LIBRARY IN SHOLINGANALLUR

A THESIS

Submitted By

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BONAFIDE CERTIFICATE

Certified that this thesis forming part of course work JULY 2023, of X Semester, B.Arch, entitled "**LIBRARY IN SHOLINGANALLUR**" submitted by **ELYAS JAMES**, Reg.no. **U18AR012**, in the School of Architecture, Bharath Institute of Higher Education and Research for the award of Bachelor Degree in Architecture is a Bonafide Record of work carried by his/her under my supervision.

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DECLARATION

I declare that this thesis entitled "**LIBRARY IN SHOLINAGANALLUR**" is the result of my work and prepared by me under the guidance of **Ar. Priya**, and that it has not formed the basis for the award of any Degree, Diploma, Associateship or Fellowship of any other University or Institution previously. Due Acknowledgement have been made wherever anything has been borrowed from other sources.

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ABSTRACT

The amount of knowledge one can possibly gain throughout their life is infinite. People gain knowledge and learn new things through various experiences. A building type which can be co-related with knowledge is a library.
Libraries have been around the world hundreds of years ago, what started as a storing space for scriptures, documents etc,, has been recognized as a sanctuary for knowledge. Books have played a huge part in the advancement of human civilization, since the records of the past help learn to have a better future. A place where books, manuscripts, documents, microfilms etc., is what is called a library today.

With the speed at which humans have developed, along with that many changes need to be made to their surroundings to satisfy the development, thus along with other things even libraries have to be designed to make them more efficient.
Efficiency in a space like a library is totally depends on the circulation and zoning of the parts inside. It should be known that, libraries are one of the building types that need to be given equal importance when it comes to the exterior and interior architecture. The exterior attracts people while the interior helps them feel comfortable to stay and use the vast amount of knowledge available there.

Even with a lot of changes and progress in technology, books still tend to be the choice of preference for learning for a vast majority of people, which in return goes to show the importance of library as a public space. Library is often understood only as a place where there are lot of materials to improve oneself and people who like reading, but on a wider point of view, a library is a cultural hub for a locality where it is built, which can promote interaction between people and also gain new experiences.

The main aim of this project is to propose a public library design, that helps to bring an interest to all the people to visit and experience an environment like a library in a more interactive manner.
The design should tend to give solutions to tackle problems in relation to libraries like, lighting, sound-proofing, furniture layout, circulation etc.
Along with the normal requirements, the proposed design will try to achieve being environmental friendly and sustainable. The design will also incorporate ideas to bring people of all age groups to the library and have a pleasant experience in the environment.
The project will also help in understanding the complexities in designing a space that requires the design to be flexible to the range of users that tend to visit this kind of space.

CONTENTS

1. SYNOPSIS

1.1 – Introduction

Books have been of great importance throughout history. From true documentation to fiction, books have helped in shaping mankind to what it is today. Library space is where books are stored, studied and lent. Libraries help a lot of people seeking to expand their knowledge regardless of the technological advancements. Presently, a lot of people have come to appreciate hard copies of books which offer a better reading experience, thus in return increasing the popularity of libraries.

It is well known that the environment a person is in while studying directly affects their performance in their studies and dive more into the content they are reading. The environment produced by a library has proven to be a very effective space in this regard, due to its basic attributes. Therefore designing a complete library has been one of the few where equal importance is needed to be given to both the exterior and interior of the structure.

Though technological advancements have given rise to digital reading in the form of eBooks (Electronic Books), many libraries still tend to house many of the rarer and exclusive books which are not available through eBooks. This keeps the populace from neglecting the use of libraries and makes them a significant building type in the context of the current scenario.

Libraries though offer mainly one particular service are still divided based on the users, material types, subjects etc. This makes designing a public library challenging due to the various requirements to be met for the convenience of the users.

1.2 – Aim

The main aim of this project is to propose a public library design that helps to bring an interest to all the people to read and experience an environment like a library in a more user friendly manner. The design should tend to give solutions to tackle problems in relation to libraries like, lighting, sound-proofing, furniture layout, circulation etc.

Along with the normal requirements, the proposed design will try to achieve being environmental friendly and sustainable. The design will also incorporate ideas to bring people of all age groups to the library and have a pleasant experience in the environment. The project will also help in understanding the complexities in designing a space that requires the design to be flexible to the range of users that tend to visit this kind of space. It also slightly targets studies based on human psychology when it comes to usage of building types similar to libraries.

1.3 – Objective

To study the existing patterns and activities in libraries.

Understanding the need for space management in relation to designing spaces of cultural significance to create more functional spaces.

Division of space based on their function and placing them accordingly to be as convenient as possible for the users of the space.

Maximising the use of natural lighting while reducing the intensity of heat waves hitting a structure.

1.4 – Scope

To develop forms of aesthetic appeal, without sacrificing functionality of the spaces involved.

Understand the complexities of designing cultural buildings.

Understand methods of prevention or reduction of damage from natural disasters, through convenient planning, without the need for any external assistance.

Designing a space for better interaction and artistic value, to serve the society.

1.5 – Limitations

Detailed drawings will not be included in this design

Working drawings will not be included in this design.

Structural drawings and structural analysis will not be included in this design.

Financial estimate will not be included.in this design.

1.6 – Methodology

Aim==>Objective==>Data Collection==>Case Studies==>Inference==>Site Selection==>

SiteAnalysis==>Concept==>Design Development==>Zoning==>Plan==>Elevation==>

Section==> 3D Views.

2. DATA COLLECTION

2.1 - Time-Saver Standards for Building Types

The basic principles when planning for a library are –

Location to insure maximum accessibility, simplicity of design concept, ease of supervision by library staffs, and provision for future expansion

Spatial Standards (for population of 25000)

Space for book collection - 5,000sqft (464.5sqm)

Reader space (minimum of 75 seats) - 2,250sqft (209sqm)

Staff work space - 1,500sqft (139.3sqm)

Estimated additional space required for special uses, utilities, and miscellaneous - 6,250sqft (580.6sqm)

Total estimated floor space - 15,000sqft (1393.5sqm)

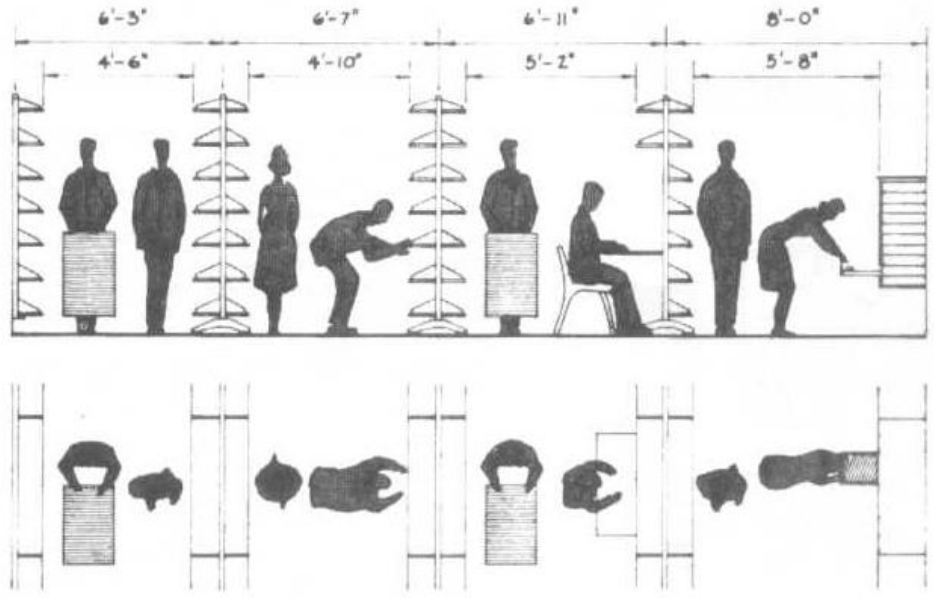
Population size	Book stock – volumes per capita	No. of seats per 1,000 population	Circulation – volumes per capita	Total sq ft per capita	Desirable, first floor, sq ft per capita
Under 10,000	3½-5	10	10	0.7-0.8	0.5-0.7
10,000-35,000	2¾-3	5	9.5	0.6-0.65	0.4-0.45
35,000-100,000	2½-2¾	3	9	0.5-0.6	0.25-0.3
100,000-200,000	1¾-2	2	8	0.4-0.5	0.15-0.2
200,000-500,000	1¼-1½	1¼	7	0.35-0.4	0.1-0.125
500,000 and up	1-1¼	1	6.5	0.3	0.06-0.08

Experience Formulas for Library Size and Costs

Population served	Shelving Space*			Reader space, sq ft	Staff work space, sq ft	Estimated additional space needed, sq ft‡	Total floor space, sq ft
	Size of book collection, volumes	Linear feet of shelving†	Amount of floor space, sq ft				
Under 2,499	10,000	1,300	1,000	Min. 400 for 13 seats, at 30 sq ft per reader space	300	300	2,000
2,500–4,999	10,000, plus 3 per capita for pop. over 3,500	1,300. Add 1 ft of shelving for every 8 vols. over 10,000	1,000. Add 1 sq ft for every 10 vols. over 10,000	Min. 500 for 16 seats. Add 5 seats per 1,000 over 3,500 pop. served, at 30 sq ft per reader space	300	700	2,500, or 0.7 sq ft per capita, whichever is greater
5,000–9,999	15,000, plus 2 per capita for pop. over 5,000	1,875. Add 1 ft of shelving for every 8 vols. over 15,000	1,500. Add 1 sq ft for every 10 vols. over 15,000	Min. 700 for 23 seats. Add 4 seats per 1,000 over 5,000 pop. served, at 30 sq ft per reader space	500. Add 150 sq ft for each full-time staff member over 3	1,000	3,500, or 0.7 sq ft per capita, whichever is greater
10,000–24,999	20,000, plus 2 per capita for pop. over 10,000	2,500. Add 1 ft of shelving for every 8 vols. over 20,000	2,000. Add 1 sq ft for every 10 vols. over 20,000	Min. 1,200 for 40 seats. Add 4 seats per 1,000 over 10,000 pop. served, at 30 sq ft per reader space	1,000. Add 150 sq ft for each full-time staff member over 7	1,800	7,000, or 0.7 sq ft per capita, whichever is greater
25,000–49,999	50,000 plus 2. per capita for pop. over 25,000	6,300 Add 1 ft of shelving for every 8 vols. over 50,000	5,000. Add 1 sq ft for every 10 vols. over 50,000	Min. 2,250 for 75 seats. Add 3 seats per 1,000 over 25,000 pop. served, at 30 sq ft per reader space	1,500. Add 150 sq ft for each full-time staff member over 13	5,250	15,000, or 0.6 sq ft per capita, whichever is greater

Guidelines for Determining Minimum Space Requirements

Aisles are the walkways in the library, this is the space where the user reaches to a book to take it or keep a book back. It is a very important space in a library due to it's recurrence and user movement around it. The figure below shows the minimum clearance for various positions while in the aisles of a library.



