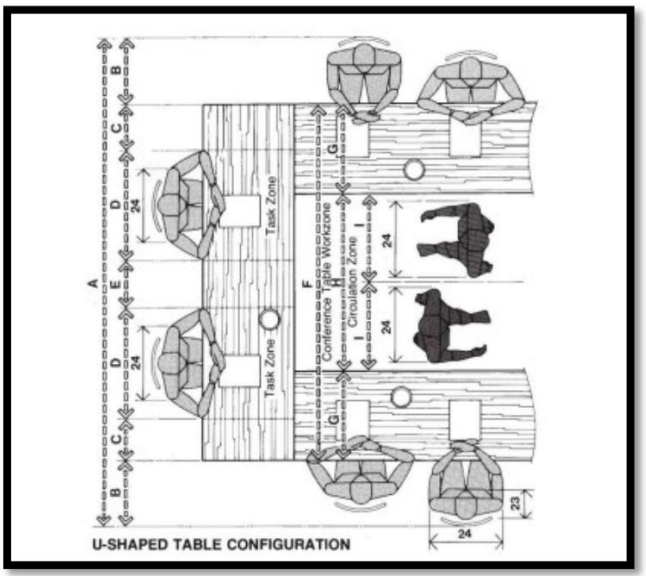


Figure 22: Seating standards for a conference table

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

2.30 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.

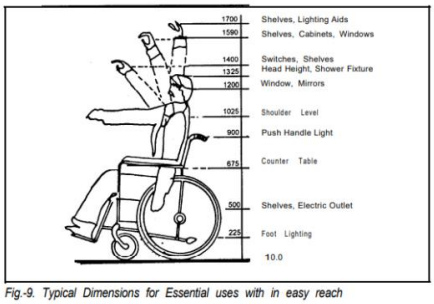


Fig.-9. Typical Dimensions for Essential uses with in easy reach

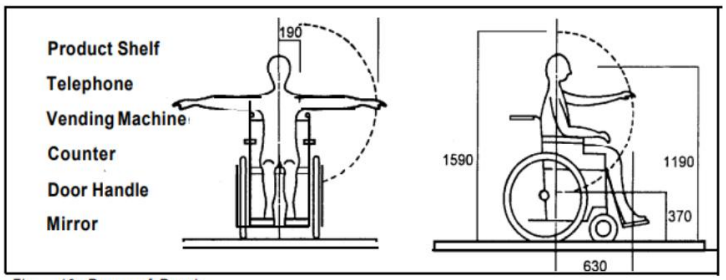
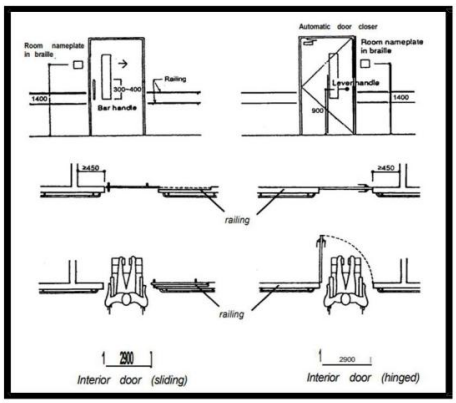
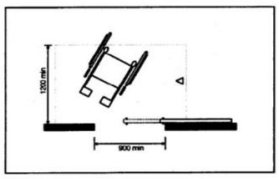


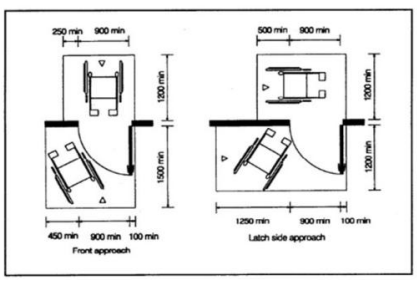
Fig. - 10. Range of Reach

Entrance/Exit Doors





Sliding door



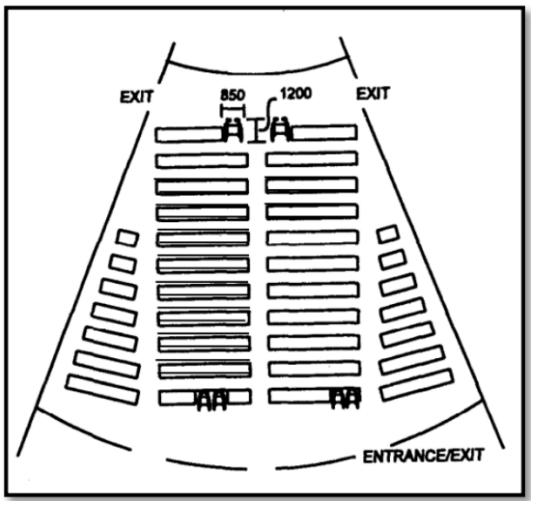
Minimum clear opening of the entrance door shall be 900 mm. and it shall not be provided with a step that obstructs the passage of a wheel chair user. Threshold shall not be raised more than 12 mm.

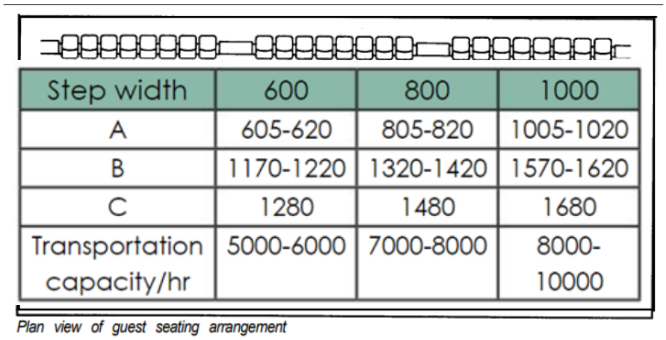
2.31 Auditorium

• 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

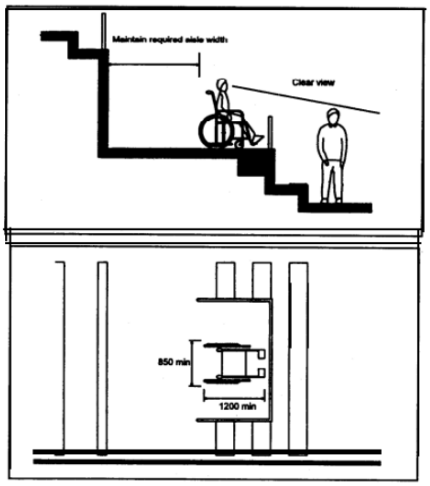
physical disabilities a choice.





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



2.32 VERTICAL CIRCULATION

2.32.1 Escalators

Escalators are required for continuous mass transportation of people. The standard dimensions for various depths of an escalator are prescribed in the adjoining table.

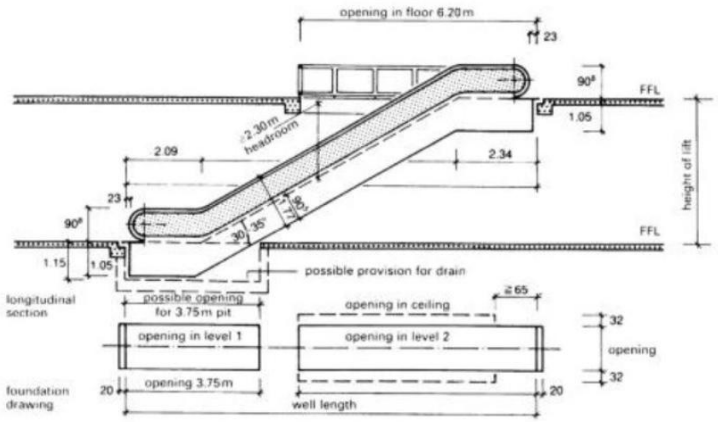


Figure 35: Cross section of an escalator

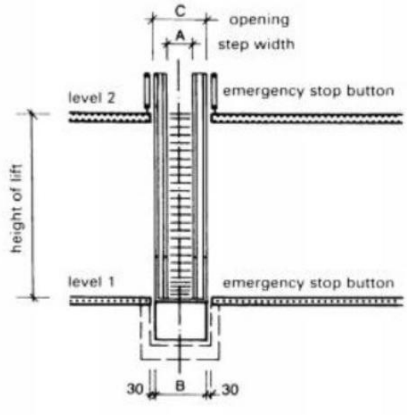


Figure 36: Escalator width

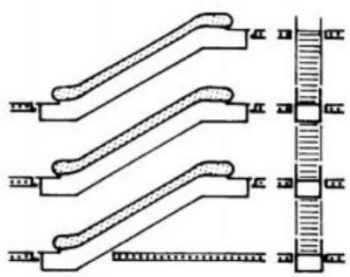


Figure 37: Superimposed

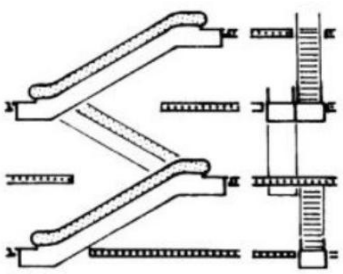


Figure 38: Crossover

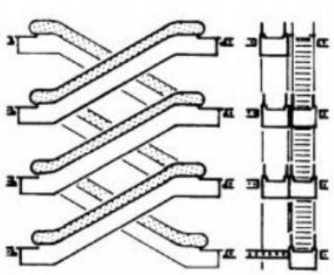


Figure 39: Double crossover

i. Angle of inclination of an escalator from the horizontal shall not exceed 30°. but for rises not exceeding 6 m the angle of inclination is permitted to be increased up to 35

ii. In accordance with a worldwide standard, the width of the step to be used is 60cm (for one person), 80cm (for one-to-two people width) and 100cm (for two people width). A 100cm step provides ample space for camuing goods.

iii. Calculation of length in plan for an escalator:

   a) with 30deg, escalator 1.732 storey height

   b) with 35deg, escalator = 1.428 storey height

iv. The landing area of escalators shall have a surface that provides a secure foot hold for a minimum distance of 0.85 m measured from the root of the comb teeth.

2.32.2 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.

i. Provision of the lifts shall be made for all multi-storeyed building having a height of 15.0 m. and above.

ii. 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.

iii. Grounding switch at ground floor level to enable the fire service to ground the lift car in case of emergency shall also be provided.

iv. The lift machine room shall be separate and no other machinery be installed in it.

Lift Enclosure/Lift:

General requirements shall be as follows:

i. 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

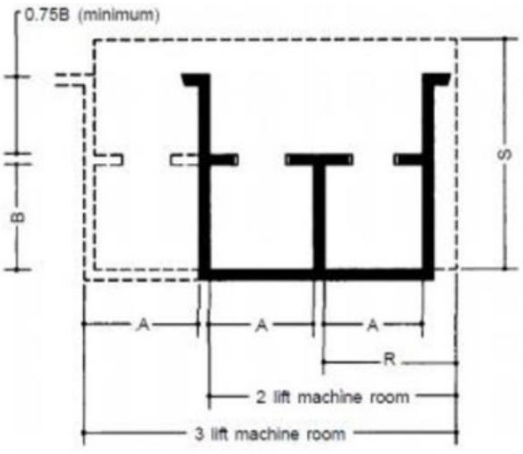
ii. Lift motor room shall be located preferably on top of the shaft and separated from the shaft by the floor of the room.

iii. Landing door in lift enclosures shall have a fire resistance of not less than one hour.

iv. 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

v. Lift car door shall have a fire resistance rating of 1 hour

vi. 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.



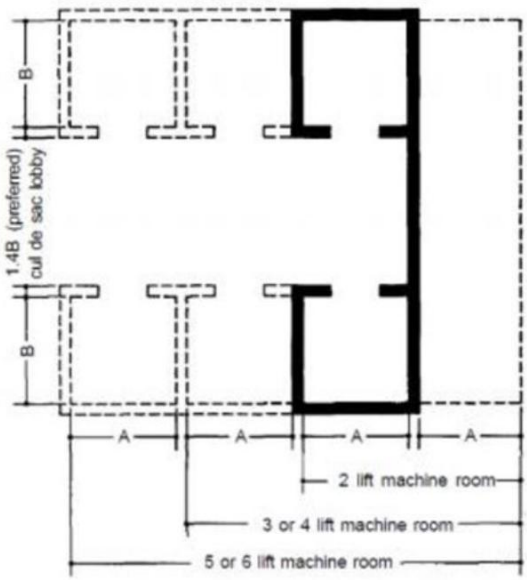


Figure 40:
(a.) Plan of recessed lobby and machine room for multi-lift installation
(b.) Plan of cul-de-sac lobby and machine room

- **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

2.32.3 Ramps

These are used to allow wheeled vehicles such as trolleys, wheelchairs, and buggies to change levels.

a) A ramp when provided should not have a slope greater than 1 in 20 or maximum a I in 12 for short distance up to 9000 mm.

b) Each ramp shall have at least 1800 mm of straight clearance at the bottom

c) At least one entrance usable by individuals in wheelchairs shall be on a level that would make the elevators accessible.

d) 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.

2.23.4 Internal staircase

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

a) 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.

b) The rise should not exceed 190 mm, and the going should not be less than 250 mm.

c) The top of the handrail should be between 900 and 1000 mm above the pitch line.

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

2.23.5 Staircase

Spiral Stairs

• The use of spiral staircase shall be limited to low occupant load and to a building height 9 m.

• A spiral stair shall not be less than 150 cm in diameter and shall be designed to give the

adequate headroom

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)

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

2.23.6 Capacity of Exits

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

Table 4.3 Occupants per unit Exit width

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

Minimum Width Provisions for Passageway Corridors:

The following minimum width provisions shall be made way corridor for each passage.

c) Assembly buildings like auditorium theatres and cinemas. 2.00 m

2.23.7 VEHICULAR RAMPS

• Ramps of slope of not more than 1 in 10 may be substituted for and shall comply with all the applicable requirements of all required stairways as to enclosure capacity and limiting dimensions. Larger slopes shall be provided for special uses but in no case greater than 1 in 8. For all slopes exceeding 1 in 10 and where the use is such as to involve danger of slipping, the ramp shall be surfaced with approved non-slipping material

• The minimum width of the ramps in the Hospitals shall be 2.4 m. and, in the basement, using car parking shall be 6.0 m

• Handrails shall be provided on both sides of the ramp.

• Ramp shall lead directly to outside open space at ground level or courtyards of safe place.

• For building above 24.0 m in height, access to ramps from any floor of the building shall be through smoke fire check door.

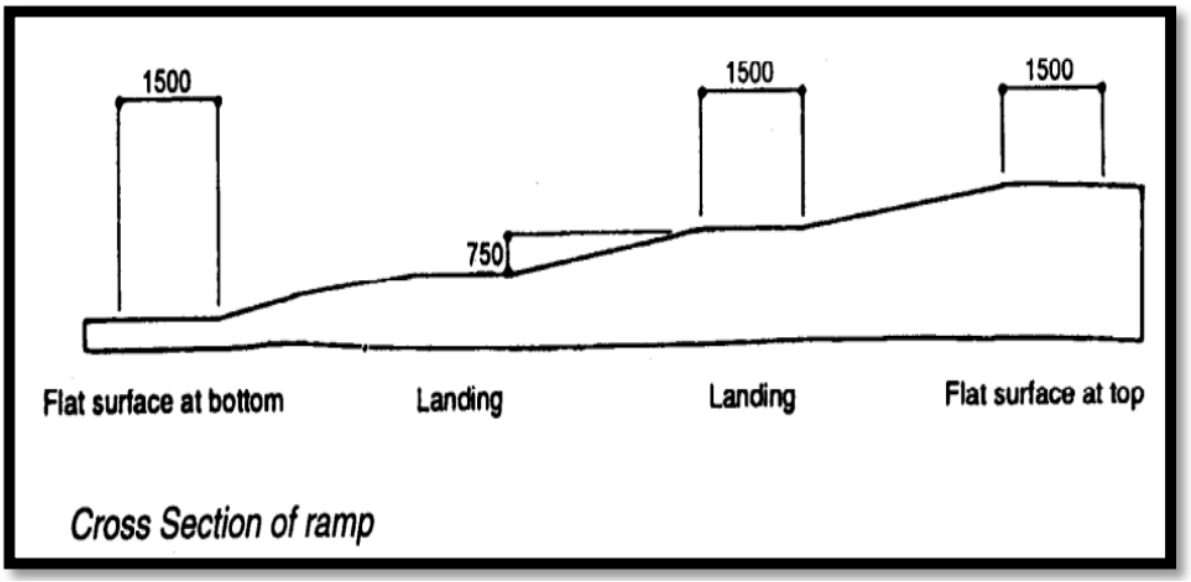
• In case of nursing homes, hospitals, etc. area exceeding 300 sq m at each floor one of the exit facilities shall be a ramp of not less than 2.4 m. in width.

• Prevent the installation of steep ramps.

• Prevent the installation of steep ramps.

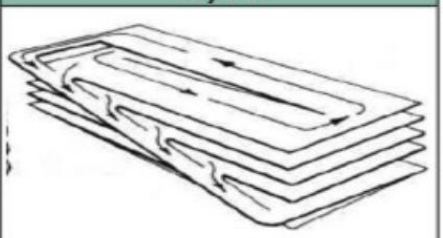
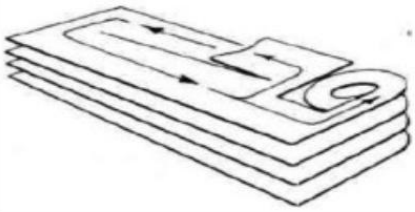
• Make sure the grade of a ramp is a moderate rise of 10 mm to each 120 mm of travel.

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

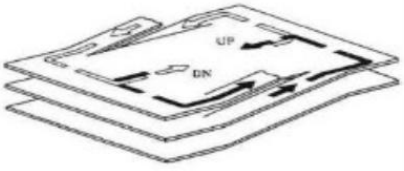


Cross Section of ramp

Ramp systems:

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

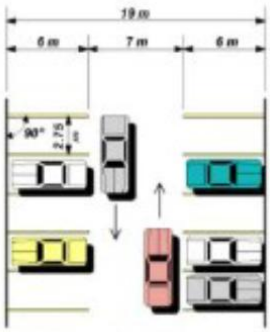
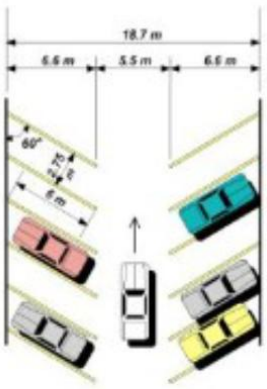
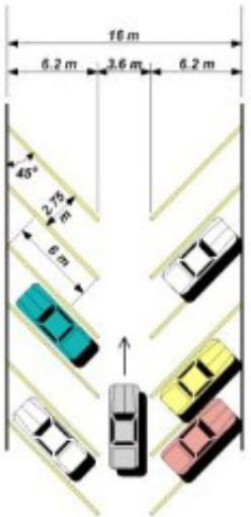
Ramp Design:

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

2.24 PARKING

2.24.1 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.

2.24.2 Basement parking

a) 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.

b) Adequate ventilation shall be provided for the basement.

c) The access to the basement shall be separate from the main and alternative staircase providing access and exit from higher floors.

d) 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

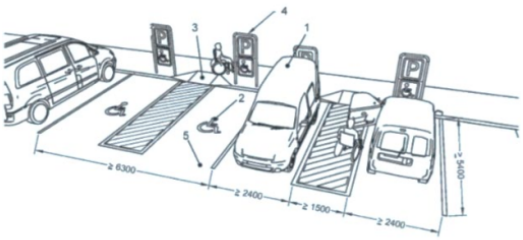
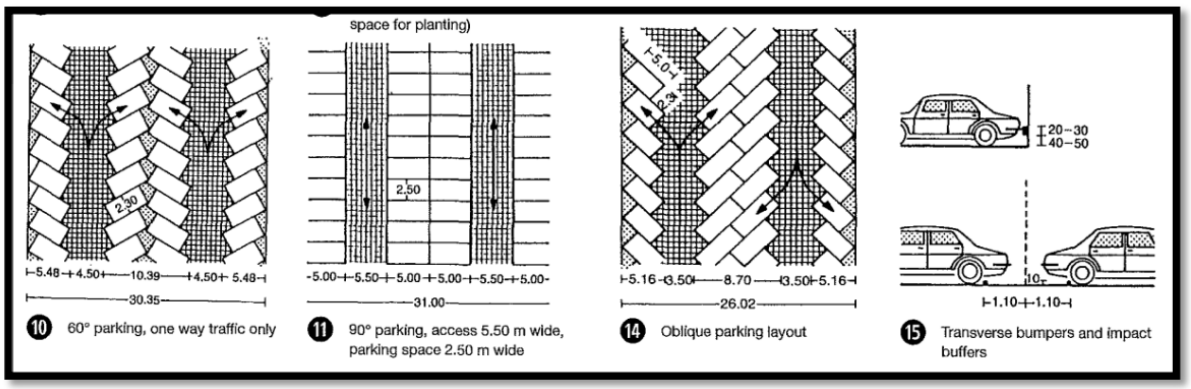


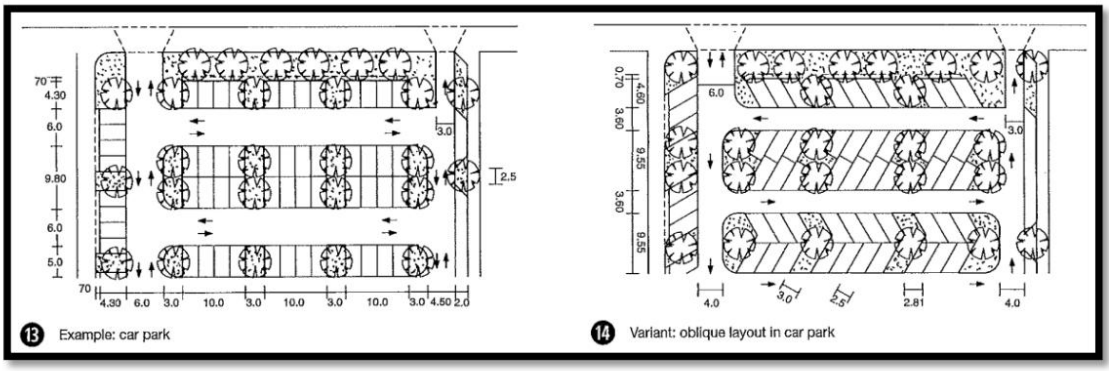
FIG. 38 ACCESSIBLE PARKING SPACES ACCESSIBLE PARKING SPACES WITH ONE SHARED TRANSFER AREA

Designated parking for physically handicapped

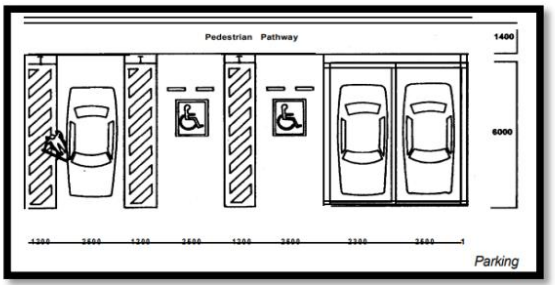
The minimum size of the parking space for a car shall be 3.9m x 5.4m

If two parking spaces share a transfer are: 6.3 m





2.20.3 Parking for handicapped people



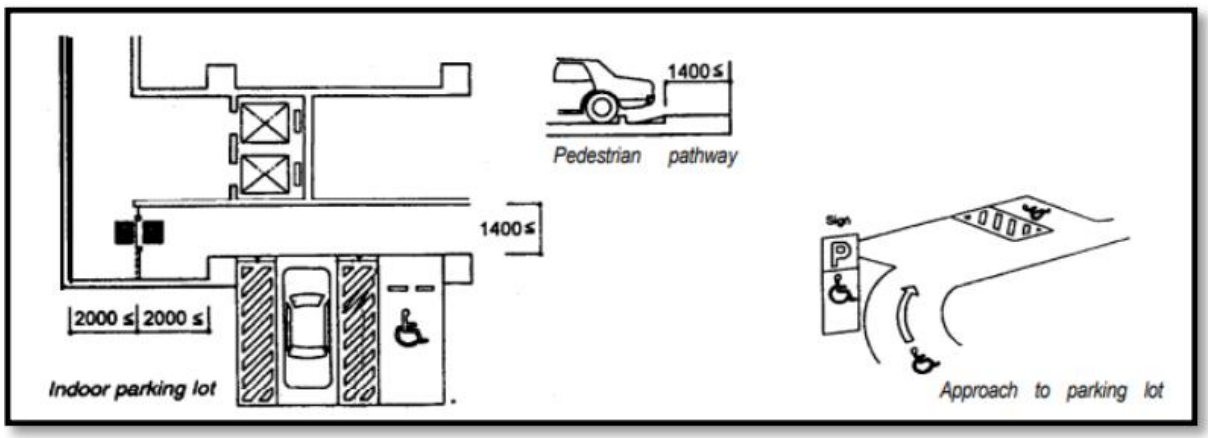
For parking of vehicles of handicapped people, the following provisions shall be made:

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.



2.25 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.

2.26 NORMS

3.16 Socio – cultural facilities

Table 3.15 Development Controls for 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.

Sl. No.	Height of the Building (m.)	Exterior open spaces to be left on all sides in m. (front rear and sides in each plot) As per prescribed set backs
1	10	3
2	15	5
3	18	6
4	21	7
5	24	8
6	27	9
7	30	10
8	35	11
9	40	12
10	45	13
11	50	14
12	55 and above	16

Note: *On sides where no habitable rooms face, a minimum space of 9.0 m. shall be left for heights above 27.0 m.*

2.27 SANITATION REQUIREMENTS FOR ASSEMBLY BUILDINGS

Sl. No.	Sanitary Unit	For Public		For Staff	
		Male	Female	Male	Female
1	Water Closet (W.C.)	One for 200 persons upto 400 persons. For over 400 persons, add at the rate of 1 per 250 persons or part thereof	Four for 100 persons upto 200 persons. For over 200 persons, add at the rate of 1 per 50 persons or part thereof	One for 1-15 persons. Two for 16-35 persons.	Two for 1-12 persons. Four for 13-25 persons, add at the rate of 1 per 6 persons.
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 for 50 persons or part thereof	--	Nil upto 6 persons One for 7-20 persons Two for 21-45 persons	--
4	Wash Basins	One for every 200 persons or part thereof. For over 400 persons, add at the rate of 1 per 250 persons or part thereof.	One for every 200 persons or part thereof. For over 200 persons, add at the rate of 1 per 150 persons or part thereof	One for 1-15 persons Two for 16-35	One for 1-12 persons Two for 13-25 persons
5	Cleaner's Sink	One per floor, minimum			
6	Drinking Water Fountain	One per 100 persons or part thereof			
7	Shower/Bath	As per trade requirements			

Sl. No.	Sanitary Unit	For Public		For Staff	
		Male	Female	Male	Female
1.	Water Closet (W.C.)	One per 50 seats upto 200 seats. For over 200 seats, add at the rate of 1 per 100 seats or part thereof	One per 25 seats upto 200 seats. For over 200 seats, add at the rate of 1 per 50 seats or part thereof	1 for 15 persons. 2 for 16-35 persons. 3 for 36-65 persons. 4 for 66-100 persons.	2 per 1-12 persons. 4 for 13-25 persons. 6 for 26-40 persons. 8 for 41-57 persons. 10 for 58-77 persons. 12 for 78-100 persons.
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 for 50 persons or part thereof	--	Nil upto 6 persons. 1 for 7-20 persons. 2 for 21-45 persons. 3 for 46-70 persons. 4 for 71-100 persons.	--
4.	Wash Basins	One for every water closet			
5.	Kitchen Sinks & Dish Washer	One per each Kitchen			
6.	Service Sink	One in the restaurant			

Water requirement and facilities:

Water requirement for the facility may be worked out and enough storage for ½ day operation is to be kept in storage. The pans must be of Pour Flush (PF) design i.e., with a steep slope. Traps should be of a 20 mm water seal. (Use of 50 mm water seal traps will require more water for flushing.) If toilet is to be linked to city sewer, a master trap must be provided at the sewer connection.

2.28 SITE DEVELOPMENT

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

Access Path/Walk Way

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

Parking

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

• Surface parking for two car spaces shall be provided near entrance for the physically differently-abled persons with maximum travel distance of 30.0 m. from building entrance.

• The width of parking bay shall be minimum 3.6 meter.

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

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

Building requirements

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

Approach to plinth level

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

• Ramped Approach

• Stepped Approach

• Exit/Entrance Door

• Entrance Landing

Corridor connecting the entrance/ exit for the differently abled

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

• Guiding floor materials shall be provided or device that emits sound to guide visually impaired persons.

• The minimum width shall be 1500mm.

• In case there is a difference of level, slope ways shall be provided with a slope of 1:12. Stair-ways One of the stair-ways near the entrance/exit for the differently abled shall have the following provisions:

• The minimum width shall be 1350 mm.

• Height of the riser shall not be more than 150 mm and width of the tread 300mum. The steps shall not have abrupt (square) nosing.

• Maximum number of risers on a flight shall be limited to 12.

• Handrails shall be provided on both sides and shall extend 300 mm on the top and bottom of

each flight of steps.

Lifts

Wherever lift is required as per bye-laws. Provision of at least one lift shall be made for the wheel chair user with the following cage dimensions of lift recommended for passenger lift of 13 person's capacity of NBC 2005. BIS. Section 4.9.3 Table no.

Desirable Lift size

• Clear internal width 1100 mm

• Clear internal depth 2000 mm

• Entrance door width 900 mm

Toilets

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

• The minimum size shall be 1500 mm x 1750 mm.

• Minimum clear opening of the door shall be 900mm and the door shall swing out.

• Suitable arrangement of vertical horizontal handrails with 50mm clearance from wall shall be

made in the toilet.

• The W.C. seat shall be 500mm from the floor. Harvesting provisions in various Building categories:

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

The indicative provisions of rainwater harvesting in various buildings types are: Rain Water Harvesting Provisions for Open spaces in cities.

Table 9.1 Provisions for Rainwater harvesting by building types

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

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

2.29 GREEN BUILDINGS AND SUSTAINABILITY PROVISIONS

Provisions and Applicability

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

Provisions for Sanction

1. Water Conservation and Management
• Rain Water Harvesting
• Low Water Consumption Plumbing Fixtures
• Waste Water Recycle and Reuse
• Reduction of Hardscape 2. Solar Energy Utilization
• Installation of Solar Photovoltaic Panels (detailed at section 10.2.3 below)
• Installation of Solar Assisted Water Heating Systems

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

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

4. Waste Management

• Segregation of Waste
• Organic Waste Management

5. Roof Top Solar Energy Installations

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

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

Installation of Solar Water Heating System

a) New Buildings: Clearance of plan for the construction of new buildings of the aforesaid categories shall only be given if they have a provision in the building design itself for an insulated pipeline from the rooftop in the building to various distribution points where hot water is required. The building must have a provision for continuous water supply to the solar water heating system. The building should also have open space on the rooftop. which receives direct sunlight. The load bearing capacity of the roof should at least be 50 kg. per sq. m. All new buildings of above said categories must complete installation of solar water heating systems before obtaining necessary license to commence their business.

b) Existing Buildings: Installation of Solar Assisted Water Heating Systems in the existing building shall be made mandatory at the time of change of use to above said category provided there is a system or installation for supplying hot water.

