

BIOPHILIC COMMUNITY LIVING

THESIS

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Architecture degree

By

SHEBI S (3621071)



**DEPARTMENT OF ARCHITECTURE SCHOOL OF
BUILDING AND ENVIRONMENT**

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INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY) Accredited with
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JUNE 2021



DEPARTMENT OF ARCHITECTURE
BONAFIDE CERTIFICATE

This is to certify that this Thesis Report is the bonafide work of Shebi S (3621071) who carried out the Thesis entitled “Biophilic community living” under our supervision from January 2021 to June 2021.

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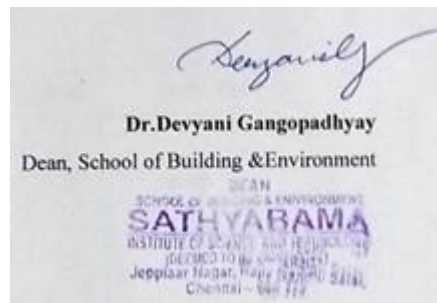
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DECLARATION

I, **Shebi S** hereby declare that the Thesis Report entitled “**Biophilic Community Living**” done by me under the guidance of **Ar. Surya Rajkumar** (Internal Guide), **Ar. Shankar.V** (Internal Review Member) and **Ar. Loganathan.T** (External Guide). Sathyabama Institute of Science and Technology is submitted in partial fulfilment of the requirements for the award of Bachelor of Architecture Degree.

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ABSTRACT

Humans are aesthetically attracted to the natural systems and to the landscapes. Recent studies were proved that there are many positive impacts in connection with the nature and nature integrated built environments physiologically, cognitive and psychologically. The natural systems in the built environment also reduce stress. Connecting with nature is essential for people to live with less stress, and better overall health and well-being. The thesis is about how biophilic design, including integration of greenery, can be used to create a good and attractive community living.

A gated community design with biophilic approach has been tried out with the features of small residential streets and include various shared amenities, a park and other common area. It may be possible for the residents to stay within the community for most daily activities. Designed with the consideration of various user groups. And it helps in the reduction of microclimate.

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Biophilic design is a design philosophy that encourages the use of natural elements and processes into the built environment. It is based on the Biophilia hypothesis, which clearly proposes that humans have a strong connection to the natural world and that exposure is very important for human health and well-being.

- Biophilic design aims to create buildings in a better way that reconnects humans with the natural world.
- As our population grows, we'll be trying to find more ways to live sustainably.
- One of those solutions and a trend we've seen in apartment living is biophilic design.
- Biophilic design connects our daily lives with the peace and tranquility of nature.

The most serious problem of the modern urban apartments is the few opportunities for the residents to know each other. The separate structure of apartment makes it more difficult to meet people. Therefore, the external spaces in the apartment complex are an important place for the residents to meet each other and establish a community. The community space cannot be established simply by the resting space like a pavilion, but it should be established connecting with the community facilities and external space such as stores, sports center and library out of the complex. In addition, it should introduce the space where the residents can conduct activities with the medium of external space such as complex gardens and sports space.

1.2 AIM

The aim of the thesis is to provide a better standard of living with a variety of houses to serve different income group.

And self-sufficient in terms of open spaces, recreation, services etc.

It also aims to provide a holistic and sustainable design solution by incorporating the biophilic design for a healthier built environment.

1.3 OBJECTIVE

- Planning a smart community - residential development with all amenities.
- Improve standard of living by providing amenities like Swimming Pools, Gyms, Play Areas, Parks, Community spaces, Club house etc.
- To design place close to harmony and nature.
- To develop a design solution which establishes an eco – friendly relationship with the built spaces and people.
- To achieve a green space around the dwelling areas.
- Implementing the patterns of biophilic in the building to improve health and well – being.
- To provide a design solution which produce a healthy environment.

1.4 METHODOLOGY OF STUDY

- To study about the general information about gated community planning.
- Detailed study the collection of data standards provided for the gated community planning.
- To study how the gated and biophilic community has been planned through various case studies.
- Study of how the biophilic has been approached in the apartment spaces.
- Final step is the evolution of design and progress towards it.

CHAPTER 2

DATA STANDARDS AND LITERATURE STUDY

2.1 BIOPHILIC ARCHITECTURE

Biophilia - Bio means life and philia in Greek means fondness. Biophilia is a term coined by Erich Fromm in his book *The Anatomy of Human Destructiveness*. Edward O Wilson popularized the hypothesis in his book *The Biophilia Hypothesis*. He suggests that humans originate from nature and hence have the innate tendency to get attracted to life and life-like processes. Biophilic design is a design of spaces that promotes and encourages the interaction of humans with nature and natural systems. It is the experience of person with nature and natural elements. The flow of water, being able to see the changes in the times of the day and experience the changes in seasons is some examples of connections to nature.

It is not just important for humans to stay connected to nature but also interact with it due to the fact of health and well-being. This connection would make a person feel that they are a part of a bigger system creating empathy for the system, which in turn creates a shift in their thinking from “I” to “we”. Biophilic Design not only helps improve human health but also the health of the environment. It helps in making the community more resilient.

Nature also helps in nurturing a sense of place. Sense of place is a phrase used to describe a person's relationship or association with a place and a community attachment to the place. Once a person has an association to a place, he or she tries to protect and preserve the place. Green neighborhoods and natural environments have been associated with stress reduction and improved physical and mental health.

2.1.1 Biophilia Hypothesis

The biophilia hypothesis recommends that there is a strong bond between human beings and other living systems. Edward O. Wilson presented and popularized the hypothesis in his book, *Biophilia* (1984). The term "biophilia" implies "love of life or living systems." It was first utilized by Erich Fromm to portray a psychological orientation of being attracted to all that is lively and vital. Wilson uses the term within the same sense when he characterizes biophilia as "the urge to affiliate with other forms of life."

2.1.2 Biophilic design, Health and Wellbeing

The biophilia hypothesis proposes that humans have an inherent tendency to affiliate with natural systems and processes. Kellert and Wilson (1993) propose that biophilia is the result of a process of cultural and biological co-evolution. And this evolutionary process has shed light on a basic human need – ongoing connections with the natural world. This insight is key in the context of health and wellbeing since it proposes that biophilia lies at the roots of our minds, our behavioral patterns, and our physiological working. If we are conscientious of affinity for nature, which has been adjusted and refined over millions of years, we can improve community well-being and wellness through the built environment, and can offer a sense of having a place and security.

2.1.3 Benefits of Biophilia

- Repeated and sustained engagement with nature.
- Human adaptations to the natural world that over evolutionary time have advanced people's health, fitness and wellbeing.
- Positive interactions between people and nature.
- Emotional attachment to particular settings and places
- Interconnected and integrated architectural solutions.

Not every green building is meant with biophilic strategies. Biophilic architecture is a part of an innovative view in architecture, to encourage the connection between humans and nature and the comfort creates from a nature.

2.1.4 14 Patterns of Biophilic Design

An advanced classification was found by Stephen Kellert as well. He divided tents of biophilia into 3 main categories which are Nature in the Space, Natural Analogs and Nature of the Space. Nature in the space consists of visual connection with nature, non-visual connection with nature, non-rhythmic sensory stimuli, thermal and airflow variability, presence of water, dynamic and diffuse light, and connection with natural systems. Natural analogs consist of biomorphic forms and patterns, material connection with nature, and complexity and order. Nature of the space consists of prospect, refuge, mystery, risk /peril.

2.2 STANDARDS

DCR

2.2.1 General

Minimum extent of plot

80 Square meters

Minimum plot frontage

6 metres

Minimum road width

6 m

Maximum F.S.I.

2

Maximum plot coverage

70

Minimum width for corridor

1 m

Minimum width for stairways

1.25 m

FRONT SET BACK

Above 30 m - 6m

Above 15 m but less than 30 m - 4.5 m

Above 10 m but less than 15 m - 3.0 m

Below 10 m - 1.5 m

REAR SET BACK

Upto 15 metres - 1.5 metres

Between 15 to 30 metres - 3.0 metres

Above 30 metres - 4.5 metres

SIDE SET BACK

- 1.0 metre on one side for plots having a width of not more than 6 metres.
- 1.5 metres on one side for plots having a width of more than 6 metres but not more than 9 metres.
- 1.5 metres on either side for plots having a width of more than 9 metres.

PARKING SPACES

- The minimum area to be provided for each car is 18 sq.m (3m by 6m) with a minimum head room of 2.1 meters if parked in a covered area.
- The minimum area to be provided for motor cycles and scooters is 2.5 sq.m and 1.5 sq.m.

The parking provided for motor cycles and scooters should not be more than 25% of the car parking space so as to leave clear space round the building for the movement of vehicles.

OPEN SPACES

For buildings above 9.5 meters. The minimum requirements are

Above 9.5 upto 12	4.5
Above 12 upto 15	5.0
Above 15 upto 18	6.0
Above 18 upto 21	7.0
Above 21 upto 24	8.0
Above 24 upto 27	9.0
Above 27 upto 35	10.0 Above
35 upto 40	11.0

2.2.2 Fire Protection and Exit Requirements

- All buildings exceeding 15 meters in height shall have at least two staircase.
- The distance between the two staircases should not exceed 22.5 meters.
- Fire escapes shall have straight flight of not less than 75 cm in width, 20 cm tread and riser not more than 19 cm.
- The number of risers is to be limited to 16 per flight.

2.2.3 Rules covering various parts of Buildings

1. Plinth - the minimum plinth level shall be 45cm.

2. Habitable room - Minimum floor area to be 8 sqm

Minimum height to be not less than 2.75 meters for non AC buildings.

Minimum height to be not less than 2.4 meters for AC buildings.

The maximum height should not exceed 4.2 meters for any habitable room.

3. Kitchen - Minimum floor area to be 8 sqm

Minimum width to be 2.4 meters

Minimum clear height to be 2.75 meters

The minimum size of window opening shall be 1 sqm. It should open directly to an interior or exterior open space but not into any shaft.

4. Bathroom

Minimum floor area to be 1.8 sqm

Minimum width to be 1.2 meters

Minimum height to be 2.2 meters

Water Closet

Minimum floor area to be 1.1 sqm.

Minimum width to be 0.9 meters.

Combined bath room and water closet

Minimum floor area to be 2.0 sqm

Minimum width to be 0.9 sqm.

Every bathroom or water closet should have one of its walls opening to an exterior open space and shall have an opening in the form of a window or ventilator or louver or not less than 0.3 sqm.

Lofts

- The area of lofts to be restricted to 25% of floor area of the kitchen / habitable rooms and to full 100% space of bath rooms, water closets and corridors. It may cover 100% of any corridor.
- The maximum height of any loft to be 1.5 meters.
- The minimum height below the loft shall be 2.2 meters.

LIGHT AND VENTILATION

1. Every habitable room, kitchen, staircase, bathroom or water closet shall have at least one window or aperture opening directly to the external air or into an open verandah, not more than 2.4 meters in width, for admission of light and air.
2. The minimum area of each openings shall not be less than $\frac{1}{6}$ th of the floor area.
3. No Portion of a room shall be assumed to be lighted if it's more than 7.5 m from the opening assumed for lighting that portion.

PARAPET

Parapet walls and handrails provided on the edges of roof terrace, balcony etc. should not be less than 1.0 m

LIFTS

Walls of lift enclosures shall have a fire rating of 2h, lift shafts shall have a vent at the top of area not less than 0.2 sq.m.

2.2.4 Planning Considerations

- Circulation through the living area should be as direct as possible, yet it should not interfere with the furniture placement.
- The kitchen should be conveniently located near the dining area, living area and utility area.
- The kitchen should provide direct access to the dining area.
- Balconies are often enclosed with windows to create a large internal space.
- There is a deep in the floor level between the balcony and the interior of the flat for rain protection and as a splashguard.
- The standard bathroom size - 5' x 7'
- Bathroom lie in the wet zone, the floors may turn slippery and become hazardous. Hence non - slip surface or flooring should be used.
- PASSING FROM BEDROOM TO BATHROOM
 - It should not be necessary to cross the living space. Ideally, one should not be seen at all.
- PASSING FROM KITCHEN TO BATH ROOM
 - This should be done, if possible, without crossing the living space.

CHAPTER 3

CASE STUDY

3.1 CASE STUDY – 1 – KANCHANJUNGA APARTMENT



Fig 3.1 Kanchanjunga Apartment

3.1.1 Introduction:-

Location:-

Mumbai

Architect:-

Charles Correa

Year:-

1983

Architectural style:-

Modern, Brutalism

Location

Bombay lies on the western coast of India and its major commercial center for the country. The apartments are located southwest of downtown Mumbai in an upscale suburban setting.

In Mumbai, buildings are ideally oriented east-west directions to catch the prevailing sea-breezes, and also the views out to the Arabian Sea on one side and the harbor on the other.

Historical Context

- The Kanchanjunga - tower is one of the first high-rise buildings in this area of Bombay.
- Almost all current skyscrapers are built after Kanchanjunga.