Minimum Clearance for Various Positions While in the Aisles

Reading area arrangement is a very key part when it comes to designing a library, since the arrangement of tables and chair when done properly don't disrupt any activities that happen in a library. The below figure shows the table space requirements for readers in a library, which can be used when arranging the furniture.

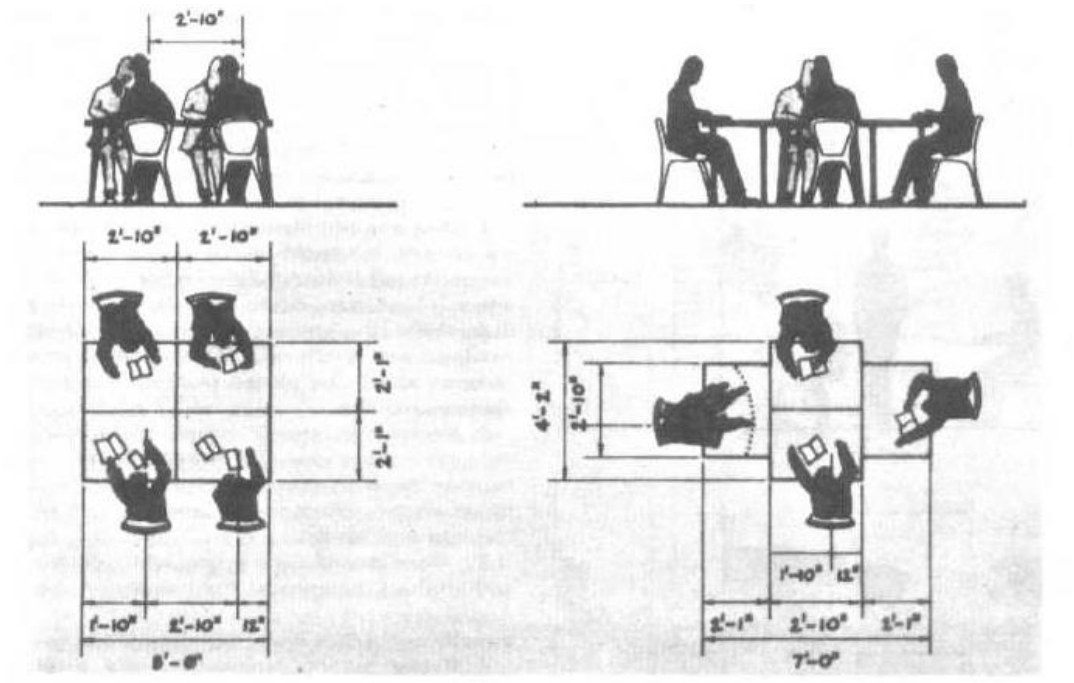


Table Space Requirements for Readers

2.2 - Rules and Bylaws for Designing a Library in India (IS 1553 : 1989)

Location –

- The requirements for the site for designing a library are as follows -
- Adequate separation (about 10m) should preferably be available between the building and the other neighboring buildings.
- The site shall not be in the immediate neighborhood of any hazardous occupancy.
- The site shall abut on a road of not less than 12m width. One end of the road shall join another road of the same width and the road shall not have a dead end.
- Adequate supply of water is assured for fire fighting purposes.
- A public fire brigade is within easy running distance from the site.
- A public library shall be centrally situated along with other community buildings.

Size of the Building –

- The size of different libraries will vary with the volume of the service to be rendered, that is the amount of material and the level of activity in the library. Due to this libraries often are seen in different sizes depending on their usage.

Rooms required for a Library –

- The number of rooms and types of rooms vary according to the type of library and it's size. Various rooms are to be used for the mentioned purpose, so as to not create any issues with the circulation. The following table shows the rooms required for different types of libraries.

Sl No.	Room Normally Separate	Public Library					Academic Library		Institutional Library	Dormitory Library
		NL	SL	CL	DL	BL	UL	DL		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
i)	Stack room	R	R	R	R	R	R	—	R	R
ii)	Catalogue room	R	R	R	R	R	R	—	R	—
iii)	General reading room	R	R	R	R	R	R	R	R	—
iv)	Periodicals reading room	R	R	R	—	—	R	—	R	—
v)	Special reading room	R	R	R	—	—	R	—	—	—
vi)	Research cubicles	R	R	R	—	—	R	—	—	—
vii)	Group study room	R	R	R	—	—	R	—	—	—
viii)	Seminar room	R	R	R	—	—	R	—	—	—
ix)	Conference room	R	R	R	—	—	—	—	—	—
x)	Exhibition room	R	R	R	R	—	R	—	—	—
xi)	Librarian's room	R	R	R	R	R	R	—	R	—
xii)	Deputy librarian's room	R	R	R	R	—	R	—	R	—
xiii)	Technical staff room	R	R	R	R	—	R	—	R	—
xiv)	Administrative staff room	R	R	R	R	—	R	—	—	—
xv)	Committee room	R	R	R	R	—	R	—	—	—
xvi)	Display space at entrance	R	R	R	R	—	R	—	—	—
xvii)	Night watchman's room	R	R	R	R	R	R	—	—	R
xviii)	Microfilm reading room	R	R	R	—	—	R	—	R	—
xix)	Document reproduction room	R	R	R	R	—	R	—	R	—
xx)	Computer cell room	R	R	—	—	—	R	—	R	—
xxi)	Audio-visual room	R	R	R	R	—	—	—	—	—
xxii)	Store room	R	R	R	R	R	—	R	R	R

'R' indicates required.
'—' indicates not required.

Rooms Required for Different Types of Libraries

Circulation –

- Each floor of the library building shall be at one single level to facilitate the movement of book trolley from one part to another. Thresholds shall not be provided anywhere inside the building.
- The movement of the book trolley from one tier to another where there are three or more tiers in the stack room, should be through electric lifts provided within the stack room with landing at every tier of the stack room and at other connected adjacent rooms. In large libraries where quick mechanical carriage of books and related materials are required, special arrangements, such as, pneumatic tubes and belt conveyors may become necessary. This may require to be considered at the initial stages of design of the library and its building.
- The rooms shall be arranged in such a way that the staff other than those servicing the reading room shall not-have to pass through the reading room disturbing the readers.