Capacity:

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

Specifications:

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

Auxiliary System:

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

Sustainable Waste Management

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

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

Sustainability of Building Materials

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

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

• Fly Ash bricks, Portland Pozzolana cement, Fly ash concrete, phosphor-gypsum- based

walling & roofing panels, particle wood recycled use of industrial/ agricultural by-products.

(Ref. Table 14)

• Fly ash/ AAC (Autoclaved aerated light weight concrete) panels/ CLC (Cellular lightweight

concrete) panels- ensures thermal comfort (significant reduction in air conditioning

requirement)

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

2.30 SERVICES

2.30.1 Ventilation shaft

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

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

• For buildings above 30.0 m. height, mechanical ventilation system shall be hustled besides the provision of minimum ventilation shaft

• For fully air-conditioned residential buildings for lodging purposes, the ventilation shaft need not be insisted upon, provided the air-conditioning system works in an uninterrupted manner also, provided there is an alternative source of power supply. However, it is not mandatory in case of buildings where ventilation is mechanized.

Interior Open Space for Light and Ventilation

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

• Sunken Courtyard

• Skylight

2.30.2 Fire Escapes or External Stairs

• Fire escape shall not be considered while calculating the number of staircases for a building.

• All fire escapes shall be directly connected to the ground.

• Entrance to the fire escape shall be separate and remote from internal staircase.

• The route to fire escape shall always be free of obstructions except the doorway leading to the fire escape which shall have the required fire resistance.

• Fire escape shall be constructed of non-combustible materials.

• Fire escape stairs shall have straight flight not less than 125 cm wide with 25 cm treads and risers not more than 19 cm.

• Handrails shall be at a height not less than 100 cm.

• Fire escape staircase in the mercantile, business, assembly, hotel buildings above 24 m. height shall be a fire toder and in such a case width of the same shall not be less than the width of the main staircase. No combustible material shall be allowed in the fire tower.

2.30.3 Fire lift

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

• To enable fire service personnel to reach the upper floors with the minimum delay, one or more of the lifts shall be so designed to be available for the exclusive use of the fireman in an emergency and be directly accessible to every dwelling/lettable floor space on each floor.

• The lift shall have a floor area of not less than 1.4 sq.mt. It shall have a loading capacity of not less than 545 kg. (8 persons lift) with automatic closing doors.

• The electric supply shall be on a separate service from electric supply mains in a building and the cables run in a route safe from fire, that is within a lift shaft. Lights and fans in the elevator having wooden panelling or sheet steel construction shall be operated on 24-volt supply

• In case of failure of normal electric supply, it shall automatically switch over to the alternate supply. For apartment houses, this changeover of supply could be done through manually operated changeover switch. Alliteratively, the lift should be so wired that in case of power failure, it comes down at the ground level and comes to stand still with door open.

2.30.4 Basement

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

• The access to the basement shall be either from the main or alternate staircase providing access and exit from higher floors. Where the staircase is continuing the same shall be enclosed type serving as a fire separation from the basement floor and higher floors. Open ramps shall be permitted if they are constructed within the building line subject to the provision of the (iv).

• In case of basement for office enough exit ways and access shall be provided with a travel distance not more than 15.0 m. The travel distance in case of dead-end shall be 7.5 m.

• The basement shall be partitioned and in no case, compartment shall be more than 500 sq m and less than 50 sq m area except parking. Each compartment shall have ventilation standards as laid down in Bye-Laws separately and independently. The partition shall be made in consultation with Chief Fire Officer

• The first basement (immediately below ground level) can be used services/parking/other permissible services. Lower basement, if provided, shall exclusively be used for car parking

2.30.5 Service ducts/refuge chute

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

2.30.6 Electrical services

Electrical Services shall conform to the following:

• The electric distribution cables/wiring shall be laid in a separate duct shall be sealed at every floor with non-combustible material having the same fire resistance as that of the duct. Low and medium voltage wiring running in shaft and in false ceiling shall run in separate conduits.

• Water mains, telephone wires, inter-com lines, gas pipes or any other service lines shall not be laid in ducts for electric cables.

• Separate conduits for water pumps, lifts, staircases and corridor lighting and blowers for pressuring system shall be directly from the main switch panel and these circuits shall be laid in separate conduit pipes, so that fire in one circuit will not affect the others. Master switches controlling essential service circuits shall be clearly labelled.

2.30.7 Air-conditioning

Air-Conditioning should conform to the following:
• Escape routes like staircase, common corridors, lift lobbies: etc. should not be used as return air passage.
• The ducting should be constructed of metal in accordance with BIS 655:196
• Wherever the ducts pass through fire walls or floor, the opening around the ducts should be sealed with fire resisting material of same rating as of walls/floors.
• Metallic ducts should be used even for the return air instead of space above the false ceiling.
• The material used for insulating the duct system (inside outside) should be of flame resistant (IS 4355: 1977) and non-conductor of heat.
• Area more than 750 sq m. on individual floor should be segregated by a firewall and automatic fire dampers for isolation should be provided.

2.30.8 Fire dampers

These shall be in air ducts and retum air ducts passages at the following points:
• At the fire separation wall
• Where ducts/passages enter the central vertical shaft
• Where the ducts pass through floors
• At the inlet of supply air duct and the return air duct of each compartment on every floor.

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

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

• Fire smoke dampers (for smoke extraction shafts) for building more than 24 m in height.

• For apartment houses in non-ventilated lobbies corridor operated by detection system and

manual control sprinkler system

• For other buildings on operation of smoke heat detection system and manual control sprinkler system.

• Automatic fire dampers shall be so arranged so as to close by gravity in the direction of air movement and to remain tightly closed on operation of a fusible link.

2.31 MEANS OF ESCAPE

2.31.1 Travel distance

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

Exits

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

Stairs

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

Ramps

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

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

2.30.2 Conference rooms

Fire safety norms by the National Building Code of India

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

General Exit Requirements

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

Capacity of exits

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

Doorways

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

Stairways and ramps

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

The minimum width for a staircase shall be 2m.

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

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

Horizontal exits

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

2.32 RETAIL

Shopping Malls

A Shopping centre is a complex of retail stores and related facilities planned as a unified group to give maximum shopping convenience to the customers and maximum exposure to the merchandise.

General characteristics of a shopping mall:

- The mall usually consists of the principal mall, the major pedestrian shopping street of the project, and one or more subsidiary approach malls or access routes connecting the main mall
- with the parking areas or adjacent streets.

- With few exceptions, all stores have their principal entrance on the main mall or, less
- desirably, on approach malls, whether these stores have additional entrances to
- parking lots or adjacent streets.

- The main mall can be on one level or on two or more superimposed levels. Each mall level
- should, however, avoid slopes or steps within its own walkways to avoid hindrance to
- shopping and a source of accidents.

- The mall can be:
  - Open, with weather protection consisting solely of continuous canopies along the store
  - fronts,
  - Completely covered but open to the air, or
  - Completely enclosed, necessitating heating in winter and air-conditioning in summer.

General Design Criteria:

• **Column Spacing:** One of the significant dimensions in designing a mall is the width of the frontages of stores. The common widths are 20, 25, 30 ft. with the last the most flexible.
• **Store Depths**: The stores with depth of 120,140 ft. are commonly used while sometimes the store widths are increased to accommodate larger depths. In the case of basements, the depths are reduced by 20 to 25 percent.
• **Clear Heights**: The clear heights vary from **10 to 14 ft.** or more with 12ft as an average height. The height should be adequate for air-conditioning ducts, recessed lights, and structural system.
• **Ducts & Shafts:** While dealing with the ducts and shafts, mechanical engineers are set up to schedule the location and sizes of the principal ducts and shafts to avoid serious future space problems.
• **Roof Equipment Concealment:** Mechanical supports from the engineers are set up for the provision of properly designed and located roof screens and enclosures.
• **Exterior Walls:** Depending upon the store's requirements, service doors, public entrance doors, trash rooms, show windows and other modular designs are suitably accommodated for functionality without disturbing the visual effect.
• **Traffic:** The car capacity of road ways must be sufficient to accommodate the traffic generated by the shopping centre. Proper signal controls, reservoir lanes, divider strips and other traffic control features must be provided.
• **Parking:** Adequate parking spaces should be provided as required.
• **Visibility:** Visual communication should be maintained through the use of open wells and shop fronts.

• **Vertical Transportation:** Comfortable and accessible transporters such as escalators, elevators and staircases should be provided as requirement to avoid congestion.

Service Entry/Exits:

• Servicing involves the delivery of goods to the various stores and the removal of thrash and garbage.
• In the simple strip centre, the servicing is customarily by an alley in the rear of the strip of stores. It is desirable to conceal the alley from adjacent neighbourhood areas by a wall or landscaping. In the one-level regional suburban centre, servicing is customarily by one of the following:
Underground Service tunnels: Usually under the mall, connecting directly to the tenant

leased basements.
Service Courts: On the periphery of the building complex, usually partially shielded by 6 - 10' masonry walls.
Over-the-curb & Sidewalks: Service trucking routes on the site are often separated from customer routes. These usually connect to fireproof passages at the rear of the stores. Mezzanines are occasionally used to provide storage and non-selling space.

HVAC & Mechanical Services:

- Controls ensure occupant comfort, provide safe operation of the equipment, and in a modern HVAC control system enables judicious use of energy resources.
- Sanitary and Electrical Duct must be provided at necessary yet convenient spaces.
- A mechanical control room is placed on top of every lift shaft to contain the counter weight, pulleys and other mechanical systems.
- An electrical control room is provided usually in the basement to control the regular power supply and backup power supply systems.

Outdoor Plaza:
- Outdoor public space free from vehicular movement.
- Public activities like strolling, sitting, eating, entertaining, passing leisure time, social interaction and watching the world go by.
- Quality of plaza determined by liability and social interactions.

Atrium:
- Usually for natural lighting and aesthetics.
- Can also be designed to enhance buildings cooling system by the help of stack effect.
- Circulation space arranged around atrium space.
- Atrium also gives visual connection displays and shops on different levels thus establishing as a common feature of commercial complex.

2.33 CONSTRUCTION TECHNOLOGY

1. Modular grids/Structural grids:
Structural grids are kept as large as practicable. For light-weight roofs with internal heights of 12 meter to 15 meter or more, as required for large exhibition halls, column spacing of 30 meters across the together with perimeter wall columns at 15-meter centres are often adopted. The trusses spanning the bays are usually N- or V-braced, box sections serving also as walkways to give access to overhead services. In larger halls space frames are also used. Smaller halls are based on a 10 to 15-meter structural grid. The location of columns has a considerable influence on booth layout and hence on circulation planning and utility service grids.

2. Wall Construction:
The lower areas of walls should be resistant to scarping and in vulnerable places, like external corner, corridors and entrances to goods doors or services elevators, extra protection by covers or fenders is required. Other requirements are concerned with combustibility and-where fire division is involved –the period of fire resistance. It is also important to consider alternative uses to which the hall may be put. For meeting a sound diffusive surface will invariably be necessary to echoes and air resonance from cross reflections.

3. Ceilings:
As a rule, the ceilings of exhibition halls are left open for economy and to allow access to ceiling mounted equipment. In the case of a hall providing a clear height of 5m (16ft) or more, the view of the roof structure and associated engineering equipment is above 35 degrees from eye level over most of the floor and the visual intrusion will be minimal. If necessary, this can be further camouflaged by:

• Mounting lighting battens and other terminal equipment in the same horizontal plane so that the spaces above are screened.
• Selecting luminaries which provide a controlled distribution of light below this place.
• Having a uniform matt dark (black, grey, brown) colour of high chrome in the ceiling void
• For halls of lower height, a formed ceiling construction is usually desirable, particularly if hall is to serve for other purposes. The ceiling must be panelled to allow access to the equipment above and to satisfy other criteria:
• Easy access, without damaging the panels.
• Easy-to-clean, permanent surfaces for wiping off hand marks.
• Robust to withstand handling.
• Incombustible or very low rate of surface flame speed (class 0 to 1).
• Modular with luminaries, air diffusers, loudspeakers, sprinkler systems etc.
• Sound absorbency, depending upon the multiple use of hall.
• Aesthetic acceptability for the use as a banquet hall or congress hall.

4. Roof Construction:
Exhibition halls are usually clear wide span structures. So, in case of roof construction, it makes some complication with its large spanning property. So, the construction technology for the roof is selected according to the requirement of the building. There are different technologies by which one can build the structure. In country like Nepal, concrete technology is widely used for the different type of structures. It gives flexibility of the shape but giving some restriction to the spanning size. There are other technology using steel and glass. This technology gives the flexibility to the design as well as span. Today the world is using this technology in a very wide range for constructing building like conference centres, exhibition centres, auditorium, concert halls, etc.

LONG-SPAN STRUCTURE

A question can always be aroused that "how long is long span for buildings? The answer to this question is that the structure with span larger than 20m is called a long span structure. This type of span is unable to be achieved by ordinary RCC structure.

Long span or complicated structures can be constructed used different construction technologies. There are different types of structure which should be constructed using the appropriate methods. They are mentioned as below:

I. ***Flexible and non-rigid elements:*** These types of structures can be constructed using three different methods. They can be constructed in the form of arches, cables and tents. The height of arch in this case can rise with the span of the structure, while the tents are high tensioned structures and are made from special textile. These can cover up to 100m span.

II. ***Flexible but Rigid Elements:*** These types of structures can be constructed using three different methods. They can be constructed in the form of shell, plates, and domes.

Shells structures can be made if the ratio of the thickness to the span is 2.4” to 100”
It can be constructed using RC, plastic, glass, metal, ply etc.

III. *Rigid, Solid and Linear Elements:* These types of structures can be constructed usingthree different methods. They can be constructed in the form of beam frame and slab.

IV. *Trusses:* Truss is very much in use these days. Different kinds of trusses are used to cover different types of structure and of different spans. The large span buildings can be constructed using flat, curved or space truss.

Analysis of Long Span Structure

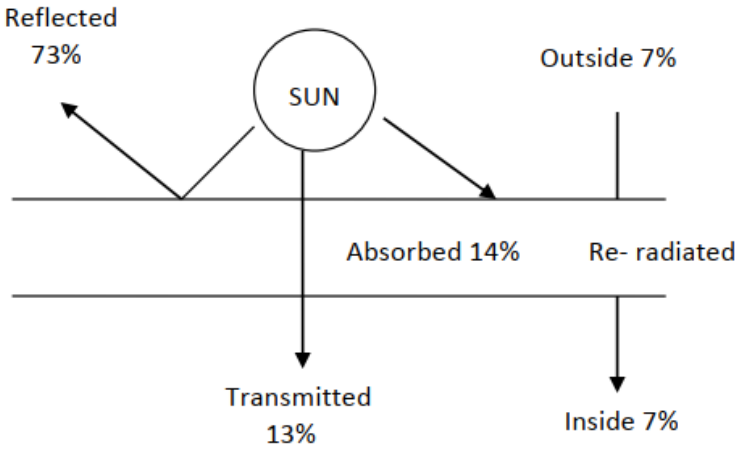
Long span roof is today widely applied for sport, social, industrial, ecological, and other activities. The experience collected in last decades identified structural typologies as space structures, cable structures, membrane structures and new - under tension - efficient materials which combination deals with lightweight structural systems, as the state of art on long span structural design.
Long span structures are today widely applied mainly for sport buildings as:
- Stadia
- Sport halls
- Olympic swimming pools
- Ice tracks and skating rinks
- Indoor athletics

Space structures
- Single layer grids
- Double and multi-layer grids
- Single and double curvature space frame

Cable structures
- cable stayed roofs
- suspended roofs
- cable trusses
- single and multilayer nets

Membrane structures
- pre-stressed anticlastic membranes
- pneumatic membranes

Convertible roofs
- overlapping sliding system
- pivoted system
- folding system



Sheer fill fabric

Nowadays a new kind of materials is being used in large structures in place of the conventional material that is glass. This material is called the Sheer Fill membranes. Features of sheer fill membranes are:

- Provides aesthetics and performance benefits to glass glazing
- Diffusion of light through it eliminating glare.
- Weather and fire resistant.
- The material is flexible, high tensile strength thus it is elastic.
- Display illumination broadly to the space below.
- This material is immune to Ultra Violet radiation.

PART 3. SITE INVENTORY

OVERVIEW

This site inventory includes gathering essential data about a site's existing conditions to guide planning and design decisions. It covers defining the scope, which involves boundaries and key elements such as topography, soil, vegetation, existing structures, and cultural resources. Additional factors, such as climate patterns, drainage systems, and accessibility, are also assessed to identify opportunities and constraints. Data collection methods include observations, measurements, and surveys, with tools like GIS mapping enhancing accuracy and efficiency. The process also includes analysing and documenting findings to inform decisions, address environmental concerns, comply with regulations, and develop sustainable, context-sensitive designs that maximise the site's potential.



Figure 2 Site photograph

3.1 CONNECTIVITY TO WARANGAL

City Area: **406.97 sq. km** (as per official sources like GWMC and Census of India).

Warangal is the second-largest city in Telangana, after Hyderabad. Located just 140 km from Hyderabad, with good rail, road, and air connectivity (nearest airport: Mamnoor airport, being developed). It is a gateway to northern Telangana and a hub for the surrounding districts. Identified as

a growth centre for the industrial, educational, and tourism sectors. TSIIC is actively promoting Warangal as an IT and innovation corridor, reducing dependency on Hyderabad.

3.1.1 Geographical Details

Site Location: Sy. No. 1791/1 Of Madhikonda (V) Warangal (U) District
City: Warangal
Coordinates: Approximate region is adjacent to NH 163, facing Warangal Textile Park, with easy access from Hyderabad (~140km) and Warangal Railway Station (~20km).

3.1.2 Boundary Description

- North: Vacant Land
- South: Vacant Land
- East: NH 163 Access Road
- West: Dharmasagar Canal

3.1.3 Terrain

Regular, mostly flat with excellent road frontage and visibility.

3.1.4 Roadways

- NH-163
- **Route:** Hyderabad – Warangal – Bhopalpatnam
- NH-563
- **Route:** Jagtial – Karimnagar – Warangal – Khammam – Suryapet
- SH-1 and SH-3
- Link Warangal with districts like **Mulugu, Bhupalpally, and Mahbubabad**

3.1.5 Warangal Outer Ring Road (ORR)

Proposed to ease congestion and improve freight movement.

3.1.6 Railways

- **Kazipet Jn.** Major Junction- 5km from Warangal city centre
- **Warangal Railway Station-** Central Station in the city.
- **Hanam Konda Station**- Smaller Stop: Local traffic

3.1.7 Airways

- **Nearest Airport (Operational)- Rajiv Gandhi International Airport (RGIA)** Located in Shamshabad, Hyderabad
- **Distance from Warangal**- 160 km (via NH-163), 3 Hours by Road.

3.2 PROXIMITY
3.3 SITE ACCESSIBILITY & TRAFFIC

3.2 CLIMATE ANALYSIS

3.2.1 Climate of Warangal

- Climate Type: Tropical wet and dry (savanna); pronounced summer, monsoon, and moderate winter.
- Average Highs (May): 40–45°C (hottest month)
- Average Lows (Dec-Jan): 13–17°C (coolest months)
- Rainfall: Main monsoon (June–September), annual average ~900–1000mm.
- Humidity: High during rainy season; moderate rest of the year.
- Wind: Peak winds in late summer and monsoon; generally, from southwest in monsoon, east/northeast in dry season.

Warangal, located on the **eastern Deccan Plateau**, has a **semi-arid, hot-dry climate**, with summer peaks in May (average highs around 40–43 °C) and mild winters (December–January highs ~22–26 °C / lows ~13–17 °C).

3.2.2 Average Monthly Temperature

Month	Max Temp (°C)	Min Temp (°C)
January	28	15
February	32	17
March	36	21
April	39	25
May	42	28
June	38	26
July	33	24
August	31	24
September	32	23
October	32	21
November	30	18
December	29	15

3.2.3 Average Monthly Rainfall

Month	Rainfall (mm)
January	3
February	6
March	10
April	12
May	24
June	122
July	305
August	335
September	167
October	69
November	15
December	6

3.2.3 Average Monthly Relative Humidity

Month	8:30 AM	5:30 PM
January	73	44
February	68	37
March	59	31
April	52	28
May	49	29
June	66	49
July	80	69
August	84	74
September	82	70
October	76	59
November	74	51
December	75	46

3.2.4 Cloud Cover and Sunshine

Month	Cloud Cover (Oktas)	Sunshine (Hours/Day)
January	1	9
April	2	9
July	6–7	4
October	2	8

3.2.5 Wind Direction & Speed

Season	Prevailing Wind Direction	Average Speed (km/h)	Site Relevance / Inference
Summer	Southeast (SE), East (E)	10–15	Hot winds, potential for dust; cross-ventilation design should utilize E-SE flow
Monsoon	Southwest (SW), South (S)	15–25	Strong, humid winds; larger apertures/openings on SW-S can maximize cooling
Winter	Northeast (NE), East (E)	5–10	Cool, dry breezes; lesser wind speeds, minimal cooling effect

3.2.6 Sunpath Analysis



A. Sunpath Observations:
Sunrise and Sunset Range:

1. Earliest Sunrise: ~5:27 AM (around June)
2. Latest Sunrise: ~6:38 AM (around December)
3. Earliest Sunset: ~5:49 PM (December)
4. Latest Sunset: ~6:50 PM (June)

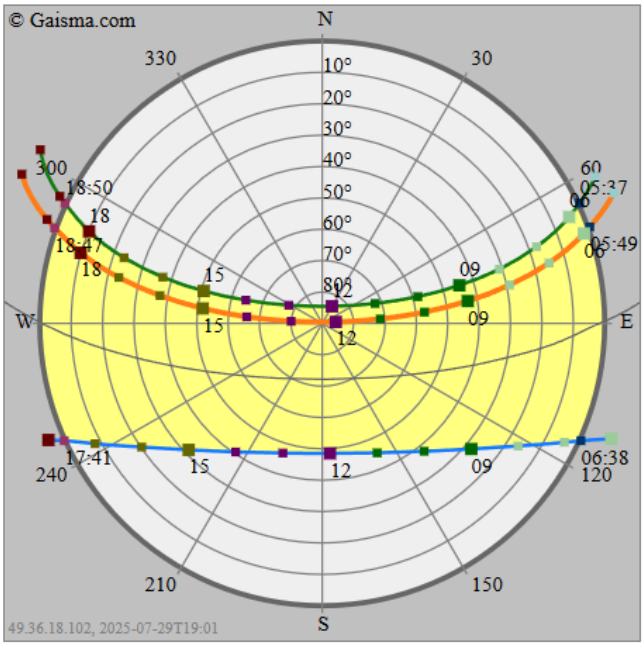
Solar Altitude:

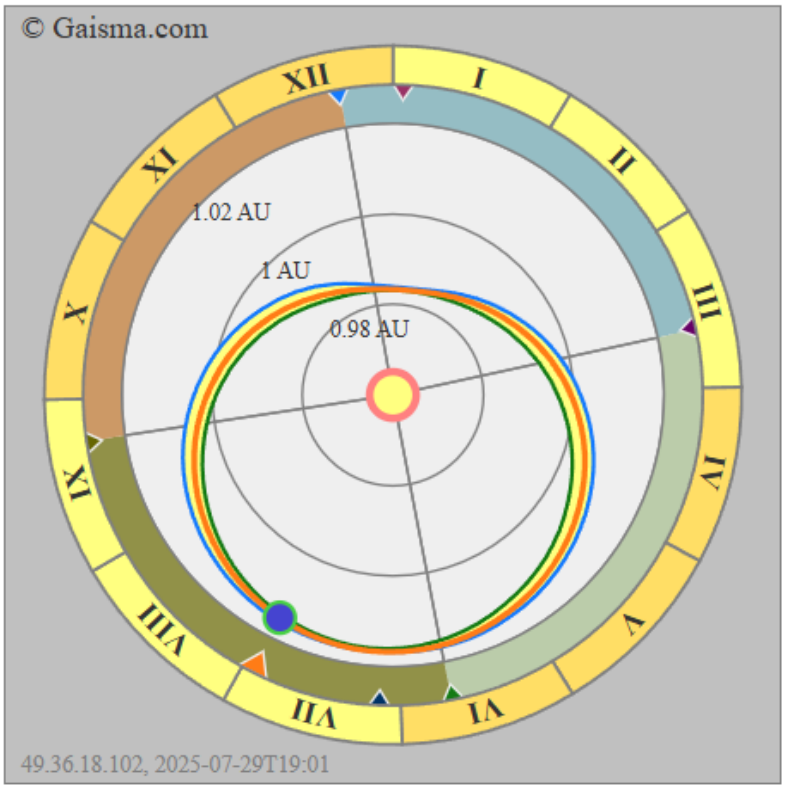
1. **Max Altitude** (summer noon): ~80°
2. **Min Altitude** (winter noon): ~45°

Daylight Duration:

1. **Longest day**: ~13 hours (June)
2. **Shortest day**: ~11 hours (December)







Events

- Today
- December solstice
- March equinox
- June solstice
- September equinox
- Perihelion [?]
- Aphelion [?]

Earth's orbit

- This year
- Min, years 1600–2600 [?]
- Max, years 1600–2600 [?]
- Variation, years 1600–2600

Seasons

- Winter
- Spring
- Summer
- Fall

(B) Design Inferences:

1. **Orientation:**

- Face primary activity areas towards North-East or North-West to avoid harsh direct sunlight, especially from the South.

- South-facing facades should be shaded or double-skinned to reduce solar heat gain.

2. **Glazing and Openings:**

- Minimize large South-facing windows.
- Use horizontal shading devices on South façades.
- Use vertical fins or screens on East and West to block low-angle morning and evening sun.

3. Roof Design:

- Use high reflectivity roofing or green roofs to reduce heat gain.
- Consider solar panels positioned for optimal exposure, tilted to ~10–15° south.

4. Shading Strategy:

- Provide deep verandas, louvers, and overhangs to shade building surfaces, especially on southern exposures.

5. Natural Daylighting:

- Utilize skylights and clerestories with light shelves to bring diffused daylight into large interior spaces without glare.

6. Material Selection:

- Use high thermal mass materials inside (like brick, concrete) to stabilize internal temperatures.

- Use low U-value windows with high-performance glazing to reduce heat ingress.

7. HVAC and Passive Cooling:

- Consider passive ventilation through cross-ventilation aligned with prevailing wind (Southwest to Northeast in summer).

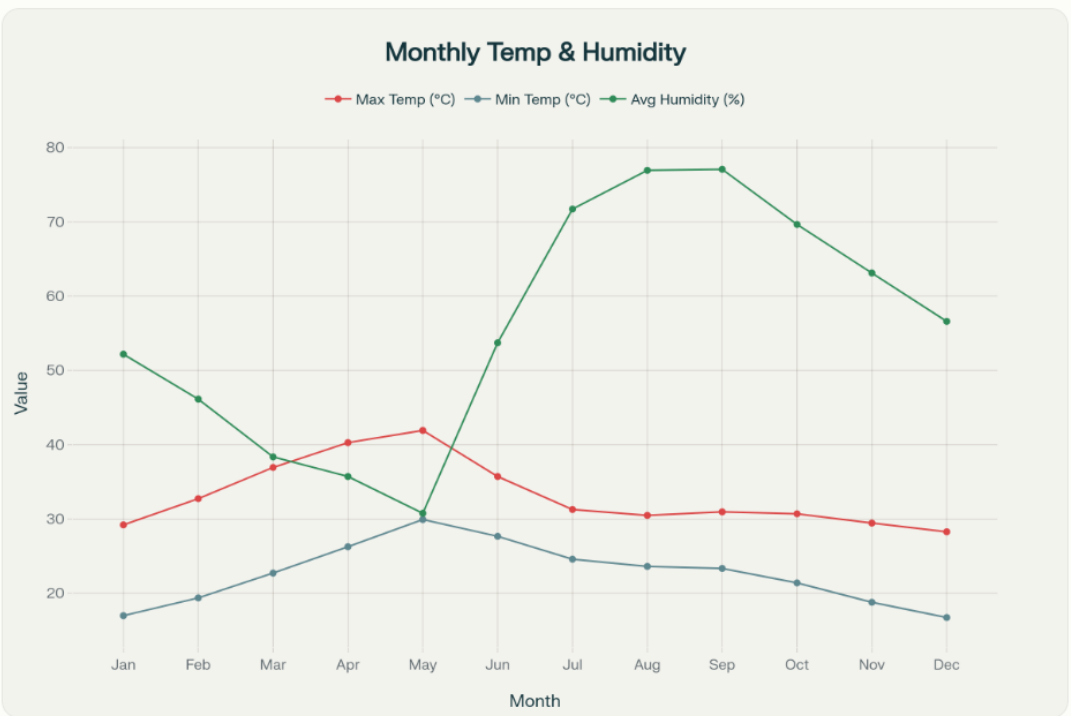
- Integrate cooling courtyards, water bodies, or atriums in the centre for microclimate control.

3.2.7 Psychometric Study

Interpretation

- Peak Heat and Dryness: March–May: Max Day temps 37–42°C with humidity often below 40% (hot/dry).

- Monsoon Comfort: June–September: Lower temps 31–36°C but humidity rises sharply (54–77%); cooling must address moisture, not just temperature.
- Winter Comfort: November–February: Cooler, comfortable temps with moderate humidity.
- Building Comfort Windows: Most working hours (except monsoon) are in hot/dry or warm/humid zones. This guides passive and mechanical cooling/ventilation demands.



3.2.7 Inferences from the Climatic Data

Orientation and Shading

1. South and Southwest Shading: These façades receive the most intense summer sun (solar altitudes up to ~80°). Design prominent overhangs, louvers, green screens, and vegetation shielding to minimize solar gain.
2. East/West Shading: Low-angle sun in morning/evening (especially April–June) calls for vertical shading elements or deep-set glazing on E/W walls to prevent glare and overheating.

Ventilation & Cooling Strategies

1. Cross-Ventilation: Prevailing summer breezes (SE/E) and strong monsoon winds (SW/S) can be harnessed with window/opening placements for natural cooling, especially in lobbies and public areas.
2. Evaporative Cooling/Pergolas: During hot and dry months (March–May, humidity <40%), passive cooling with water bodies, shaded courtyards, ventilated roof spaces, and landscape misting becomes highly effective.
3. Mechanical Cooling: Monsoon (June–Sep) brings high humidity (up to 77%)—natural ventilation alone won't suffice. Design robust mechanical systems (HVAC/dehumidification) for assembly spaces and interior comfort in these months.

Thermal Comfort & Envelope

1. High Insulation: The envelope must limit peak daytime heat gain (temps up to 42°C, especially in May) using double-glazed low-e glass, insulated walls/roof, and reflective finishes ("cool roof" materials).
2. Nighttime Comfort: Winters are mild but nighttime temperatures drop (min~16°C in Dec/Jan), so some spaces—like hotels—may need provision for gentle heating.