Historical buildings (before 1900)

20th Century buildings (before 1970)

Kanchanjunga (1970 - 1983)

Recent buildings (after 1970)

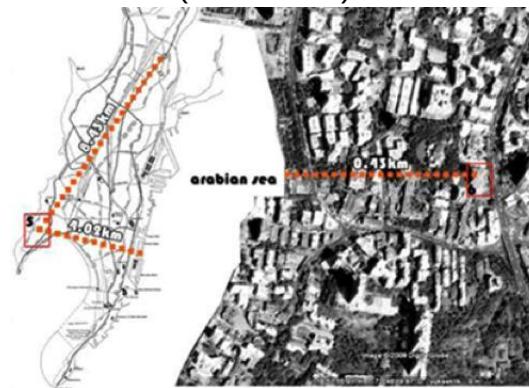


Fig 3.2 Site and its surroundings

- The site has a separate road for the individual approach which is connected to the main road.
- Building is approachable from two opposite sides, one from the east and the other from the west.

3.1.2 Site Context:-

- The Kanchenjunga apartments is a building containing 32 luxury apartments ranging in size from 3 to 6 bedrooms.
- These apartments are built within a lower towards the east and the west to take advantage of the prevailing breezes and views of the Arabian sea and the surrounding harbors.
- Area: 441 sqm
- Site and situation: City landscape have been surrounded by the mid-rise and high-rise structures.
- Surface parking - 20
- Basement parking - 30
- Clubhouse and pool
- A,B,C and D type apartments.
- Elevator stops at alternate floors



Fig 3.3 Site plan

3.1.3 Concept

- He mainly worked on the sectional displacement by bringing changes within the floor surfaces.
- He applied cellular planning by using interlocks in one and half story 3 and 4 bedroom units with two and half story 5-6 bedroom units.
- Small displacements in levels differentiated the external earth filled terraces with internal elevated living volumes.
- The Kanchanjunga Apartments are a direct response to this present culture, the escalating urbanization, and therefore the climatic conditions for the region.
- The building is a square tower. Charles Correa created gaps in the tower.
- The two floors high loggias are created to keep out the sun and absorb the cool sea breeze.

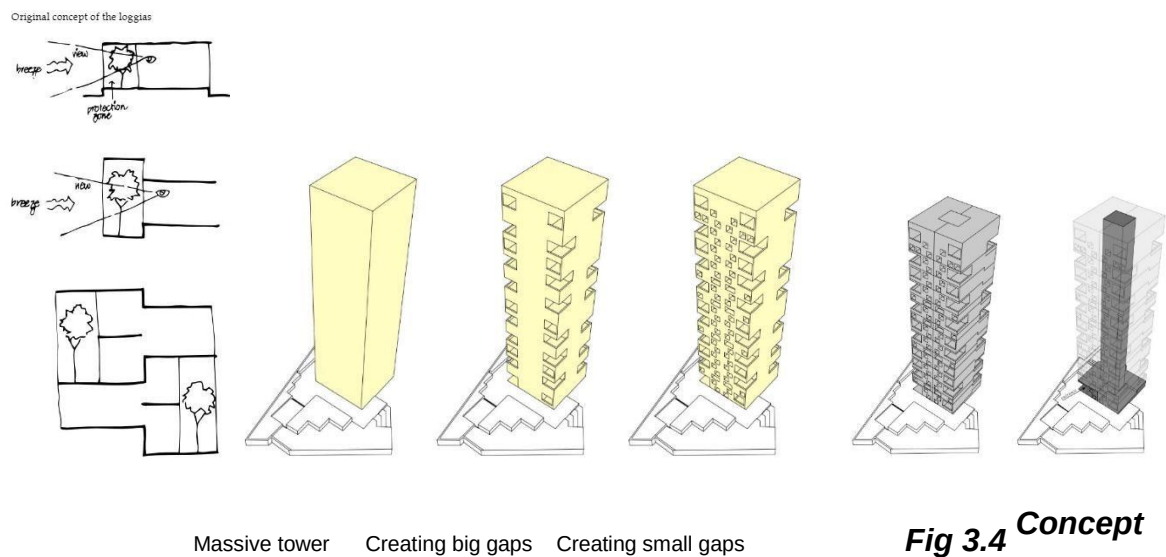


Fig 3.4 Concept

- The tower is placed on a heightened ground level on a parking beneath.
- Entrance and central core with staircase and elevators
- The opening from the apartments within the tower happens with a central core for vertical transport.

3.1.4 Orientation

- This building has to be oriented east – west directions to catch prevailing sea breezes and to open up the best view of the city.
- Unfortunately, these are also the directions of the hot sun and also the heavy monsoon rains.
- The old bungalows solved these problems by wrapping a protective layer of verandas around the main living area and therefore providing the occupants with two lines of defense against the weather.
- From the interlock of four different apartment typologies varying from three to six bed rooms each.
- Smaller displacements of level were critical during this work in that they differentiated between the external earth filled terrace and therefore the internal elevated living volumes.
- These subtle shifts enable Correa to effectively shield these high-rise units from the effects of both the sun and monsoon rains.
- This was largely achieved by providing the tower with relatively deep, garden verandas, suspended within the air.

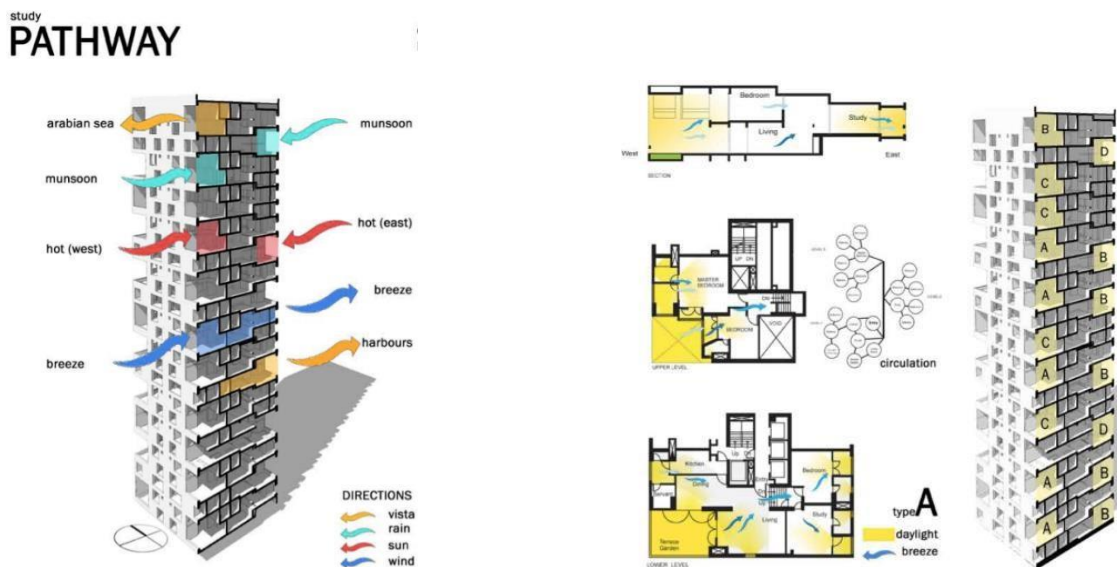


Fig 3.5 Wind directions

Fig 3.6 Orientation of space

3.1.5 Analysis Of Plan

Total 4 house typologies are there in kanchanjunga.

Type A is a 3BHK house having a carpet area of 294 sq.m.

Type B is a 3BHK house having a carpet area of 242 sq.m.

Type C is a 5BHK house having a carpet area of 373 sq.m.

Type D is a 4BHK house having a carpet area of 361 sq.m.

- The building is planned in east and west orientation.
- West side of the building have sea and east side have view of the city which plas a dynamic role from the building.
- But orientation toward hot sun and heavy rain, the orientation is often rotate which will be give positive value.
- It's also fine because verandas give covering the cool breeze and provides a comfort to the living.
- Also, the building has good access of day light and breeze through terrace garden and window.
- The building has 4 different types of house, that is of variations expressed externally by shear end walls that hold up the cantilevers.
- The surfaces cut away to open up the double height terrace gardens at the corners is also a good idea.
- These apartments have a central inner staircase to bridge the differences in levels.

3.1.6 Climate Analysis

Warm and humid

Since Mumbai is a coastal city, the weather is usually humid year round. Also, because it is in tropics, it never gets very cold and therefore the yearly extremes lie within a 30 degree Celsius range.

Mumbai's weather can be divided into 4 seasons winter (dec- feb), summer (marmay) , monsoon (june-sept), with drawal season(oct- dec).

- During winters the temperature goes right down to the minimum of 15 degree Celsius.
- Summer temperature has ranges from 20 degree Celsius to 35 degree Celsius.

- Monsoons will affect the residents of Bombay with heavy showers. • Water logging is a major problem within the city during this season.



Fig 3.7

March 21 and September 21 are the mean days of the year. A sun study on that days is representative for the mean daily situation.

- In the morning, the eastern skyscrapers project big shadows on Kanchanjunga.
- During the morning bathing is only possible for the residents of the high east apartments.

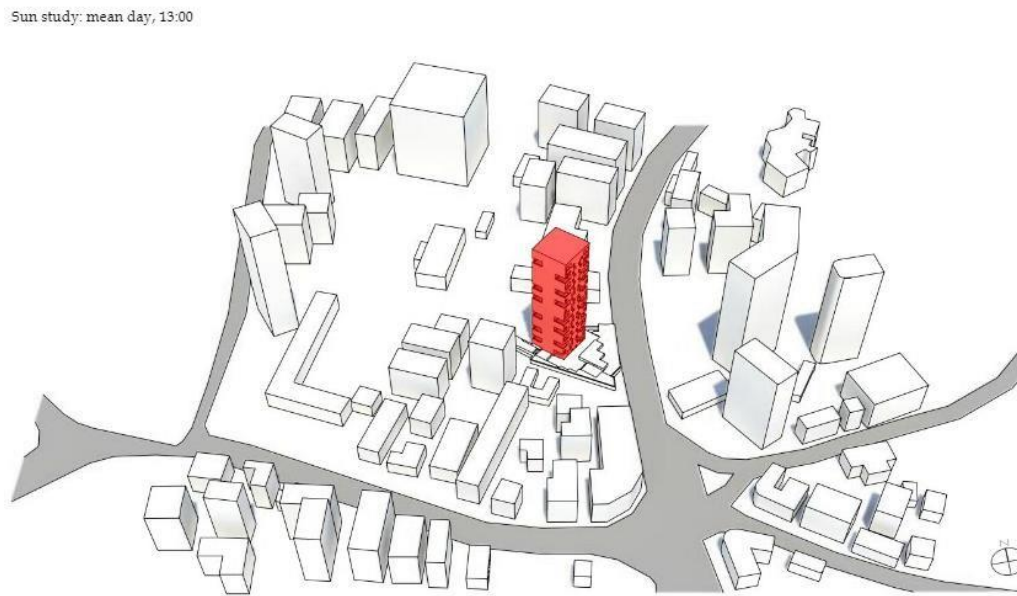


Fig 3.8

Halfway the day, all loggias within the southwestern and southeastern facades get sun. That is possible, because there are no skyscrapers in the south.

- In the end of the afternoon, the northwestern and southwestern facades get sun.
- In the evening, the western skyscraper always throws shadows on Kanchanjunga.
- The loggias within the southwestern facade gets almost always sun.