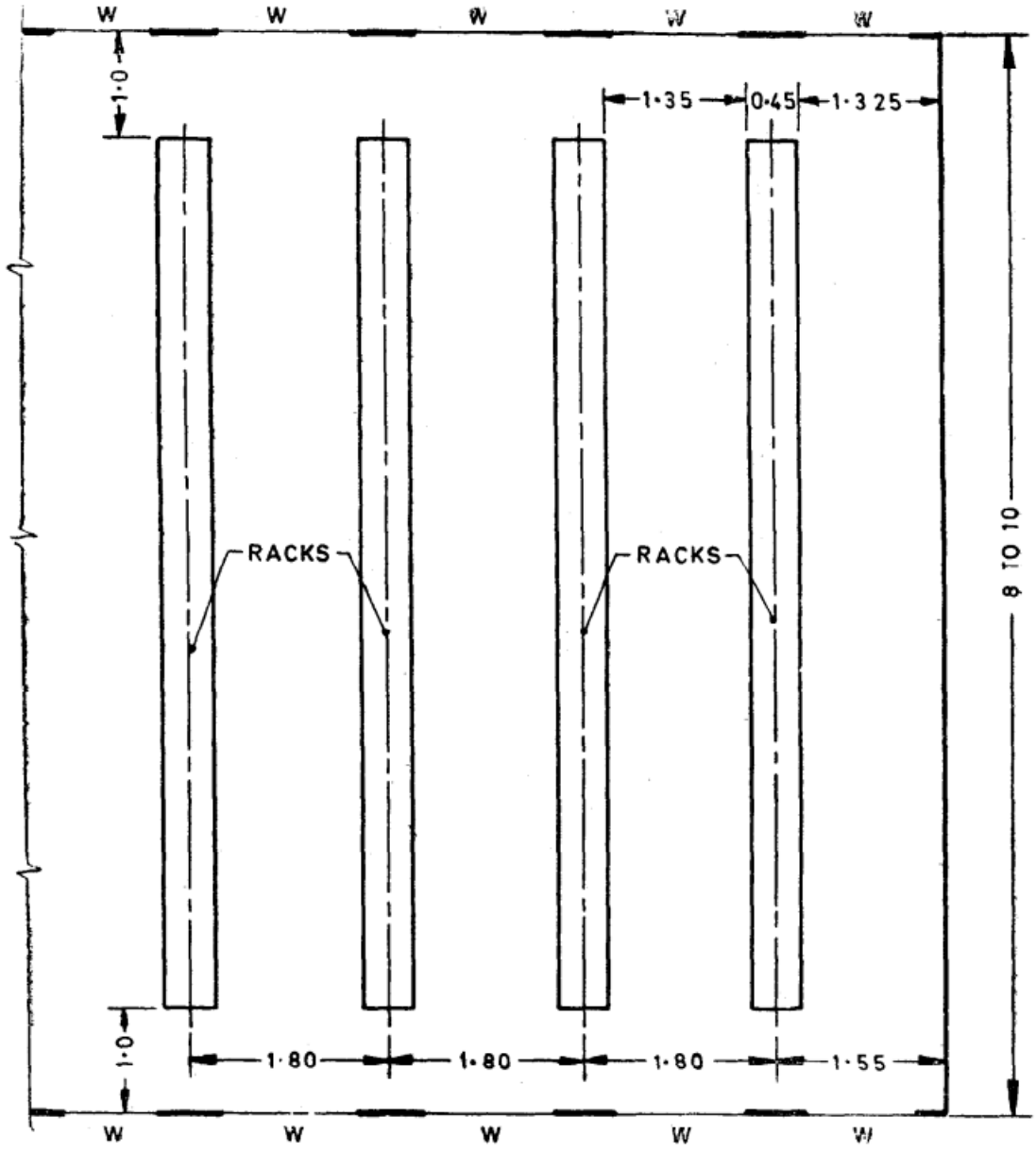
Control Region –

- Entrance to the library building and exit from it shall be only through the counter enclosure in the general reading room at the point of ~entrance from the entrance lobby.
- The control region shall be arranged so as to not permit any contact between a person in the reading room and a person in the entrance or exit gangway.
- All the other open areas resulting between the stack room and the wings of the main building shall be properly enclosed with a view to ensuring the safety of books.
- Relative Positions of Rooms –
- The stack room should be placed in such a way that it is easily accessible from and proximate to every part of the library.
- The catalogue room should be like an anteroom to the stack room on the way from the general reading room to the stack room
- The general reading room should be close to the entrance.
- Periodicals room may be further removed from the general reading room. But independent access to it shall be possible when the other rooms in the library are closed.
- Special reading rooms may be still further removed from the general reading room..
- The librarian or the deputy librarian should have his room in close proximity to the general reading room.
- The rooms of the technical and administrative staff should be placed in close proximity to the rooms of the librarian and the deputy librarian.
- The technical staff shall have independent access to the stack and ‘catalogue areas.
- The cubicles, the rooms for group study, the committee room, etc., may be in a separate wing or a separate floor.
- The exhibition room may be combined with the entrance lobby or placed as close to it as possible.

Sizes of Rooms, Gangways and Position of Gangways –

- Gangways are not only essential for efficient functioning of the library but also to allow easy access/passage to firemen to various parts of a room/building.
- The minimum clear width of gangways shall be as follows:
    a) Longitudinal gangway not less than 1m,
    b) Cross gangway not less than 1.35m, and
    c) End gangway (between the end wall and nearest row of racks/reading table) not less than 1.325m.
- All gangways shall be maintained clear without any obstruction whatsoever, at all times. No books, records or furniture or any other article shall be placed in a gangway.

A typical arrangement of gangways is given in the following figure -

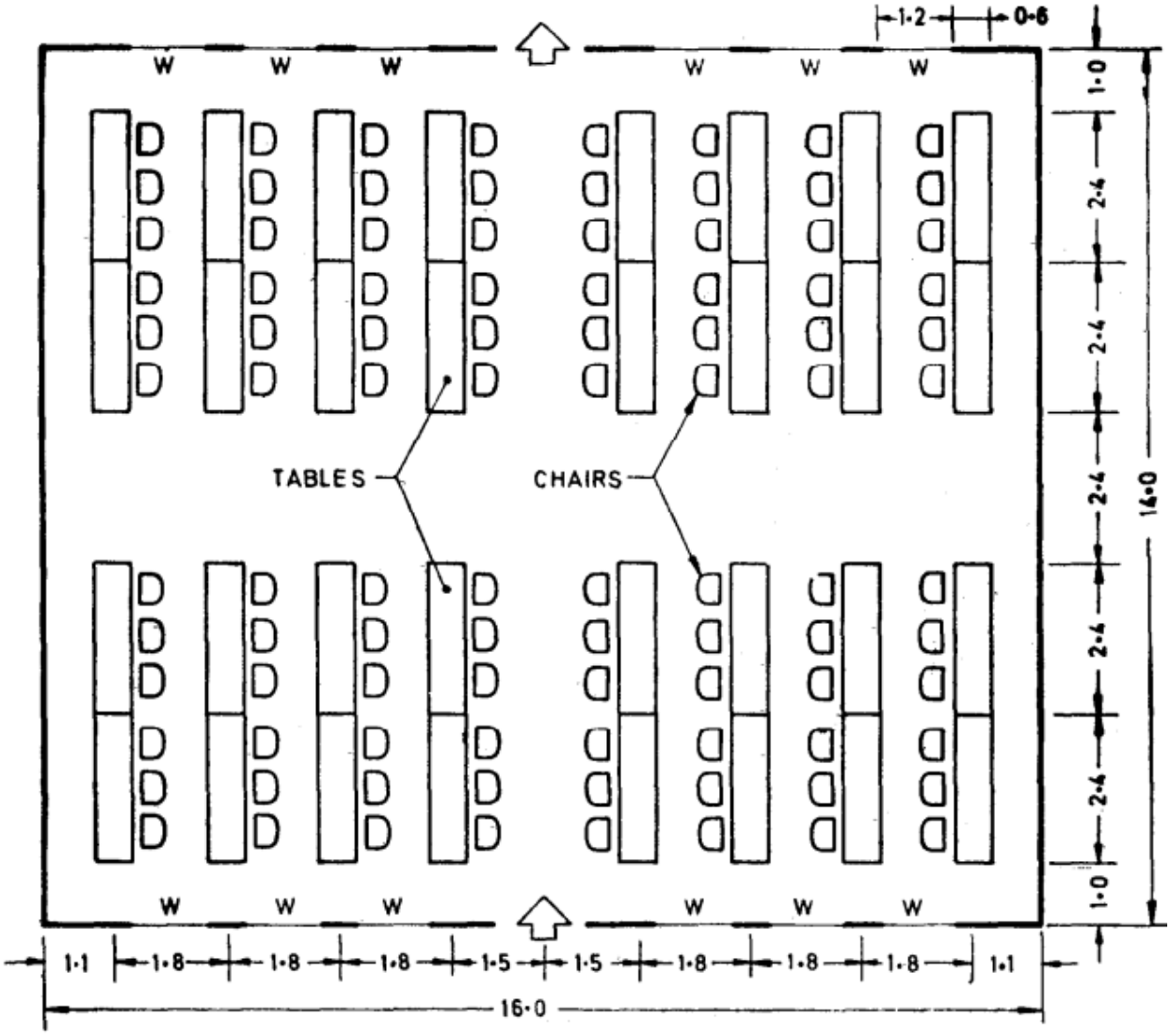


Arrangement of Racks for the Required Gangways

- The dimensions of stack room should be as follows -
    a) Clear Length in Meters, 1’80 n + 3’10 where n is the number of rows of book racks.
    b) Clear Height from floor to ceiling is 2.40m
    c) Clear Width
        1) 3m (on the basis of 1 rack, plus one longitudinal gangway close to a longitudinal gangway of 1m) close to a longitudinal wall;
        2) 5m (on the basis of 2 racks, each 2m long plus one longitudinal gangway of 1m) close to a longitudinal wall;
        3) 8m (on the basis of 3 racks, each 2m long plus two longitudinal gangways of 1m each) close to each of the longitudinal walls; and

4) 10m (on the basis of 4 racks, each 2m long plus two longitudinal gangways of 1m each) close to each of the longitudinal walls.

- Reading room – The average area per reader in a reading room should be 2.33sqm, *Min.* An illustrative layout of the reading room is shown in the following figure.



Layout of Reading Room

- The sizes of the other rooms shall be as follows :
  a) Librarian and deputy librarian - 30sqm
  b) Classifier, cataloguer, accession librarian and maintenance librarian - 9sqm per person
  c) Secretary to the librarian – 9sqm
  d) Visitor's room - 15sqm
  e) Administrative and professional staff not at service points and other than those mentioned in (b) – 5sqm per person
  f) Group discussion room - 2sqm per person
  g) Conference room – 2sqm per person

h) Seminar room – 2sqm per person
i) Committee room - 2sqm per person
j) Cubicles – 7sqm per person

This concludes the main rules to be followed when designing a public library.

3. CASE STUDIES

3.1 – Kanazawa Umimirai Library

Basic Information -

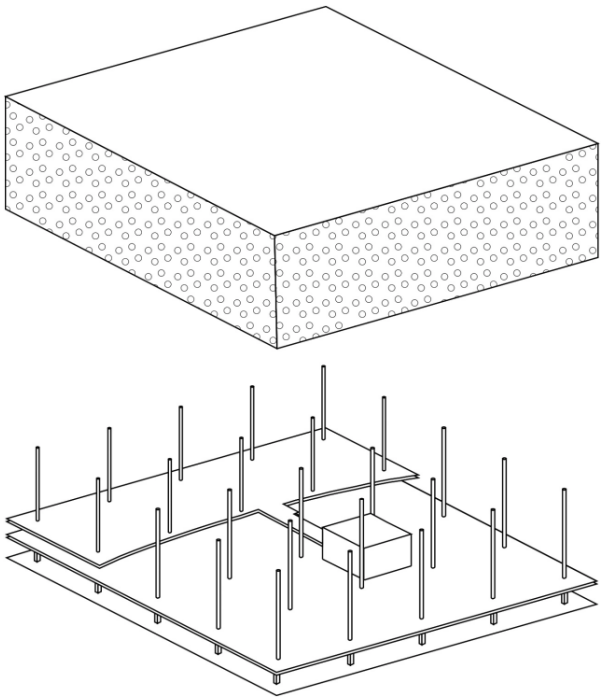
- Location – Kanazawa, Ishikawa Prefecture, Japan
- Architecture Studio – Coelacanth K&H Architects
- Lead Designers – Kazumi Kudo and Hiroshi Horiba
- Category – Library
- Total Area – 2,311.9sqm
- Project Year – 2011
- Primary Material – Concrete and Glass
- Primary Color – White
- Landscape – Patterned Grass Garden and Small Trees

Introduction

- Established in 2011, the Kanazawa Umimirai Library is a public library located in Kanazawa, Ishikawa Prefecture, Japan. The building was designed by the collaboration of architects Hiroshi Horiba and Kazumi Kudo. It has been described by the architects as a “simple space” of 45m x 45m and 12m high.
- The design helped Hiroshi Horiba and Kazumi Kudo to win a Japan Institute of Architects Prize in 2013.The library houses a collection of around 400000 volumes across approximately 5500sqm.