Rainfall and Site Management

1. Monsoon Drainage: Peak rainfall (June–September; up to 335mm/month) demands engineered drainage, flood-proofing, and strategic site grading.
2. Covered Entrance/Drop-Offs: Design entry zones to stay dry during monsoon downpours.
3. Rainwater Harvesting: Seasonal rainfall patterns Favor sustainable harvesting and reuse—integrate large tankage and permeable landscape zones.

Renewable Energy & Sunlight

1. Rooftop Solar PV: With 8–10 sunlight hours most months, optimize roof orientation/tilt (17° south) for effective solar energy generation.
2. Skylights/Daylighting: Use controlled daylighting with light shelves and diffused glazing to reduce energy use for artificial lighting—balanced to avoid excessive heat gain.

Wind, Dust, and Microclimate

1. Windbreaks: Summer brings moderate, dusty winds; use green belts and screens on SE flanks to filter air and reduce dust ingress.
2. Landscape Microclimates: Leverage adjacency to Dharmasagar canal—plan water features and shaded outdoor environments for enhanced comfort.
3. Enclosure Positioning: Place service blocks or solid landscape elements to shield active outdoor spaces from harsh, dusty SE winds and noise from the highway.

Flexible Planning for Event Loads

1. Peak Cooling Loads: Large crowd events during hot/dry or warm/humid seasons require robust, scalable cooling with zoning to allow partial operation.

Acoustics and Traffic

1. Sound Insulation: Proximity to the highway necessitates high-performance acoustic glazing and buffering landscape zones to reduce noise intrusion.

Challenge	Design Response
Extreme summer heat	High insulation, cool roofs, shading, east/west screening
Monsoon rainfall	Flood-proofing, large overhangs, rainwater harvesting
Humid monsoon months	Mechanical ventilation, effective dehumidification
Hot, dry winds	Cross-ventilation, dust filtering landscape, water features
Nighttime winter cool	Optional mild heating, high-performance glazing
Solar energy potential	Rooftop PV, optimal solar orientation, daylight harvesting
Wind and acoustics	Orient sensitive spaces, greenbelt buffers, acoustic design

PART 4. CASE STUDY

4.1 INDIA HABITAT CENTRE

Location: Lodhi Road New Delhi
Managed by: HUDCO
Architects: Joseph Allen Stein.
B.V. Doshi. Bhalla and Associates
Completed: 1993

Site Area: 9.6 Acres (38850 sq.m)
Ground Coverage: 25% (9609 sq.m)
F.A.R. Achieved: 1.4 Out Of 2.5
Parking: 2 Level Basement

4.1.1 Introduction





India Habitat Centre is a multipurpose building which is India's most comprehensive Convention Centre. India Habitat Centre is considered as an environment which acts as a catalyst for relationship between Individuals and Institutions. It serves a variety of facilities and capable of conducting various events. meetings and exhibitions at the same time. It consists of exhibition halls. Conference rooms, meeting rooms. auditorium. galleries. offices and open exhibition areas.

India Habitat Centre (IHC) has been conceived as an ideal physical environment with a range of facilities, that would maximize the effectiveness of the individuals and institutions, in their holistic support of the habitat. The principal resolve of the Centre - "to restore at every level - environment and ecological - a balanced, harmonious and improved way of life," is reflected in its concept and design.

The India Habitat Centre logo, an amalgam of the divine archer Shiva, juxtaposed against the downward pointing triangle that represents his consort Shakti, symbolizes the archetypal marriage of energies projected in abstract form A key to the secret of cosmic and universal harmony.

4.1.2 LOCATION AND ACCESS

The India Habitat Centre (THC) is located off the Lodhi Road on the fringes of Lutyens's Delhi. spread over nine acres of land II-IC has a built-up area of approximately one million square feet. The shaped site has frontage on the three sides. It is bounded by the Meera Marg on west, the Vardhman Marg on south and the Lodhi road on the north. The Fourth side is flanked by Bal Bharthi School. The complex has an access from three sides having the Lodhi Road on the north, Meera Marg towards the west and Vardhaman Marg on the southern side. Thus, it has three main gates, evened to as gate no. l, gate no. 2 and gate no. 3. Gate no. 2, on the Meera Marg is the o e, which directly leads to the double level basement. The lifts then take to the upper levels from this point. The other two gates direct the vehicles to the surface parking that has been provided. This parking basically caters to the public areas like the conference hall, etc.

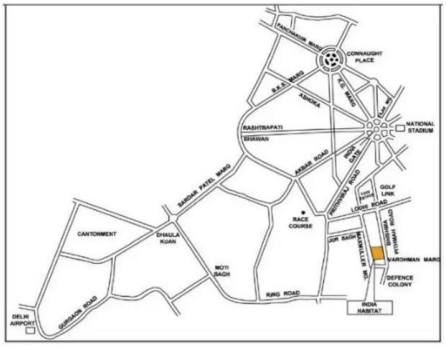


Fig.: Location plan of IHC

Building Program

- 40000 sq.m. of office accommodation.
- Conference rooms (capacity: 1000).
- 60 Guest Rooms. 5 Suites. 5 Service Apartments.
- Convention Halls. Cafeteria Restaurants and Dining rooms



can accommodate 1500 persons.

- 700 sq.m. of Exhibition Space.
- 420 capacity auditorium. 250 capacity amphitheatres.
- Parking for 933 Cars and Two wheelers.

4.1.3 Proximity

From	Distance
International Airport	15 Kms.
Domestic Airport	12 Kms.
New Delhi Railway Station	07 Kms.
Old Delhi Railway Station	16 Kms.
Connaught Place	05 Kms.
India Gate	03 Kms.
Diplomatic Enclave	05 Kms.
Jor Bagh Metro Station	1.6 Kms.
J.L.N. Metro Station	1.5 Kms.



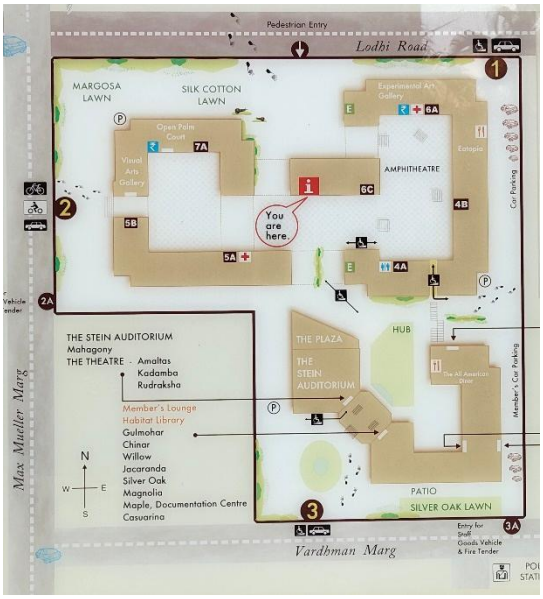
4.1.4 Architectural Design

The entire building consists of contemporary architectural expression with elimination of unnecessary details. Choice of material is such that it has a strong emphasis on balanced visual perception of the viewers. Exposed brickwork and Exposed RCC is used for the exterior facade. Domination of horizontal and vertical lines can be observed from the exterior facade.

4.1.5 Structural System

Modern conventional method of construction is adopted. Beam-column. RCC, brickwork and steel girders are the main structural members of India Habitat Centre. Windows used are ribbon windows which has a slot for plantation od RCC. It has a structural stability as well as aesthetically pleasant appearance.

4.1.6 Circulation





4.1.7 SPATIAL ORGANISATION

- The habitat centre is organised as a series of four to seven storey blocks around linked shaded courtyards.
- Spaces are segregated on the based on how public they are. All areas which are expected to have large and regular inflow of public have been placed close to the entrances.
- Offices are accessed from the courtyards.
- Courts and landscaped areas connect the public with the semi- public areas
- There is limited engagement between the office workers and the activity in the courtyard due to horizontal windows where vertical would have suited better.

The ground was perceived as a vehicle-free environment, and a fairly elaborate system worked out to deny entrance to all motorized traffic except for repair and fire. All cars and scooters are directed into two levels of basements. The conference block is the only one that allows entry to vehicles. Building volumes are articulated to form interconnected internal courtyards that are the major public spaces. The entire building is divided into five building blocks of ring shape forming a courtyard within themselves. These courtyards are appreciated by landscaping such that it subdues the bulkiness of the building form. The site is surrounded by three major roads; Vardhman Marg, Meera Marg and Lodhi Road. Each road has an entry and exits point respectively. the entire building has 4 gates to provide vehicular, public and service circulations with respect to their corresponding vehicles. There are extra 2 gates for services.



Fig. - Plan of IHC showing circulation patterns

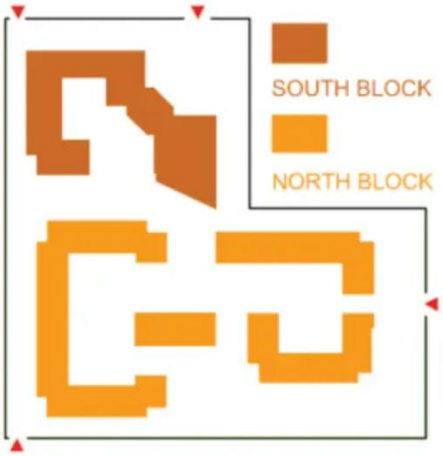
4.1.8 Building Block

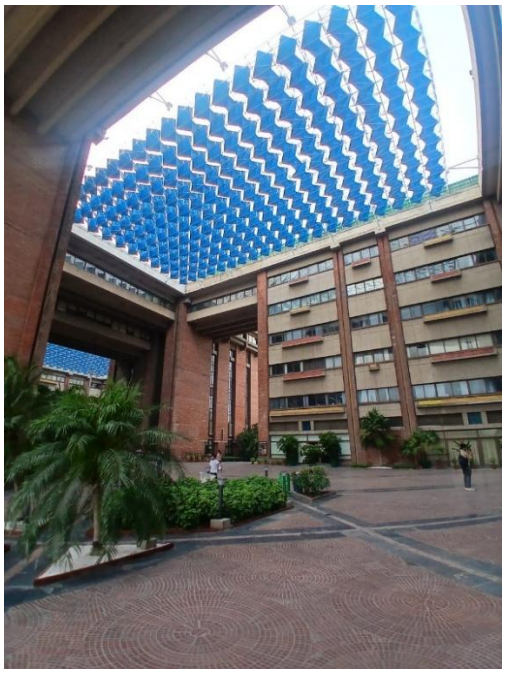
The complex is divided in two main blocks:

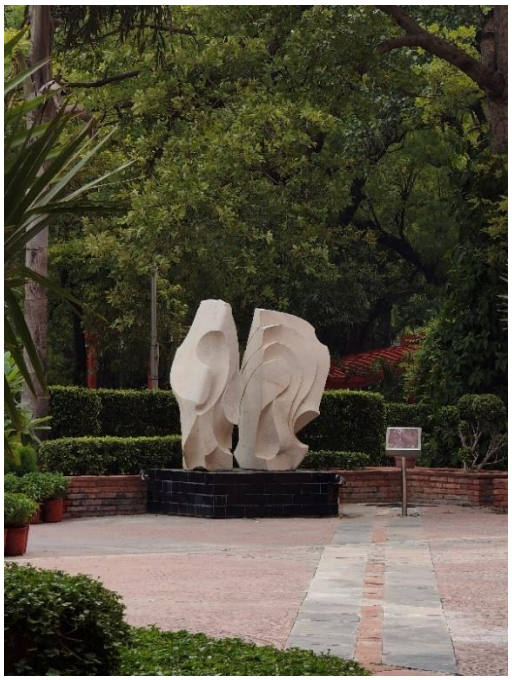
• **NORTH BLOCK-** along the main roads is made of 7 storeyed office spaces. Lower floors remain public.

• **SOUTH BLOCK**- along the Lodhi Housing Colony, holds functions like auditorium, theatres, library, member facilities and guest rooms.

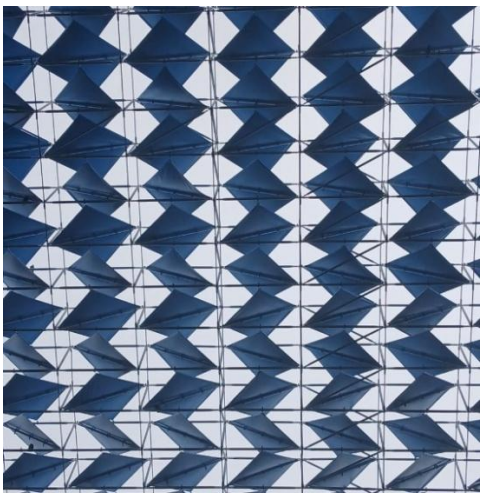
The height decreases progressively from the north to the south block in response to the housing. The built is also set further back from the plot line on this edge.











4.1.9 Spaces

Stein Auditorium

- Auditorium capacity = 400
- Area = 576 m2
- Distance between two seats = 0.6 (approx.)
- Terrace is used to prepare and serve meals.
- Acoustics panels and gypsum boards are used as acoustic materials.

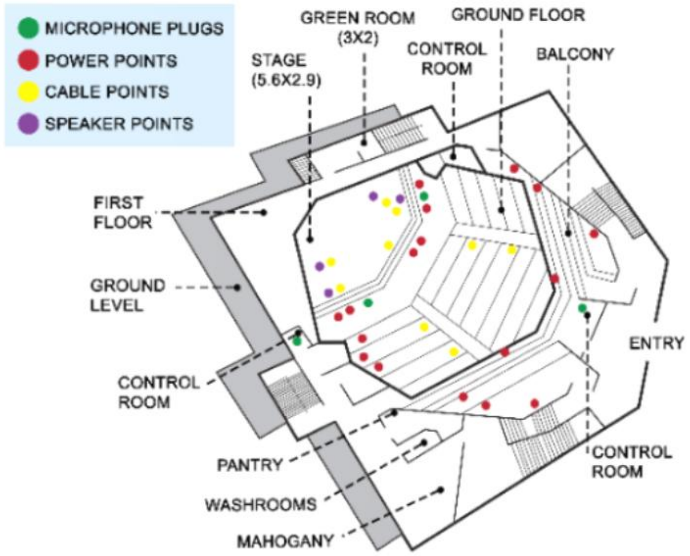


Fig. 7.1.3 Auditorium layout
[Image Source: Author]

Silver Oak Hall

- Capacity = 250
- Area = 495 m2

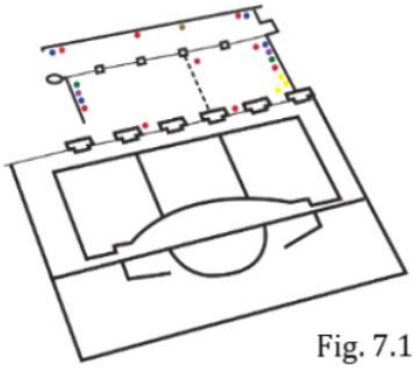


Fig. 7.1.4 Silver Oak Layout
[Image Source: Author]

Gulmohar Hall

- Capacity = 130
- Area = 266 m^2

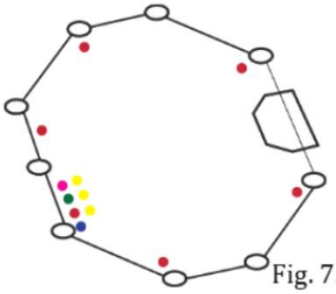


Fig. 7.1.5 Gulmohar Layout
[Image Source: Author]

Chinar and Willow

- Capacity = 51
- Area = 81 m^2

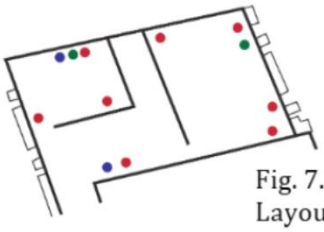


Fig. 7.1.6 Chinar and Willow Layout *[Image Source: Author]*

Magnolia

- Capacity = 120
- Area = 143 m^2

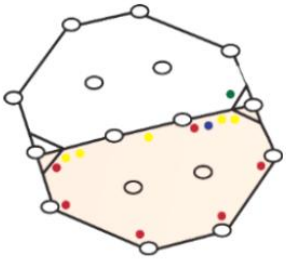


Fig. 7.1.7 Magnolia Layout
[Image Source: Author]

Casuarina

- Capacity = 60
- Area = 141 m^2

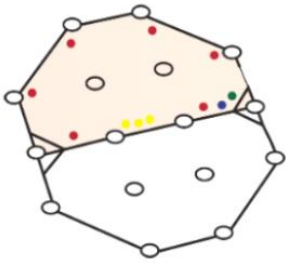


Fig. 7.1.8 Casuarina Layout
[Image Source: Author]

Jacaranda

- Capacity = 120
- Area = 238 m^2

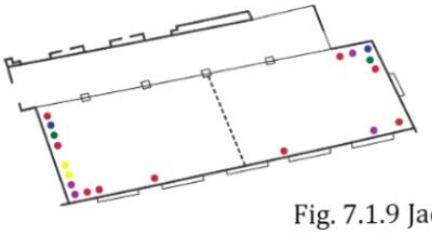
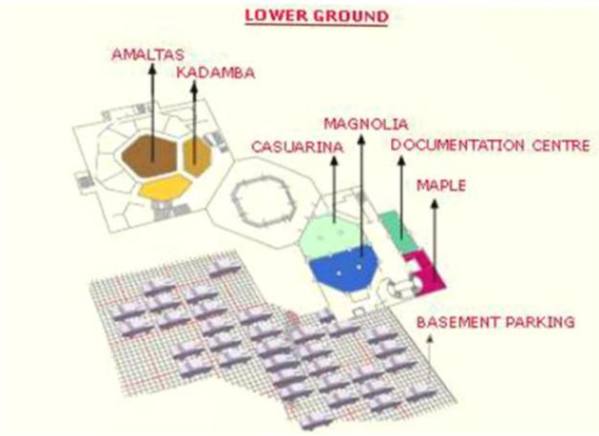
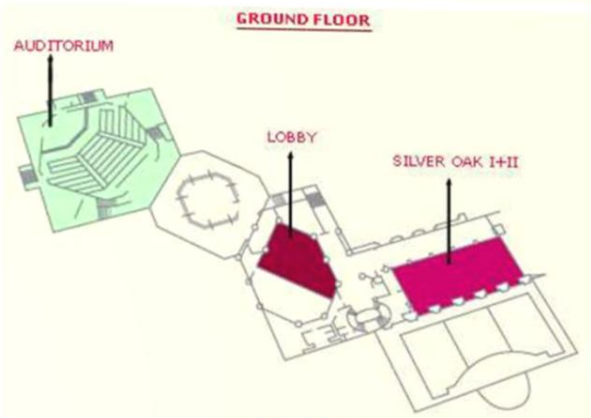
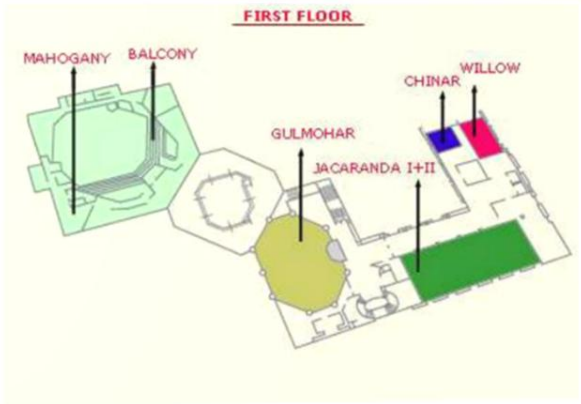


Fig. 7.1.9 Jacaranda Layout
[Image Source: Author]

4.1.10 Zoning







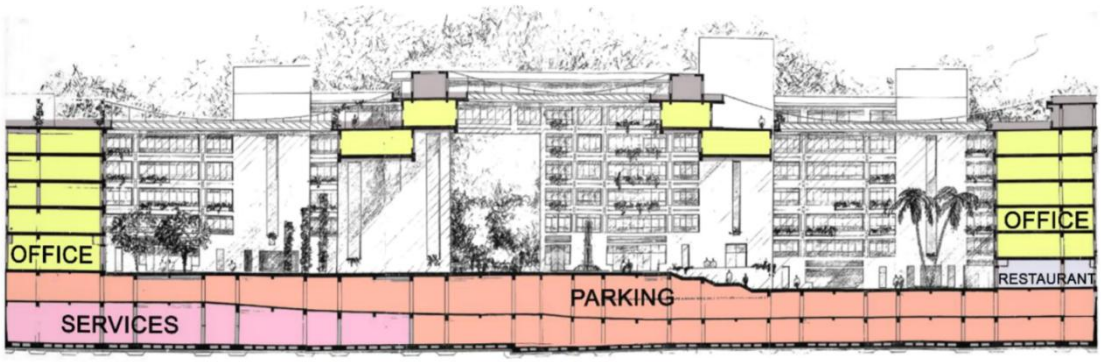
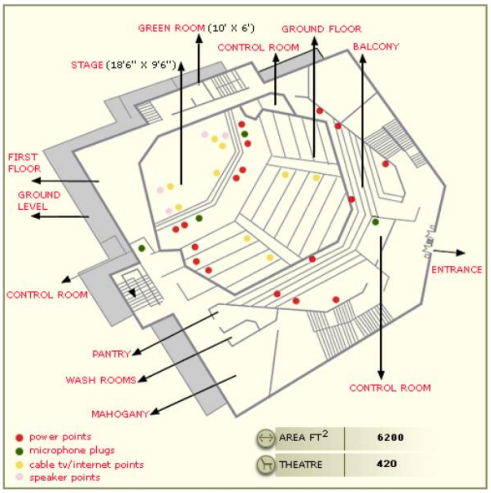
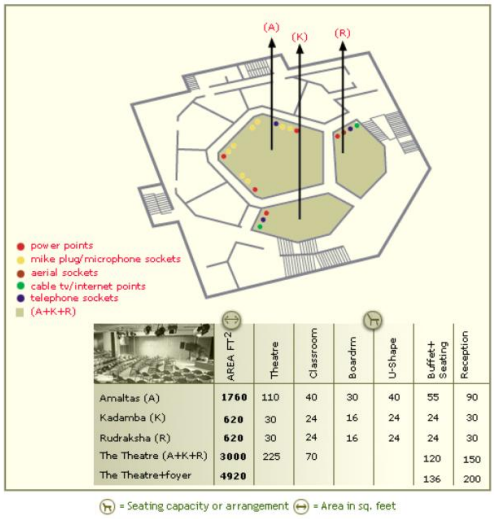


Fig. 7.1.11 Vertical zoning *[Image Source: IHC, Library]*

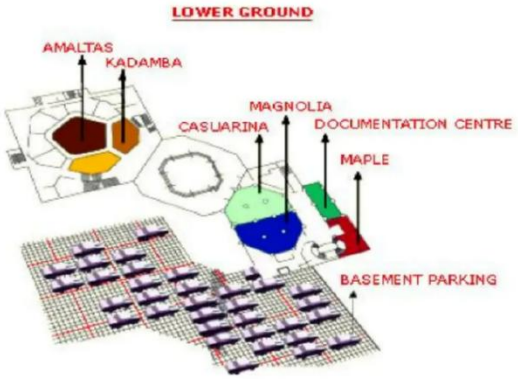




	AREA FT-2	Theatre	Classroom	Boardrm	U-Shape	Buffet+ Seating	Reception
Amaltas (A)	1760	110	40	30	40	55	90
Kadamba (K)	620	30	24	16	24	24	30
Rudraksha (R)	620	30	24	16	24	24	30
The Theatre (A+K+R)	3000	225	70			120	150
The Theatre+foyer	4920					136	200

The image shows Stein Auditorium with 576 m^2 with a carrying capacity of 420 pax. On the right is The Theatre with various carrying capacity and has three segments Amaltas, Kadamba and Rudraksha namely which can be adjusted as per use.

- Documentation center
- Basement Parking
- Amaltas
- Kadamba
- Rudraksha
- Casuarina
- Magnolia
- Maple



AMALTAS, KADAMBA, RUDRAKSHA

This 'trinity' of rooms is an extremely flexible set with individual as well as combined usage possibilities. Ideal for workshops, board meetings and theatre/cultural performances of all kinds when combined. Can be used as three individual meeting rooms too.

DOCUMENTATION CENTER

The Documentation Centre at Habitat has 6 cabins as well as 6 workstations that can be hired for variable periods of time. Fitted with all modern business aids, the Documentation Centre provides an ideal setting for a Secretariat for large international conferences.



Fig.: Amaltas, Kadamba, Rudraksha



Fig.: Documentation center

CASUARINA

A fixed seating hall equipped with state-of-the-art multimedia facilities and each table equipped with a set of mikes. Ideal for seminars, corporate presentations, press interactions, product launches etc.

MAGNOLIA

A free seating hall, allowing flexible seating option suited for both conference and party usage.



Fig.: Casuarina



Fig.: Mangolia

MAPLE

The Maple Room has been elegantly done up for that exclusively party or small conference

BASEMENT PARKING

There is a basement in two levels for parking around cars sq.m). Each driveway is provided with proper directional signage. The movements are simplified by adopting one way system that generally follows clock- wise movement pattern. The entry and exit is provided near the main entry to avoid confusion.

1.6.2 GROUND FLOOR

- Auditorium
- Lobby
- Silver Oak 1
- Silver Oak 2



JOSEPH STEIN AUDITORIUM

• One of the best auditoria in the country, the auditorium at habitat world is equipped with state-of-the-art infrastructure enabling direct telecast and 35mm projection.

The hall is ideal for large conferences, seminars, film screenings, presentations, theatre and cultural performances of all kinds.

• Main auditorium has the translation system for three languages. It is easily operable by the user as selection can be done from the seats itself. There is provision for controlling volume too.

• Main auditorium is also provided with mahogany room, a hall suited for small gathering with attached kitchenette and washroom apart from control rooms and projector room on the first floor.

• Green room lacks the usual requirement of toilets.

• Ground floor also has offices & coffee lounge.

The level difference between two-seat platforms is 1—6 which makes viewing absolutely obstruction free.

• This auditorium has been provided with balcony seating too.

• Double wall system avoids sounds disturbance from outside.

• Area of this auditorium is 6200 sq. Ft. —And it has a capacity of 537 persons.



Fig.: Auditorium Entrance


Fig.: Auditorium Seating

SILVER OAK 1

One of the finest halls at Habitat, Silver Oak also has outdoor attachments in form Of a patio as well as garden space. Ideally located on the ground floor level, the hall allows versatile use of space for everything - ranging from exhibitions, conferences, seminars etc. to the finest banquet parties in the evening. The hall could even be divided into two separate sections, further enhancing its versatility.


Fig.: Silver Oak

- Mahogany
- Balcony
- Gulmohar
- Jacaranda 1 & 2
- Chinar
- Willow



MAHOGANY

A hall best suited for small gatherings. Ideal for VIP requirements when used in conjunction with the Auditorium.

GULMOHAR

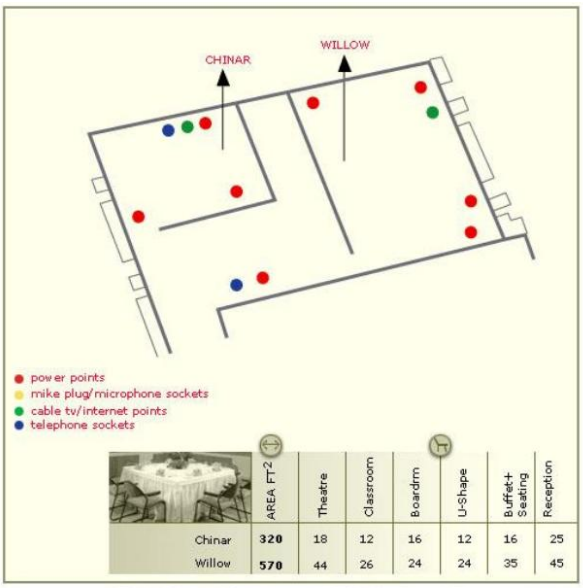
A large fixed seating hall with excellent acoustics and state of the-art multimedia facilities. Each table is equipped with a set of mikes. Ideal for large seminars, corporate presentations, press interactions, product launches etc.