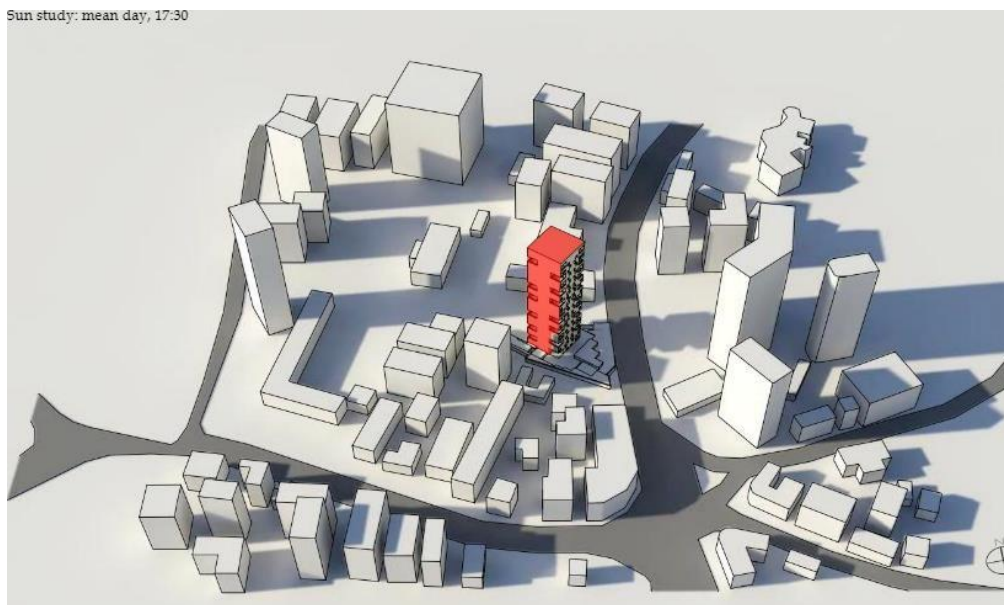


Fig 3.9

3.1.7 Floor Plans

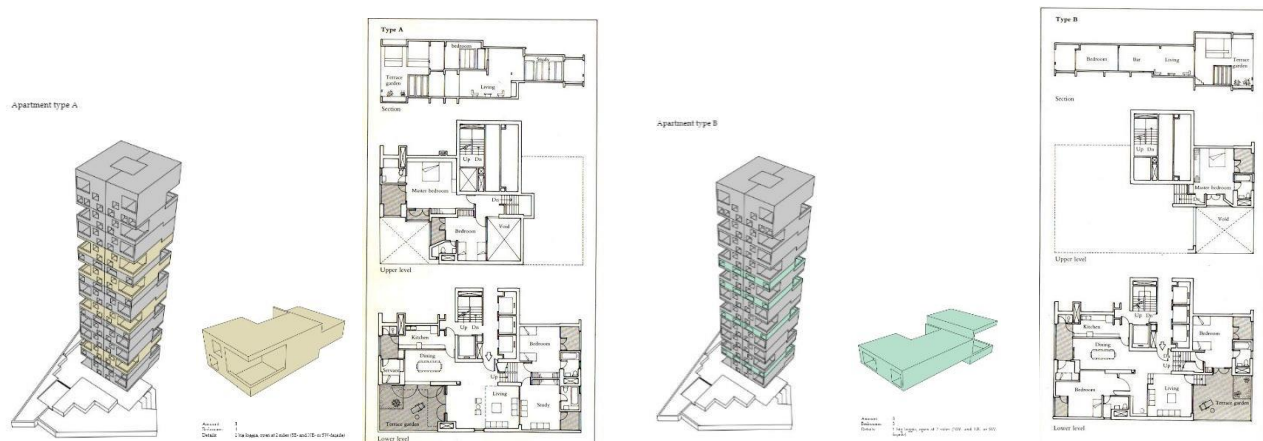


Fig 3.10 Apartment type A and B

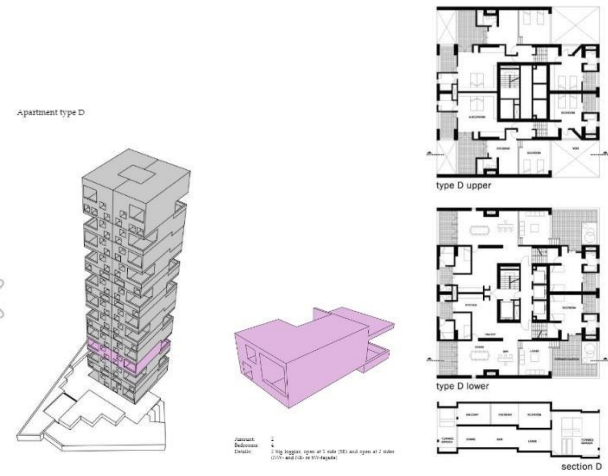
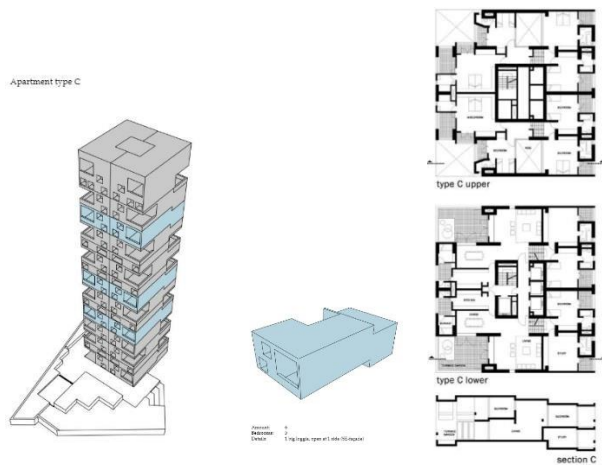


Fig 3.11 Apartment type C and D

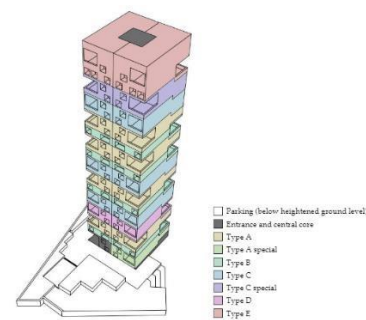
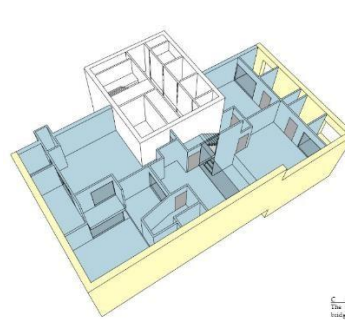
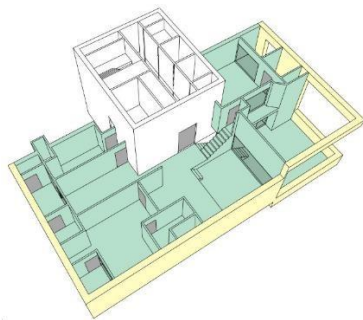


Fig 3.13 Overview of all apartment types

Fig 3.12 Overview interior type B and C

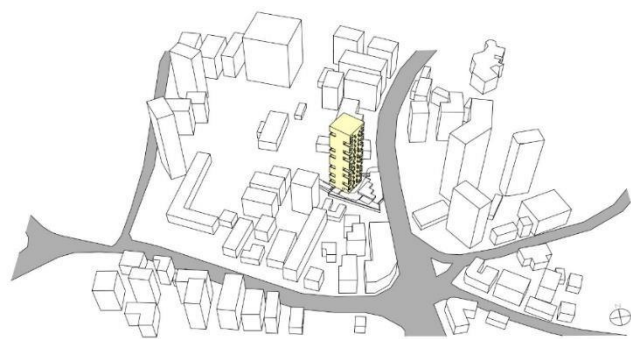
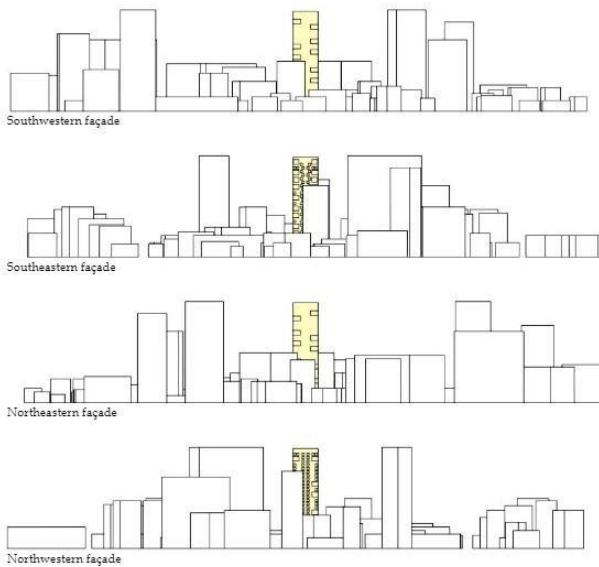


Fig 3.14 2d Views

SECTION

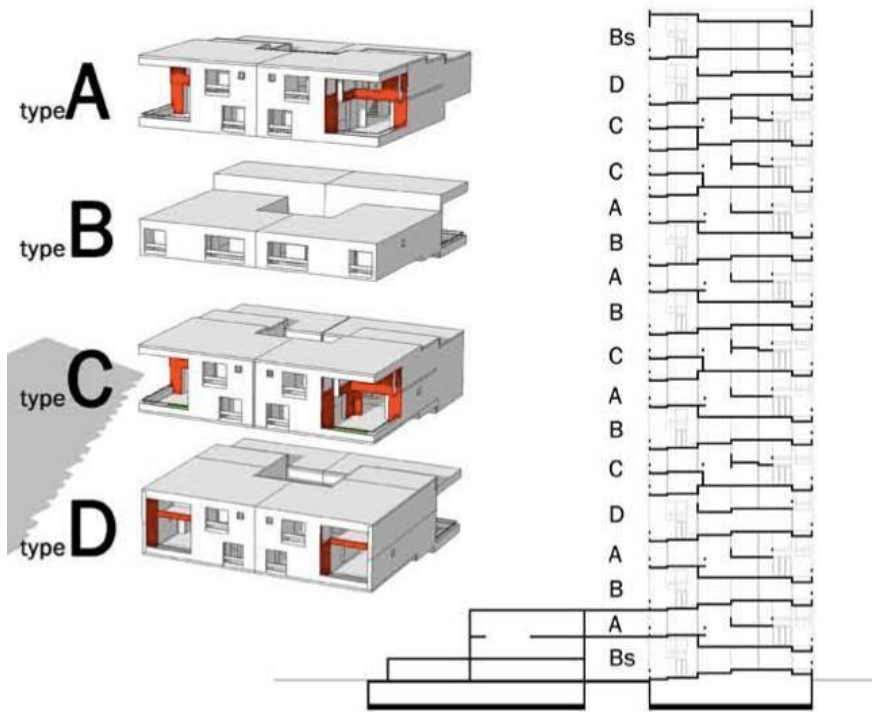


Fig 3.15 3d view

Fig 3.16 Section

ELEVATION

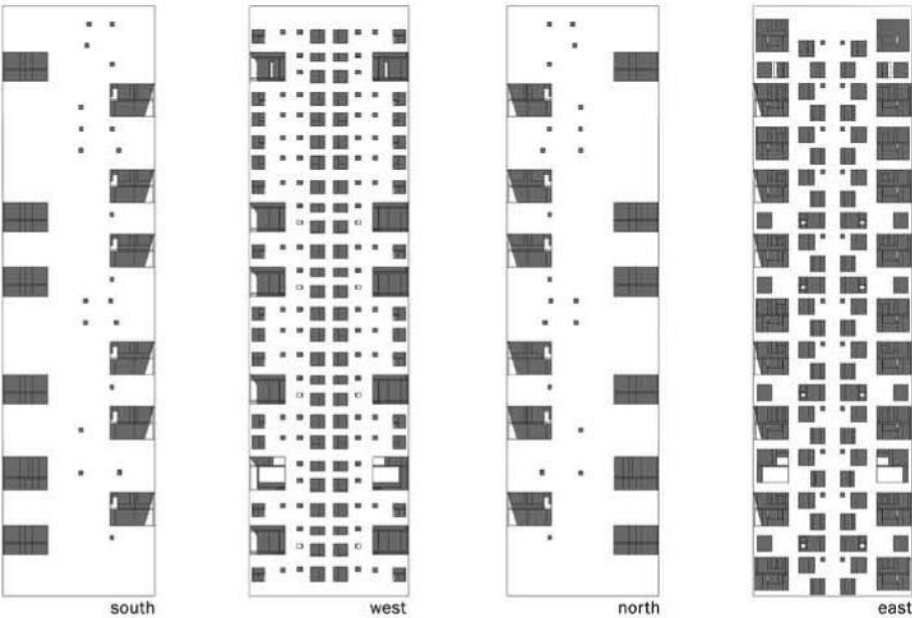
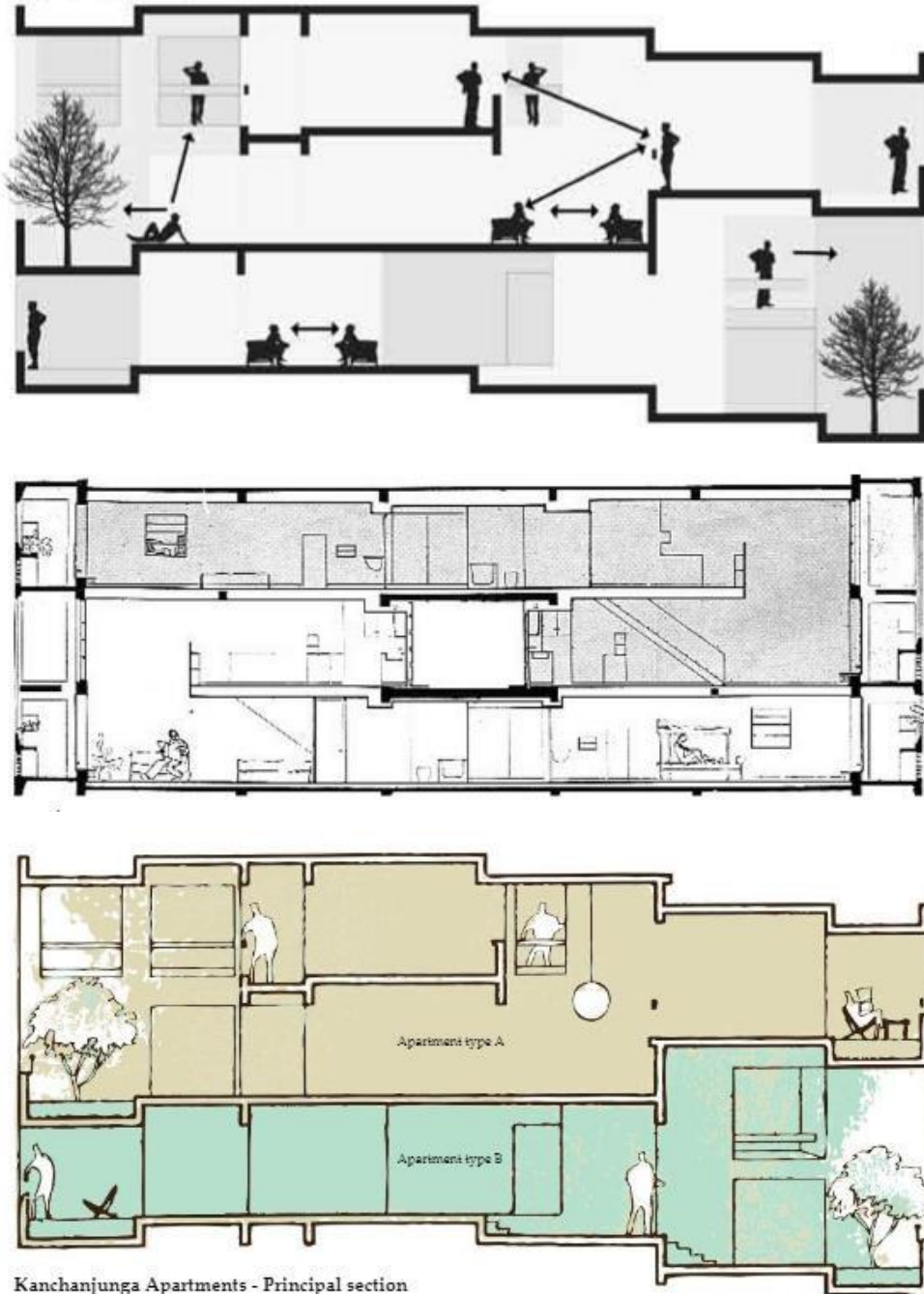