Design

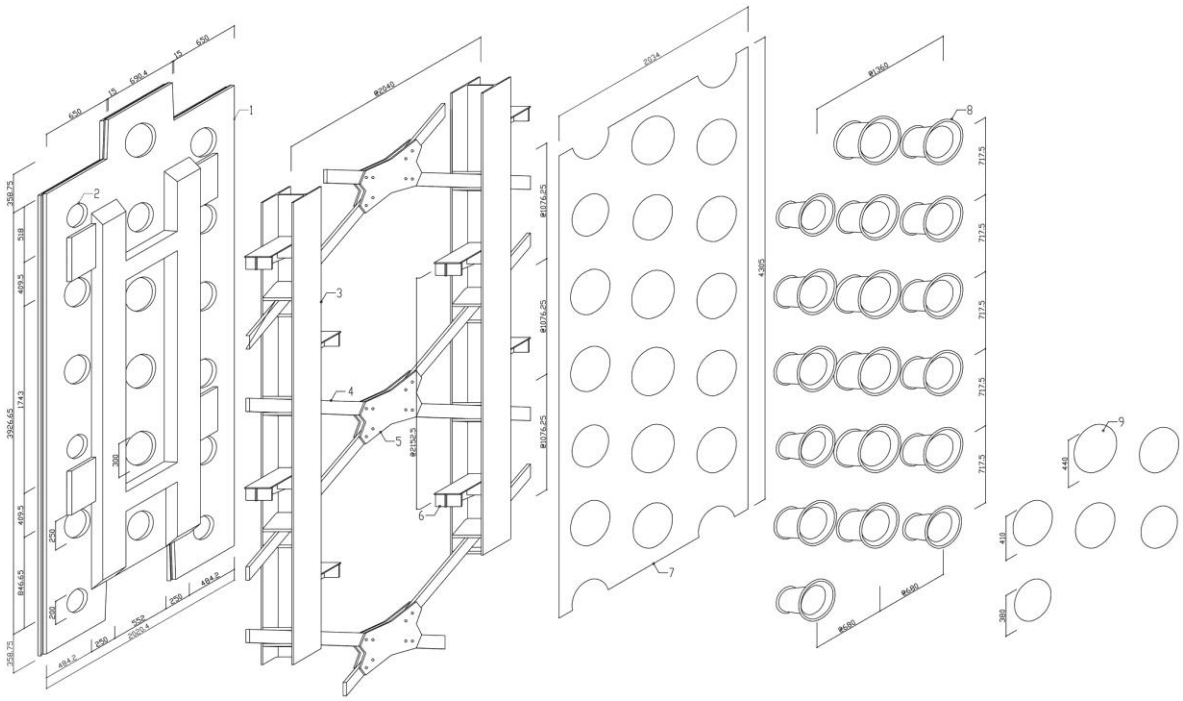
- Presently, libraries in Japan are moving towards a system that encourages readers to stay and linger, instead of their traditional function as spaces for collecting and lending out books. Reflecting the general trend for libraries to facilitate reading as well as other functions, this library uses compact automated shelves that operate as a closed stack system.
- This is combined with halls and meeting rooms that promote social exchange between its users, much like a community center. The facility was also designed to serve as a new hub for social life among the local community.
- As a whole, it is a simple space measuring 45m by 45m with a height of about 12m, enclosed by a punching wall and supported by 25 pillars that would function as a storehouse for books and a hub for human communication. This huge, massive volume served as a reading space while keeping with the mood and setting of a library.
- The overall structure of the library resembles an internal three-layered floor covered with a large box that was refer to as a "cake box“, by the architects The large external "punching wall" in the cavernous reading room features some 6,000 small openings (measuring 200, 250 and 300mm) across its entire surface that allow a soft, uniform light to enter the building. In addition, the burden of seismic force from any earthquakes is dispersed across the entire expanse of this wall.



Cake Box Visualisation

- Punching Wall

  The outer wall of the cake box is 45m × 19m and has a thickness of 475 mm. It is a composite structure with a built-in structure designed to bear horizontal forces and wind pressure. A glass reinforced concrete (GRC) wall was designed with three glass types blocked on the outside, 6-mm thick steel panels on the inside, and an aluminum spatula frame on the opening cross section. Small openings were uniformly arranged so that it looked like one semi-transparent wall.



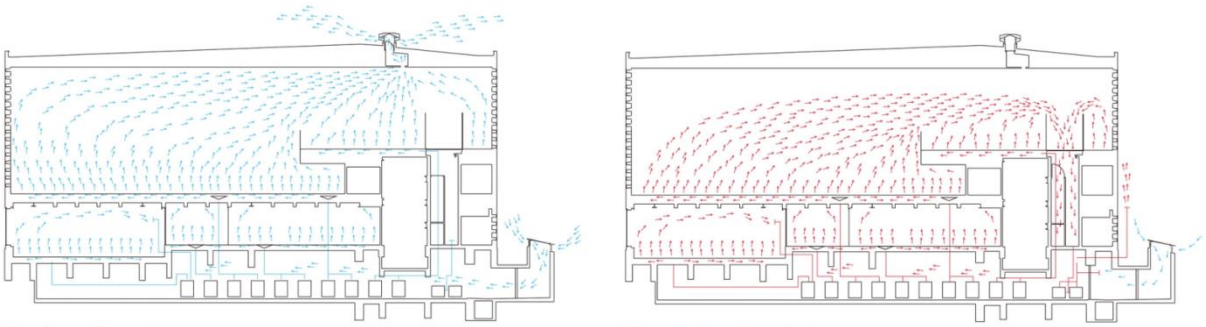
EXTERIOR WALL COMPONENT 1/60

1. Exterior wall:super low pollution fluororesin paint, flat finish with brush and roller,glass fiber reinforced cement mortar sprayed,perlite mortar boared
2. Opening: glass block 8 mm + HS 6 mm,photocatalyst KBL coating,single component silicone-modified epoxy+ single component modified silicone
3. Periphery column: H300 x 300 x 10 x 15 mm, ceramic fire protective coating 10 mm (1 hour fireproof)
4. Brace: flat bar 32 mm x 125 mm anticorrosive coating
5. Gazette plate: 16 mm steel plate x 2, SHT B2-M22 anticorrosive coating
6. Façade fastener catch: 9 mm steel plate,semi-dry spray rockwool 25 mm (1 hour fireproof)
7. Internal wall: steel panel 3.2 mm, anticorrosive coating, synthetic-resin oil-based paint
8. Enboss: 3 mm aluminium with metal spinning synthetic-resin oil-based paint
9. Climb and dust cover: 3mm polycarbonate sheet, stainless-steel screw fixed

- Environmental Thermal Design

  As shown in the following figure, a vertical duct shaft was set penetrated the first and second floors from the machine room in the basement, and airflow was made to flow along the each floor level. The floor outlets used a direct airflow type on the perimeter, and in the reading room, blew horizontally from under the bookshelves. The high-ceilinged reading room spanned the second and third floors, so the air conditioning system was designed as a separate system, like a theater, to keep the temperature difference between the upper and lower floors as small as possible.

Return airflows into the underground machine room consisted of a vertical shaft of 2.9m × 6.4m from the floor grating surrounded by the glass screen on the third floor. The toilets on the first and second floors were in the center of the floor, so ventilation was required for 24hr. However, a heat pump exhaust heat recovery air conditioner was used to save energy by recovering heat from the toilet exhaust.



For outside air-cooling, ventilation was supplied by the air conditioner fan and exhausted from an exhaust tower on the roof. The intake of air was achieved through a desalting filter from the air supply trench in the underground machine room, and the return air was blocked by four large dampers with 1sqm power cylinders in the shaft. The rooftop exhaust tower was linked to the return side by eight 0.75m × 1.6m open and close dampers (motor driven) that controlled the open and close operation pattern during the cooling, heating, and intermediate periods.

Materials

- Efficient materials were selected for the purpose of pre-casting, but each part was supported by highly skilled manual work. These included the GRC, laser cutting technology for the glass blocks and steel panels, and an embossed cylinder for spatula drawing.

Conclusion

- A heating system that warms and cools the building was installed under the floor in order to make the large space comfortable to inhabit, while large natural ventilation openings in the roof ensure a pleasant and comfortable indoor environment during the warmer months.
- The overall library's artificial lighting energy consumption was reduced due to the natural light of the punching wall.
- To enhance energy conservation, the air conditioning system, was designed to reduce the cooling and heating period due to the effect of outside air-cooling in the interim period. The air conditioning system divided the standard floor into four zones, each of

which was ventilated and air-conditioned with a gas heat pump air conditioner. Additionally, in areas requiring constant ventilation, exhaust heat was recovered with an air-cooled heat pump air heat exchanger.

- Concerning energy consumption, since the library opening, and despite the visitor's number exceeding expectations, the effects of the air conditioning during interim periods have been effective. Compared to ordinary libraries and government buildings, the energy consumption has been significantly less, which confirmed that the system worked effectively.