Fig.: Mahogany

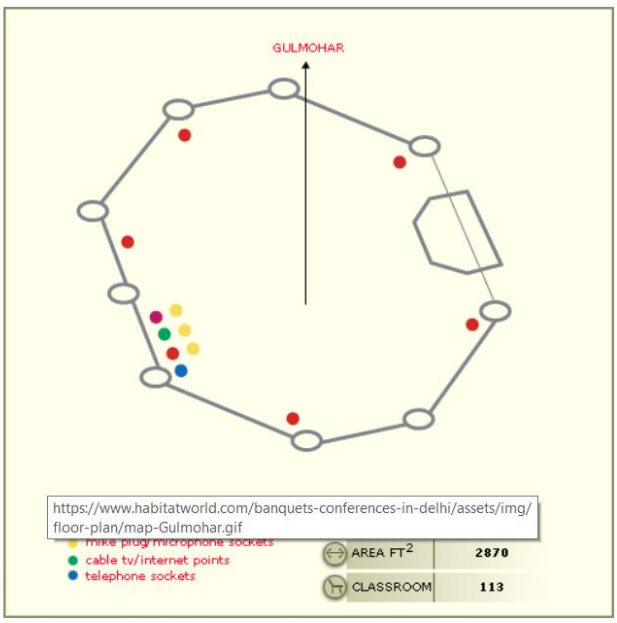


Fig.: Gulmohar



	AREA FT²	Theatre	Classroom	Boardrm	U-Shape	Buffet+ Seating	Reception
Chinar	320	18	12	16	12	16	25
Willow	570	44	26	24	24	35	45

= Seating capacity or arrangement = Area in sq. feet



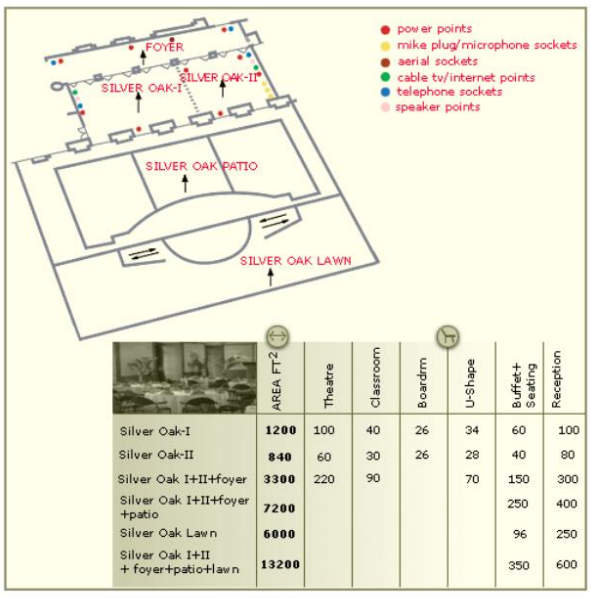
AREA FT²	2870
CLASSROOM	113





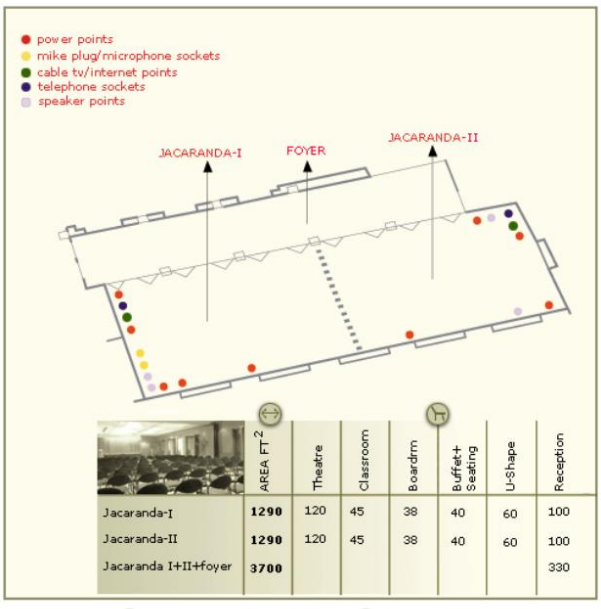






	AREA FT²	Theatre	Classroom	Boardrm	U-Shape	Buffet+ Seating	Reception
Silver Oak-I	1200	100	40	26	34	60	100
Silver Oak-II	840	60	30	26	28	40	80
Silver Oak I+II+foyer	3300	220	90		70	150	300
Silver Oak I+II+foyer +patio	7200					250	400
Silver Oak Lawn	6000					96	250
Silver Oak I+II + foyer+patio+lawn	13200					350	600

= Seating capacity or arrangement = Area in sq. feet



	AREA FT²	Theatre	Classroom	Boardrm	Buffet+ Seating	U-Shape	Reception
Jacaranda-I	1290	120	45	38	40	60	100
Jacaranda-II	1290	120	45	38	40	60	100
Jacaranda I+II+foyer	3700						330

= Seating capacity or arrangement = Area in sq. feet

4.1.11 Area Program

AUTORIUM BLOCK			
SPACE	LEVEL	AREA (m²)	CAPACITY
AUDITORIUM	GROUND FLOOR	576	400
MAHAGONY HALL	FIRST FLOOR	43	24
THE THEATRE	BASEMENT	278	120
KHADAMBA HALL	BASEMENT	57	24
RUDRAKSH	BASEMENT	57	24
AMALTAS	BASEMENT	163	55
TOTAL		**1174**	**647**

FUNCTION BLOCK			
SPACE	LEVEL	AREA (m²)	CAPACITY
MAGNOLIA	BASEMENT	143	60
SILVER OAK I	GROUND FLOOR	111	60
SILVER OAK II	GROUND FLOOR	78	40
SILVER OAK FOYER	GROUND FLOOR	306	150
CHINAR	FIRST FLOOR	29	16
WILLOW	FIRST FLOOR	52	35
GULMOHAR	FIRST FLOOR	266	130
JACARAND I	FIRST FLOOR	119	60
JAKARAND II	FIRST FLOOR	119	60
TOTAL		**1223**	**611**

SERVICE AREA	
SPACE	AREA (m²)
STORAGE	2340
OFFICE	41000
PUMP ROOM	20
WATER TREATMENT PLANT	125
RECYCLING UNIT	25
FIRE FIGHTING	150
WATER SUPPLY PLANT	500
HVAC PLANT	750
TOTAL	**44910**

Table 7.1-1 Area Analysis *[Image Source: Author]*

4.1.12 Services

The building services a 53,000 sq. m. built area With two basements, each 18,000 sq. m. in area, allowing for a parking of 933 cars.

All services are centralized. Upper basement is for car and two wheeler parking and offices. Half of the lower basement is used for car parking and half for the services of air conditioning, electrical panels, D.G. sets water storage and water supply services.

The entire building is air-conditioned and the basements are mechanically ventilated, sprinkler systems are installed in all the useable areas and the complex has its own water purification plant.

Fire escape staircases and lobbies are pressurized to prevent the spread of fire along vertical shafts.

All office spaces have the flexibility of providing their own wet areas, apart from those provided in the central cores. A floor grid provides adjustable connections for power and telephones that can be integrated with the partitioning.

Computerized building management systems have been designed for the efficient operation of all systems, including watering of window boxes and the detection of faults

AIR CONDITIONING : Chilled water system has been used with a capacity of 2700 tons, 100 A.H.U. and IOOF.C.U. (for guestrooms). Generators : 2 nos. of 100 kva for air conditioning 2 nos. Of 500 kva for emergency lighting 1 no. Of 125 kva for building management works.

PLUMBING : 3.5 lacs storage capacity for fire-lighting in upper ground & storage capacity of 12.5 lacs litres in basement for raw and treated water. It is fed by 3 bore wells of IOhp & municipal water supply. Water is first filtered, softened & distribution is done with the help of hydro pneumatic system.

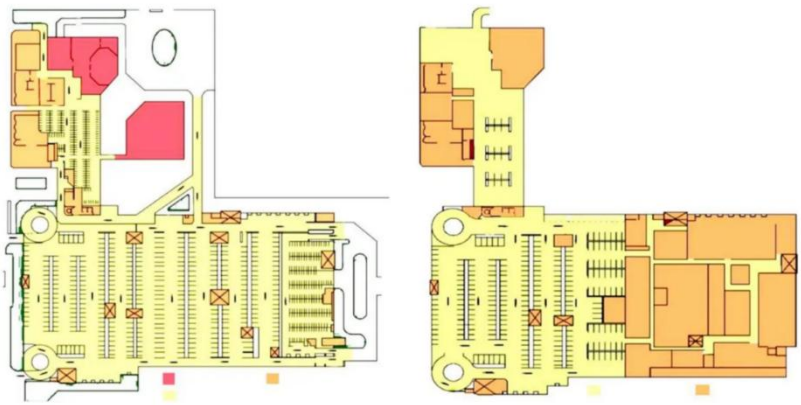
FIRE FIGHTING : Sprinkler system provided in both the basements and automatic fire detector system on upper floors and carbon —dioxide spreading system for electric sub-station. Fire pump room has sprinkle pump, hydrant pump, diesel pump, and (work with diesel in case of power failure). Jockey pump with this, in case of minor leakage pressure is maintained) Fire escape staircase & lobbies are pressurized to prevent the spread of fire.

PARKING : The parking has been consigned to the basement with only landscaped courts occupying the ground or public level. Main parking is in the two basements while parking space for the essential charted busses and private cars is just outside the site, that the parked vehicles don't hog the road. Underground parking area measures around 36000 m2 and has a capacity for 933 cars and about 2000 two wheelers.

- Upper basement; 10546 sq. m.
- Lower basement: 16306 sq. m.
- This amounts to 30% of the gross project area.
- All car & scooters are directed into levels of basements

.I. Parking

- Levels = Upper (stilt) and Basement
- Capacity = 520 in Basement, 60 on Stilt, 500 for 2-wheelers
- Use of ducts for ventilation
- Clear Height = 4.5m
- Grid = 6mx6m



Upper basement (600 cars) *Lower basement (400 cars)*



Fig. 7.1.12 Underground Parking *[Image Source: Author]*

II HVAC

- Use of central AC system in Basement
- 97 AHU's, 20 tons each
- 4 chillers of 300 tons each
- chillers of 600 tons each
- Area consumed = 30m x 25m
- Expansion tank used for maintaining water level
- Cooling tower situated near underground parking entrance.



Fig. 7.1.13 HVAC *[Image Source: Author]*

II Electrical

- 33kV of high-tension electricity is received in building
- 5 steps down transformers converting into 440v.
- Use of 4 diesel generators.
- Area Consumed = 40mx20m
- Total capacity = 10 Mva (Peak load capacity = 4Mva)



Fig. 7.1.14 Substation *[Image Source: Author]*

IV.Water supply

- Underground tank = 1.25 lac liters, 2.5 lac liters, 3.5 lac liters
- 2.5 lac liters is used for plantation daily
- Use of hydropneumatics system for water supply.
- Filter water = 1.25 lac liters
- Area of plant = 20mx25m
- Drinking water = 60,000 liters



Fig. 7.1.15 Water Supply Room *[Image Source: Author]*

V. Fire protection

- Pump Used = DG driven Pump, Jockey pump, Hydrant pump and
- Sprinkler pump
- Sprinklers, heat detectors and fire alarms are used for firefighting.
- Area consumed = 10mx15m
- 3.5 lac liters main tank is used
- ABC type fire extinguishers are installed.



Fig. 7.1.16 Fire Pump Room *[Image Source: Author]*

VI.Security

- Two rooms of 6mx4m are used as control room.
- CCTV is installed in entire building
- Bag scanning system

VII.Sewage Treatment Plant (STP)

- Oil discharge is conducted manually in collection sump.
- Aeration sump is supported by 2 tanks
- 240 min cycle one at time in air filter
- Activated carbon filter
- Filtered water is used in flushing



Fig. 7.1.17. STP *[Image Source: AITSAP, Library, Noida]*

4.1.13 Landscaping

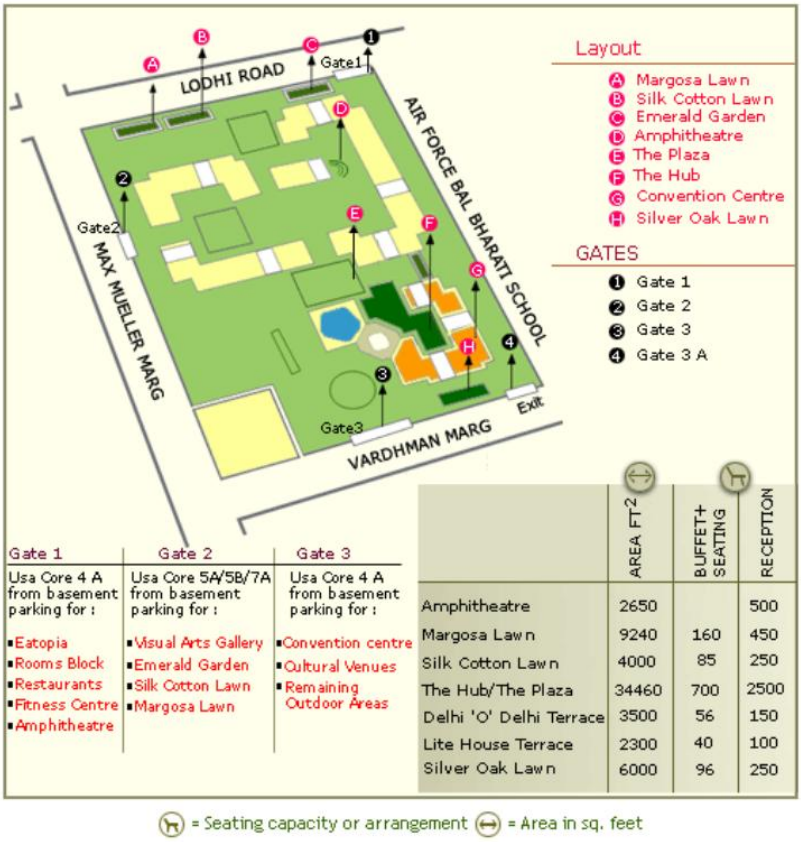
The entire building is provided with green courtyard and lawns. Use of native plants has been the first priority while considering landscaping features. Plants over the window slot gives a pleasant appearance with the combination of façade materials.



Fig. 7.1.18 Courtyard view *[Image Source: Author]*

Sustainability Features

The interesting blue sunshade provided between two buildings in court helps maintain a comfort environment and has a cooling effect. The trees help maintain a green environment. Fountains make the environment cooler & give an effect of lightness. The building is planned in such a way that maximum part of the floor enjoys sunlight. Sunlight is also allowed in the basernent through interesting glass and metal structures in the courtyards.



Gate 1	Gate 2	Gate 3
Usa Core 4 A from basement parking for :	Usa Core 5A/5B/7A from basement parking for :	Usa Core 4 A from basement parking for :
▪Eatopia ▪Rooms Block ▪Restaurants ▪Fitness Centre ▪Amphitheatre	▪Visual Arts Gallery ▪Emerald Garden ▪Silk Cotton Lawn ▪Margosa Lawn	▪Convention centre ▪Cultural Venues ▪Remaining Outdoor Areas

	AREA FT^2	BUFFET+ SEATING	RECEPTION
Amphitheatre	2650		500
Margosa Lawn	9240	160	450
Silk Cotton Lawn	4000	85	250
The Hub/The Plaza	34460	700	2500
Delhi 'O' Delhi Terrace	3500	56	150
Lite House Terrace	2300	40	100
Silver Oak Lawn	6000	96	250

= Seating capacity or arrangement = Area in sq. feet

INFERENCE

- The IHC has different building volumes articulated to form interconnected internal courtyards, which are major public space and bridges connecting these blocks.
- The space has distinct identity to it conducive to type of function or activities anticipated. This has been achieved by paving patterns in different material, the use of water and a play of levels and plants.
- The space is highly pedestrian friendly and universally accessible.
- The climate responsive features make it more efficient along with exposed brickwork and landscape is a major contribution.
- The segregation of blocks as per its use while still being connected greatly fulfills the function of the building.
- Vehicular movement restricted to the periphery.
- The public spaces are inward looking with volumes containing the inside from inside.
- Effective zoning for handling crowds.

4.1.14 ARCHITECTURAL FEATURES

BUILT FORM :

- The I.H.C. has different Building volumes articulated to form interconnected internal courtyards, which are the major public spaces.
- The service cores rise to maximum height, above rest of the structure creating interesting blocking.
- Building blocks are linked at the fifth and sixth floor level and above by bridges to form framed huge gateways for entrance to various zones/court.
- The bridges form framed view & vistas and complete the character of the enclosed courts.
- The roof of the building is designed as a series of terraces accessible from various offices and restaurants.

FACADE :

- The external and internal-court-facing facades are very thoughtfully articulated.
- The external facades, presenting a stable, almost classic appearance with more of HUDCO favored brick masonry and less glazing;
- The internal facades supporting light hanging gardens with strip windows characterizing the fagade.
- The exterior elevations posses a visually solid, well detailed base', a simple middle' and a 'cornice' on top in the form of an entire floor cantilevering out on brackets.
- The external faces have been given a more formal quality, to act as a foreground for the building.
- The facades abound in window boxes, where plants will further soften the wall surfaces.
- Plaster and exposed brickwork and ceramic tiles on concrete planters.China mosaic tiles have been used as an additional finish material to add reflective ness and color in the courtyards.
- Roof is finished / covered with white ivory china mosaic.
- Anodized aluminum frames for the windows are used.
- Kota stone, first class bricks, sand stone etc. have been used in the courtyards.



Fig.: Exposed Brick Facade



Fig.: Exposed RCC

FINISHES :

- The external finish for the building was originally visualized in brushed aggregate (grit), carefully controlled to result in a dark base that became progressively lighter as the building was viewed against the sky. This could not be implemented because of the lack of skilled labor.
- Brick that symbolizes habitat better is used in the Exterior.
- Exposed Brickwork With exposed R.C.C in cantilevered corridors.
- Ceramic Tiles-Green, Red & Grey used in Extensions to define verticality and also in Interiors of Lobby, Lifts to give an effect of flow.

LANDSCAPING :

- Each internal courtyard has been designed to impart a distinct-identity to the spaces and is conducive to the type of functions or activities that can be anticipated.
- This has been achieved by paving patterns in different materials, the use Of water, a play of levels and plants.
- Palm trees have been planted to create a refreshing environment inside.
- Sculptures have been placed at strategic points creating an element Of interest.
- Water ponds are provided to cut the rigidity of harsh materials.
- Stepped planters serve as sitting space too.
- The rcx»f of the building, too, is designed as a series of terraces, which have been entirely converted into roof gardens.
- The external spaces have a more formal quality, to act as a foreground for the building. The facades abound in window boxes, where plants further soften the wall surfaces.





4.1.15 INFERENCES

By bringing together a number of institutes from various habitat related professions in one complex, the complex problems of meeting facilities, coordination between different professionals and the problems like car parking, food services etc. have been smartly solved.

• The blocks have been functionally demarcated — North block comprises office space and ancillary facilities are in south-block — resulting in well coordinated spaces.

• The articulation of the blocks has been largely successful in achieving the design objectives. Computerized building management system has been designed for the fficient operation of all systems, including watering of window boxes and the detection of faults.

The grouping of 6-7 story building blocks has been done around climate tempered

courtyards, which has enlivened up the atmosphere inside the complex.

• Facade treatment on the exterior presents a very stable and strong visual effect by use of special bricks whereas the inner facades are very light, delicate and support light hanging gardens.

• The structure of the building is thought-fully designed R.C.C. framed structure, which has created flexible spaces in the interior.

• Vehicular movement is restricted only to the periphery of the site with only pedestrian movement allowed inside the blocks creating a very clean environment. Parking has been kept in the basement allowing rest of the site to be landscaped.

4.2 HYDERABAD INTERNATIONAL CONVENTION CENTRE

AREA:
Total site area: 128,901.01 sq.mt (31 acres)
Site area for HICC: 15 acres
HICC ground coverage: 15,922.3 sq.mt (3.93 acres
Total built up area: 34,634.84 sq.mt
Novotel hotel ground coverage: 2311.14 sq.mt
Built up area: 13,866.84 sq.mt
Total built up area, Novotel and HICC: 52,640,29 sq.mt
Achieved F.A.R,: 0.408 sq.mt

4.2.1 Introduction

Hyderabad international convention centre is India's first purpose built and state of the art convention facility managed by accor hotels, the world's leading hospitality and tourism management group.

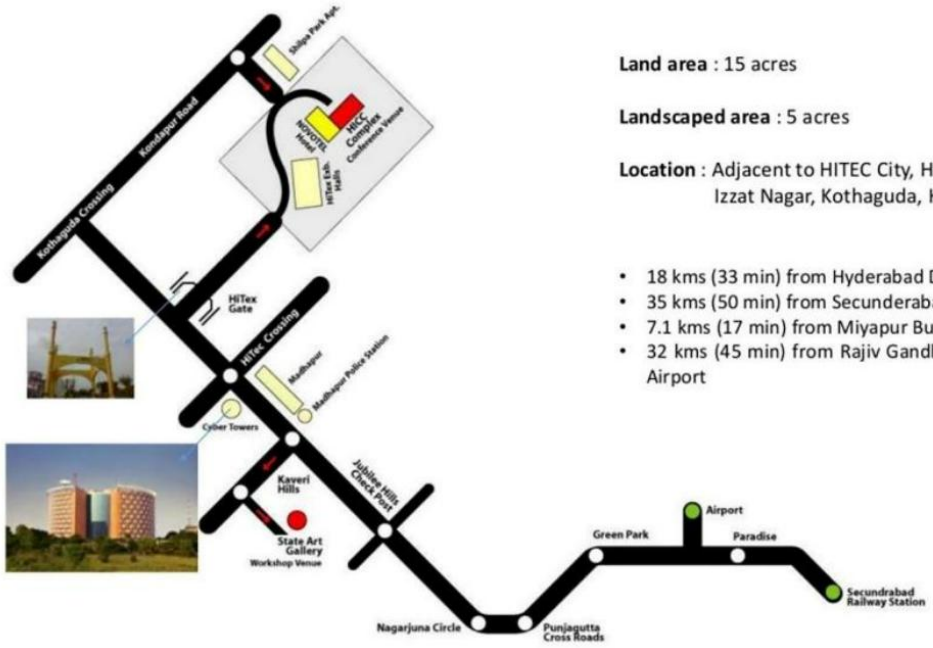
The Hyderabad international convention centre (hicc) is a state-of-the-art convention facility located in Hyderabad, india. It is one of the premier convention centers in south asia and has hosted several national and International conferences, meetings, and events. The hicc has a total area of over 400,000 square feet, and it offers world-class amenities and services to its Guests. The facility has a total seating capacity of up to 6,500 people, making it ideal for hosting large-scale Events.

The hicc is equipped with advanced audio-visual technology, high-speed internet connectivity, and Simultaneous interpretation services to cater to the needs of event organizers and participants. The hicc is managed by accor, a leading hospitality company, and is part of the Hyderabad international trade Expositions limited (hitex) complex. The hitex complex also includes a modern exhibition center and a luxury

Hotel. The hicc is conveniently located in the heart of Hyderabad's it district, making it easily Accessible from Major transportation hubs in the city.
The hicc has won several awards and accolades for its world-class facilities and services. It is an ideal venue For hosting international conferences, trade shows, exhibitions, and other events, and has played host to Several high-profile events over the years.

4.2.2 Location

Novotel & HICC complex (adjacent to hitec city), p o bag 1101 Cyberabad post office,
500081 Hyderabad, India
Latitude: 17.472219; longitude: 78.372603



Land area : 15 acres

Landscaped area : 5 acres

Location : Adjacent to HITEC City, HI-TEX Gate, Izzat Nagar, Kothaguda, Hyderabad.

- 18 kms (33 min) from Hyderabad Deccan Station
- 35 kms (50 min) from Secunderabad Station
- 7.1 kms (17 min) from Miyapur Bus Stop NH-9
- 32 kms (45 min) from Rajiv Gandhi International Airport

AMENITIES AT HICC

Some of the world-class features that HICC offers are:

- State-of-the-art its infrastructure, design, technology, telecommunications and av equipment
- Pillar-less internal hall of net 6480 sqm that can hold a 6000-delegate plenary and can be partitioned into 6 smaller halls
- Best meeting & conference venue with a spacious pre-function foyer area
- 37 breakout rooms, including specialized meeting rooms, speaker preparatory room, boardrooms,
- VIP lounge
- 12.5 meters high ceiling, roof cat walkers and truss to withhold heavy suspension
- Service pits every 6 meters, with power, water, internet etc.
- In-house 5-star banqueting service

HICC is connected to Novotel Hyderabad convention center: an international business hotel. It has 288 rooms and is equipped with meeting rooms, restaurants, business center, spa and a health club. It is also the best south India travel awards winner admired for its outstanding service.



Figure 62 reception lobby



Figure 61 auditorium



Figure 60 bussiness center

KEY FEATURES



Figure 63 Aminities at main hall

I. Meeting rooms and convention halls: HICC Hyderabad features a variety of Meeting rooms and convention halls, including a large main hall that can Accommodate up to 6,500 people. All of the meeting rooms and convention halls Are equipped with the latest audiovisual technology.

PURPOSE BUILT FACILITIES

a pillar-less main hall spanning over 6480 sq. M. Which can be partitioned into six smaller halls with advanced design, technology, telecommunication and Av equipment along with a pre-function foyer area exceeding 6500 sq. M.

EVENT PLANNING

HICC events team works dedicatedly to ensure seamless integration and implementation of events.

ACCESS AND TRAVEL

40 minutes from Rajiv Gandhi international airport.

35 minutes from Secunderabad railway station.
10 minutes from Madhapur metro station.

CEILING HEIGHT
clear ceiling height of 12.5m with rooftop catwalk and truss to withhold heavy suspension.

5-STAR HOTEL
adjacent to Novotel Hyderabad convention centre, a 5-star hotel with 288 rooms, assuring a
premium quality banquet experience.

RIGGING BEAM
each beam has a suspension capacity of one tonne.
SERVICE PITS & POWER SUPPLY
service pits at every six metres with power, water, and internet supply. 100% power back-up.

BREAKOUT VENUES AND REGISTRATION AREA
37 breakout venues come with 16-seater registration area.

LOADING DOCK
secure and managed loading dock with tailor-made capacities.

VIP LOUNGE AND ORGANIZER SUITE
separate lounge for VIP delegates and suites with private workspace for event organizers.

2.Buslness Center: the convention center has a fully equipped business center That offers a range of services, including photocopying, printing, scanning, and Secretarial services.

4.Caterlng services: hicc hyderabad offers a range of catering services, from Coffee breaks And snacks to full-service banquets and receptions.

5.Parklng: the convention center has a large parking lot that can accommodate Over 2,500 cars.

6.Accommodatlon: there are several hotels located near hicc hyderabad, Including the novotel hyderabad convention centre, which is connected to the Convention center by a walkway.

7.Transportatlon: hicc hyderabad offers transportation services, including

Airport transfers and local transportation for attendees.

8.Securlty: the convention center has 24-hour security, including cctv Surveillance and on-site security personnel.

9.Accesslbllty: hicc hyderabad is fully accessible for people with disabilities, With ramps, elevators, and wheelchair-friendly facilities.

ACTIVITY PLACEMENT

PRIMARY	SECONDARY	TERTIARY
CONVENTION HALL (6)	MEETING ROOM B (8)	CLUB (1)
AREA- 6480 SQ.MT	AREA: 756 SQ.MT	PANTRY (1)
CAPACITY- 6500	CAPACITY- 350	FACILITY OFFICE (2)
MEETING ROOM A (14)	GALLERY SITTING (3)	AV OPERATION (1)
AREA: 1764 SQ.MT	AREA: 1300 SQ.MT	STORAGE (4)
CAPACITY – 700	CAPACITY- 2600	INTERPRETATION BOOTH (6)
WASHROOMS A (10)	WASHROOM B (2)	BREAKOUT ROOMS (32)
ORGANISERS OFFICE (2)	VIP LOUNGE (1)	
RECEPTION	SPEAKER'S PREPARATION (4)	
ADMIN OFFICE	REGISTRATION	

PUBLIC
SEMI PRIVATE
PRIVATE

Table 1 activity placement in HICC

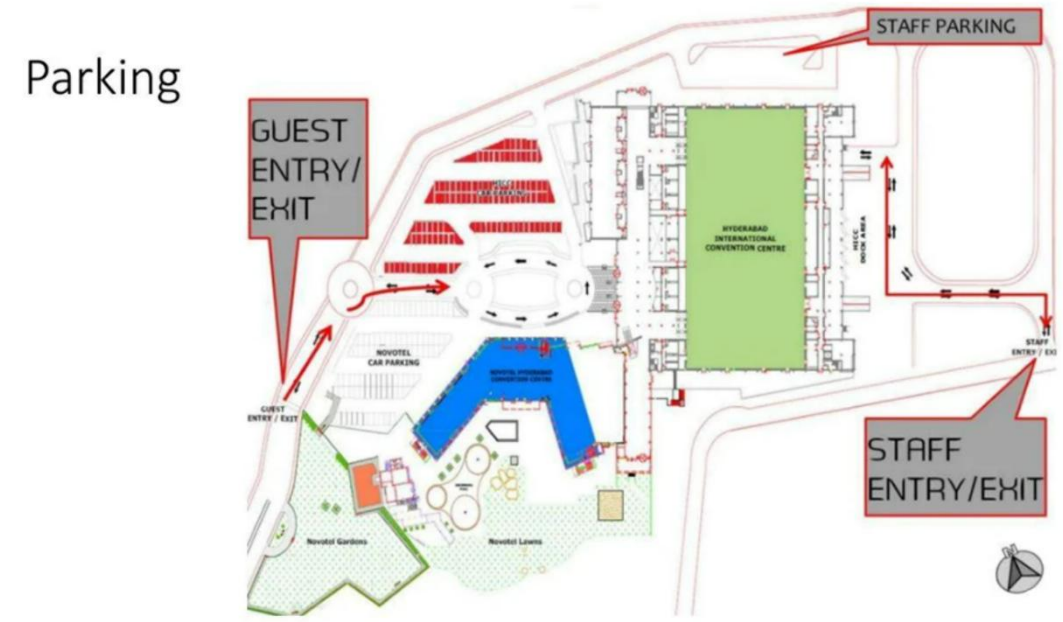


Figure 67 Parking; entry/ exit points at HICC

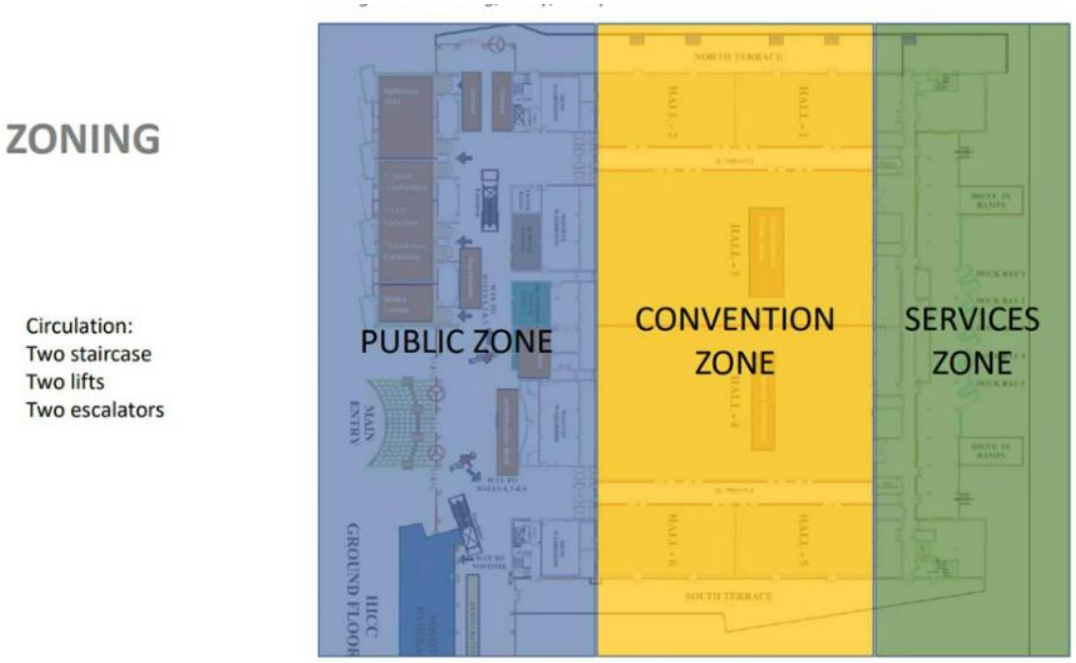


Figure 66 Zoning at HICC

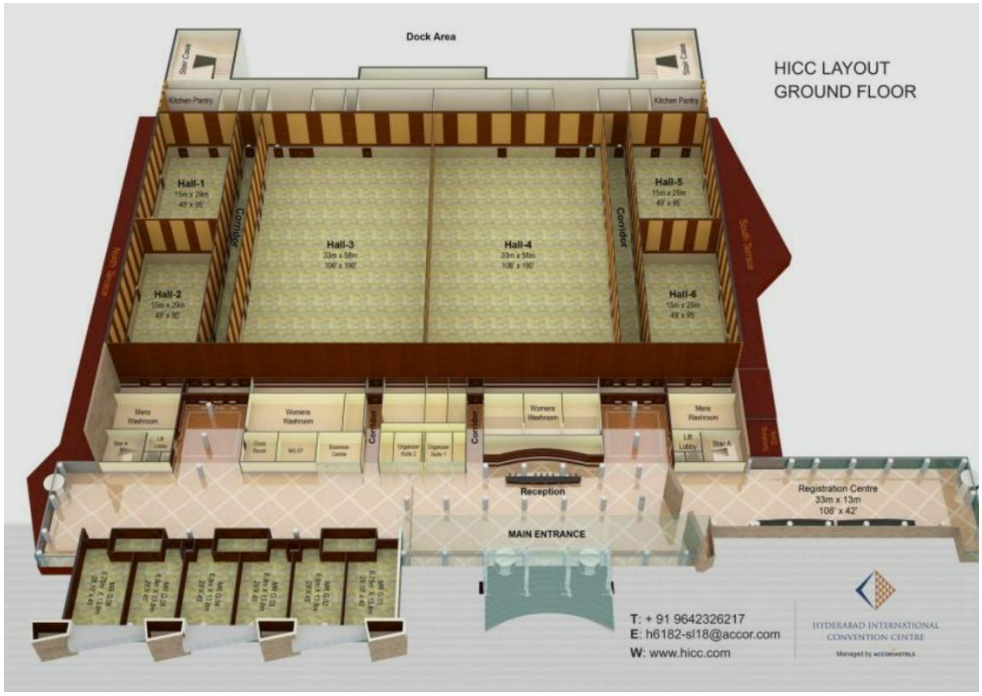
- The convention centre features a modern, streamlined design with clean lines and large, open spaces. The building is constructed of glass, steel, and concrete, which not only gives it a modern look but also allows for ample natural light to enter the building.
- One Of the key features Of the design Of HICC Hyderabad is its flexibility. The convention centre can be configured to host a wide range of events, from small meetings and seminars to large-scale conventions and exhibitions. The main hall, which can accommodate up to 6,500 people, can be divided into smaller spaces to accommodate different events and functions.
- Another important aspect of the design of HICC Hyderabad is its sustainability. The convention centre was designed with several eco-friendly features, including rainwater harvesting, energy-efficient lighting and air conditioning systems, and the use of recycled and locally sourced materials.
- Overall, the concept behind the design of HICC Hyderabad was to create a world-class convention centre that would be both functional and visually striking, while also taking into consideration the local culture and environment.