Fig 3.17 Elevations

Correa created a tower with only 2 apartments on each floor. Therefore, he used a central vertical core for the opening up.



Kanchanjunga Apartments - Principal section

Fig 3.18 Sections

Green deal of transparency has been achieved by the use of huge opening and terrace garden on every floor.

3.1.8 Structural Overview

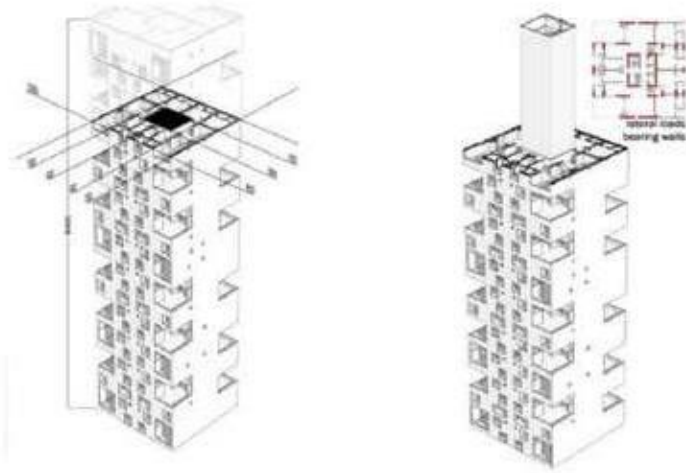


Fig 3.19 Structure

- Whole structure is made of reinforcement cement concrete.
- It is 27 stories building with concrete structure 6.3 m cantilever beam.
- As a part of material brick masonry has been used.
- Central core of 7.8x6.9 m house the lifts and service areas.
- This central core also acts as a main structural element in resisting lateral loads.
- 2 of 4 types of the apartments are oriented to the west view to the harbours and the other half of them to the east to the Arabian sea.
- 62.5 percent of the total verandahs are oriented to the view of the harbours(east).
- It is also the correct orienting for the sunshine instead of west.
- The interesting feature is the continuous variation in the internal spaces - which has been expressed in the elevations formed by the shear walls on the north and south faces of the building.

- The orientation of the building is such that there is proper cross ventilation.
- The volume of the exterior has been interrupted by cuts for terraces and verandahs.

3.1.9 Salient Features

- Aesthetically point of view it is very nice because it has composition of the only squares & rectangular form using basic design principles.
- It's high rise view and end of the four side corner as verandah which also giving a good look with comfort.
- Garden terraces actually a modern interpretation of a feature of the traditional Indian bungalow the verandah.
- Each apartment provided with a deep two story high garden terrace that is oriented away from the sun so as to afford protection from the elements.
- With its concrete construction and large areas of white panels, it bears a strong resemblance to modern apartment buildings in the West.
- However, the garden terraces of Kanchenjunga Apartments are actually a modern interpretation of a feature of the traditional Indian bungalow: the veranda.

3.1.10 Inference

- Kanchanjunga Apartment is strategically located and provides direct connectivity to just about all other major points in and around Mumbai.
- Designing of deep Veranda and open balcony creates a protective layer for the living room.
- Landscaping all around the building creates a passive cooling effect for a building.
- Kanchanjunga is located in the main city center therefore having roads on many sides.
- Traffic jams always happen on the roads cause substantial noise pollution on the site.
- Trees on all sides of the building help to reduce the noise pollution on the site

3.2 CASE STUDY – WINDMILLS OF YOUR MIND



Fig 3.20

3.2.1 Introduction:-

Location:-

Bangaluru

Architect:-

Kamal Sagar

Year:-

2005

Type:-

Fusion of vernacular
Modern style

Total number of houses - 405

Total number of floors - 19

Total number of towers - 7

Windmills of Your Mind is an Award winning residential development.

Windmills of Your Mind is a gated community on 24 acres in Whitefield, Bangalore. This project has 73 villas and 332 apartments in 7 towers of 19 floors each . Home sizes range from 2500 to 7648 sq.ft.

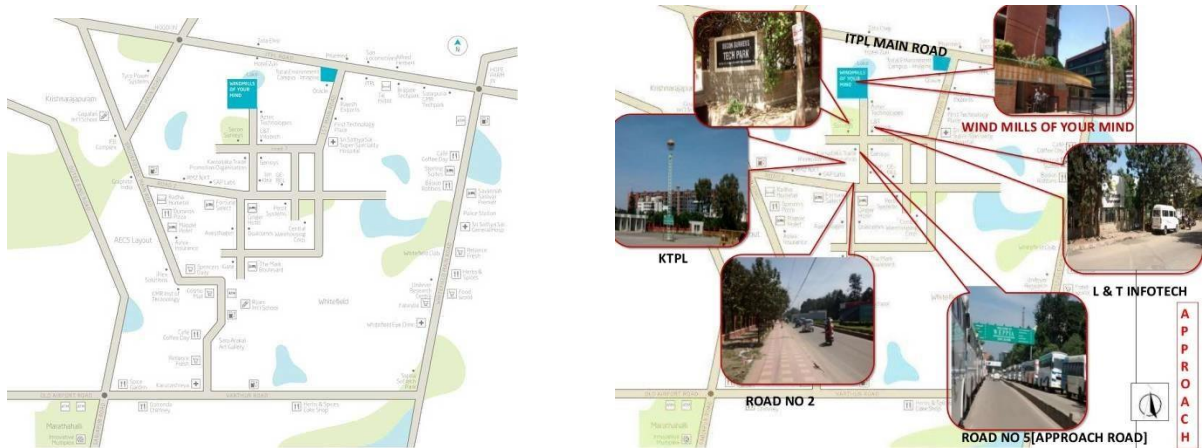


Fig 3.21 Neighborhood

- Located in the vicinity of one of Bangalore's oldest IT hubs and urban centres, Windmills of Your Mind, our flagship project in Whitefield, Bangalore, has been conceived and designed on a sprawling 24-acre campus along the edges of a small lake.
- This community comprises some of the most luxurious duplex apartments and villas in Bangalore, India.
- In addition to the high aesthetic and construction standard of these homes, skilful integration of nature with living spaces, make these homes highly liveable.
- The cantilevered terrace gardens are spacious enough to house full-grown trees and feature sprinklers and drip irrigation systems.
- More than 3,000 trees are scattered around the campus making it one of the greenest projects in Bangalore



Fig 3.22 Site plan and section

- The two-level villas are designed to take advantage of the natural slope of the land and appear to be single level homes from the internal cobbled roads, but are actually spacious two-level homes.
- Each of these homes has a green roof and home-owners are growing everything from banana and papaya trees to tomatoes, strawberries, green chilies and vegetables.
- The large apartments are designed to feel just like the homes on the ground, each with its own garden, water body and wood deck.
- The landscape is beautiful with spacious 3 Blocks and over 405 Houses.
- It provides beautiful view with an intake of over 405 spacious houses.
- It is a 19 storeyed residential development and is designed to provide sufficient source of natural light and air.

3.2.2 Analysis of plan

MASTER PLAN



Fig 3.23 Master plan

FLOOR PLAN OF TRIPLEX (PENTHOUSE)