3.2 – Lilavati Lalbhai Library

Basic Information -

- Location – Ahmedabad, India.
- Architecture Studio – RMA Architects
- Lead Designers – Rahul Mehrotra, Payal Patel, Robert Stephens
- Category – Library
- Total Area – 2847sqm
- Project Year – 2017
- Primary Material – Concrete, Wood and Glass
- Primary Color – Concrete Grey and Brown
- Landscape – Grass and Trees

Introduction

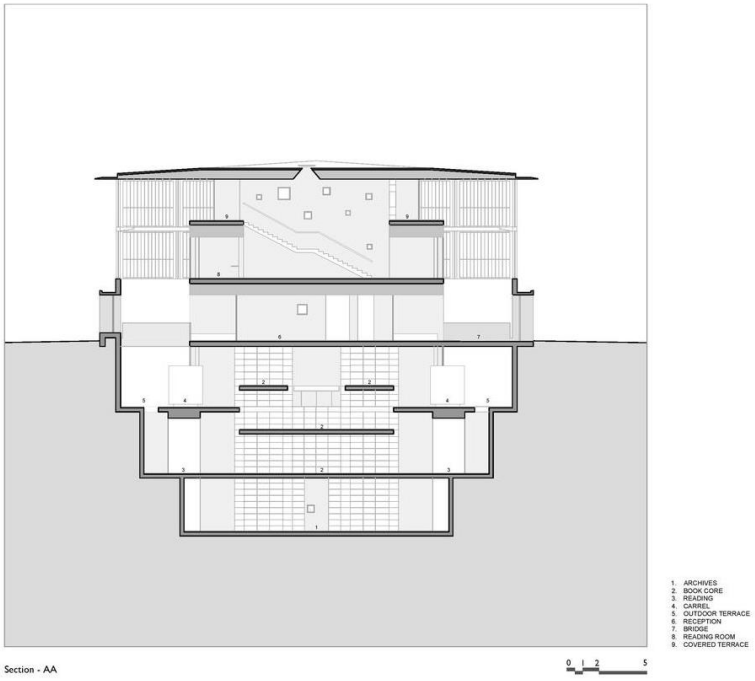
- Located in the heart of the CEPT University campus designed by the late Indian architect B. V. Doshi, the CEPT library, also called the Lilavati Lalbhai Library is

often viewed as a location or space for improving connections between students and faculty of various departments.

- It was designed by Rahul Mehrotra, thus making it the first building in the campus to not have been designed by the late B. V. Doshi. It was opened for use in the year 2017.

Design

- Three distinct spaces layered within each other, like tree rings, fulfill the basic concept of the building. The first area is the exterior space designed to combat the harsh climate of Ahmedabad by acting as the 'skin' of the building.
- The second layer is made of wide spaces meant to flood the structure with light. This second layer is created as an intermediate space between the skin and the core.
- The final layer, or the library core, contains the stack space and the more private reading areas and is made of steel and glass along with concrete.
- The library follows and recreates the existing architecture, this is due to the site being based on the original master plan of the University, leading it to be aligned with pre-existing structures.
- The height of the structure was restricted to match the existing context and built it downwards in such a way that half of the building is buried, which in return provides the added advantage of temperature control. The library core extends down to these basement levels, with quieter spaces for reading and archiving.



Sectional Elevation

- Shifting Façade
  More flexible spaces that also connect the building with the natural context are present in the upper levels. The skin of the building plays an important role in this. While the internal layers are made of structural steel, concrete, and glass, the skin has a material palette of concrete and wooden louvers.

Conclusion

- Through alignments in plan with adjacent buildings, modulation of sectional levels into and above the earth, and honest material selection and expression, the building respects the continuum of existing architectural expression.
- At the most fundamental performative level, the Lilavati Lalbhai Library is a technologically adept repository of multi-format media, both responding to and anticipating the current and future acquisitions of the university.
- The library acts as a passive demonstration of climate mitigation strategies in architecture. Complete with an operating manual for students, the building's modulated, louvered facade can be manually adjusted to allow in less light or more ventilation in response to Ahmedabad's severely hot and dry climate.
- Located at -4 meters and -8 meters below ground level, the book stacks, carrels, and study spaces benefit from both plentiful and filtered natural lighting that pours in through the louvered facade as well as the natural cooling effect provided by the surrounding earth.

- The building serves as a hands-on laboratory for students to experiment with the principles of passive ventilation, lighting, and traditional cooling systems in South Asia.

3.3 – Anna Centenary Library

Basic Information –

- Architect – C. R. Narayan Rao
- Firm – CRN Arhitects
- Building Type – Public/Institutuional
- Year - 2010
- Location – Gandhi Mandapam Rd, Surya Nagar, Kotturpuram, Chennai, Tamil Nadu 600085
- Total Area – 41806sqm
- Capacity for Materials – 1200000
- Cost of construction – 172 Cr Indian Rupees
- Number of floors – 9
- Certification – LEED Gold

Introduction

- The Anna Centenary Library is a Government sponsored Institutional Complex housing a Public Library, a multipurpose state of the art Auditorium, an open air Amphitheater, a Food court and other amenities covering 0.4million sqft of built up area.
- The building was designed in an environmentally responsive way which employs both passive design features and resource efficient active elements to increase its sustainability.
- Designed by CRN, the 9-floor Anna Centenary Library building houses a total area of 41806sqm (450,000sqft) and has a capacity to accommodate 1.2 million books. At any given point, the library can accommodate 1200 people, not including an auditorium that can separately seat 1280 people.

Design

- The planning principles include appropriate orientation, scaling down of built mass, developing the roof of the auditorium as amphitheater, segregating movement patterns etc.
- Low-energy architecture has been achieved through an environmentally responsive design, using both passive design features and resource efficient active elements.

- Passive design features include building shape and form (optimizing surface to volume ratios), appropriate orientation and integrated shading devices achieving maximum daylight penetration with minimum heat ingress. Reading areas, facing North and East directions, are located next to structurally glazed facades. Along the Southwest direction (where heat gain is highest) are located thermal buffer zones of service cores and a 9 floor high atrium with an outward sloping glass wall. Roof overhangs, Pergolas, Metal louvers provide distinct architectural features creating an identity for the complex, while cutting off heat and glare. Landscaped terraces reduce heat island effect.
- Active Energy elements include efficient Air conditioning system, Heat recovery wheels, Lighting fixtures with daylight and motion sensors, Intelligent building management system, Waste water recycling system, Sensor based sanitary fixtures and Building materials with low embodied energy like Fly ash blocks, PP (Portland Pozzolana) cement, Solar efficient glass, Low VOC Paints and chemicals, Recycled Carpets etc.
- High performance glazing glass balances daylight transmission with heat penetration.

Conclusion

- Located in a well developed area in Kotturpuram, Chennai, amidst Educational and Institutional buildings and on a location with easy access from all parts of the city, makes the library a building of significance in the locality.
- The shape and form of the building have been designed with optimized surface to volume ratios in mind, as well as passive solutions which increases the building's sustainability.
- Thus sensitive architectural design and efficient building services solutions have resulted in a sustainable, low-energy building, delivered within a commercially viable budget without compromising aesthetics.

3.4 – Summary of the case studies

The case studies summarised here, show how in every one of these projects, when it comes to designing a library, the main focus is on managing the space. Managing space is not just about avoiding wastage of space or restrict overcrowding, it is about using the entirety of a space and trying to make it more functional. The other factor to consider, is the importance of natural lighting which provides a better experience for the readers and can potentially save energy wherever possible.

Furniture layout can impact the circulation within a space, if the layout is done systematically, the users will feel more comfortable and have a pleasant experience. The

layout at the end is a determining factor considering the movements in a space like a library by the various kinds of users.

The proximity of structures like library to educational institutions enable it to expand more in terms of popularity and have a significant impact as a cultural hub or center for the locality it is part of, this helps in more people engaging themselves and communicating with others, which may benefit them.

For a structure to be visited, it needs to look the part, providing a aesthetic look to structures like libraries can be more welcoming to the people and gain a significant amount of attention, which can help promote the library, and help it flourish.

4. SITE SELECTION

4.1 – Location

The site is located in Sholinganallur,Chennai. It covers an area of 20886 sqm which happens to be around 5 acres.

4.2 – Site Justification

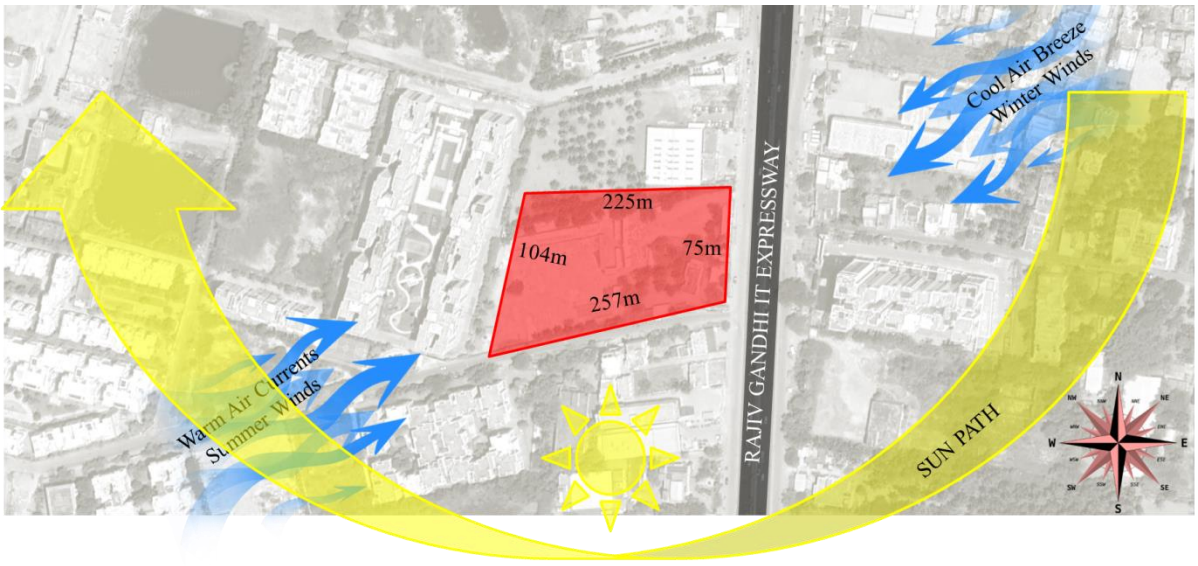
Located in South Chennai, Sholinganallur happens to be one of the fastest developing places in Chennai. With the flourishing of IT field, the place has seen a rapid growth with many noticeable IT infrastructure.