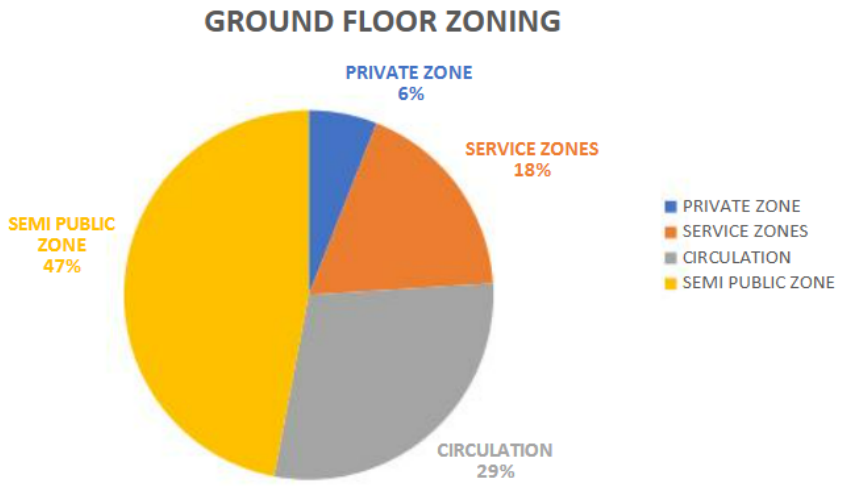


Figure 68 banquet hall;

Figure 69 vip reception lobby

4.2.3 GROUND FLOOR

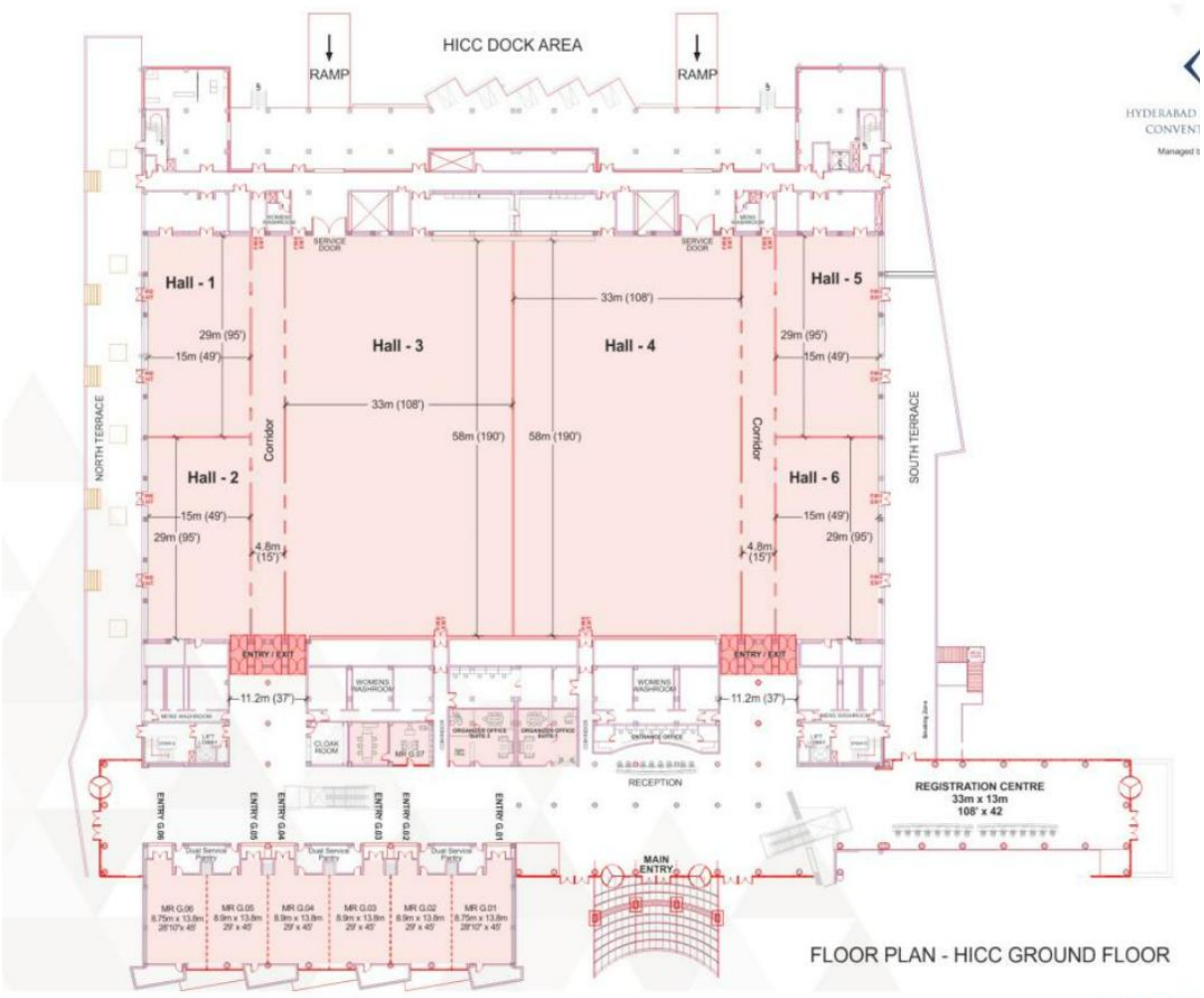


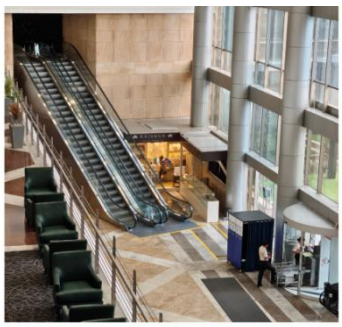
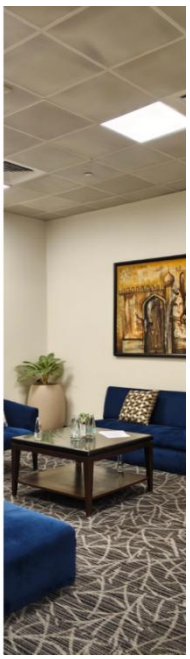


- PUBLIC AREAS SUCH AS RECEPTION, MAIN HALL, RESTAURANTS, ORGANISER'SOFFICES.
- FEXIBLE ROOMS ARE MEANT FOR THE GENERAL PUBLIC AND DELEGATES.

ADMINISTRATIVE AREA

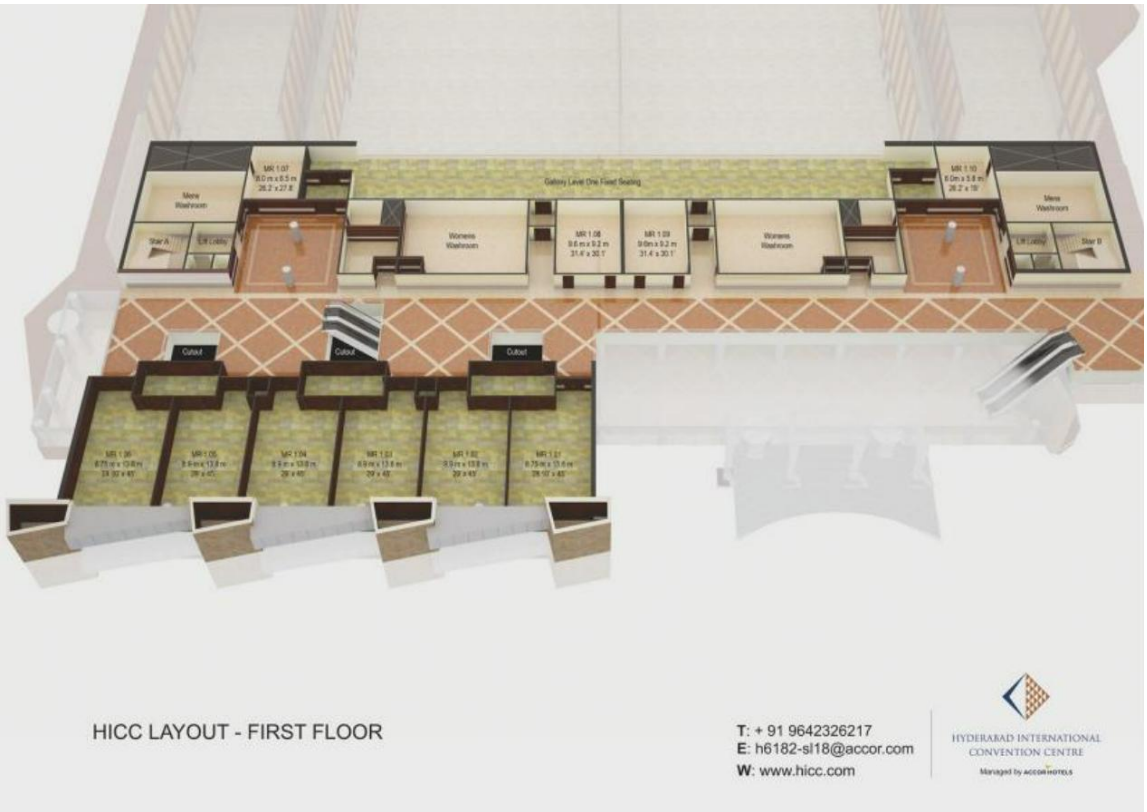
- CIRCULATION: 2 STAIRCASES, 2 LIFTS, 2 ESCALATORS
- RECEPTION
- ORGANISATION MANAGER'S OFFICE
- BANQUET MANAGER'S OFFICE
- ORGANISERS OFFICE (WAITING LOUNGE, MEETING SPACE AND OFFICE)
- BUSSINESS CENTRE


HICC DOCK AREA
RAMP
RAMP
Hall - 1
Hall - 2
Hall - 3
Hall - 4
Hall - 5
Hall - 6
33m (108')
29m (95')
15m (49')
58m (190')
Corridor
NORTH TERRACE
SOUTH TERRACE
ENTRY / EXIT
WOMENS WASHROOM
11.2m (37')
RECEPTION
REGISTRATION CENTRE
33m x 13m
108' x 42
MAIN ENTRY
FLOOR PLAN - HICC GROUND FLOOR

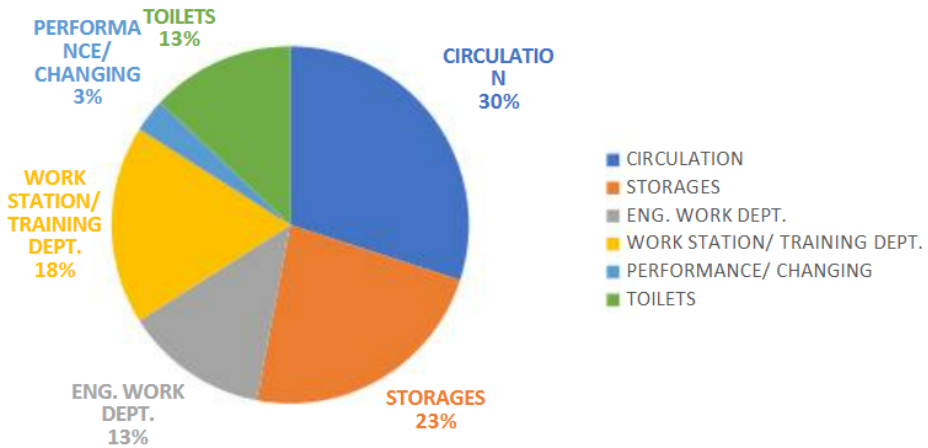







4.2.4 FLOOR FLOOR

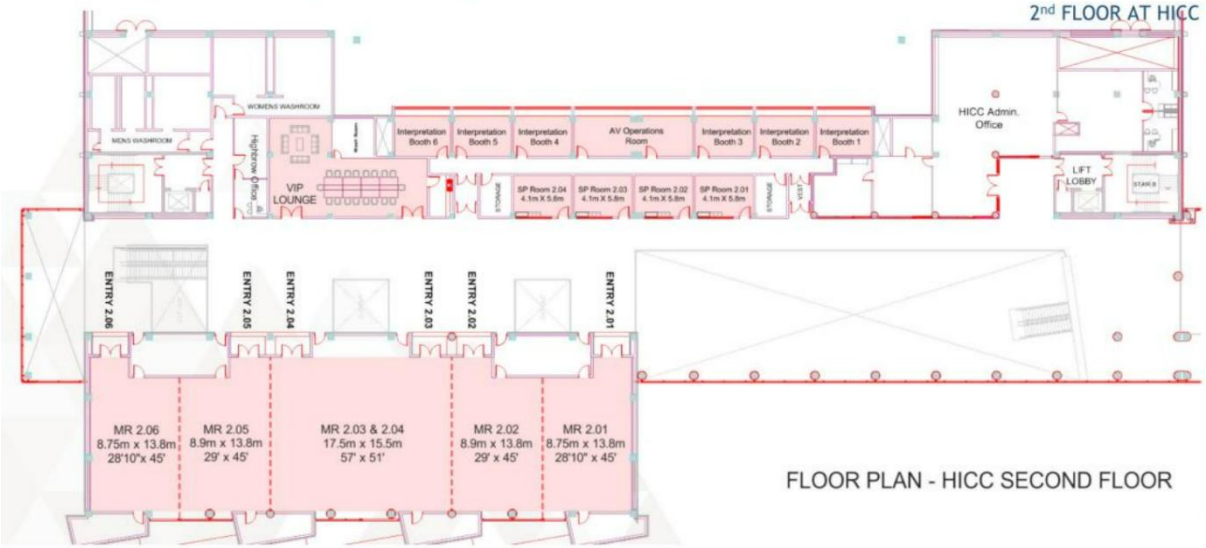


FIRST FLOOR ZONING

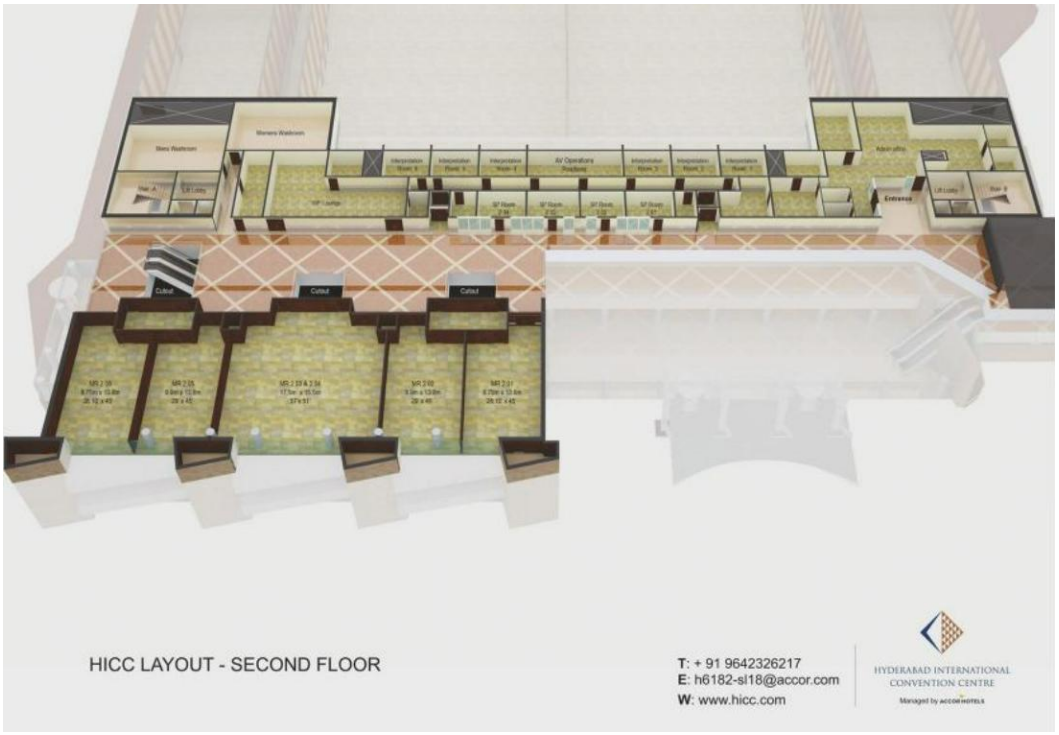


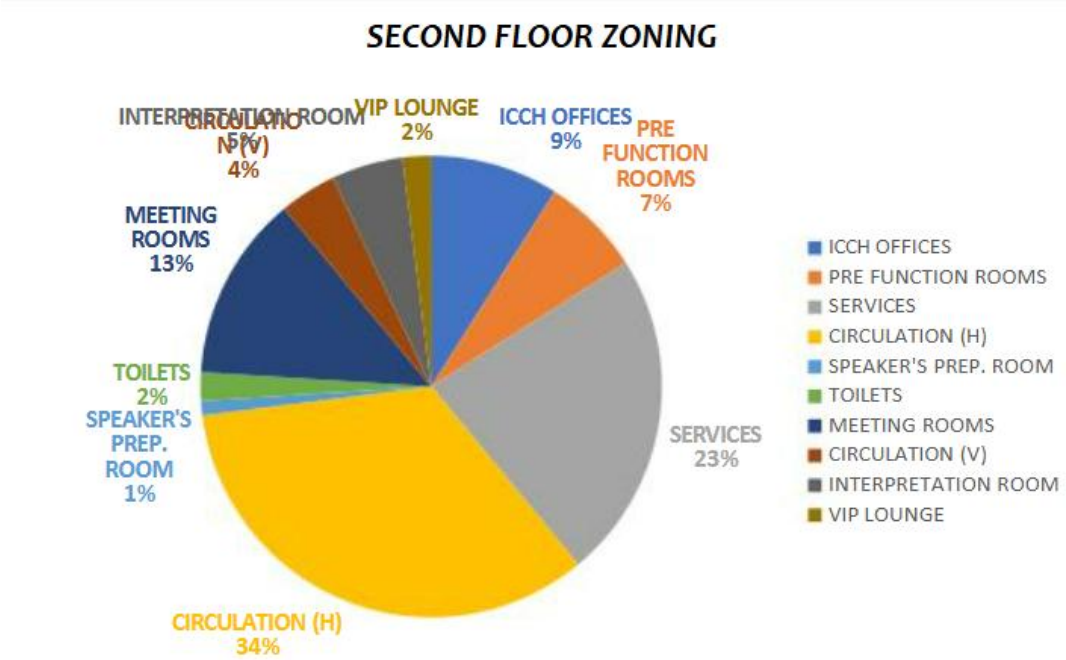
- BOARD ROOMS
- BUSSINESS CENTRES
- GALLERY SEATINGS
- FLEXIBLE ROOMS ARE MEANT FOR BUSSINESS OFFICIALS


1st FLOOR AT HICC
GALLERY
1st LEVEL
MR 1.07
MR 1.10
MENS WASH-ROOM
LIFT LOBBY
IT Office
WOMENS WASHROOM
MR 1.08
MR 1.09
VPC
ENTRY 1.06
ENTRY 1.05
ENTRY 1.04
ENTRY 1.03
ENTRY 1.02
ENTRY 1.01
Dual Service Pantry
MR 1.06 8.75m x 13.8m 28'10"x 45'
MR 1.05 8.9m x 13.8m 29' x 45'
MR 1.04 8.9m x 13.8m 29' x 45'
MR 1.03 8.9m x 13.8m 29' x 45'
MR 1.02 8.9m x 13.8m 29' x 45'
MR 1.01 8.75m x 13.8m 28'10" x 45'
FLOOR PLAN - HICC FIRST FLOOR


2nd FLOOR AT HICC
MENS WASHROOM
WOMENS WASHROOM
Highrow Office
VIP LOUNGE
Interpretation Booth 6
Interpretation Booth 5
Interpretation Booth 4
AV Operations Room
Interpretation Booth 3
Interpretation Booth 2
Interpretation Booth 1
HICC Admin. Office
LIFT LOBBY
SP Room 2.04 4.1m X 5.8m
SP Room 2.03 4.1m X 5.8m
SP Room 2.02 4.1m X 5.8m
SP Room 2.01 4.1m X 5.8m
STORAGE
VEST
ENTRY 2.06
ENTRY 2.05
ENTRY 2.04
ENTRY 2.03
ENTRY 2.02
ENTRY 2.01
MR 2.06 8.75m x 13.8m 28'10"x 45'
MR 2.05 8.9m x 13.8m 29' x 45'
MR 2.03 & 2.04 17.5m x 15.5m 57' x 51'
MR 2.02 8.9m x 13.8m 29' x 45'
MR 2.01 8.75m x 13.8m 28'10" x 45'
FLOOR PLAN - HICC SECOND FLOOR

4.2.5 SECOND FLOOR





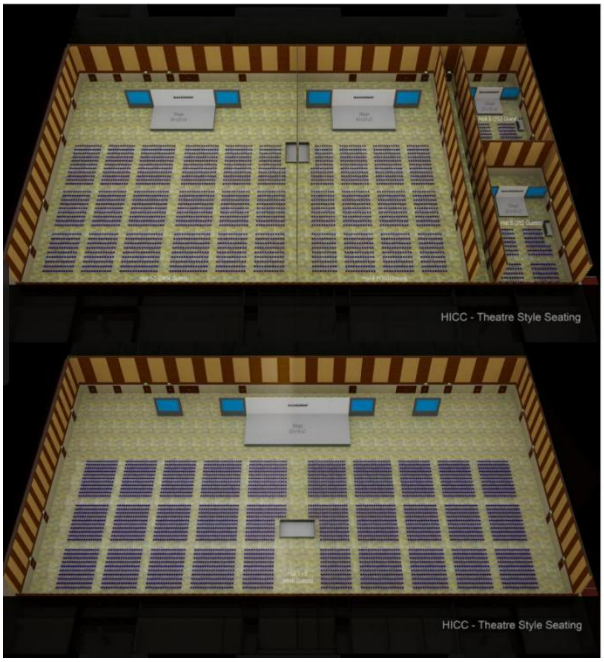
THE SECOND FLOOR CATERS TO HIGH PROFILE GUESTS HAVING THE CONFERENCE ROOMS, VIP LOUNGES, MEETING ROOMS AND HICC ADMIN OFFICES.

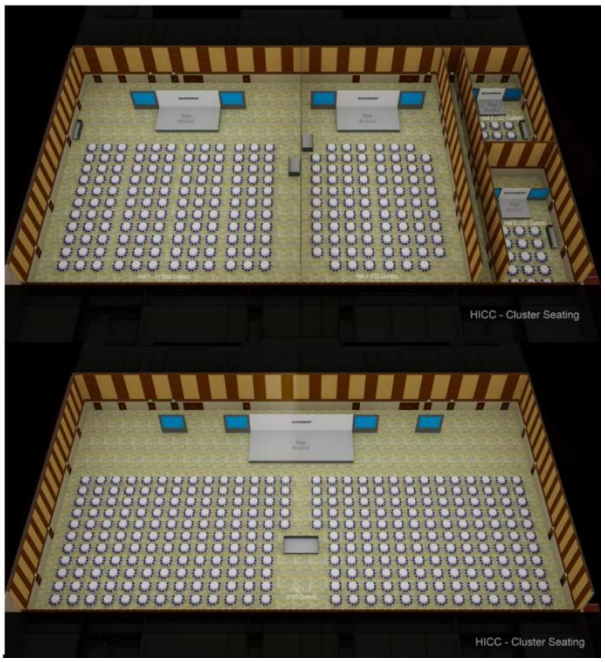
Venue	Theatre Back Projection	Theatre Front Projection	Classroom Back Projection	Classroom Front Projection	Cluster Back Projection	Cluster Front Projection	U-Shape	Board Room	Area in Square Metres	Area in Square Feet	Ceiling Height in Metres	Ceiling Height in Feet	L X B (Metres)	L X B (Feet)
GROUND FLOOR														
Organizer's Suite 1									56	602	2.9	9.5		
Organizer's Suite 2									62	667	2.9	9.5		
Registration Centre									429	4616	3.2	10.5	33 X 13	108 X 42
Convention Hall - 1	250	300	125	150	125	150			442	4760	12.5	42	15 X 29.5	49 X 96
Convention Hall - 2	250	300	125	150	125	150			442	4760	12.5	42	15 X 29.5	49 X 96
Convention Hall - 3	1350	1500	750	850	600	725			1914	20600	12.5	42	33 X 58	108 X 190
Convention Hall - 4	1350	1500	750	850	600	725			1914	20600	12.5	42	33 X 58	108 X 190
Convention Hall - 5	250	300	125	150	125	150			442	4760	12.5	42	15 X 29.5	49 X 96
Convention Hall - 6	250	300	125	150	125	150			442	4760	12.5	42	15 X 29.5	49 X 96
Corridor 'A' or Corridor 'B'									283	3046	12.5	42	4.8 X 59	16 X 192
Hall - 1&2 or Hall - 5&6	700	800	400	425	350	400			885	9522	12.5	42	15 X 59	49 X 192
Convention Hall - 1&2 + Corridor or Hall - 5&6 + Corridor	850	950	575	625	450	525			1168	12568	12.5	42	19.8 X 59	65 X 192
Convention Hall 1-3 or Hall 4-6	2400	2800	1300	1450	1050	1250			3074	33076	12.5	42	53 X 58	173 X 190
Convention Hall - 3&4	3000	3500	1700	1900	1400	1700			3857	41500	12.5	42	66.5 X 58	216 X 190
Convention Hall 1 - 4 or Hall 3-6	4000	4600	2200	2400	1750	2100			5017	53982	12.5	42	86.5 X 58	284 X 190
Convention Hall 1 - 6	4850	5800	2750	3000	2200	2650			6177	66464	12.5	42	106.5 X 58	348 X 190
Meeting Room G.01		80		50		40	30	25	125	1345	2.9	9.5	8.75 X 13.1	29 X 43
Meeting Room G.02		80		50		40	30	25	127	1367	2.9	9.5	8.9 X 13.1	29 X 43
Meeting Room G.03		80		50		40	30	25	125	1345	2.9	9.5	8.9 X 13.1	29 X 43
Meeting Room G.04		80		50		40	30	25	127	1367	2.9	9.5	8.9 X 13.1	29 X 43
Meeting Room G.05		80		50		40	30	25	125	1345	2.9	9.5	8.9 X 13.1	29 X 43
Meeting Room G.06		80		50		40	30	25	127	1367	2.9	9.5	8.75 X 13.1	29 X 43
Meeting Room G.07									75	800	2.9	9.5	12.2 X 6.2	40 X 20
FIRST FLOOR														
Meeting Room 1.01		80		50		40	30	25	127	1367	2.3	7.5	8.75 X 13.1	29 X 43
Meeting Room 1.02		80		50		40	30	25	125	1345	2.3	7.5	8.9 X 13.1	29 X 43
Meeting Room 1.03		80		50		40	30	25	127	1367	2.3	7.5	8.9 X 13.1	29 X 43
Meeting Room 1.04		80		50		40	30	25	125	1345	2.3	7.5	8.9 X 13.1	29 X 43
Meeting Room 1.05		80		50		40	30	25	127	1367	2.3	7.5	8.9 X 13.1	29 X 43
Meeting Room 1.06		80		50		40	30	25	125	1345	2.3	7.5	8.75 X 13.1	29 X 43
Meeting Room 1.07								12	46	400	2.3	7.5	5.8 X 8.0	19 X 26
Meeting Room 1.08								14	88	947	2.3	7.5	9.2 X 9.6	30 X 31
Meeting Room 1.09								14	88	947	2.3	7.5	9.2 X 9.6	30 X 31
Meeting Room 1.10								12	46	400	2.3	7.5	5.8 X 8.0	19 X 26
SECOND FLOOR														
Meeting Room 2.01		80		50		40	30	25	125	1345	2.3	7.5	8.75 X 13.1	29 X 43
Meeting Room 2.02		80		50		40	30	25	127	1367	2.3	7.5	8.9 X 13.1	29 X 43
Meeting Room 2.03 & 2.04		180		120		104	54	44	274	2948	2.3	7.5	17.9 X 15.3	58 X 50
Meeting Room 2.05								20	125	1345	2.3	7.5	8.9 X 13.1	29 X 43
Meeting Room 2.06								20	127	1367	2.3	7.5	8.75 X 13.1	29 X 43
V I P Lounge		54		36		36	27	18	115.8	1247	2	7		
Speaker's Preparation Booth 1 or 2 or 3 or 4 (each)									23.7	255	2.3	7.5	4.1 X 5.8	13 X 19

NOTES:

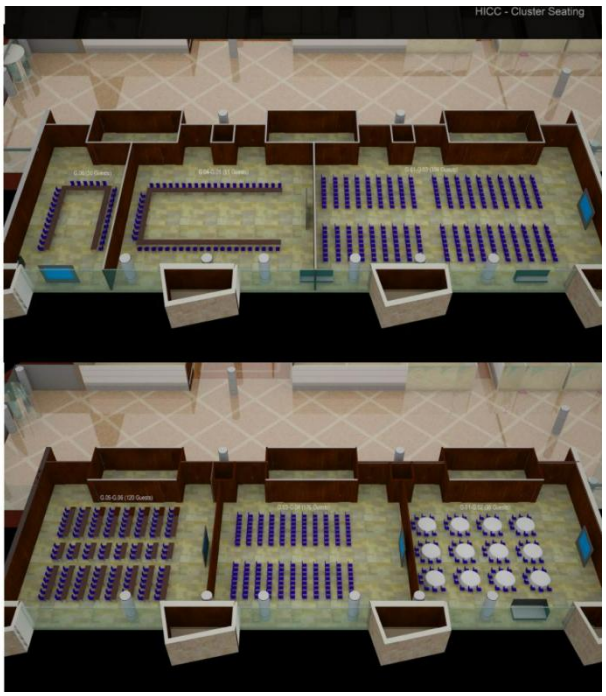
The above seating capacities are considering the stage sizes as below.
For Hall : 1, 2, 5 or 6 stage size is 20' x 16'
For Hall : 3 or 4 stage size is 40' x 24'
For Hall : 1-3, 4-6, 1-4, 3-6 or 3&4 stage size is 48' x 24'
For Hall : 1-6 stage size is 80' x 32'
The seating capacity of any / all the halls may vary in case of customised AV (or) stage requirements.