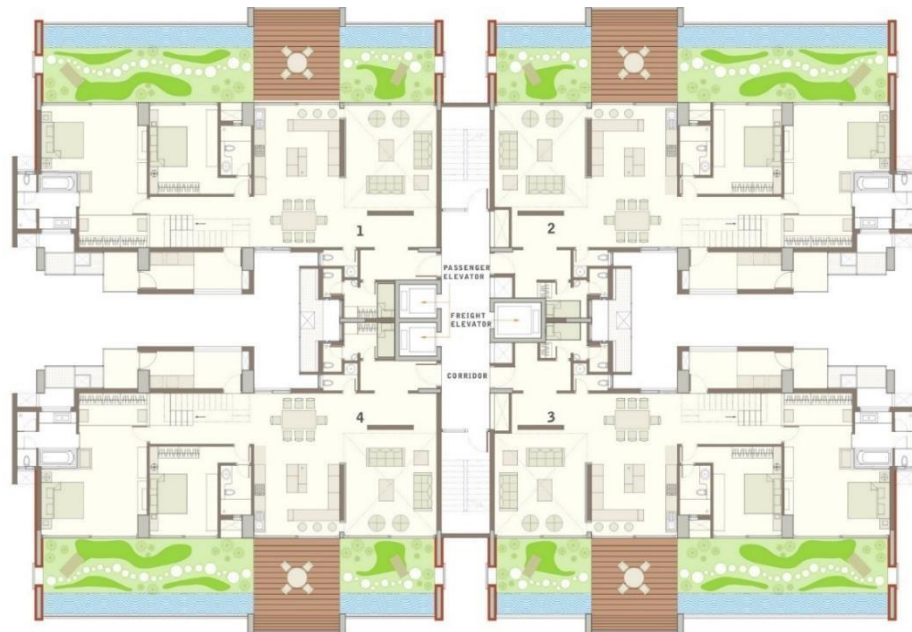


Fig 3.24 Floor plan of penthouse



Fig 3.25 Floor plan of simplex



Fig 3.26 Floor plan of duplex

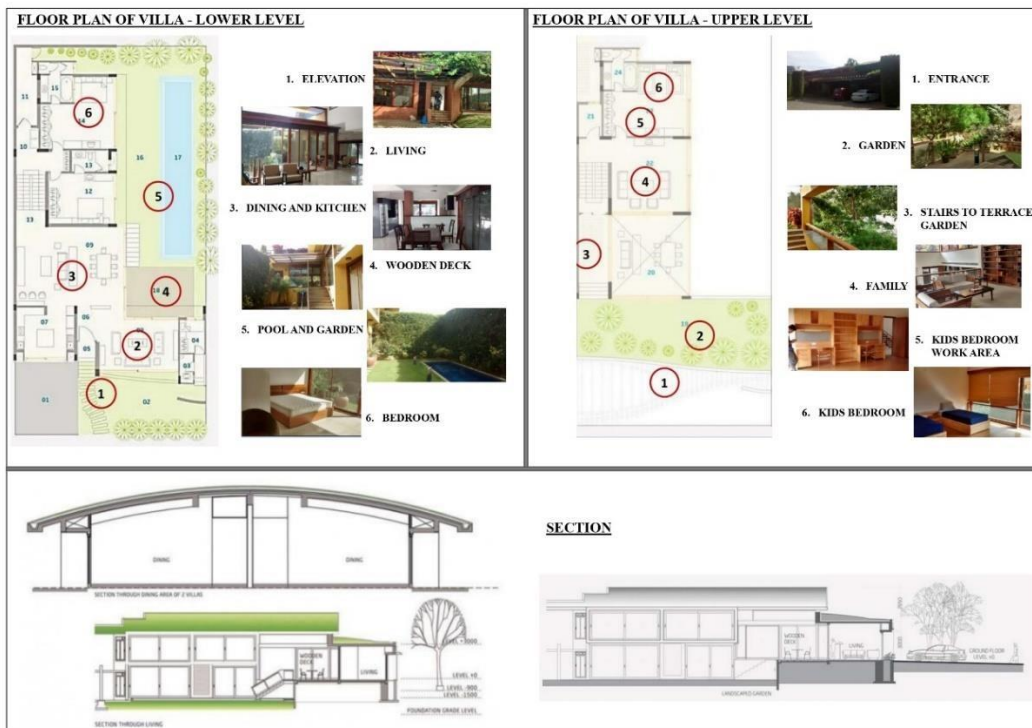
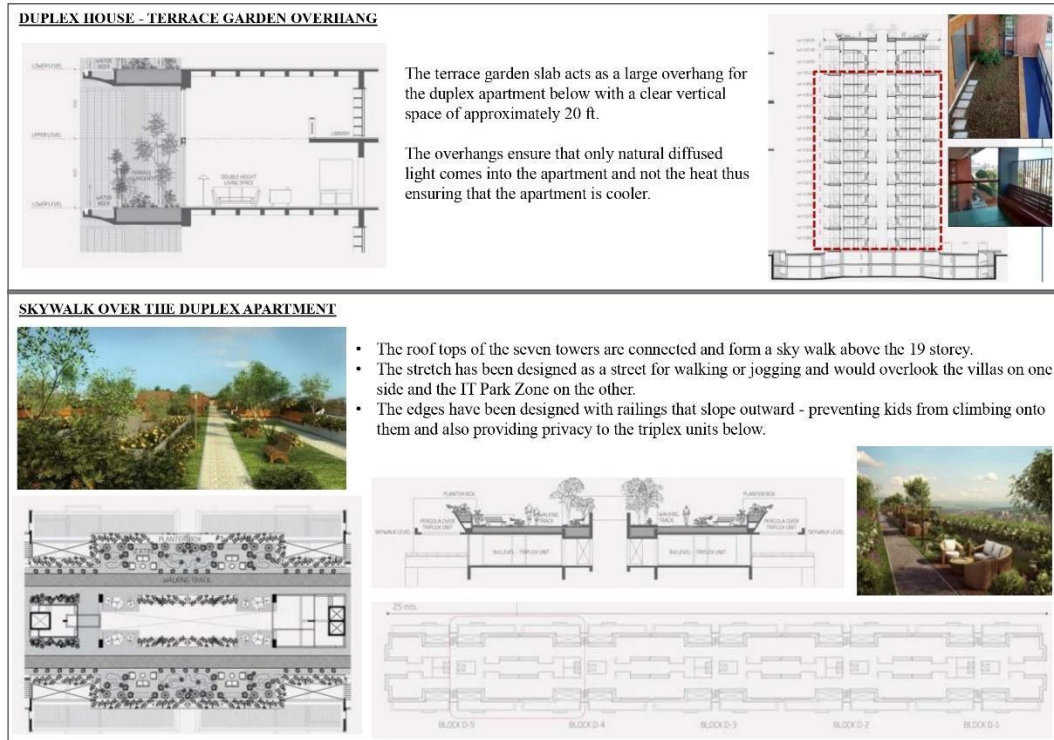


Fig 3.27 Floor plan of villa

3.2.3 Views



			
SIMPLEX(CIRCULAR), DUPLEX, TRIPLEX	VILLAS	CLUB HOUSE	ENTRANCE
	SWIMMING POOL		
• The aesthetic and construction quality of these homes is unparalleled. • Right from the green roofs of the villas and the community centre, to the landscaped gardens of apartments, Nature resonates throughout this community. • Almost all living spaces in these homes open onto private gardens while large glass windows and French doors ensure that the living spaces are always awash with natural light.			RAMP TO BASEMENT
AMENITIES			
☐ Gymnasium ☐ Squash court ☐ Hot and Cold swimming pool ☐ Business center ☐ Creche ☐ ATM ☐ Multi purpose hall ☐ Conference room ☐ Parks ☐ Kids pool ☐ Rain water harvesting			KIDS PLAY AREA
			
			BADMINTON COURT
			
			LANDSCAPED AREAS

3.2.3 Inference

- The aesthetic and construction quality of those homes is unparalleled.
- Right from the green roofs of the villas and the community center, to the landscaped gardens of the apartments, nature has filled deeply throughout this community.
- Almost all living spaces in these homes are open directly to the private gardens and also the large glass windows and French doors ensure that the living spaces are always covered with natural light.

3.3 CASE STUDY 3 – GARDEN & HOUSE



Fig 3.3 Garden & House

3.3.1 Introduction:-

Location:-

Tokyo, Japan

Architect:-

Ryue Nishizaw

Project type:-

RESIDENTIAL ARCHITECTURE

Year:-

2009

3.3.2 Site

The site is a tiny rectangle with a size of 8×4 meters.

To the right, the left, and across the street are large buildings of over 30 meters of height standing with no setbacks. These makes the site much like a small dark valley surrounded by a massive construction.

3.3.3 Analysis of plan

Floor Plan

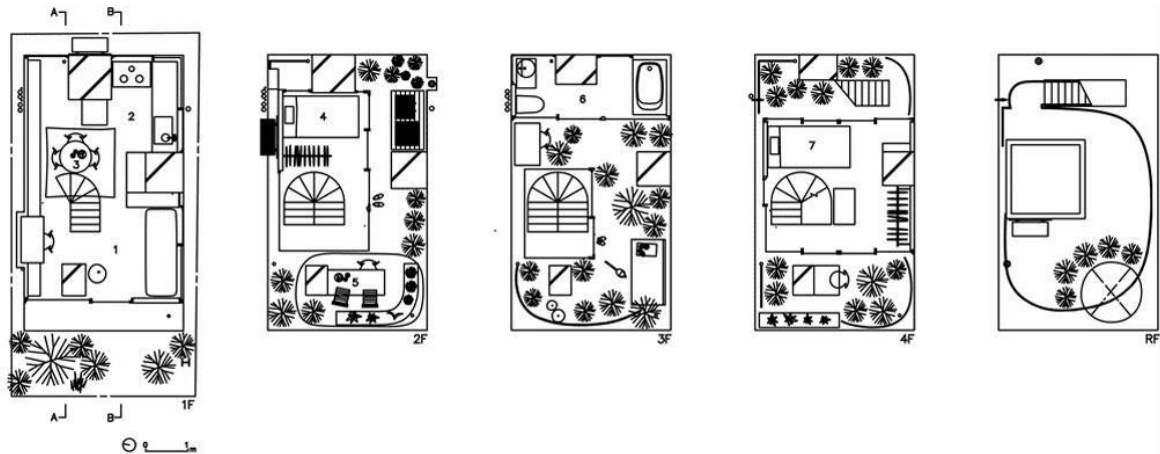


Fig 3.31 Floor plans

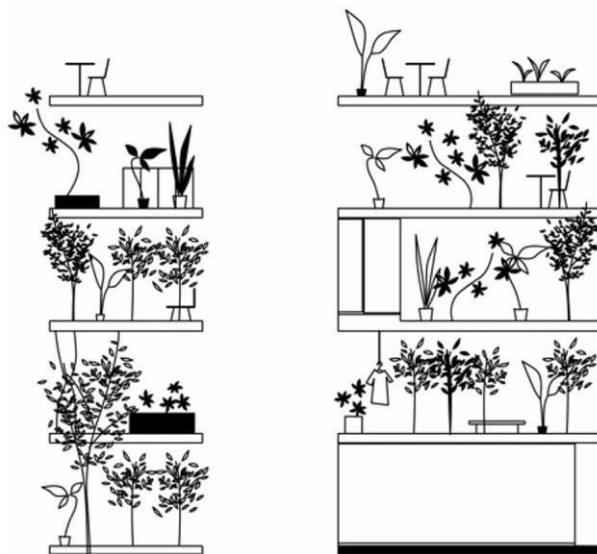


Fig 3.32 Sections

Section

3.3.4 Inference

- Structure consisted of a vertical layer of horizontal slabs to make a building without walls. A garden and an area are distributed as a pair on each floor.
- Whether it's the living room, private room, or the toilet, every room features a garden of its own in order that the residents may go outside to feel the breeze, read a book or cool off within the evening and luxuriate in an open environment in their lifestyle.
- Each room is smaller than the slab allowing freedom in determining the connection between the space and therefore the garden no matter the ground level. Everything may be a wall-less transparent building designed to supply an environment with maximum sunlight despite the dark site conditions.



Fig 3.33 Garden & House staircase view

3.4 CASE STUDY - 4 - PARKROYAL ON PICKERING



Fig 3.4

3.4.1 Introduction:-

Location:-

3 Upper Pickering St, Singapore

Area:-

12,121 ft

Project type:-

Hotel

Design team:-

WOHA

The Park Royal on Pickering, another WOHA-designed building, which has achieved

Singapore's highest environmental certification, provides an example of what the bio-philic design. The 300,000-square-foot hotel and office building includes 160,000 square feet of sky gardens, so that an adjacent park appears to be stepping up and through the building. A very cheerful greenery, although a dramatic expression, is not the only way to achieve biophilic effects. Together with 14 patterns of biophilic, the building was designed with lot of biological responses such as lowering stress, elevating emotion and mood which supporting their effects on health and well-being.

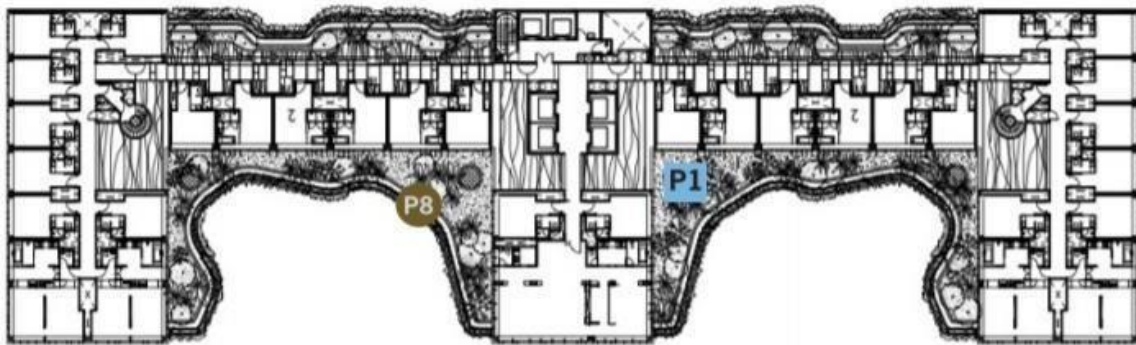


Fig 3.41 parkroyal plan

Designed as a hotel and office in a garden, the project at Upper Pickering Street is a study of how we can not only conserve our greenery in a built-up high-rise city centre but multiply it in a manner that is architecturally striking, integrated and sustainable. A massive sky garden with water features is cantilevered at every level between the blocks of guest rooms. The interior of the building also provides greenery and green walls are placed in the lobby and the separation gap between hotel rooms. Vertical greenery of more than 200 percent of the total land area is constituted by sky gardens and lush landscaping.

The external corridors at every floor are opened on the side facing the adjacent building. Rather than providing a wall, the plants along the edges act as a boundary. This provides many natural ventilations. The swimming pool is at level 5 and it has an open roof concept. This is to promote natural ventilation along the whole floor. The sky

gardens that cantilever out provide partial sun-shading to the building. The greeneries along sideways give shade to the corridors.

3.3.2 Approach of Biophilic

The following biophilic patterns has been used in the building

P1 - Views of Hong Lim Park or the sky-gardens are accessible from nearly every guest room, indoor plantings and water features are provided.

P2 - Odors from indoor plants and sounds of birds.

P3 - The wind rustling through trees on planted sky gardens.

P4 - Cool air flow from the water features both inside and outside.

P5 - Abundant water features incorporated into sky- gardens, lobby, passageways and pool.

P6 - Dappled light through the tree canopy, light reflected off the water, translucent curtains in guestrooms.

P7 - Opportunities to observe interactions between birds, insects, and plants.

P8 - Woodwork on the lobby ceiling and front desk; furniture and light fixtures.

P9 - Unfinished stone walls, polished granite walls, unpainted wood surfaces, carpet with natural color palette and varied textures.

P10 - Lattice pattern in the spiral staircase and other interior design elements.