Due to the increasing development in the area, it has been subjected to increase in traffic due to the growing work force in the IT field and its proximity to IT hubs. Due to the establishments of educational institutions nearby the place has also seen a rapid increase in literacy rate.

The availability of easily accessible public transport which also includes the upcoming metro rail system along with the above mentioned description makes the site ideal for public structures like libraries.

Site Photos

5. SITE ANALYSIS

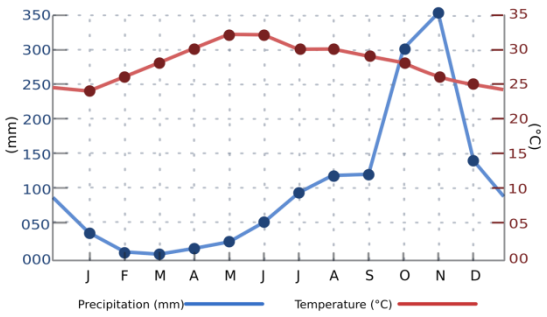


5.1 - Connectivity

- The site is connected to the main city via the Rajiv Gandhi IT Expressway.
- The closest bus stop is the Sholinganallur Bus Stop within 700m.
- The closest railway station is the Taramani Railway Station.
- The closest airport is the Chennai International Airport.

5.2 – Climate and Weather

- The site has Tropical Wet and Dry climate, while the weather is mostly Hot and Humid throughout the year.
- The HOTTEST month of the year is MAY.
- The COOLEST month of the year is JANUARY
- The month with the HIGHEST rainfall is NOVEMBER
- The month with the LOWEST rainfall is MARCH



5.3 – SWOT Analysis

- Strengths: Developing Area, Commercial Zone, IT Corridor, Flat Land, Facing Main Road.
- Weaknesses: Noise Pollution, Lack of Planning
- Opportunities: Potential to be a Landmark, Growing Literacy Rate
- Threats: Changes in Climatic Conditions, Possibility of Further Construction around the Site, Decrease in Vegetation due to Rapid Urbanization.

5.4 – More Details

- The type of trees found abundantly is the palm tree.
- The soil is predominantly Loamy, with a few instances of only clay type.

Loam Soil

- The land is flat without noticeable contours.
- Notable landmarks near the site are the
  Mohamed Sathak College of Arts and Science, located 800m North West from the site, and the Sholinganallur Lake located 850m South from the site.

Mohamed Sathak College of Arts and Science

Sholinganallur Lake

5.5 – CMDA Regulations for Library design in the location

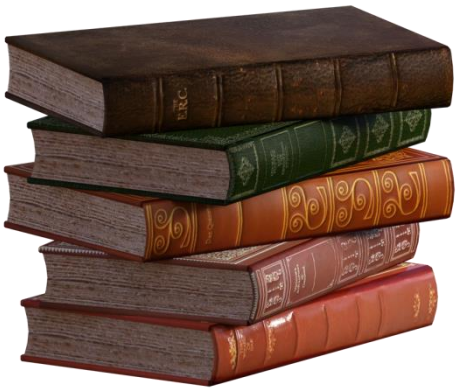
- Frontage – 30m
- Maximum Height of Building – 15.25m
- FSI – 1.5
- Maximum Plot Coverage – 40%
- Minimum Setback (all side) – 6m
- Open Space Reservation (OSR) – 10% of the Plot

6. CONCEPT

6.1 – Visualisation

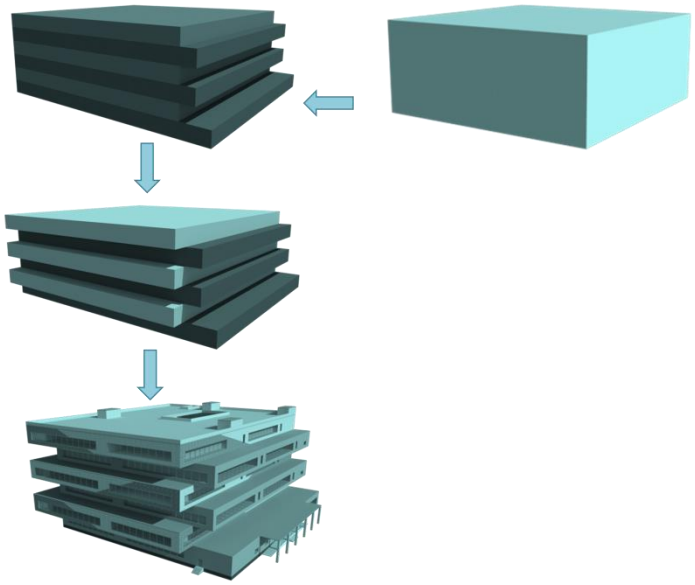
The design was derived using vertical arrangements of cuboid, overlapping each floor at fixed intervals resulting in cantilevers. The orientation of the building along with its shape helps in combating the strong winds that can arise during cyclone and avoid weakening of the structure.

The whole concept was inspired by the image of books stacked one over the other in a not so arranged manner, which is a familiar site for many students. Though books are mostly of cuboidal shapes, when played with the arrangements, the entire shapes morphs into something different and each time there is a slight change in position, it gives rise to more unique shapes.



Stacked Books

6.2 – Transition



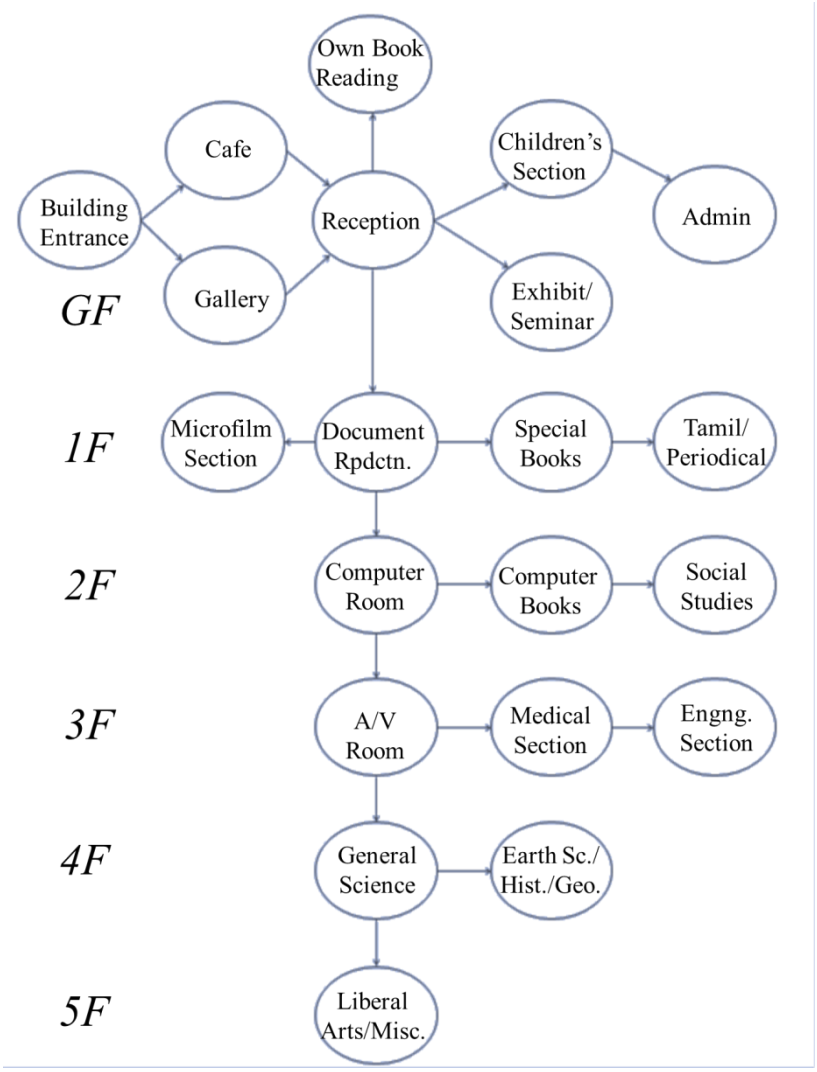
The Evolution of Design

In the beginning, a cuboid is obtained, which after the arrangement of floor plans and levels transitions to a shape similar to that of stacked books albeit in a somewhat orderly manner. The cantilevered floors act has proper shades for the floors directly below them, thus not requiring the use of additional shades for many of the opening elements.

The design of the building could make it a significant landmark in the locality due to its unique but imaginable look, which in turn can also attract people to visit the building and promote a interest in reading books in general.

Following a cuboidal shape based on a rectangular plan, provides the structure more stability when compared to other shapes, thus doing well against horizontal forces in general to a certain degree. It further goes to prove the many possible outcomes, that come from what is normally termed as simple.

6.3 – Connectivity



Connectivity diagram for Circulation

The connectivity diagram shows the flow or circulation pattern followed in the design, the study was done to improve the movement among users throughout the space, without any interruptions which is a key to make the user feel psychologically more comfortable.