HYDERABAD INTERNATIONAL CONVENTION CENTRE
Managed by ACCOR HOTELS

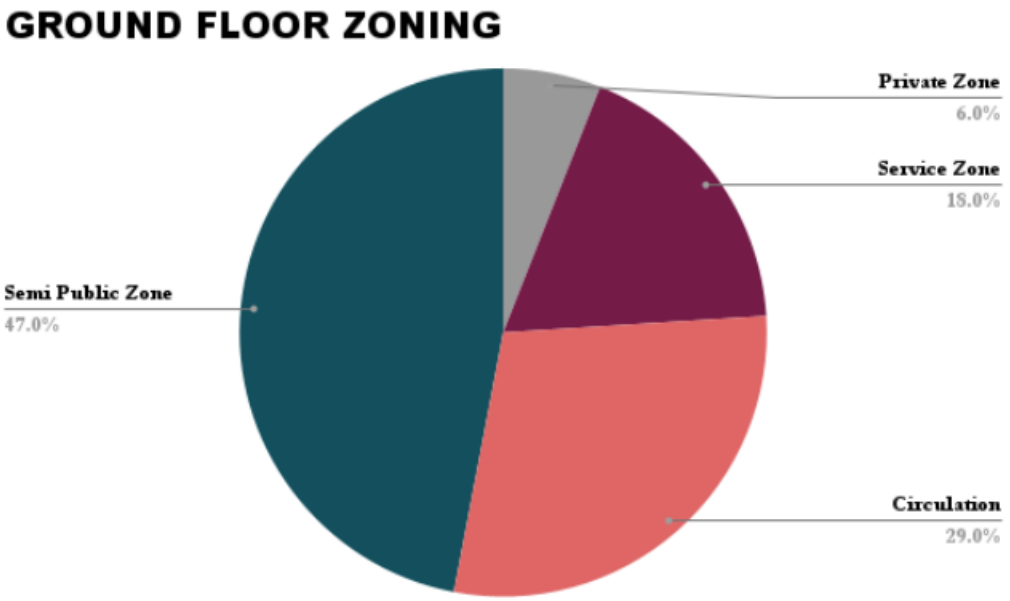

HICC - Theatre Style Seating
HICC - Theatre Style Seating


HICC - Cluster Seating
HICC - Cluster Seating


HICC - Theatre Style Seating


HICC - Cluster Seating

4.2.6 Zoning



Ground Floor:

- Lobby
- Reception
- Business Lounge
- Retail
- Meeting Room (2 Types) - Pantry Service attached
- 6 Partitionable Meeting Rooms
- Cloakrooms
- Restrooms

4.2.7 Column Free Main Hall

To design the 68 m column-free space, a steel lattice structure was selected. The bottom had to remain flat to accommodate the partition walls, and these lattices were spaced at 27 m intervals. A single lattice was insufficient for such a large span, so a double lattice with lateral connections was planned to reduce the height of the lattice and control deflection.
Supporting such a large lattice span required columns with significant moment capacity. Balancing the large end moments posed a challenge, so a configuration of four columns on either side was adopted.
This design converted the large end moments into axial compression with bending for the inner columns and axial tension with bending for the outer columns. By mounting the lattice on top of the columns, this configuration simplified the structure and allowed for a more economical design.

4.2.8 Challenges

The challenges were significant, starting with the creation of a column-free space measuring 68 meters by 120 meters. The design also required the ability to divide the hall into four, three or two separate halls using partition walls. These partitions, running both along the length and across the width of the hall, imposed a substantial load of 1.2 tonnes per metre, which needed to be suspended from the roof.

Another challenge was the storage of all partition walls in two rooms located at the extreme ends of the hall, with a total load of 120 tonnes also suspended from the roof. Additionally, the construction of

a 120 m-long catwalk presented its own set of complexities.

Anticipating challenges during the erection process, provisions were made to ensure that any potential issues could be addressed to prevent untoward incidents.

4.2.9 Design and inferences

Hall 4 at HITEX follows the ACE concept, used in the textures and panelling of the convention centre. This design ensures that every line faces upwards, symbolising integrity and the aspiration to rise, reflecting a dynamic and uplifting architectural language.

Design and Orientation Features of Hall 4 at HITEX:

- Modular Design: Can be divided into four smaller halls using movable partitions.
- Track System: Partitions hang from tracks for flexibility in space usage.
- Common Lobby: Central lobby created between the divided halls.
- Advanced Systems: Equipped with modern sound, lighting, and dimming systems.
- Acoustic Treatment: Designed for sound control with absorbers and diffusers.
- HVAC Placement: Ducts are positioned near the top slab for efficient air distribution.
- Conference Rooms: Four acoustically treated rooms on the upper floor, named Onyx and Topaz, with flexible partitions.
- Orientation: North-south alignment to optimise natural light and minimise heat gain.
- HITEX is currently undergoing construction to add rooftop garden spaces on Hall 4. These gardens aim to provide a green, relaxing environment for visitors and improve the building's sustainability by enhancing insulation and reducing heat gain.

4.2.10 NOVOTEL HYDERABAD

Novotel is a business hotel in Hyderabad owned by an international chain of hotels under the mother company ACCOR. It is a secure, gated campus located away from the congestion, noise and pollution of the city centre. It provides 15 Mbps and Wi-Fi connectivity. It has proximity to Hitec City and Gachibowli, Hyderabad's IT business district. It provides a fantastic variety, with the highest hygienic standards, of food and beverage options to choose from. It provides a complimentary shuttle to all offices at Hitec City and Gachibowli. It has other world-class facilities like a great outdoor, 24-hour fitness centre, swimming pool and spa.

Established: April 29, 2006
Accommodation:

287 Guest Rooms in Total
- 129 Superior Rooms
- 106 Superior Pool Rooms
- 21 Premier Rooms
- 16 Premier Pool Rooms
- 11 Junior Suites
- 02 Executive Suites
- 02 Deluxe Suites



Key Features:
- 24-hour in-room Dining
- hi-speed Wi-Fi, Broadband connectivity
- Flexible workstations
- Flat-Screen LCD televisions
- Mini-Bar
- Electronic safe - Large enough for a laptop
- Adjacent to India's Best convention centre, HICC

Food and Beverage:
- The Square signature all-day dining restaurant
- The Square Alfresco: the open-air extension
- Le Cantina: The Poolside Mexican Restaurant
- Le Cafe: European-style sidewalk cafe
- The Bar: The Perfect Place to unwind
- Johnnie Walker Lounge: India's First and Exclusive JW Lounge

Leisure Features:
- In Balance Fitness Centre by Novotel with Sauna
- Outdoor Swimming pool
- Cycling & jogging Track
- O2 Spa and Salon
- Tennis Court

4.2.11 Major Departments Of the Hotel

Front office:
It is the nerve centre of a Hotel. The Front Office Department Comprises the Reception, Guest Service Offices, Bell Services, Reservation, Operators, Executive Clubs, Health and Recreation Center and Business Center. Employees of the Front Office Department often provide the first and last impression of the Hotel to our Guests.

Culinary:
This department deals with all the food of the guests as well as the staff of the Hotel. There might be distinctly different sections in a large kitchen so as to deal with various aspects of food preparation, while smaller kitchens may have different functions dealt with by a single person.

Housekeeping:
The housekeeping department is responsible for the cleanliness, maintenance and aesthetic standards of a hotel.
It also maintains quality room decor, room facilities all the time. The quality of service and guest experience depends largely on the quality of housekeeping standards maintained in the Hotel.

MEETING ROOMS:

2meeting rooms with natural lighting

	AREA (M^2)	HEIGHT (M)	THEATRE	U-SHAPE	BOARD ROOM	CLASS ROOM	COCKAIL
Ballroom	237.12	2.48	160	48	38	120	150
Granite 1, 2 & 3	104.6	2.75	80	33	32	42	75
Granite 1	40.7	2.75	32	15	14	18	30
Granite 2	32.5	2.75	20	15	14	18	22
Granite 3	30.3	2.75	20	15	14	18	20
Capacity of the meeting rooms in number of guests							

Table 2 capacity chart for Novotel hotel

4.3 YASHOBHOOMI INDIA INTERNATIONAL EXPO CONVENTION CENTRE (IICC DWARKA)

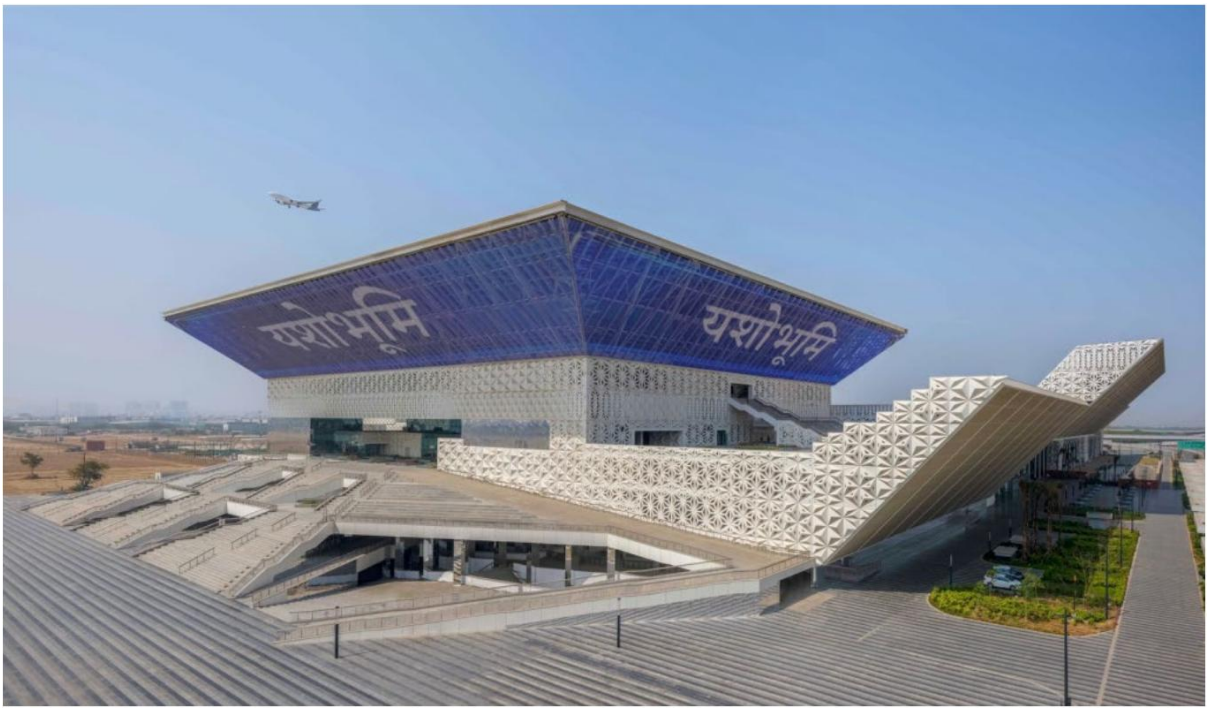


Figure 60. Yashobhoomi Convention Centre (IICC Dwarka)

4.3.1 Introduction

Yashobhoomi Convention Centre, also known as India International Convention & Expo Centre (IICC), is a landmark project situated in Dwarka, New Delhi. It stands as one of India's most ambitious infrastructure endeavours, aimed at positioning the country as a global hub for conferences, exhibitions, and business events.
This state-of-the-art facility not only serves as a venue for large-scale events but also symbolizes India's growing prowess in the global MICE (Meetings, Incentives, Conferences, and Exhibitions) industry.

4.3.2 Concept and Approach

The design and development of Yashobhoomi Convention Centre were driven by a holistic vision to blend modern architectural practices with India's cultural heritage. The concept focuses on creating a world-class convention and exhibition space that is both functional and symbolic of India's economic growth and cultural diversity.
The architectural approach is characterized by its emphasis on sustainability, flexibility, and technological integration. The design incorporates green building principles, aiming for a **LEED Platinum certification**. This is achieved through energy-efficient systems, water conservation strategies, and the use of locally sourced materials.

A critical aspect of the conceptual design is the centre's ability to host a wide variety of events, ranging from international conferences to large-scale exhibitions, concerts, and cultural events. The architecture is flexible, with spaces that can be easily adapted to different configurations and event types.

4.3.3 Proximities

11 Kms from Indra Gandhi International Airport
23 Kms from Connaught Place
26 Kms from New Delhi Railways Station
16 Kms from Gurugram
Serviced by Public Transports (Buses, Cabs, Metros)

4.3.4 Accessibility

- Adjacent to Dwarka Express for easy road access
- Connected via NH-8 and Urban Extension Road-II (UER-II)



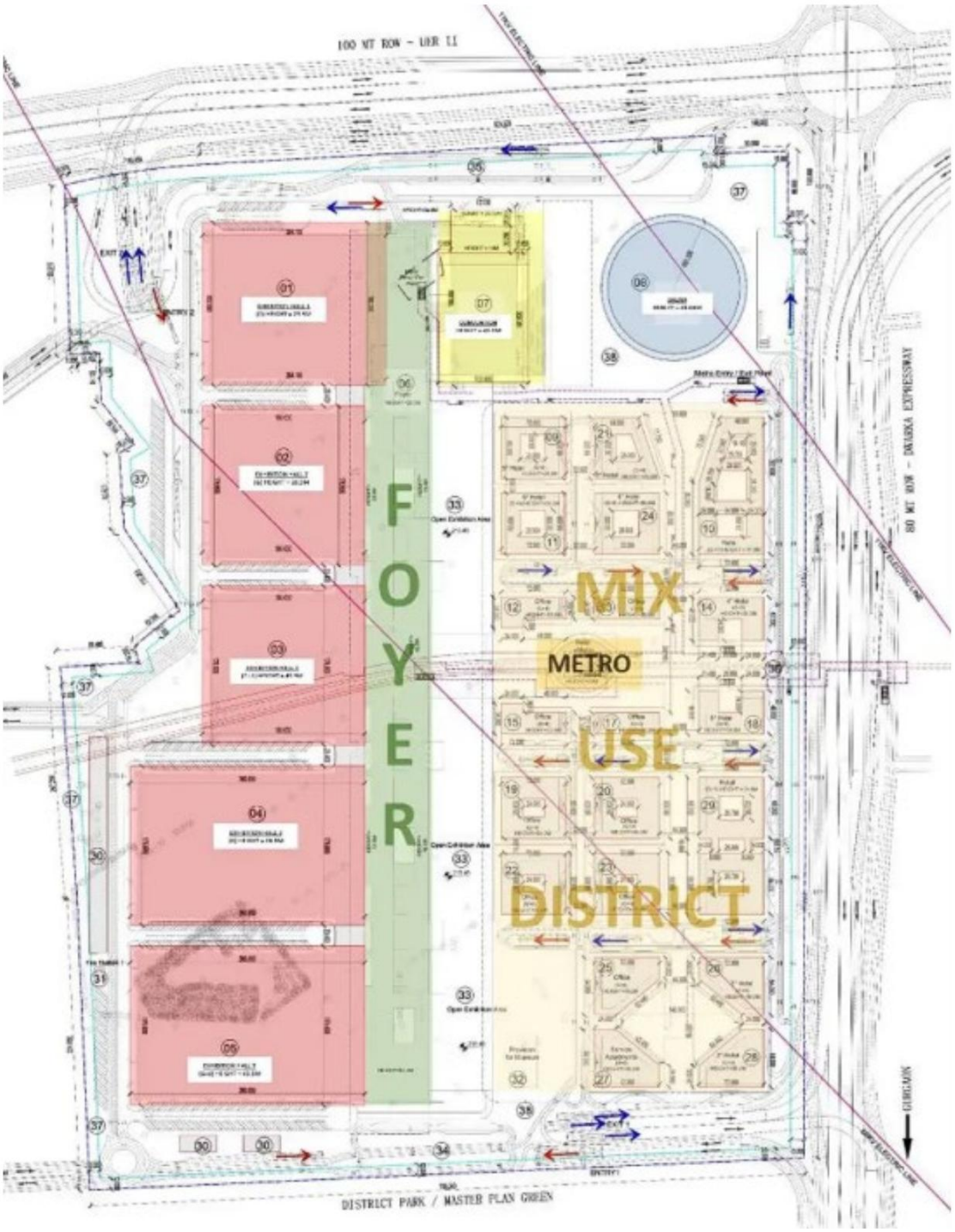


Figure 61. Site plan of Yashobhoomi

4.3.5 Spatial planning

The Master Plan structures the project in two differential sectors. It leaves the fairgrounds and Convention area to the West and
The development of mixed use (Hotels, Offices, Retail Areas) to the East.

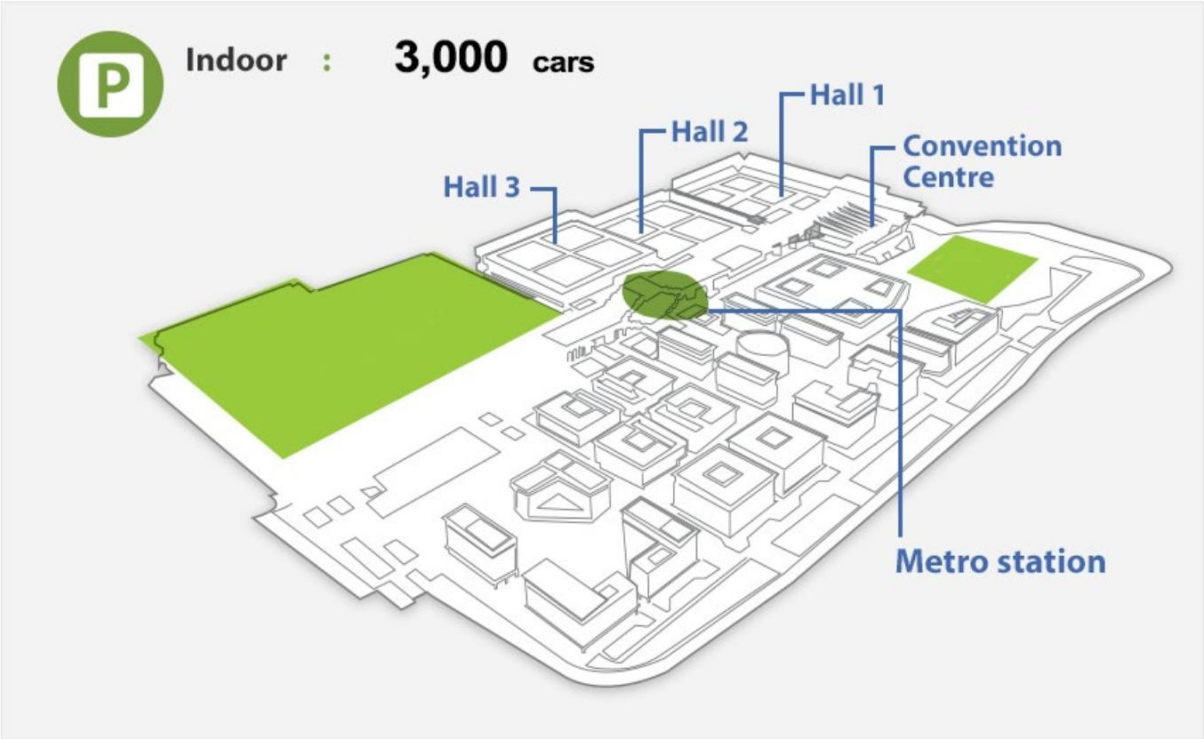


Figure 62. Spatial Arrangement of Areas

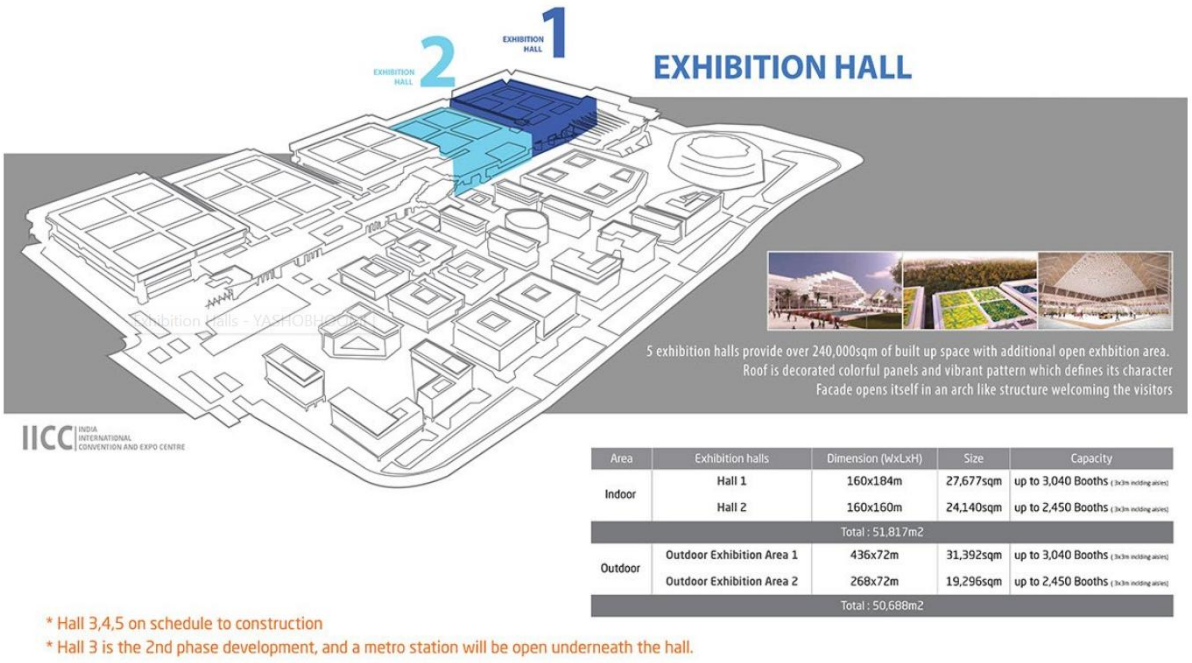


Figure 63. Positions of Exhibition Halls

Area	73000 sqm
No. of Floors	8
No. of Convention rooms	15
Capacity of Main Auditorium	6000 pax
Capacity of Grand Ballroom	25000 pax
No. of Meeting rooms	13
Total Capacity	11000