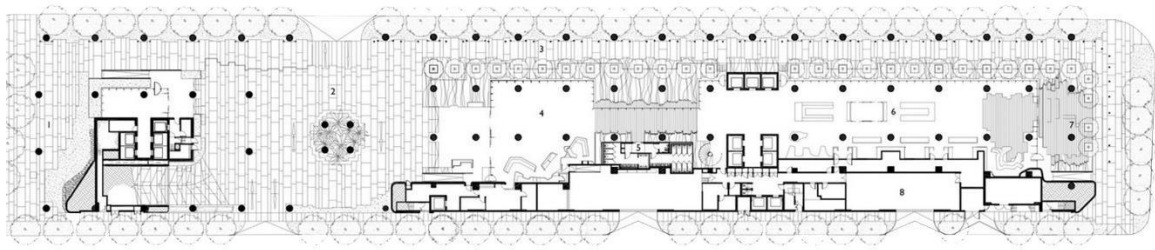
P11- Views from the sky-gardens and from guest rooms; open space of the lobby.

P12 - Secluded wooded spaces with small water features.

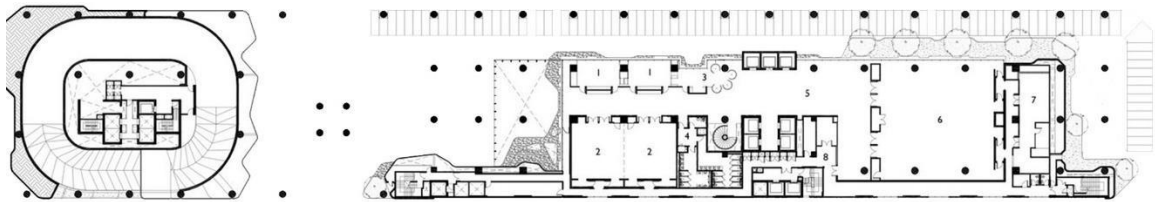
P13 - Glimpses of greenery through small open spaces cut in walls.

P14- Cantilevered 'birdcages and open air platforms which overlook the city from heights.

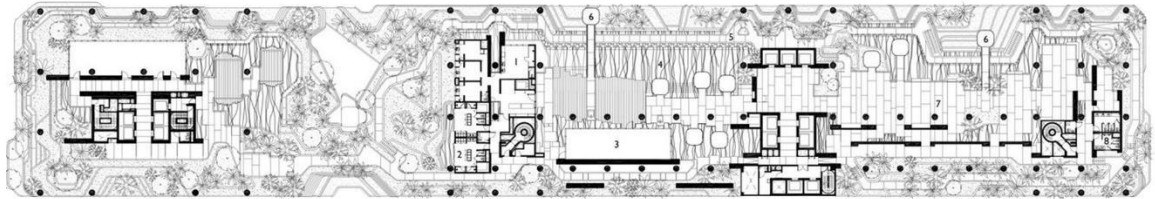
3.3.3. Plans



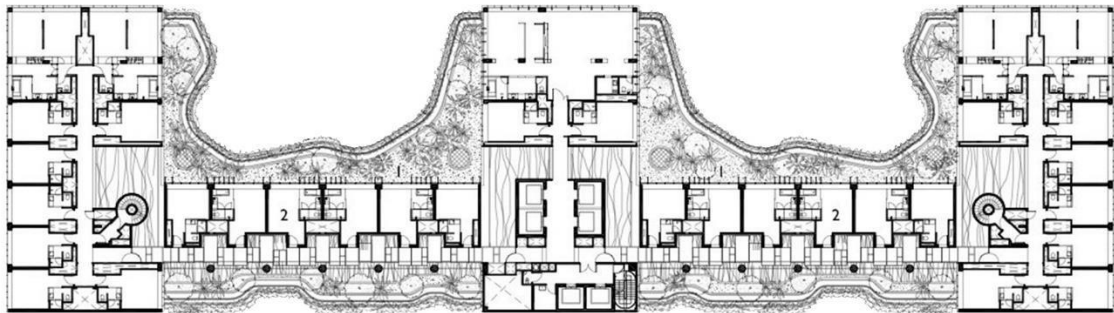
1 ST FLOOR PLAN



2 ND FLOOR PLAN



5 TH FLOOR PLAN



14 TH FLOOR PLAN

Fig 3.42 Floor Plans

Section



Fig 3.43 Parkroyal section

3.3.4 Inference

WOHA's extensive use of biophilic patterns in the design of the Parkroyal on Pickering provides an environment which facilitates strongly restorative experiences, including several potential health and wellbeing responses.

3.5 CASE STUDY - 5 - BOSCO VERTICALE



Fig 3.5 Bosco Verticale

3.3.1 Introduction:-

Location:-

Milan, Italy

Architect:-

Stefano Boeri

Year:-

2014

Type:- Vertical

Forest

3.3.2 Analysis of Plan

- Milan's Vertical Forest consists of two towers of 80 and 112 meters, hosting 480 large and medium trees, 300 small trees, 11,000 perennial and covering plants and 5,000 shrubs.
- The equivalent - over an urban surface of 1,500 m² – of 20,000 m² of forest and undergrowth.
- The Vertical Forest is an architectural concept which replaces traditional materials on urban surfaces using the changing polychromy of leaves for its walls.
- The biological architect relies on a screen of vegetation, needing to create a suitable microclimate and filter sunlight, and rejecting the narrow technological and mechanical approach to environmental sustainability.

The Vertical Forest increases biodiversity. It promotes the formation of an urban ecosystem where various plant types create a separate vertical environment, but which works within the existing network, able to be inhabited by birds and insects (with an initial estimate of 1,600 specimens of birds and butterflies). In this way, it constitutes a spontaneous factor for repopulating the city's flora and fauna.



CASE STUDY

BOSCO VERTICALE

Location:-

Milan, Italy

Architect:-

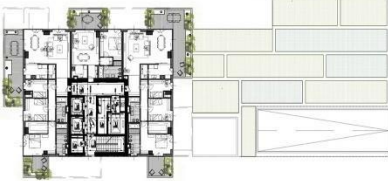
Stefano Boeri

Year:-
2014

Type:-
Vertical Forest



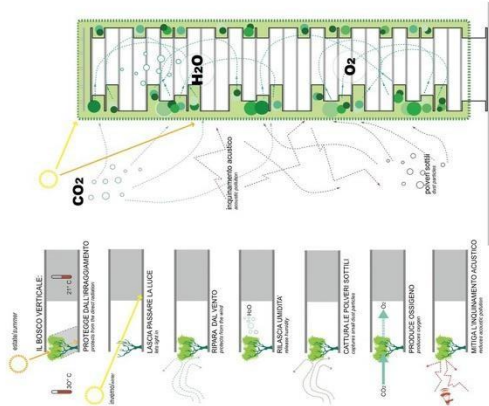
SECTION



FLOOR PLAN



The first example of a 'Vertical Forest' (il Bosco Verticale) was inaugurated in October 2014 in Milan in the Porta Nuova Isola area, as part of a wider renovation project led by Hines Italia. Milan's Vertical Forest consists of two towers of 80 and 112 metres, hosting 480 large and medium trees, 300 small trees, 11,000 perennials and covering plants and 5,000 shrubs. The equivalent – over an urban surface of 1,500 m² – of 20,000 m² of forest and undergrowth.

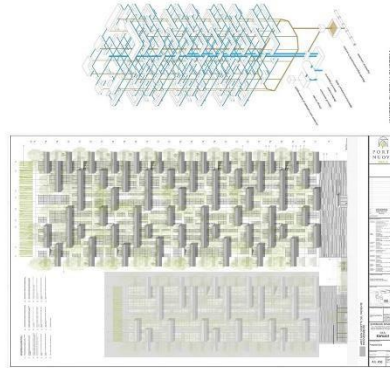


Biological Habitats:

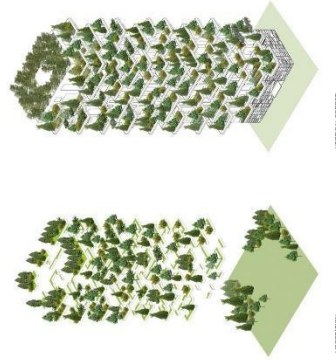
biological habitats: The Vertical Forest increases biodiversity. It promotes the formation of an urban ecosystem where various plant types create a separate vertical environment, but which works within the existing network, able to be inhabited by birds and insects (with an initial estimate of 1,600 specimens of birds and butterflies). In this way, it constitutes a spontaneous factor for repopulating the city's flora and fauna.

Mitigation:

The Vertical Forest helps to build a microclimate and to filter line particles contained in the urban environment. The diversity of plants helps to develop the microclimate which produces humidity, absorbs CO₂ and particles, produces oxygen, and protects against radiation and noise pollution.



The Vertical Forest is an architectural concept which replaces traditional materials on urban surfaces using the changing polychromy of leaves for its walls. The biological architect relies on a screen of vegetation, needing to create a suitable microclimate and filter sunlight, and rejecting the narrow technological and mechanical approach to environmental sustainability.



SERVICE

BIOPHILIC COMMUNITY LIVING

12

ARCHITECTURAL THESIS

S21PROJ2



DEPARTMENT OF ARCHITECTURE

NAME:	SHEBIS
REL. NO:	3621071
DATE:	2016-2021

CHAPTER 4

SITE SELECTION

4.1 SITE JUSTIFICATION

- The land and its surroundings should be fit for residential purpose.
- Peaceful environment, good landscape and unobstructed flow of natural air are the considerations.

Health Considerations

- Near industrial areas are unhealthy because of noise and air pollution.

Communal Facilities

The following places should be within easy reach of the site:

- (a) Primary and secondary school.
- (b) Primary health center
- (c) Post office and bank
- (d) Shopping center
- (e) Places for recreation
- (f) Public gardens
- (g) Playgrounds

Transportation Facilities

- Proximity to bus stand and railway station.
- Good approach roads from the main road up to the colony.
- Proximity to place of work and cheaper, means of transportation to the same.

4.2 SITE ANALYSIS

4.2.2 Location

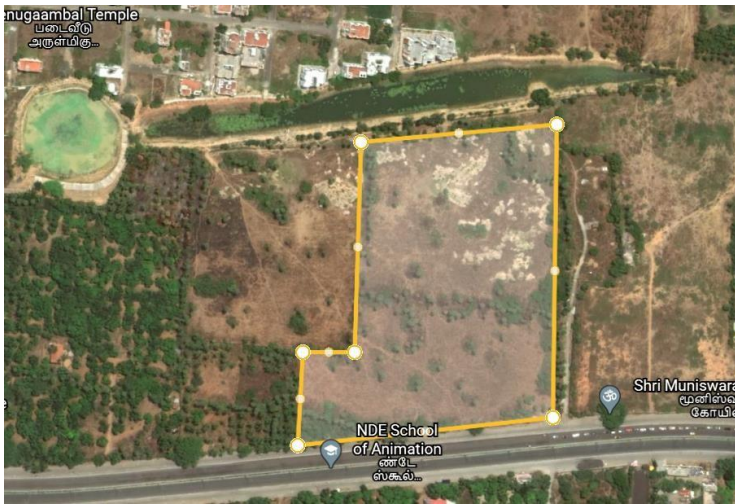


Fig 4.1 Site

OMR or IT Expressway is a major road connecting Chennai with Mahabalipuram. The prestigious TIDEL Park, home to a number of major IT Companies.

4.2.2 Neighborhood Context

Navalur is a rapidly growing south suburban of Chennai.

This area was once a village (around 2010) but with the advent of IT Companies it has become a most demanded location in Chennai.

Distances and travel between site and related locations

Airports : Chennai International Airport - 27 km

Railway Stations : Thiruvannamiyur - 18 km | Tambaram - 21 km

Hospitals : Annai Hospital - 200 m | Swaram Hospital - 6 km

Schools : Mount Litera Zee School - 3.1 km

KC High International School 3.2 km

Malls : Vivira Mall - 100 m | Marina Mall - 3.8 km

Markets : Navalur Market Street - 2.8 km

4.2.3 Urban Morphology

- Over the years, OMR is flourished with IT companies which is now a well developed IT sector which contributed to a residential settlements.
- There is a decrease in green cover due to the urbanization.

OMR Road width - 40m

SITE AREA - 13.4 Acres

SOIL - Sandy soil

TEMPERATURE - 30°C

4.2.4 Site Features

- There are bunch of trees in the south and west side, the sides which faces to the road.
- So the existing trees provides shades to the site, especially in the southern side.
- Some of them are the most common trees such as coconut, palm and mango trees.
- With the concept of biophilic, the design is focused with some of the existing trees.
- As there are some healthy trees present in the site, it it capable of providing a organic garden.
- There is view to the pond which is situated in the north eastern side of the site.
- There is a view to the waterbody present in the east side.