6.4 – Area Statement

FUNCTION OF THE SPACE	
GROUND FLOOR	AREA(m^2)
GALLERY	270
CAFE	100
CCTV/SECURITY	53.04
STORE ROOM FOR SECURITY	39
MECHANICAL ROOM	78
RECEPTION AREA	377.64
EXHIBITION SPACE	91
SEMINAR HALL	315
CHILDREN'S SECTION	462
COLLECTION/DISTRIBUTION ROOM	23.2
CATALOGUER'S ROOM	22.04
HEAD LIBRARIAN	22.04
ADMIN	22.04
FINANCE OFFICE	22.04
STAFF ROOM 1	23.2
STAFF ROOM 2	23.2
TECHNICAL STAFF ROOM	23.2
HEAD LIBRARIAN'S ROOM	22.04
CONFERENCE ROOM	84
GROUP STUDY CUBICLE	45.63
OWN BOOK READING SECTION	122
TOILET FOR MEN	37.63
TOILET FOR WOMEN	34.79
STORE ROOM	25

FIRST FLOOR	
DOCUMENT REPRODUCTION ROOM	80
MICROFILM READING SECTION	100
SPECIAL BOOK READING SECTION 1	308
SPECIAL BOOK READING SECTION 2	422.4
PERIODICALS SECTION	595.14
TAMIL BOOKS SECTION	737.1
TOILET FOR MEN	37.63
TOILET FOR WOMEN	34.79
STORE ROOM	35
SECOND FLOOR	
COMPUTER ROOM	182
COMPUTER/IT BOOKS SECTION 1	422.4
COMPUTER/IT BOOKS SECTION 2	308
SOCIAL STUDIES SECTION 1	596.7
SOCIAL STUDIES SECTION 2	481.78
TOILET FOR MEN	37.63
TOILET FOR WOMEN	34.79
STORE ROOM	35
THIRD FLOOR	
AUDIO VISUAL SECTION	182
MEDICAL SECTION 1	308
ENGINEERING SECTION 1	422.4
MEDICAL SECTION 2	595.14
ENGINEERING SECTION 2	737.1
TOILET FOR MEN	37.63
TOILET FOR WOMEN	34.79
STORE ROOM	35

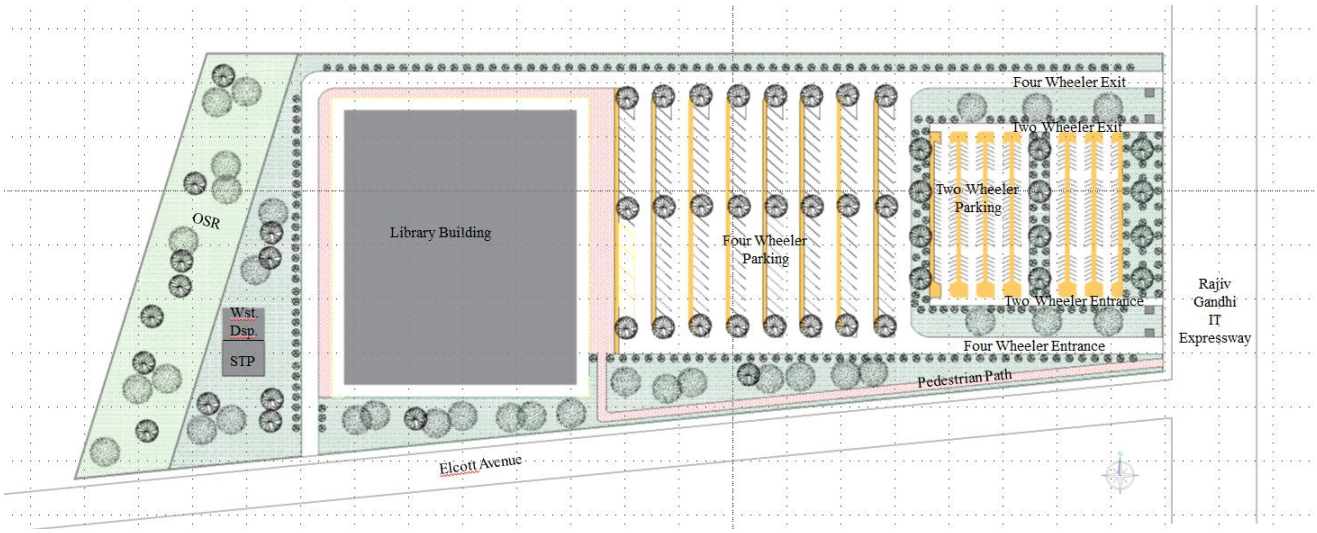
FOURTH FLOOR	
GENERAL SCIENCE SECTION 1	182
GENERAL SCIENCE SECTION 2	422.4
GENERAL SCIENCE SECTION 3	308
EARTH SCIENCE/HISTORY/GEO. SECTION 1	596.7
EARTH SCIENCE/HISTORY/GEO. SECTION 2	481.78
TOILET FOR MEN	37.63
TOILET FOR WOMEN	34.79
STORE ROOM	35

FIFTH FLOOR	
LIBERAL ARTS/MISC. SECTION 1	182
LIBERAL ARTS/MISC. SECTION 2	308
LIBERAL ARTS/MISC. SECTION 3	422.4
LIBERAL ARTS/MISC. SECTION 4	595.14
LIBERAL ARTS/MISC. SECTION 5	737.1
TOILET FOR MEN	37.63
TOILET FOR WOMEN	34.79
STORE ROOM	35

The tables posted, provide the area statement used for the different parts of the library and thus divide them accordingly, so as to avoid as overcrowding of users or wastage of space, creating a perfect balance.

7. Design Proposal

7.1 – Site Planning



Entrance/Exit

- The main entrance is through the front which abuts the Rajiv Gandhi IT Expressway, there are separate entrances for four wheelers, two wheelers and pedestrian so as to avoid traffic and accidents. The exits are also at the front along the entrances.
- The roads are all one way, with varying width based on the vehicular usage of the roads.
- The service road entrance abuts the Elcott Avenue and passes through the backside or West side of the library building. The road is connected with the four wheeler exit for joint exit.

Parking

- Total number of parking for two wheelers is 324.
- Total number of parking for four wheelers is 130.
- Total number of car parking for the differently abled is 4.
- No basement parking is provided

Structures in the site

- Library building
- Sewage Treatment Plant
- Garbage Disposal and Incinerator

The OSR (Open Space Reservation) of area 2118.6sqm is provided at the back, which can be entered by accessing the Elcott Avenue.

Landscaping

The palm trees on the site at the back were preserved and used.

The golden shower tree (cassia fistula) was widely used during separations of the parkings and at the front. The sides were covered using neem trees (azadirachta indica). Both the tree are native to Chennai.

Golden Shower Tree

Neem Tree

The road side bushes/plants used was madagascar periwinkle (catharanthus roseus), which is one of the most common flowering plants in Chennai.

Madagascar periwinkle

Orientation of the Library Building

The library building has been oriented to face the main road in the East direction, with all the other sides of the building facing their respective directions.

The distance between the building and nearest parking is 8.96m.

7.2 – Floor Planning

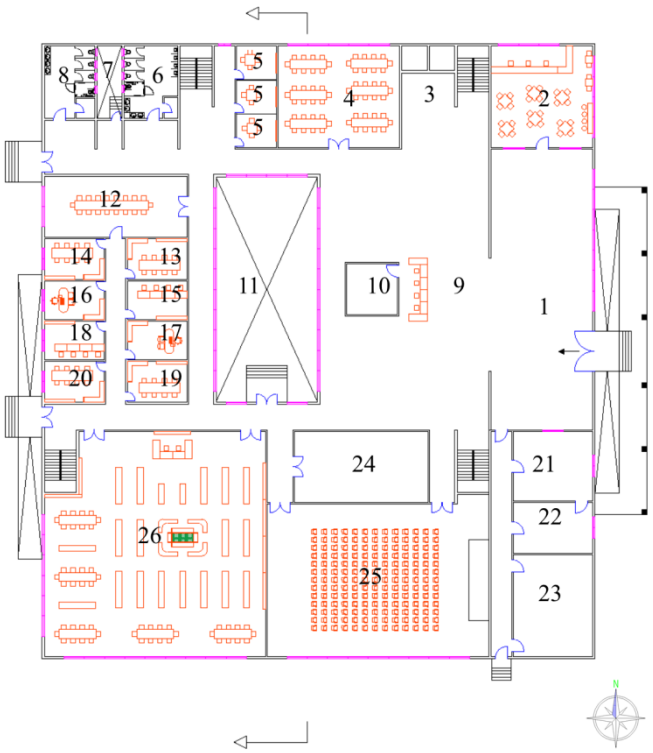
The layout is rectangular in shape, the spaces have been divided based on their functions and similarities to other spaces if any.

Leaving the ground floor, the other floors are mostly stack/reading rooms.

The admin block is situated centrally at the back of the ground floor, parallel to the children's section, this is to avoid any clashes between the zones and to better the circulation.

There is a OTS of size 10m x 22.1m, which is used for gardening and provide ventilation and natural lighting along the corridors.

All stack/reading rooms have been located in such a way that these rooms can have high amount of natural lighting and better ventilation.