4.3.6 Convention Hall

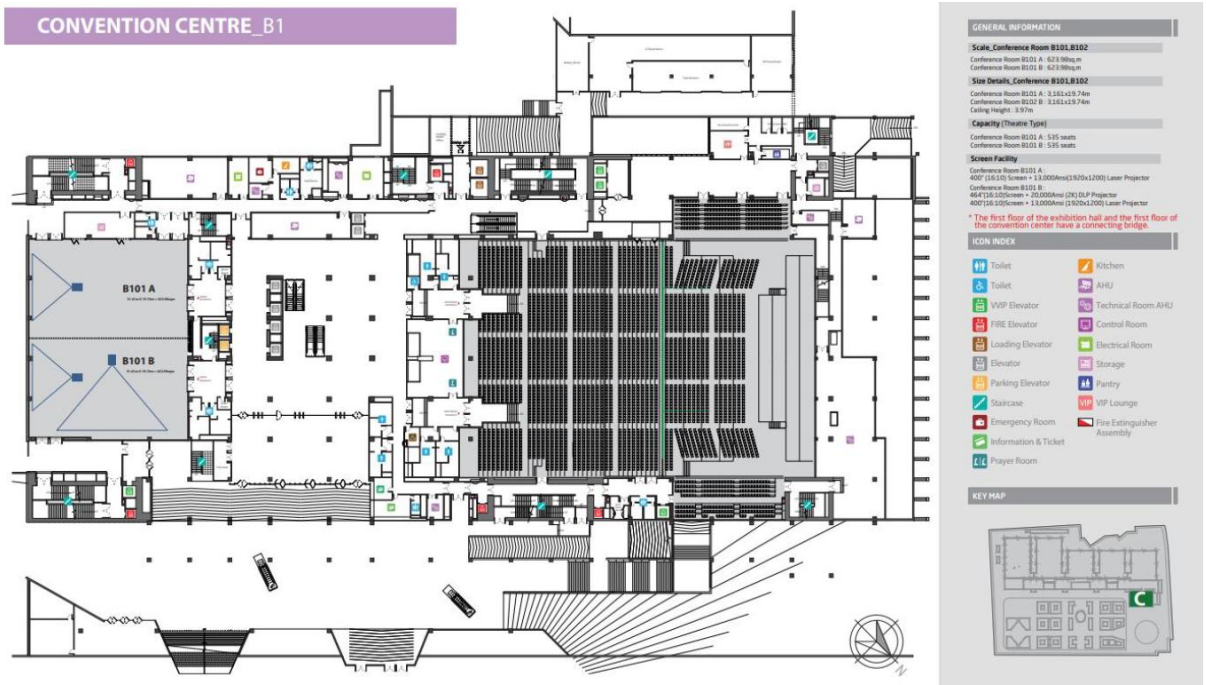


Figure 64. Convention Centre floor plan

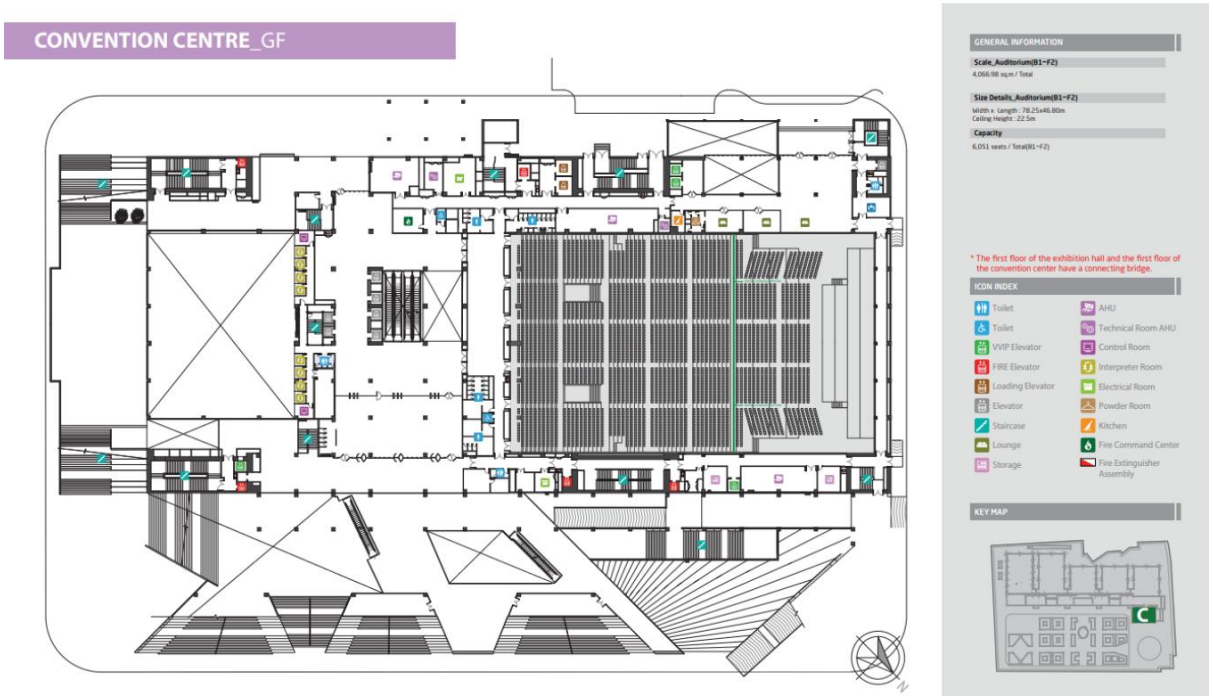


Figure 65. Convention centre ground floor plan

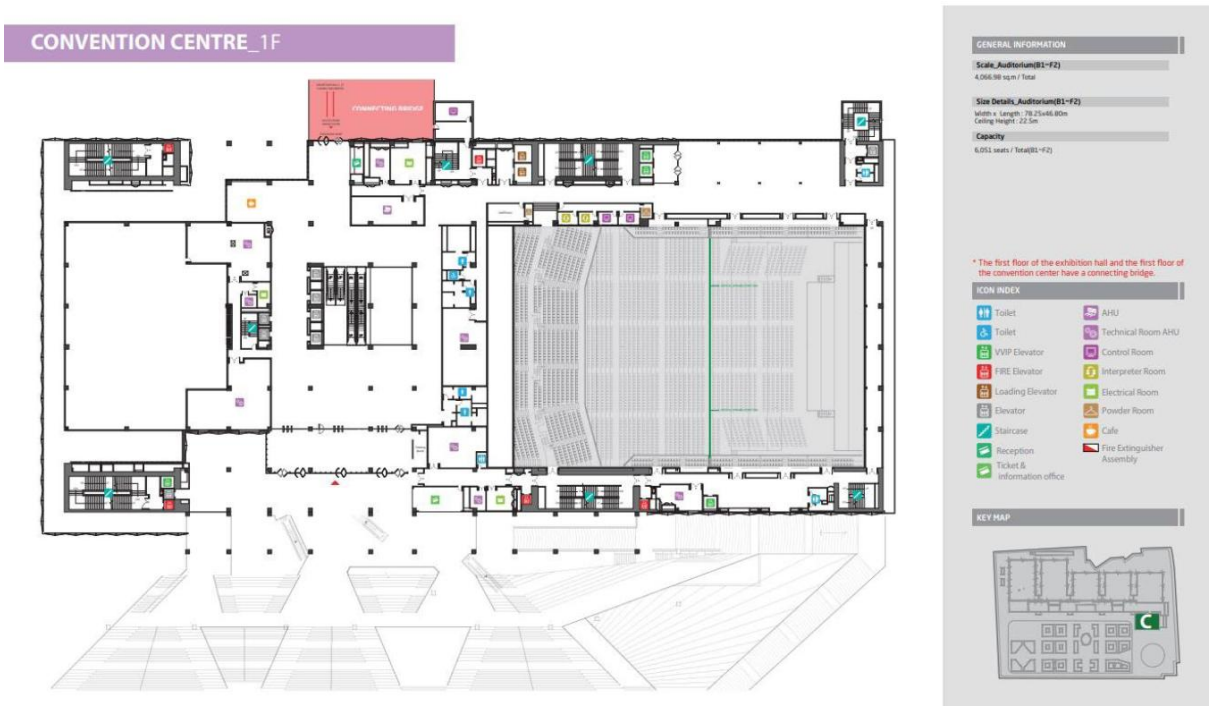


Figure 66. Convention centre first floor plan

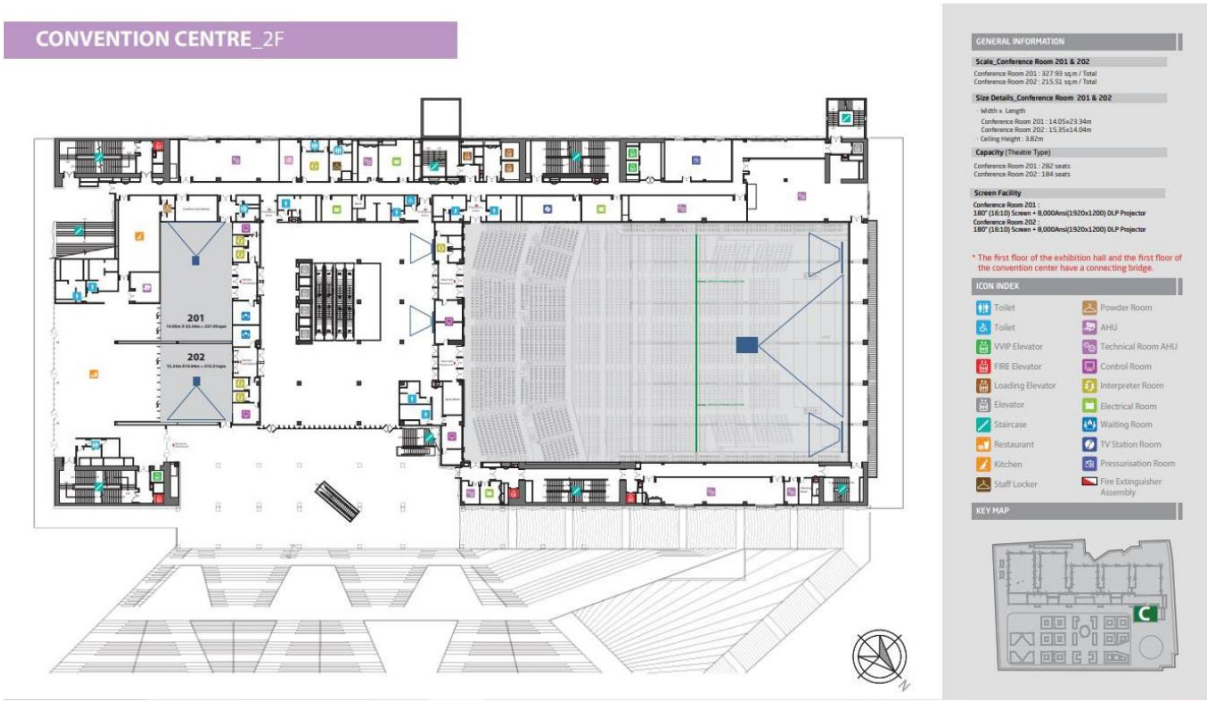


Figure 67. Convention centre first floor plan

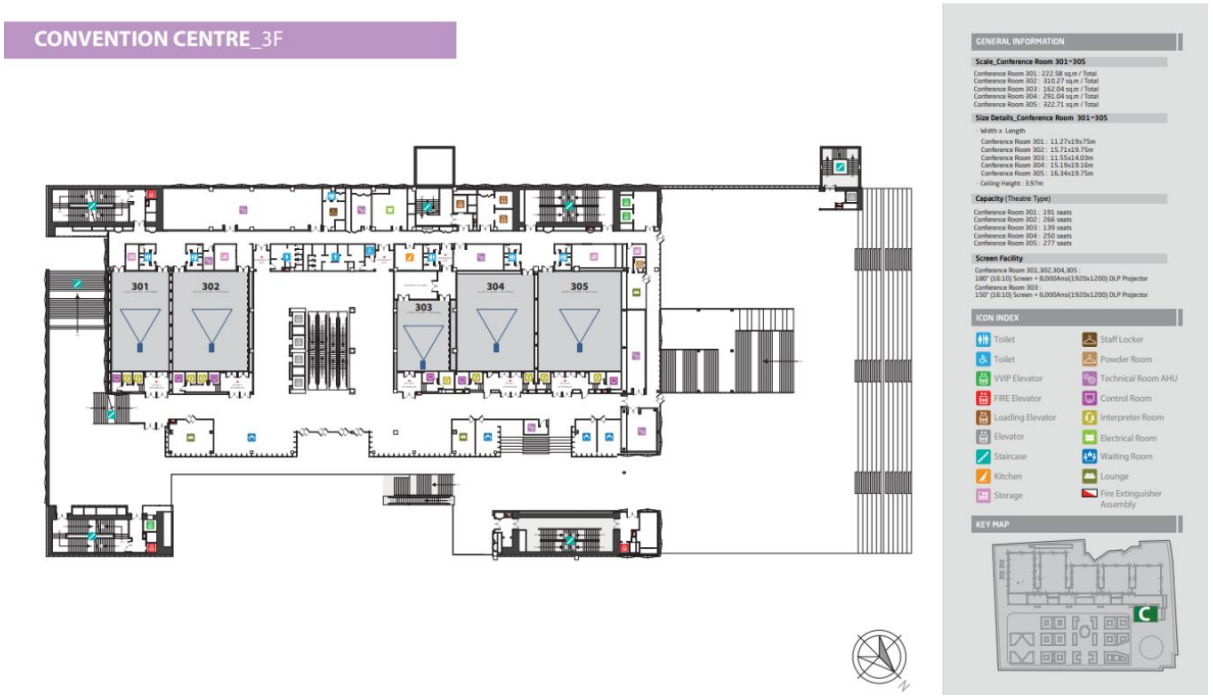


Figure 68. Convention centre third floor plan

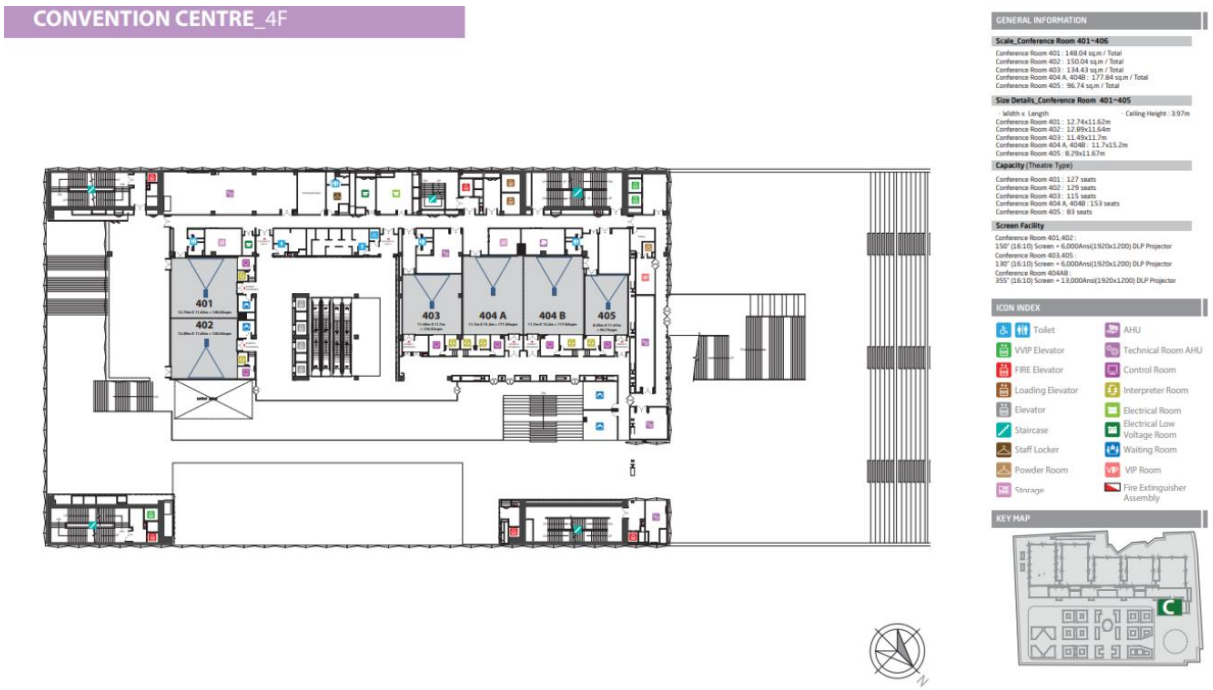


Figure 69. Convention centre fourth floor plan

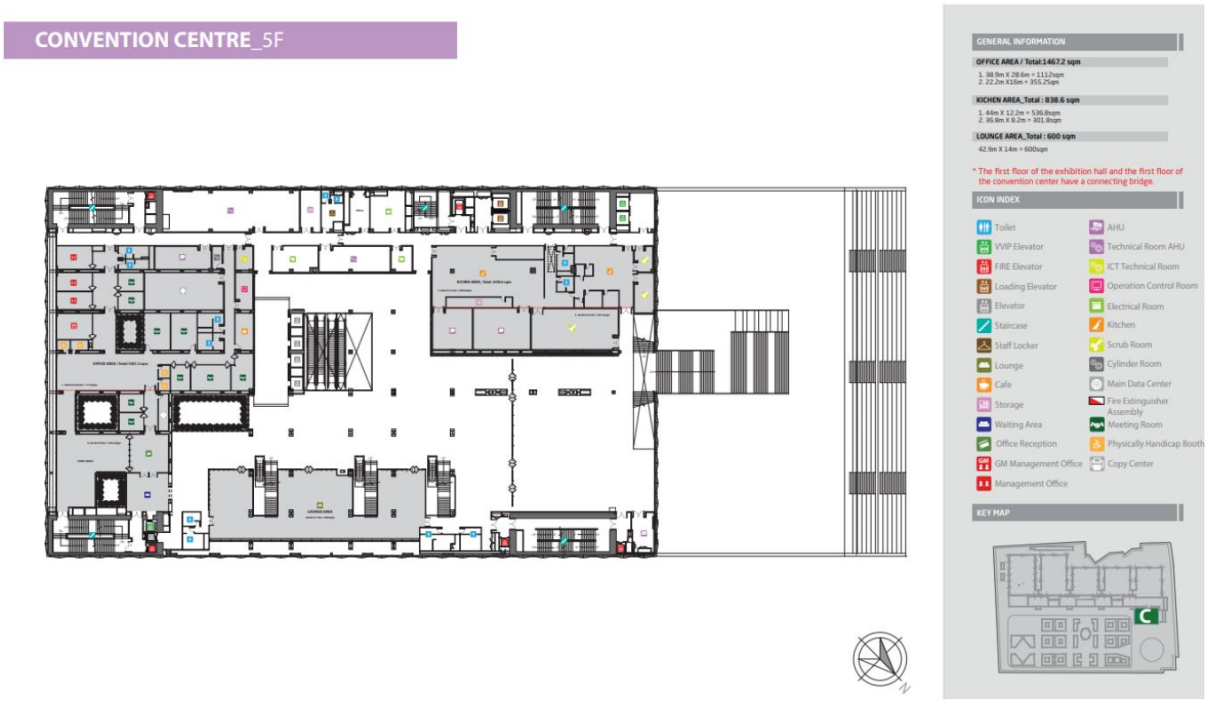


Figure 70. Convention centre fifth floor plan

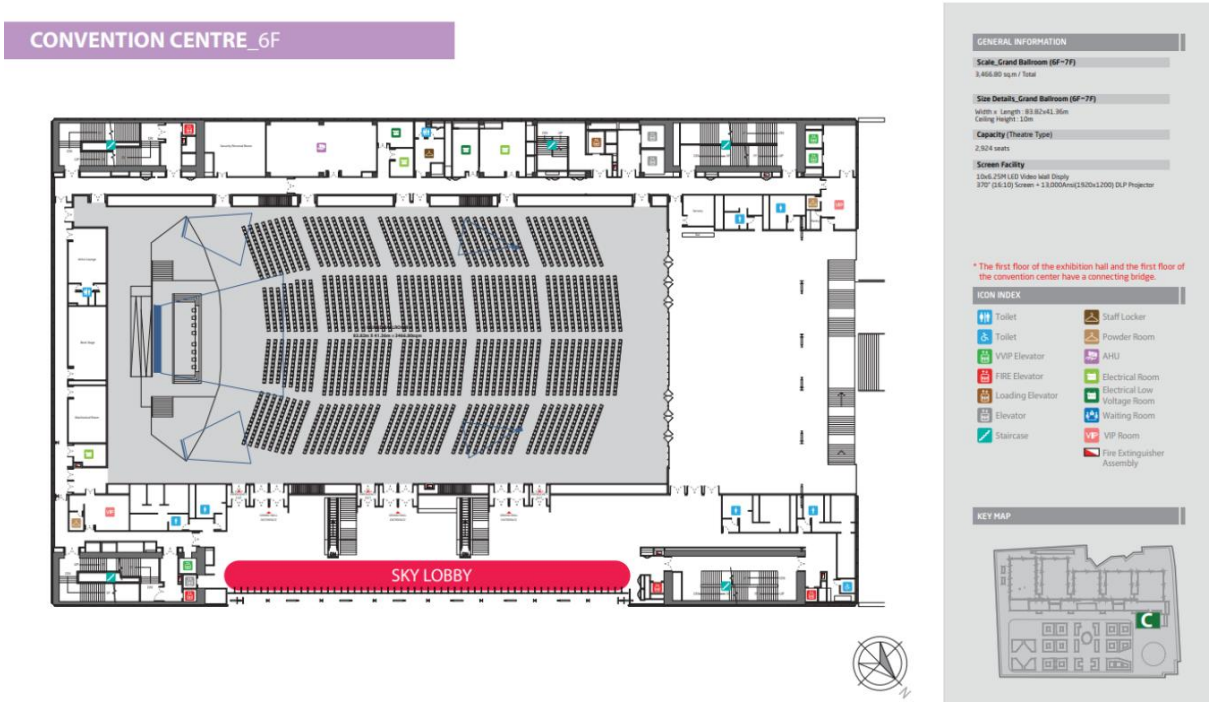


Figure 71. Convention centre sixth floor plan

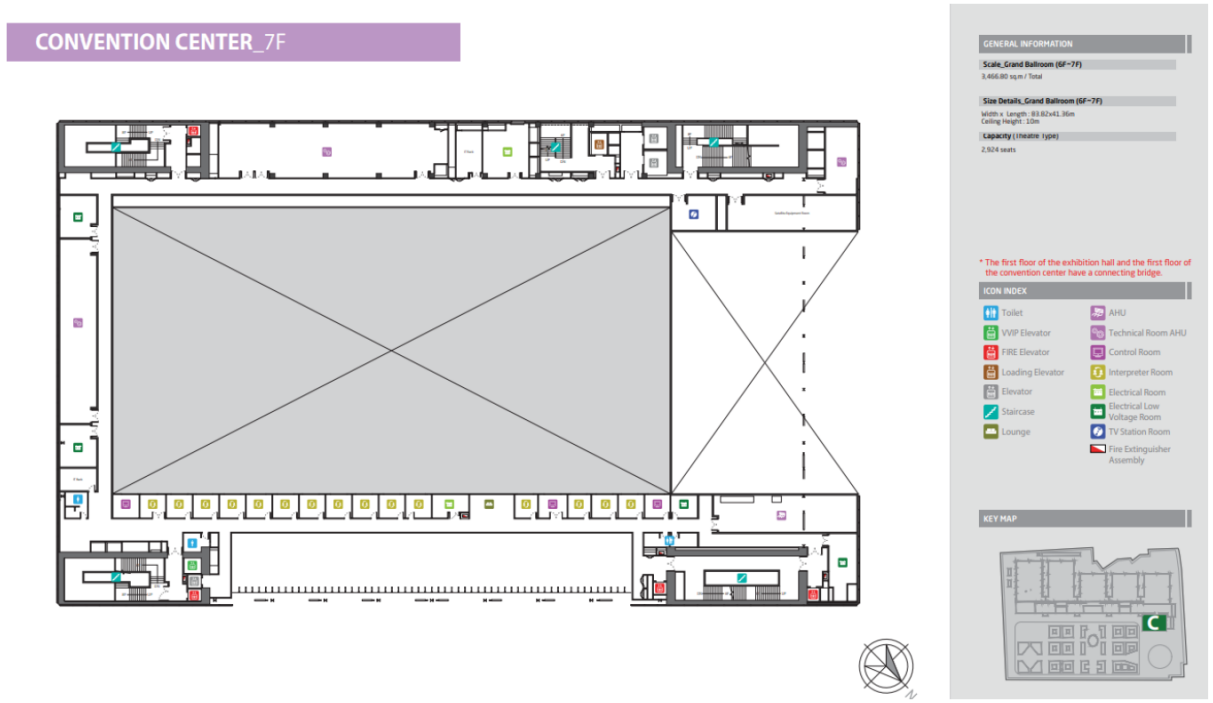


Figure 72. Convention centre seventh floor plan

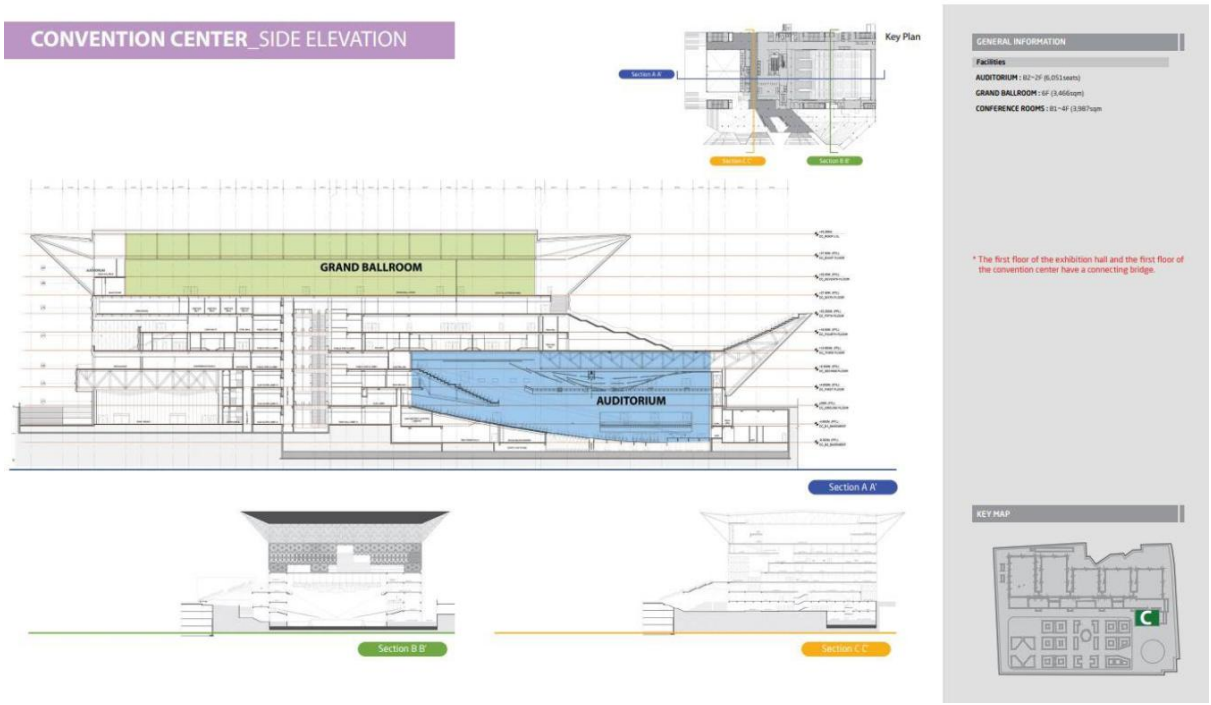


Figure 73. Convention centre side elevation

4.3.7 Auditorium

It is the core of the complex and it's equipped with a seating capacity of around 6000 people.
Other Features:

i. ii. iii. iv.

LED Media Façade on both interior and exterior sides Decoration inspired by Indian Culture Terrazzo floors, metal sound absorbers, lit-up patterned walls
Innovative automated seating system (flat floor or tiered seating)

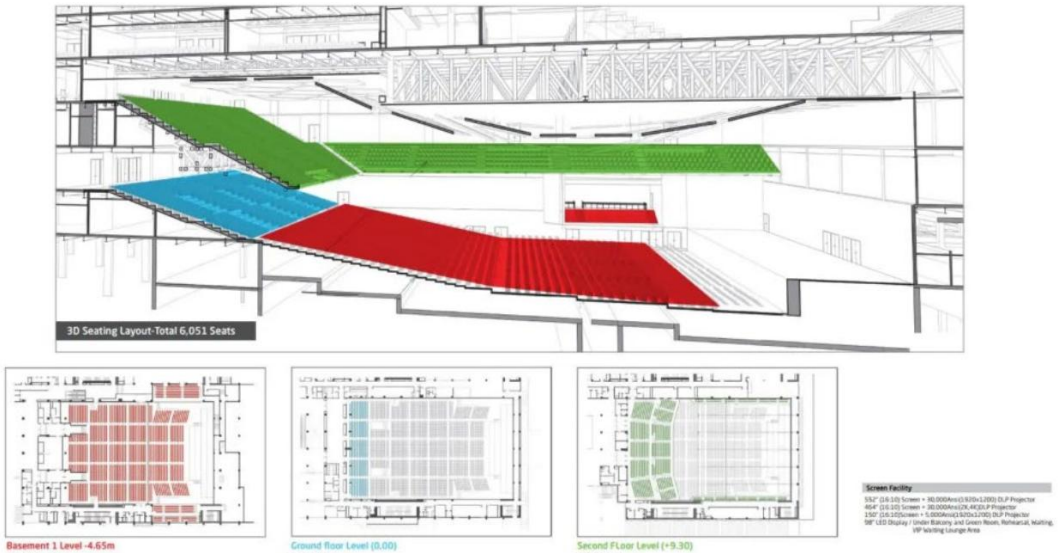


Figure 74. Auditorium

4.3.8 Exhibition halls

There are 3 Exhibition Halls constructed among a total of 5 Exhibition Halls
5 exhibition halls provide over 240000 sqm of built-up space with additional open exhibition area. Roof is decorated colourful panels and vibrant pattern which defines its character façade opens itself in an arch-like structure welcoming visitor. Each hall is equipped with flexibility to be converted into 4 small halls.



Figure 75. Placement of Rooms

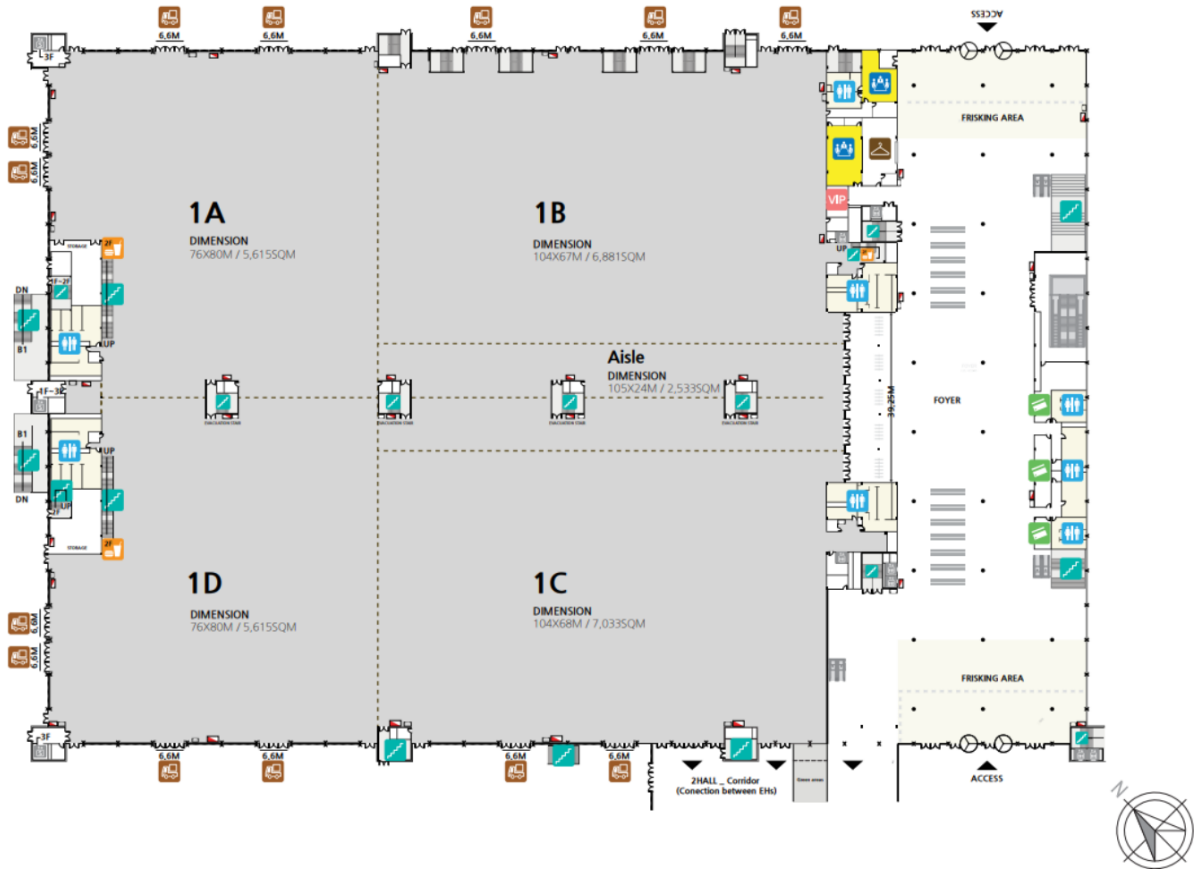


Figure 76. Floor Plan

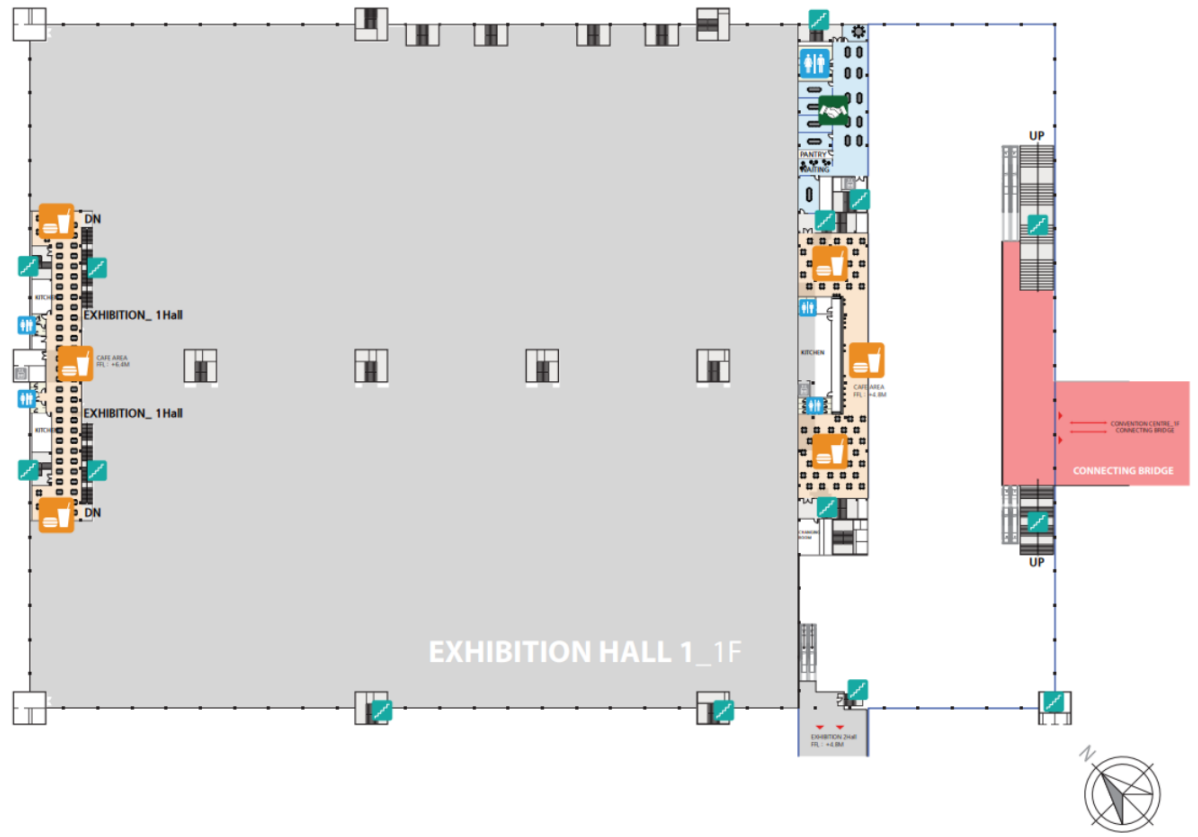


Figure 77. Floor plan

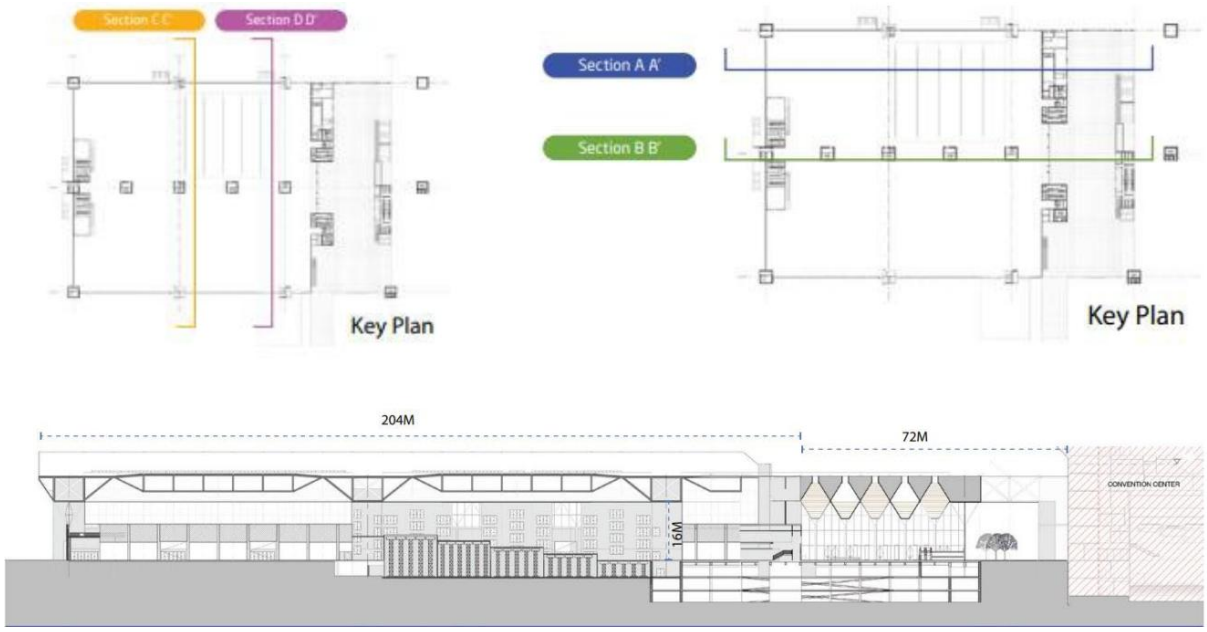


Figure 78. Section AA

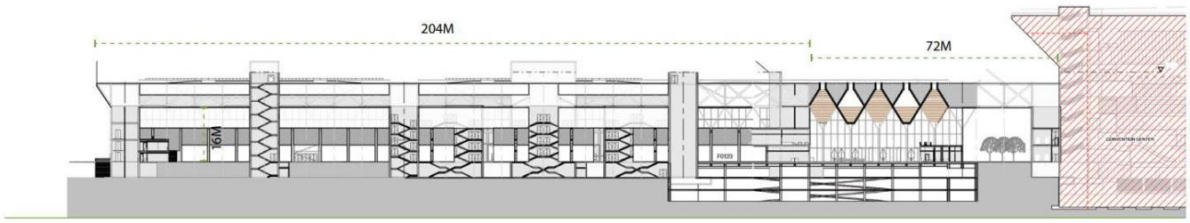


Figure 79. Section BB



Figure 80. Section CC

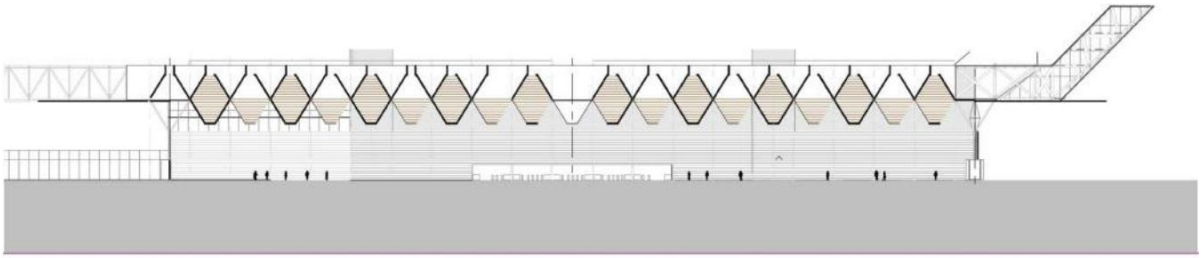


Figure 81. Section DD

4.3.9 Parking

The Project has underground parking of approx. 28,000 ECS. The Basement parking is planned with parking bay/slots with signage, graphics, and column guards etc. to give a pleasing appeal to the basement. Provisioned with driver lounge with seating arrangement and washrooms at all basement levels. An elaborate parking management system is provided for the project with the features like safeguarding checks as per the safeguarding specifications, automatic vehicle token vending machine installed interfaced with access control boom barriers. LED information screen showing the total number and available number of car parking, colour cluster wise, at the entry points of the basement car parking as well as at the entry points/adjacent to the colour cluster.