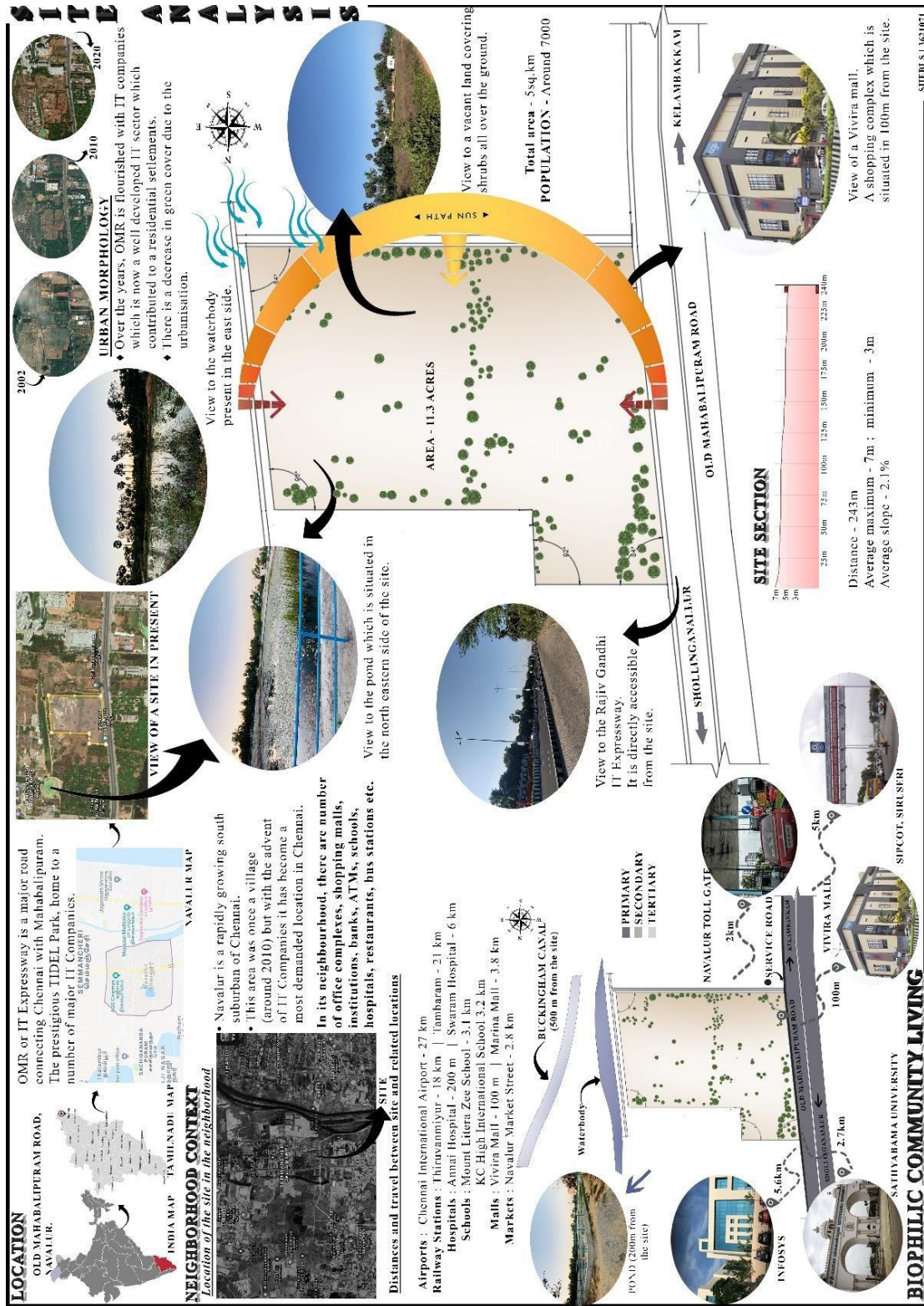


Plate 4.1 Site Analysis

- Accessible from the main road and public transportation is easily accessible.
- Presence of major business parks and malls.
- The proposal of Metro Train from Madhavaram to Siruseri.
- Existing trees in the southern side provides shades to the site.

Weakness

OMR being the main arterial road is faced with high traffic movement.

Opportunity

Preferred locality for professionals employed in the IT hubs along the OMR.

Threat

Considerable shades should be provided as there are no tall buildings around the site.

4.2.6 CLIMATE ANALYSIS

The coordinates of Navalur, India are latitude:

12.372163; longitude: 75.993233

The GPS coordinates are N 12° 22' 19.9200"; E 75° 59' 35.520

Navalur has the tropical monsoon climate prevailing.

TEMPERATURE - The average annual temperature for Navalur is 33° degrees

PRECIPITATION - There is about 248 mm of rain in a year.

HUMIDITY - It is dry for 282 days a year with an average humidity of 42% and an UV-index of 7.

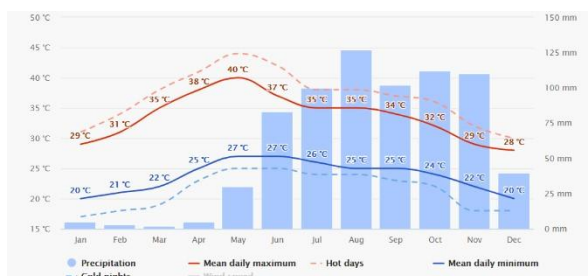


Fig 4.2 AVERAGE TEMPERATURE AND PRECIPITATION

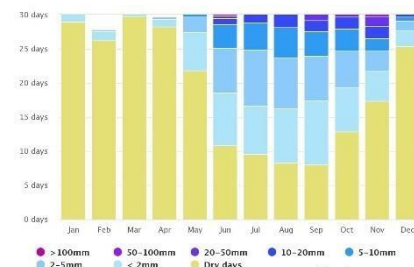


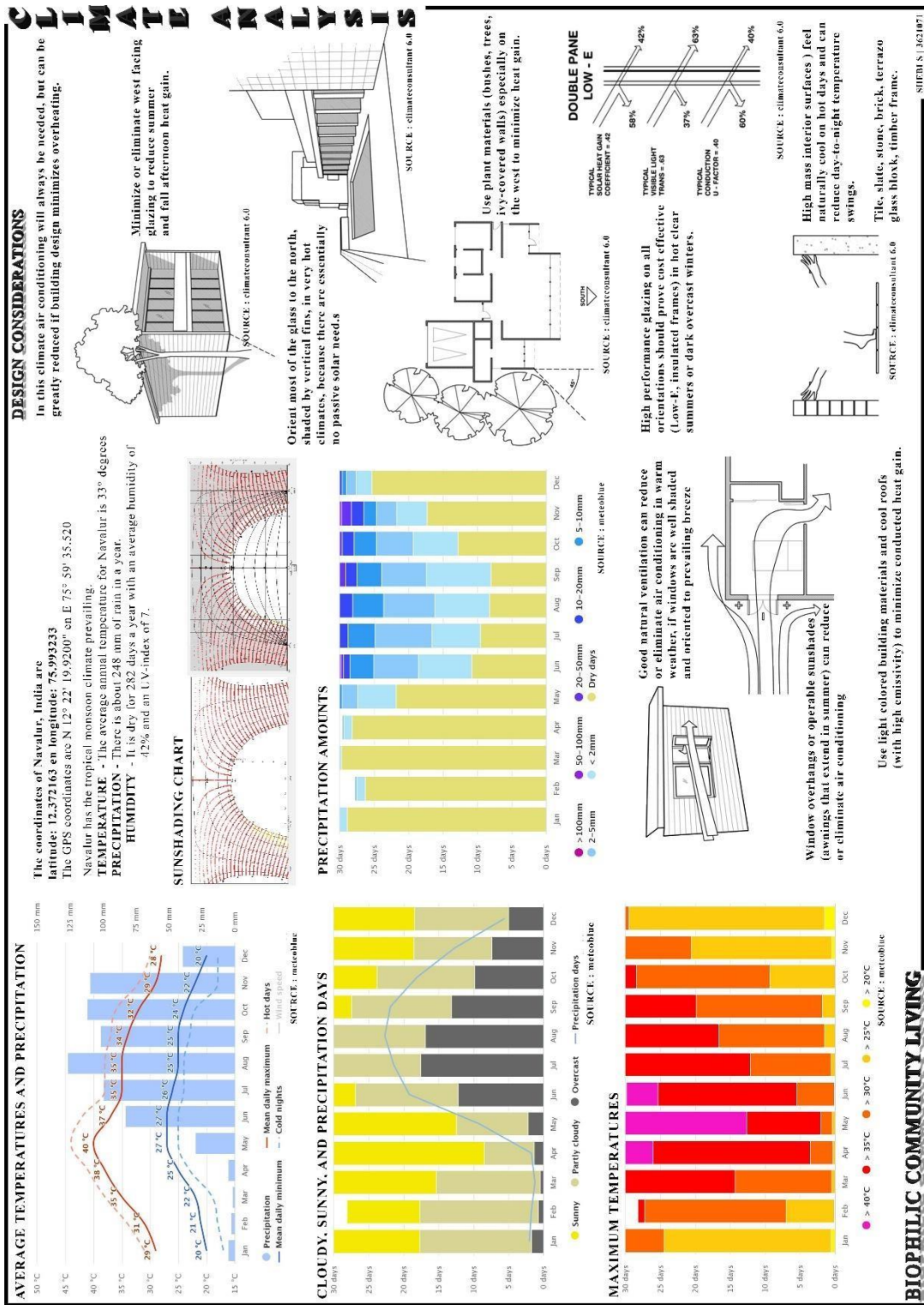
Fig 4.3 MAXIMUM PRECIPITATION AMOUNTS

4.2.6.1 Design Considerations

- In this climate air conditioning will always be needed, but can be greatly reduced if building design minimizes overheating.
- Minimize or eliminate west facing glazing to reduce summer and fall afternoon heat gain.
- Orient most of the glass to the north, shaded by vertical fins, in very hot climates, because there is essentially no passive solar need.
- Use plant materials (bushes, trees, ivy-covered walls) especially on the west to minimize heat gain.
- High performance glazing on all orientations should prove cost effective (LowE, insulated frames) in hot clear summers or dark overcast winters.
- Good natural ventilation can reduce or eliminate air conditioning in warm weather, if windows are well shaded and oriented to prevailing breeze.
- Window overhangs or operable sunshades (awnings that extend in summer) can reduce or eliminate air conditioning.
- Use light colored building materials and cool roofs (with high emissivity) to minimize conducted heat gain.

High mass interior surfaces feel naturally cool on hot days and can reduce day-to-night temperature swings.

Tile, slate, stone, brick, terrazzo glass block, timber frame.



DESIGN DRAWINGS

5.1 CONCEPT

5.1.1 Biophilic approach and its Benefits

Biophilic design is a concept used within the building industry to increase occupant connectivity to the natural environment through the use of direct nature, indirect nature, and space and place conditions.

Biophilic design has been proven to reduce stress and tension levels, which goes a long way in boosting our mental health and wellbeing.

- Use natural shapes and forms
- Use colors found in nature
- Install a green wall
- Open windows
- Hanging nature-inspired art

Biophilic environments had larger restorative impact than non-biophilic environment. Biophilic environments reduced stress and anxiety.

It can be implemented in three ways

First - direct experience of nature

Second - indirect experience of nature. nature-inspired textures or geometric patterns found in the natural world.

Last - experience of space and place. This refers to aspects like balconies which enable long views of the surroundings.



Fig 5.1 Nature in the space



Fig 5.2 Natural Analogues



BIOPHILIC

Biophilic design is a concept used within the building industry to increase occupant connectivity to the natural environment through the use of direct nature, indirect nature, and space and place conditions.

Biophilic design has been proven to reduce stress and tension levels, which goes a long way in boosting our mental health and wellbeing.

- ◆ Use Natural Shapes and Forms
- ◆ Use Colours Found in Nature
- ◆ Install a Green Wall
- ◆ Open Your Windows
- ◆ Hang Nature-Inspired Art

BENEFITS

- Several researches were proved that biophilia improves the health and well-being in the built environment.
- Greater contact with natural elements can increase health, improvement in learning rates, reduced stress, faster recovery time, and decreased use of painkillers.
- As urbanized spaces are increasing with the population these qualities are more important.
- Biophilic designs provides people healthier environment and creates a healing spaces to live.

HEALTH BENEFITS

- Plants help fight cold and flu symptoms.
- Prevent airborne diseases.
- Cure headaches by producing more of an oxygen supply
- Lower blood pressure, with a reduction of stress, preventing from some heart disease.
- They can prevent against allergens in the air.



SOURCE: <https://doi.org/10.1016/j.conven.2019.105427>

BIOPHILIC COMMUNITY LIVING



SOURCE: apartments and developments

Second - Indirect experience of nature, nature-inspired textures or geometric patterns found in the natural world.



SOURCE: apartments and developments

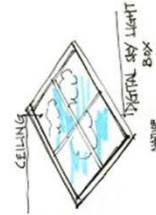
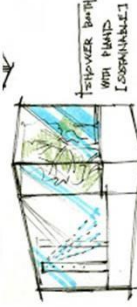
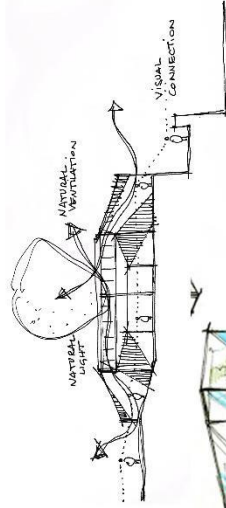
Oriented to avoid harsh south - west & west sun.
To orient all sides to have view of landscaped areas.