S.No.	LEGEND GROUND FLOOR	DIMENSION (m)
1	GALLERY	10 x 27
2	CAFE	10 x 10
3	ELEVATOR (x2)	2.5 x 2.4
4	OWN BOOK READING ROOM	12.2 x 10
5	GROUP STUDY CUBICLES (x3)	3.9 x 3
6	TOILET FOR MEN	5.3 x 7.1
7	DUCT	2.4 x 7.1
8	TOILET FOR WOMEN	4.9 x 7.1
9	RECEPTION SPACE	16.7 x 22.6
10	STORE ROOM 1	5 x 5
11	OTS INDOOR GARDEN	10 x 22.1
12	CONFERENCE/COMMITTEE ROOM	14 x 6
13	STAFF ROOM 1	5.8 x 4
14	STAFF ROOM 2	5.8 x 4
15	FINANCE OFFICE	5.8 x 3.8
16	HEAD LIBRARIAN'S OFFICE	5.8 x 3.8
17	CATALOGUER'S OFFICE	5.8 x 3.8
18	ADMIN OFFICE	5.8 x 3.8
19	COLLECTION/DISTRIBUTION ROOM	5.8 x 4
20	TECHNICAL STAFF ROOM	5.8 x 4
21	CCTV/SECURITY ROOM	7.8 x 6.8
22	STORE ROOM 2	7.8 x 5
23	MECHANICAL ROOM	7.8 x 10
24	EXHIBITION SPACE	13 x 7
25	SEMINAR HALL	21 x 15
26	CHILDREN'S SECTION	21 x 22

Ground Floor Plan

Services

There are four entrances to access the building one of them is restricted for public use.

There are four staircases provided with a total width of 3.15m, two near the front and two near the back of the building.

There are two elevators of size 2.5m x 2.4m, which have a capacity of 20 person or 1360 kilograms

Other Details in Relation to Planning

Total plot coverage is 21.3%.

Total Built-up area is 19705sqm.

FSI achieved is 0.97.

7.3 – Exterior

The exterior at a glance looks like a stack of books as visualized during the concept phase.

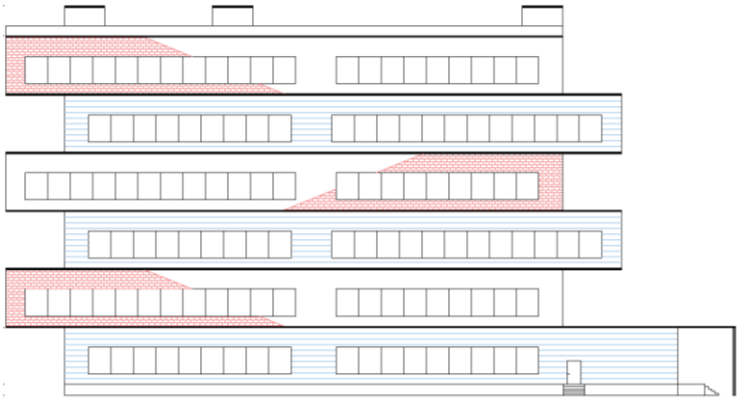
The total height of the building with the headroom is 34.55m.

The plinth provided is of height 1m from the ground level.

The windows provided are aluminium framed, which was selected due to its durability and recyclability when compared with its UPVC counterpart.

Aluminium framed windows

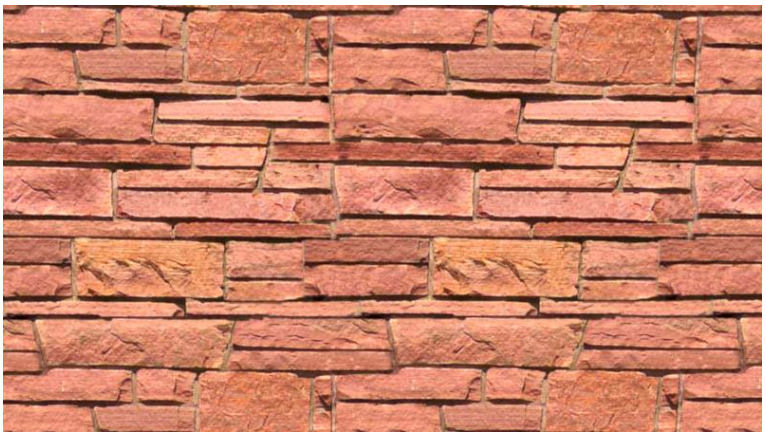
The colour combination for the building was partly inspired by the duo tone colour of the old red-blue eraser, this was partly due to libraries often being related with studying.



North Side Elvation

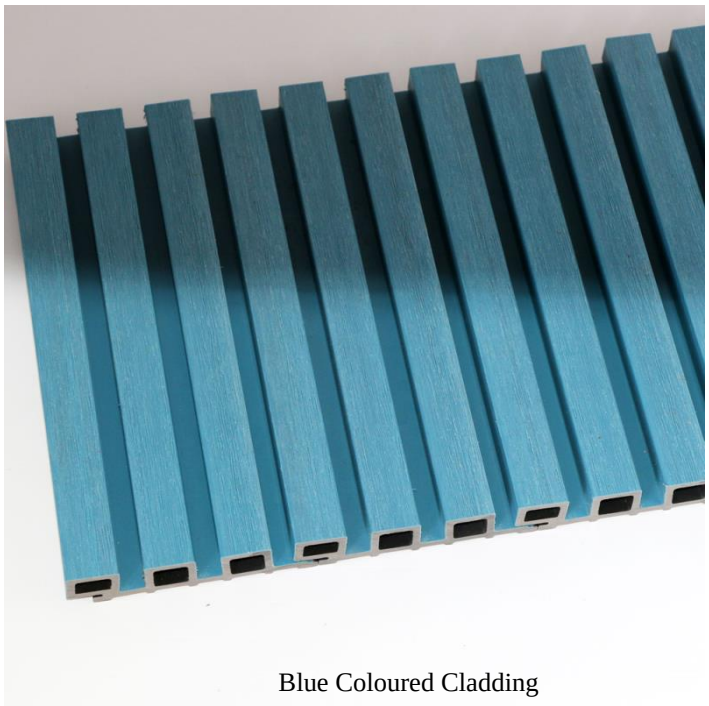
The Eraser

The material used to achieve the reddish colour is brick themed tile, arranged in ashlar style.



Ashlar Style Masonry

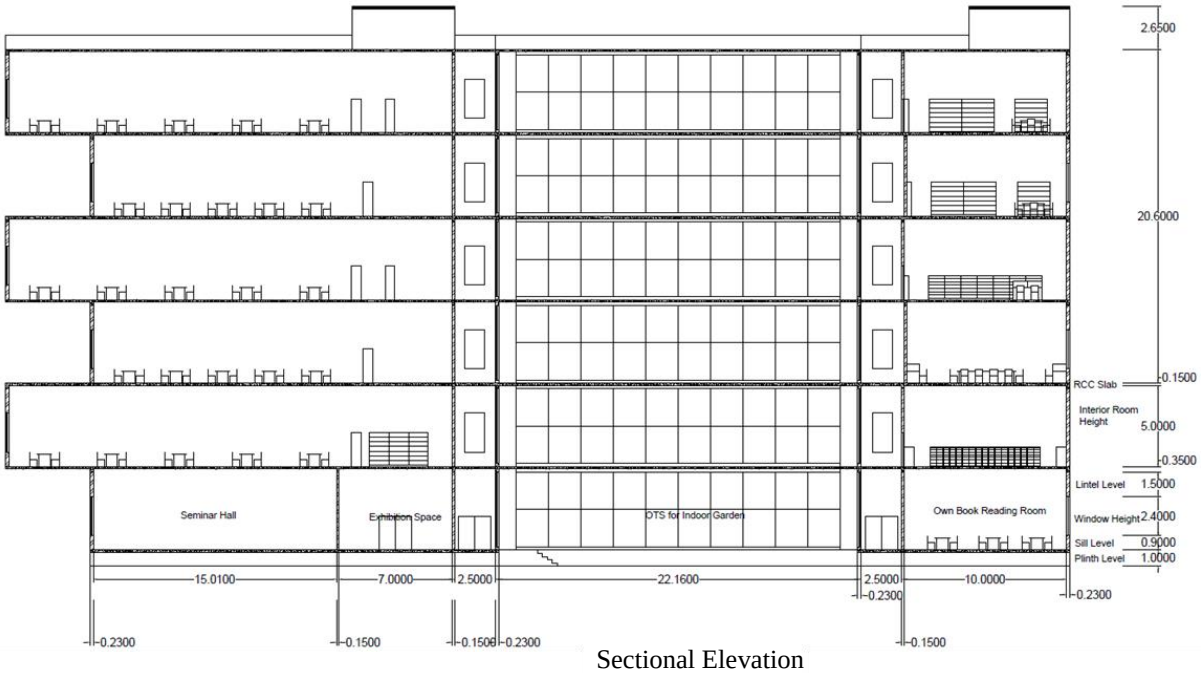
The blue part is created using wall cladding of blue colour schemes. The rest of the building is light grey in colour.



Blue Coloured Cladding

7.4 – Interior

The interior height level for each floor is at 5 m without including the false ceiling, this is to provide ample space and avoid feeling of being congested. The interior rooms are differently coloured based on their function and usage.



Sectional Elevation

The seating capacity of reading rooms is 1584.

The seminar hall which has a capacity of 169.

The group study section has a seating capacity of 12 persons, and the own book has a seating capacity of 60

The Audio Visual section has a seating capacity of 12 with the same number of systems.

Total number of computers and capacity inside E-Library is 65.

There are a total of 72 microfilm cabinets in the microfilm reading section with a capacity of 108000 approx., approximated due to the availability of rolls in 16mm or 35mm. The capacity for this section is 14 as same as the number of systems for reading microfilms.

The overall seating capacity is 1916.

The capacity of books that can be stored is approximated at around 436800 volumes. (IS 1553 : 1989 assumes 2m length book rack holds a capacity of 750 volumes).

7.5 – Sheets Submitted

- INTRODUCTION SHEET (SIZE A1)
- SITE ANALYSIS (SIZE A1)
- CASE STUDIES (SIZE A1)
- CONCEPT (SIZE A1)
- SITE PLAN (SIZE A1)
- FLOOR PLANS 1 (SIZE A1)
- FLOOR PLANS 2 (SIZE A1)
- ELEVATIONS AND SECTION (SIZE A1)
- DESIGN PROPOSAL (SIZE A0)

7.6 – Tools Used

- Autodesk AutoCad
- SketchUp
- Vray
- Microsoft Powerpoint
- Microsoft Word

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