Car Spaces Distribution

Parking is distributed across four basement levels, with a total of 6,294 ECS (Equivalent Car Spaces). These are spread across different facilities including hotels, offices, and retail areas.

A total of 168 preferred car spaces is designated across the four basements, providing convenient parking for specific categories, such as VIP or priority guests.

Various facilities such as retail, hotels, offices, and convention centres have dedicated parking spaces, with retail receiving the largest share, having 1,555 ECS in total.

4.3.10 Inferences

The Yashobhoomi Convention Centre is a landmark in modern Indian architecture, embodying a blend of cutting-edge technology, sustainability, and cultural representation. Its design and concept underscore the importance of flexible, multi-functional spaces in meeting the demands of a global MICE industry. The centre not only enhances India’s infrastructure capabilities but also serves as a testament to the country’s commitment to becoming a major player in the global conference and exhibition landscape.

4.4 KUSHABHAU THAKRE HALL (MINTO HALL)



Figure 43- Kushabhau Thakre Hall (Minto Hall)

Location : Bhopal, India

Owners : Madhya Pradesh Tourism Built by- The Last of the Four Nawab Begums, Sultan Jehan

Built In: 1909 Renovation Completed in 2018

Principal Architects (Renovation): Ar. Puneet Sohal

Site Area: 10.6 Acres

Built Up area: 4.6 Acres

Ground Coverage: 1.78 Acres



Figure 44- Nawab Begum Sultan Shah Jehan

Cost of Project: 3 lakhs at the time of construction

Renovation Cost: 65 Crore
Established: 1909
Key Events: Government Meetings
Accessibility: Well-connected by road and public transport.
Amenities: Restaurant, Bar, Wi-Fi, security, and Building maintenance system.
Design: Indo-Saracenic with colonial influence

4.4.1 Introductions

Minto Hall is a historic heritage building located in Bhopal, the capital city of Madhya Pradesh, India. It was built in honour of **Lord Minto**, the then Viceroy of India, by **Nawab**

Shah Jahan Begum, the last Begum of Bhopal. The foundation stone was laid on November 12, 1909, and the construction was completed by her son, Nawab Hamidullah Khan, in 1933.
The hall is a blend of Indian and English architectural styles and was initially intended to serve as a guest house for visiting Europeans. Over the years, it has served various purposes, including being the headquarters of the Bhopal Army and housing Hamidia College until 1946. After India's independence, it became the venue for the State Assembly until 1996.
In recent years, Minto Hall has been restored and now serves as an international convention centre with a stylish rooftop bar and restaurant. The building stands as a testament to the rich history and cultural heritage of Bhopal.



Figure 45- Minto Hall Previous and after renovation

4.4.2 Purpose of the case study

• Understanding the design approach at that time
• To compare structure of heritage and modern building
• To understand the laws and design as it is in same state

4.4.3 Entrance

The entrance of Minto Hall in Bhopal is quite impressive, reflecting its historical significance and architectural beauty. The entrance, showcase a blend of Indian and English architectural styles. The grandeur of the entrance sets the tone for the elegance and heritage that the building represents. As we

enter, there is a statue of **Kusabhau Thakre**, adding to the grandeur of the entrance, which sets the tone for the elegance and heritage that the building represents.

There is a commemorative wall mounted on a structure with four columns and has a red and beige colour scheme, displaying the name of the Minto Hall.

4.4.4 Accessibility towards the site

• Location: Strategically located on the shore of lower lake, facing the skyline of old Bhopal, Bhopal.

• Airport: About 13.6 km from Raja Bhoj Airport.

• Railway Station: 3.3 km from Bhopal Railway Station and 5.4 km from Rani Kamlapati Railway Station

• Bus Connectivity: Well-connected through buses.

• Major Roads: Accessible via Roshanpura Road and Lower lake Road.

• Hotels: MPT Palash Residency at 1.6 Km.

4.4.5 Major components of site

According to needs, the venue offers a flexible seating capacity that can accommodate anywhere from 1180 people. The hall offers seating for up to 600 people in a theatre style, with an additional of Seminar and meeting rooms.
It also has underground wiring for power, and HVAC System;

• Entrance Plaza
• 2 halls: 2 Seminar Room, 2 Meeting Rooms, 1 Media Room
• Gardens
• Parking
• Service blocks
• Restaurants
• VIP lounge

4.4.6 Architectural element

• **Pillars**
The building features a series of majestic pillars, supporting the arches and providing structural stability.

• **Arches**
Arched doorways and windows are prominent features of Minto Hall, adding an element of grace and elegance.

• **Domes**
The dome-shaped roof, a common feature in Islamic architecture, adds a touch of grandeur and magnificence.
• **Ornamentation**
The building is adorned with intricate carvings and decorative motifs, reflecting the rich artistic traditions of India.

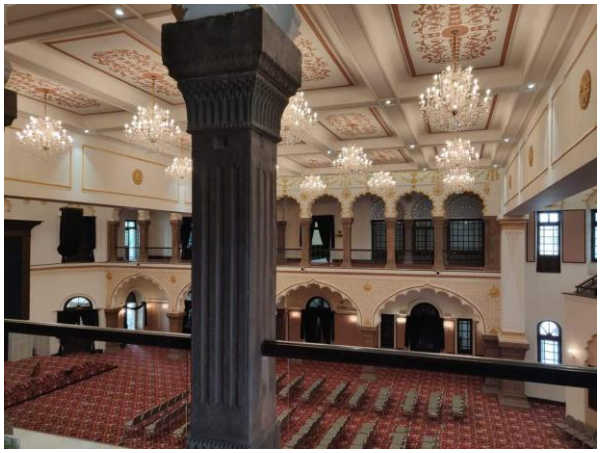
4.4.7 Building Material and Construction

• Minto Hall was built using red sandstone, a durable and aesthetically pleasing material commonly used in Indian architecture.
• The construction process involved skilled craftsmen and artisans who meticulously carved the stone and erected the building with traditional techniques.
• The use of sandstone, combined with the intricate details and skilful craftsmanship, has contributed to the hall's enduring beauty and historical significance.

4.2.8 Project program

SPACE	CAPACITY
Main hall – Raja Bhoj Hall	600
Nawab Shah Jaha Begum Hall	
Nawab Sultan Jehan Begum Room	50
Nawab Qudsia Begum Room	25
Nawab Hamidullah Hall	133
Nawab Sikander Jehan Room	
Makhanlal Chaturvedi Media Room	
Parking	300 cars





PART 5. INFERENCES

5.1 Massing & Form Development

- Complex architectural identity can emerge from **systematic modification of simple base geometry**.
- **Corner mass subtraction** reduces perceived bulk and introduces stepped visual hierarchy.
- **Horizontal mass addition** strengthens the base and defines directional circulation belts.
- Curvilinear massing expresses **movement, continuity, and civic openness** rather than decorative intent.
- Rounded/filleted corners improve **visual softness, pedestrian negotiation, and form coherence**.
- Progressive isometric evolution ensures **maintained proportional discipline** across transformation stages.

5.2 Spatial Experience & User Flow

- The **S-curve footprint naturally guides crowd movement**, reducing abrupt circulation breaks.
- Subtracted terraces become **spill-out, pause, and transition zones** for informal interaction.
- Transparent bands support **visual orientation between floors**, reducing way-finding stress.
- People-first massing ensures circulation logic is **embedded into form instead of added as signage afterthought**.
- Curved edges encourage **shorter visual decision paths**, supporting intuitive navigation during peak events.

5.3 Functional Performance

- Added masses align with **program envelopes requiring direct circulation & loading adjacency**.
- Carved masses respond to **climatic access, stack efficiency, and movement loop continuity**.
- Central raised mass helps organize **deep-plan multipurpose halls and exhibition belts**.
- Offset stacked floor plates support **elongated planning without creating monolithic program blocks**.
- Roof plates follow geometry, proving that **form logic can support long spans and constructability** simultaneously.
- Subtraction and addition work as a **balanced operational system – purpose through mass addition, comfort through mass removal**.

5.4 Design Communication

- Sequential diagrams become **architectural justification tools**, not stylistic graphics.
- Arrows marking addition/removal enhance **stakeholder and jury understanding** of design reasoning.
- Clear solid–void differentiation ensures **design decisions are explainable and measurable**.
- Evolution diagrams record **iterative thinking instead of decorative modeling**.
- Design narrative is strengthened when form operations are communicated as actions: **carve → extend → lift → connect → layer**.

5.5 Civic & Environmental Integration

- Civic buildings must feel **open before being monumental** – achieved through mass carving.
- Terraces enhance **daylight penetration, cross-ventilation, and environmental buffering**.
- Horizontal layering expresses **accessibility at public entry levels**.
- Curvilinear edges improve **micro-climatic channeling and spill-out behavior** naturally.
- Form evolution responds to human movement and climate as a **single integrated system**.

5.6 Overall Architectural Outcome

- **Iconicity evolves through usability, not against it**.
- Architecture remains expressive when **geometry serves people-flow and function** together.
- The final form infers dynamism while remaining **visually legible and experientially effortless**.
- **Adding mass gives purpose, carving mass gives comfort**, both must coexist in large public hubs.
- Convention centres benefit from:
    - **Guided movement patterns**
    - **Stacked terraces**
    - **Transparent circulation belts**
    - **Softened curved mass edges**
    - **Offset layered roofs**
- Human movement and massing must be designed as **one indivisible system** for intuitive architectural performance at large assembly scales.

PART 6. DESIGN

6.1 Introduction

Expressionism through Flow & Confluence

The Warangal Convention Center is conceived as a sculptural expression of movement and convergence, shaped by the coming together of people, ideas, and cultures—much like streams merging into a river. Drawing inspiration from the dynamic flow of the adjacent Dharmasagar Canal, the design takes form through curvilinear layouts, fluid rooflines, and organic massing. Visitors are led through a sequence of interconnected indoor and outdoor spaces that culminate in vibrant nodes such as plazas and central halls.

Light filters through Kakatiya-inspired Jaali screens, casting rippling patterns that evoke water, while reflective pools, shaded courtyards, and landscaped promenades enrich the sensory and microclimatic experience. Local stone anchors the project in regional identity, while advanced structural systems allow for expansive, flexible spaces that host exhibitions, conferences, and cultural gatherings.

6.2 Design Philosophy

The architectural approach is rooted in context-responsiveness, weaving natural site features like the canal and open terrain with strategies for Warangal's tropical climate. It carries forward cultural continuity by drawing from Telangana's craft traditions and Kakatiya-era stonework in form and detail. Sustainable resilience is embedded through passive cooling systems, rainwater harvesting, and landscape integration to minimize environmental impact. Above all, the project prioritizes a user-centric planning approach, ensuring smooth circulation, intuitive wayfinding, and adaptability to accommodate events of varying scales.

6.3 Site Context

The proposed Convention Centre is envisioned as a landmark public facility in Warangal, designed to host large-scale conferences, exhibitions, cultural events, and social gatherings. Spanning 10 acres (40,468 sq.m) along the Warangal—Bhopalpatnam Road, the site offers excellent connectivity and visibility. As per Telangana Building Rules, the project allows a permissible FAR of 2.0, enabling a built-up potential of approximately 80,936 sq.m. With a ground coverage of 40%, efficient setback margins, and a permissible height of45 m, the site provides ample scope for vertical and horizontal development. Adequate provision for parking (l ECS per 50 sq.m of convention area) further supports its functionality.

6.4 CONCEPT RATIONALE

The design begins with simple geometry and evolves through clear mass addition and subtraction.
Inspired by DHARMASAGAR CANAL, the footprint curves smoothly to guide people like flowing water, avoiding sharp 90° movement breaks.
Mass is added to support core functions — halls, exhibitions, foyers, and structure.
Mass is subtracted to create comfort — terraces, shaded pauses, airflow corridors, and pedestrian permeability.
The concept ensures the building is:

- Surge-friendly
- Easy to navigate
- Climate responsive
- Community focused

6.5 ARCHITECTURAL INTERPRETATION

6.4.1 Form & Facade

The form shifts from rigid cuboid to flowing stacked ribbons, reflecting human movement.
Facade curvature visually pulls people toward entry and along the exhibition edge.
Horizontal glass bands create a layered public scale, reducing the building's perceived bulk.
Jaali screens inspired by local Kakatiya craft add shade + cultural familiarity, not imitation.
Material reading:

- Stone base = grounded civic identity
- Glass band = movement + transparency
- Curved roof layers = visual continuity

The facade interprets the building as open, approachable, and directional.

6.4.2 Spatial Organization & Movement Sense

Zoning is organized as a front-to-back gradient:

- Front = Exhibition + Arrival
- Center = Convention Halls
- Rear = Services + Logistics
- West edge = Canal pause zone

Circulation works like a continuous loop, avoiding sharp junctions and backtracking.
Mass subtraction creates usable terraces as pressure valves during surge and social pauses when idle.
Central lifted volume becomes the indoor focus point, helping visitors read layout intuitively.

Spatial inference: Flow distributes people. Layers organize programs. Terraces absorb time.

6.4.3 Interior Design Elements & User Experience

Interior spaces prioritize orientation, comfort, and interaction.
Design elements used:

- Naturally lit foyers for instant spatial understanding
- Jaali shadows as sensory connectors to local identity
- Water-facing seating & amphitheatre edges as pause anchors
- Open terraces for breakout talks and waiting spill
- Acoustic and neutral material lining to control event intensity

Experience focus:

- Easy entry
- Smooth hall access
- Comfortable waiting
- Clear exit release

Interior inference: Spaces are felt first, understood second, used effortlessly.

6.4.4 Sustainability Technologies

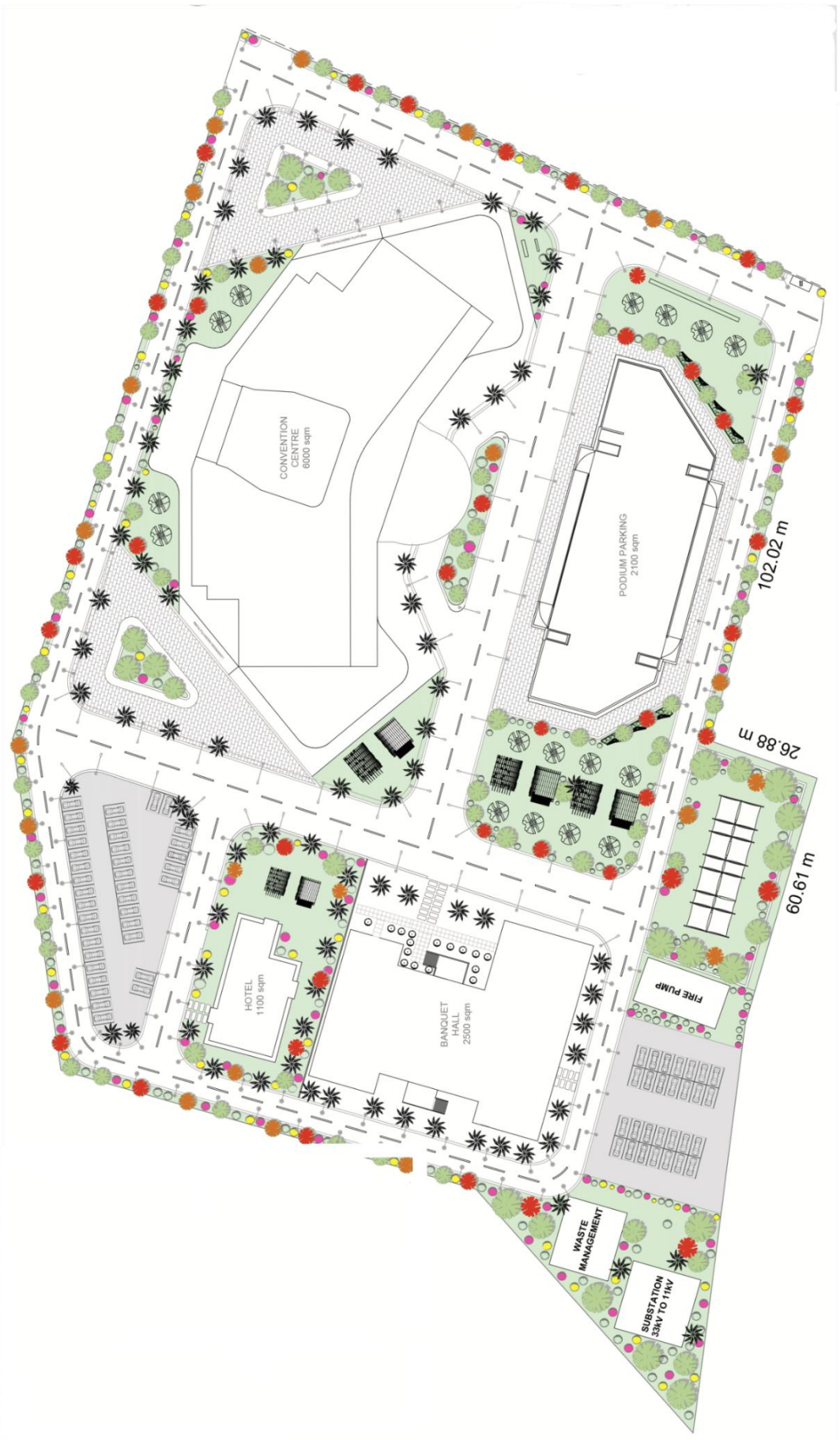
6.1 Climate-Responsive Strategies
Curved massing + open cut-outs to capture south-west winds and form cooling air eddies.
Deep shaded plazas and roof overhangs to reduce heat stress for waiting crowds.
Terrace voids working as thermal buffers between stacked floors.
6.2 Water Management Technologies
Rainwater harvesting system integrated at each roof layer.
Greywater recycling for flushing and landscape use.
Reflective cooling pools and bioswales to recharge groundwater and lower micro-climate temperature.
6.3 Energy-Efficient Technologies
Solar PV panels on stepped roof plates for clean energy generation.
LED + motion-sensor lighting in circulation and parking zones.
High-performance glazing on glass bands to cut heat gain while keeping transparency.
6.4 Low-Carbon & Local Materials Tech
Fly-ash or AAC blocks to reduce embodied carbon.
Locally sourced Kakatiya stone minimizing transport impact.
Perforated jaali screens as passive shading technology.
6.5 Waste & Management Technologies
On-site segregation units for paper, plastic, metal, organic waste.
Compost system converting organic waste for site landscape.
Event surge management planning using passive ventilation to cut mechanical load.
6.6 Smart Building Integration
IoT-based occupancy monitoring to manage crowd pulses and HVAC efficiency.
Digital wayfinding screens powered by solar + low-energy systems.
Automated climate locks at entries to maintain cooling without blocking movement.

6.4.5 Landscaping

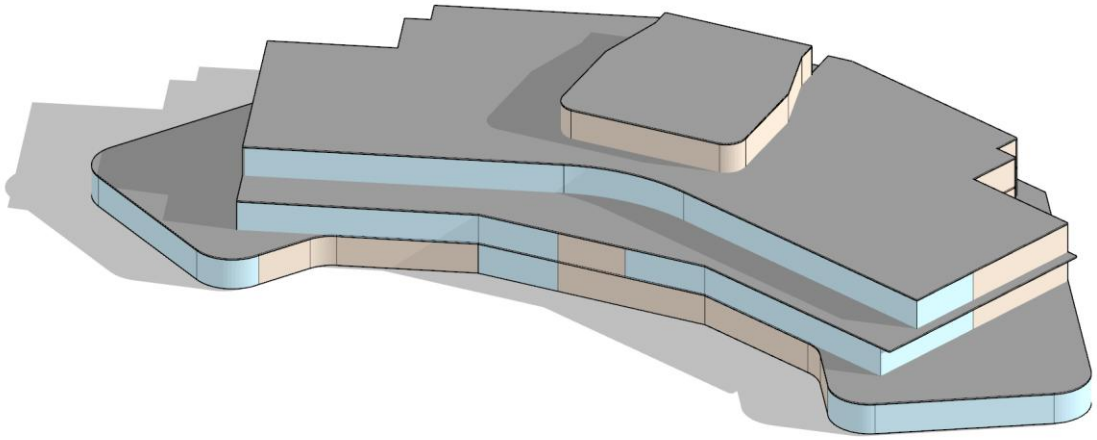
The nursery plan for Warangal soil includes Neem and Siris as shade trees, Gulmohar and Flame of Forest for flowering and native appeal, and Wild Date Palm for vertical accents. Bougainvillea and Yellow Bells add vibrant shrubs, Wedelia serves as groundcover, Kamini forms hedges, and Doob Grass creates durable lawns. Together, these species provide a balanced and practical landscape design.

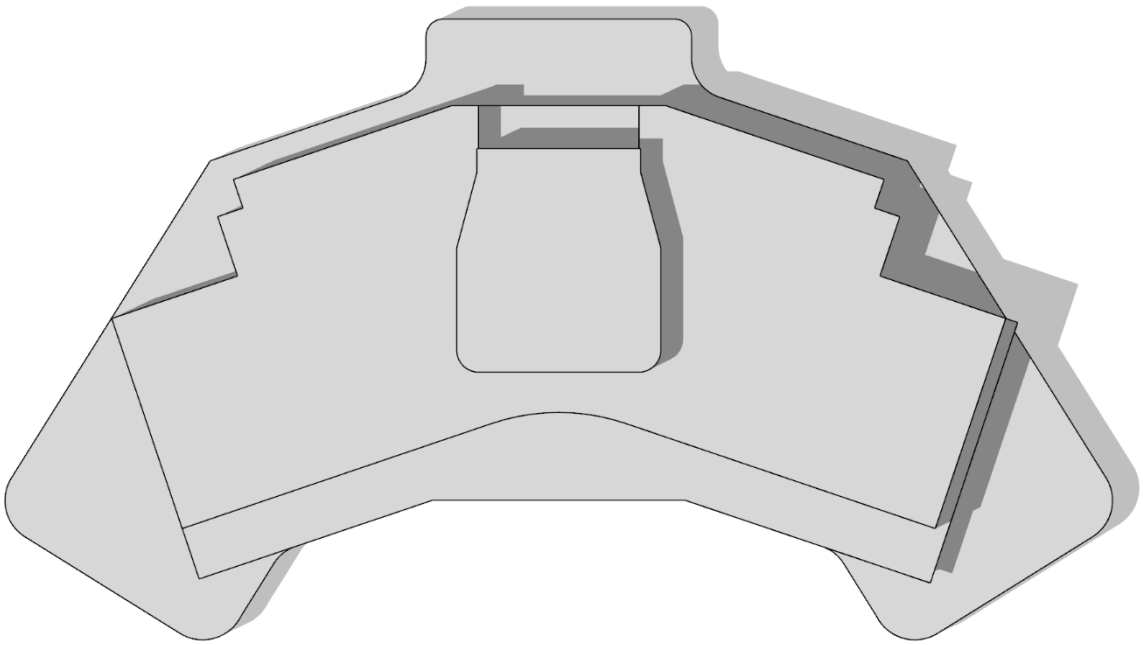


Category	Species	Common Name	Recommended Size
Shade Tree	Azadirachta indica	Neem	8–10 ft height
Shade Tree	Albizia lebbeck	Siris	8–10 ft height
Flowering Tree	Delonix regia	Gulmohar	6–8 ft height
Native Tree	Butea monosperma	Flame of Forest	6–8 ft height
Palm	Phoenix sylvestris	Wild Date Palm	8–10 ft height
Shrub	Bougainvillea spp.	Bougainvillea	6–8 ft height
Shrub	Tecoma stans	Yellow Bells	1.5–2 ft
Groundcover	Wedelia trilobata	Wedelia	6–8 inch
Hedge	Murraya paniculata	Kamini	1–1.5 ft
Lawn Grass	Cynodon dactylon	Doob Grass	Turf Rolls


CONVENTION CENTRE 6000 sqm
PODIUM PARKING 2100 sqm
102.02 m
26.88 m
60.61 m
HOTEL 1100 sqm
BANQUET HALL 2500 sqm
FIRE PUMP
WASTE MANAGEMENT
SUBSTATION 33kV TO 11kV

6.4.6 Final Form





REFERENCES

PART 1 — DESIGN BRIEF

1.1 INTRODUCTION

- Importance of integrated convention centres + hotels in growing cities.
  Book Source: *Designing for Crowds and Public Spaces* — **William H. Whyte**

1.2 AIM & 1.3 OBJECTIVES

- Setting goals for functional, crowd-friendly, clear, flexible, and connected event spaces.
  Source: Written from student's thesis intent and academic goals.

1.4 SITE LOCATION

- City and regional maps, surrounding landmark distances, site boundaries (NH-163 and canal edge).
  Online Source: Google Maps (Base mapping + academic referencing)

1.5 PROJECT DETAILS

- Space area program, built-up requirement, 2,500-pax hall, 150 hotel rooms, development timeline, land-use rules, setbacks, coverage, FAR, plinth, parking requirements.
  Primary Source: TSIIC RFP & Project Information Memorandum for WICC

PART 2 — LITERATURE STUDY

2.1 CONVENTION CENTRE

- Meaning, purpose, functions, daily operations.
  Book Source: *Congress, Convention & Exhibition Facilities* — **Fred R. Lawson**

2.2 THE MICE INDUSTRY

- Meetings, incentives, conferences, exhibitions, and its role in cities.
  Online Source: EventMB (Event Manager Blog — MICE industry insights)

2.3 USER GROUPS / 2.4 DELEGATES / 2.5 EXHIBITORS / 2.6 STAFF

- Who uses the building, how they move, queue, wait, register, explore stalls, attend sessions, exit, and service transitions.
  Book Source: *Pedestrian Planning and Crowd Flow Patterns* — **John J. Fruin**

2.7–2.9 HISTORICAL BACKGROUND & MICE TOURISM

- Early event buildings like Crystal Palace, Bingley Hall, dedicated conference centres, growth of MICE tourism in India from 1950s, and its development over time.
  Book Source: *The Story of Architecture: Public Halls and Gathering Buildings* — **Patrick Nuttgens**

2.10–2.12 UNDERSTANDING CONVENTIONS & SPATIAL ORGANIZATION

- Convention types, scale, spatial layouts (linear, central, cluster, grid), exhibition movement paths, entrances, foyers, open/covered expo halls, pause zones.
  Book Source: *Event Space Planning & Circulation Design* — **Fred R. Lawson**

2.15–2.33 BUILDING STANDARDS (Stairs, Ramps, Parking, Signage, Sanitation, Escape, Construction Tech, Retail, Sustainability, Services)

- Practical dimensions, movement width, ramps, stair spacing, exit capacity, parking types, signage clarity, sanitation needs for assembly buildings, green building ideas, service shafts, ducts, lighting, ventilation, low-carbon materials.
  Book Source: *Architect's Data Standards* — **Neufert (Ernst & Peter)**

PART 3 — SITE INVENTORY

3.1 CONNECTIVITY

- Roads, railway, airport position, regional movement context, approach strength.
  Online Source: PlanningTank (Academic planning and connectivity explanations)

3.2 CLIMATE ANALYSIS

- Temperature, rainfall, humidity, wind direction, sunshine, cloud cover, sunpath, psychometric comfort graphs and local design conclusions.
  Book Source: *Climate Responsive Architecture* — **S.V. Szokolay**

SITE CONDITIONS (Flat terrain, boundaries, canal edge, lake edge, surroundings)

- Photographic observation and site feel analysis.
  Book Source: *Site Planning* — **Kevin Lynch**

PART 4 — CASE STUDIES

IHC

- Multi-use public halls, indoor-outdoor relation, courtyards, entries and pauses.
  Book Source: *The Social Life of Small Urban Spaces* — **William H. Whyte**

HICC + Novotel

- Long open column-free halls, roof lattice, partition storage, crowd loop circulation, hotel departments relation.
  Book Source: *Long-Span Structures* — **Heino Engel**

Yashobhoomi (IICC Dwarka)

- Stacked convention halls, large auditorium, exhibition flexibility, multi-level parking, zoning idea.
  Online Source: Structurae (Large building reference database)

Kushabhau Thakre Hall (Minto Hall)

- Heritage columns, domes, sandstone, ornament and construction by craftsmen.
  Book Source: *Traditional Indian Architecture* — **Satish Grover**

PART 5 — INFERENCES

- Massing, front-back zoning gradient, terraces for crowd release, loop circulation, human-scaled decisions.
  Source: Summarized understanding from **Lawson + Lynch + Fruin** planning principles.

PART 6 — DESIGN

- Final design decisions including form, façade, spatial layout, interiors, sustainability, landscaping considering people movement and function.
  Design influenced by sources:
  — **Lawson (Planning logic)**
  — **Fruin (Crowd flow)**
  — **Lynch (Perception & mapping)**
  — **Grover (Local material & identity)**
  — **Engel (Structure reference)**