First - direct experience of nature



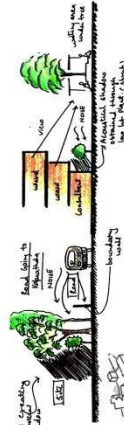
SOURCE: apartments and developments

Last - experience of space and place.
This refers to aspects like balconies which enable long views of the surroundings.

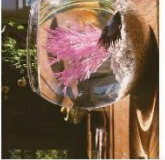


Biophilic environments had larger restorative impact than non-biophilic environment.

Biophilic environments reduced stress and anxiety.



SHEPHERD S | 3621071

CONCEPT	
VISUAL CONNECTION WITH NATURE A view to elements of nature, living systems & natural processes. Natural: Natural flow of water Vegetation Constructed: Mechanical flow of a water Pond Aquarium Green wall 	CONNECTION WITH NATURAL SYSTEM Awareness of natural processes, especially seasonal and temporal changes characteristics of a healthy ecosystem. Natural: Climate and weather patterns Hydrology Geology Constructed: Including plants in home Exposure of water infrastructure 
NON VISUAL CONNECTION WITH NATURE The senses other than seeing such as hearing, feeling, smelling, tasting that cause an intended and positive reference to nature. Natural: Fragrant herbs, flowers Natural ventilation Constructed: Highly textured fabrics Mimicking natural material textures 	BIOMORPHIC FORMS AND PATTERNS Typical references to forms, designs, surfaces, textures or numerical arrangements that exist in nature. Constructed: Decorative elements Free-standing sculptures Furniture details Mullion design Acoustic panelling 
NON RHYTHMIC SENSORY STIMULI Random & temporary connections with nature that will be analysed but not predicted precisely. Natural: Cloud movement Breezes Constructed: Reflections of water 	MATERIAL CONNECTION WITH NATURE Material and elements from nature that, through minimal processing, reflect the neighborhood geology to make a particular sense of place. Constructed: Interior surfaces Woodwork Stonework Include natural materials like wood, bamboo and stone. 
THERMAL AND AIRFLOW VARIABILITY Subtle changes in air temperature, relative humidity, airflow across the skin, and surface temperatures that imitate natural environments. Natural: Solar heat gain Shadow and shade Constructed: Window glazing Cross ventilation 	COMPLEXITY & ORDER Rich sensory information that adheres to a spatial hierarchy similar to those encountered in nature. Using symmetry and fractals in wallpapers and carpet design. Material texture and contour. 
PRESENCE OF WATER A condition that enhances the experience of a place through seeing, hearing or touching of water. Natural: River, ocean, pond Visual access to rainfall and flows Constructed: Constructed water fall Aquarium Fountain 	PROSPECT An unblocked view over a distance for surveillance & planning. Balconies Dividing the room with functional partitions 
DYNAMIC AND DIFFUSE LIGHT Provide varying intensities of light & shadow that change over time to form conditions that show up in nature. Natural: Daylight from multiple angles Direct sunlight Constructed: Multiple low glare electric light sources Color tuning lighting that produces white light during the day, and minimizes blue light at night 	REFUGE A place for withdrawal, from natural conditions or the most flow of action, in which the person is secured from behind and overhead. Create a reading nook Partial refuge – booth seating 
BIOPHILIC COMMUNITY LIVING	

5.1.2 Plants and materials

- Plants are fundamental to this form of design and some of the most important biophilic design elements, whether it be a vertical garden wall, moss art, hanging plants or air-purifying indoor plants chosen for their health benefits.
- The value system of this type of interior design entails using sustainable, earthfriendly materials like cork, FSC wood, rubber and bamboo, also natural patterns, colors, textures and finishes.
- Biophilic design also integrates acoustic, sound-absorbing solutions such as moss walls and eco flooring panels, which can reduce ambient noise while also adding a natural aesthetic into a space. The soothing sounds and scents of nature, help create a comfortable environment.
- The biophilic design definition evokes its ability to rework any space into a harmonious collection of natural elements that boost mood, productivity and wellbeing. Integrating a way of place through local artworks is one example, as are integrating natural patterns and textures into a building.

Table 5.1 Identified Air Purifying Plants

INDOOR	OUTDOOR
Money plant	Rose
Peace lily	Bougainvillea
Snake plant	Shoe flower
Areca palm	Irora
Rubber plant	Lantana
Aloe vera	Dessert rose
Weeping fig	Christ plant
Common ivy	Kolanchoe
Spider plant	Aboli
Indian basil	Princess flowers

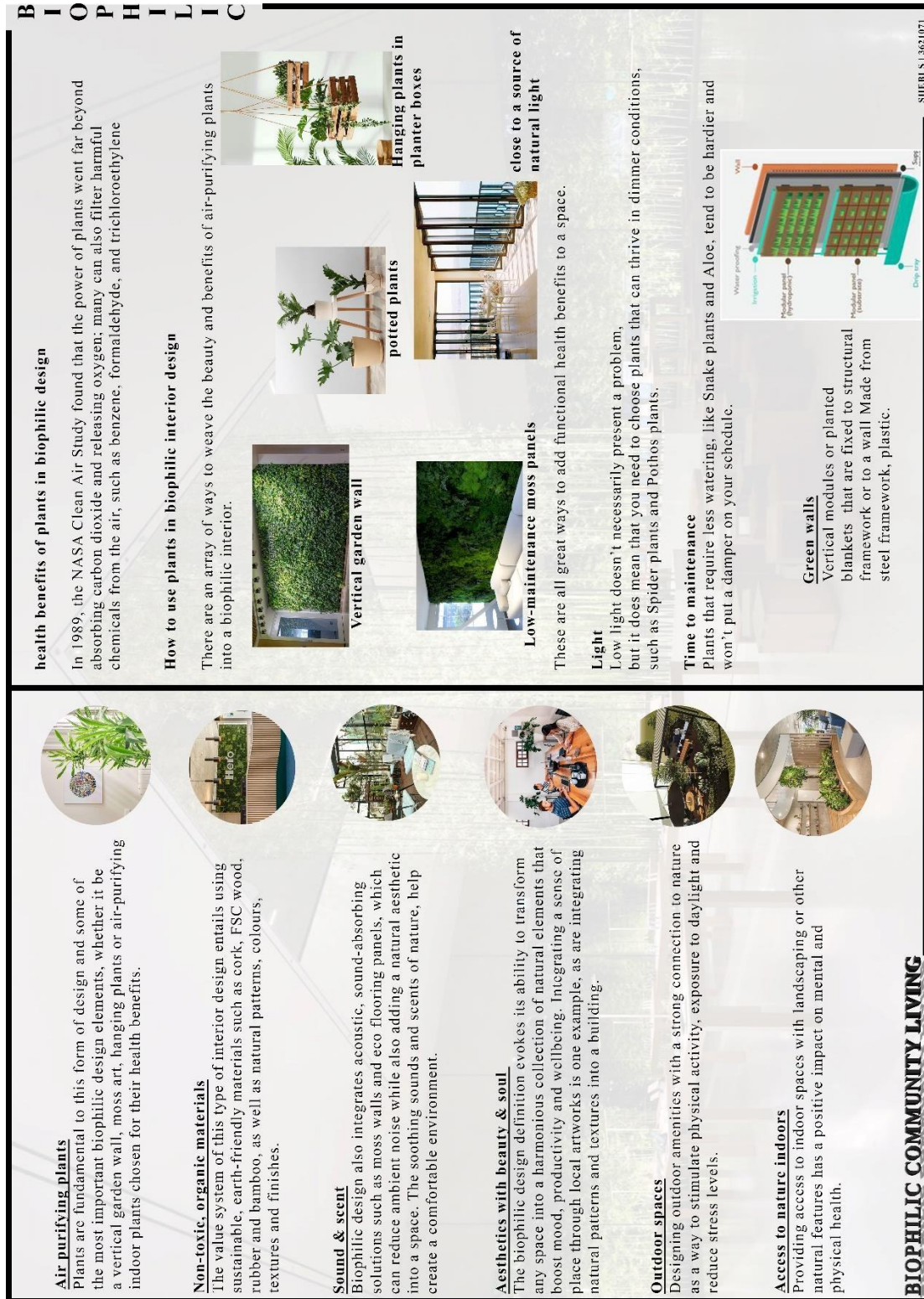


Plate 5.3 Biophilic Approaches

IDENTIFIED AIR PURIFYING PLANTS		IDENTIFIED AIR PURIFYING PLANTS	
Pothos • Hanging baskets or as a climbing plant. • Purifying qualities allow them to absorb and strip toxins like formaldehyde often found in common household items like carpet and area rugs. • Survive in a variety of lighting conditions • Low light may reduce the leaves' variegation.		Ivy • Tolerate the full range of indoor temperatures, • high or low light conditions • moist or dry soils.	
Peace Lily • Long dark green leaves and white flowers. great for small spaces. • Requires little sun for survival. • Direct sunlight can actually damage the plant's foliage. • Nickname "Closet Plant." • Doesn't require a lot of watering.		Ficus Tree • Also known as the weeping fig or Braided Ficus • Low-maintenance • Attractive plant • Also grown outdoors. • It can reach up to 50 feet tall.	
Snake Plant • Withstand weeks of neglect without losing their shape and fresh look. • Thrive in environments with very low light and water. • Ability to help purify the air.		Spider Plant • Low light • They also self propagate by sending out off-shoots.	
Iron Plant • Iron Plants boast dark leafy greens can add a visually striking aesthetic to any dark corner. • Low lighting. • Survive with very little water and poor soil.		Areca Palm • Requires indirect sunlight. • The leaves will turn yellow if they are exposed to direct sunlight for a long time. • Water enough to keep the soil moist except during the winters.	
Maidenhair Fern • Leaves are light green and feathery with soft, shiny stems. • A wonderful hanging plant. • Require medium light		Indian Basil • Commonly known as Tulsi. • Very low-maintenance • Has several medicinal properties. • One of the best indoor plants for oxygen. • Good at purifying and improving the quality of air. • Requires regular sunlight. • Need to water it regularly.	
Succulents • Little bit of sunlight. • Water once every other month.		BALCONY GARDENING POTTED PLANTS GREEN WALLS SAND BED Green walls - 3- 8 inches from the wall surface. Sand bed - Depth - 8-12 inches Vegetable beds - 12 - 18 inches Other types of bed Clay pellets Gravel bed - Ornamental grasses, shrubs Vermiculite - Shrubs and garden plants like rose, dahlias and tomatoes.	

Plate 5.4 Identified plants

5.1.2.1 ROOFS

Green roofs helps to reduce the Urban Heat Island Effect, a condition during which urban environments absorb and trap heat. A green roof plants remove air particulates, produce oxygen and also provide shade.

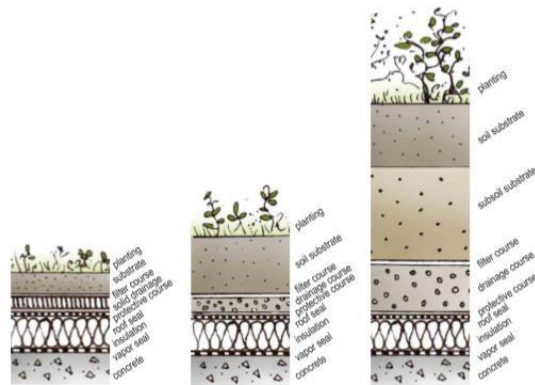


Fig 5.4 Green roofs

5.1.2.2 LIVING WALLS

Plants in living walls can either be during a soil based or hydroponic way. In the hydroponic way the plants are planted in pockets of felt or in mineral wool rather than soil.

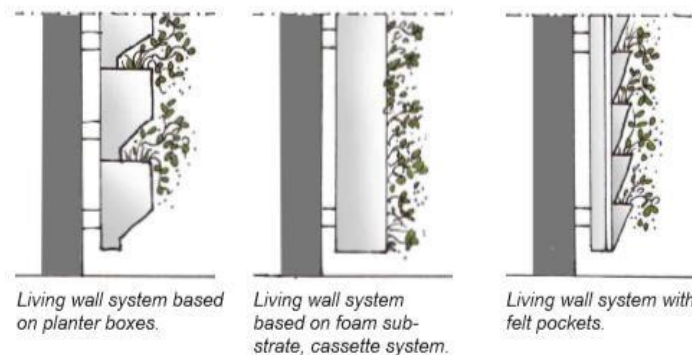


Fig 5.5 Living walls

5.1.2.3 GREEN FACADES

A “green” building envelope can be created with living walls or plants climbing along the facades, so called green facades. Climbing plants is a cheaper way of adding greenery.

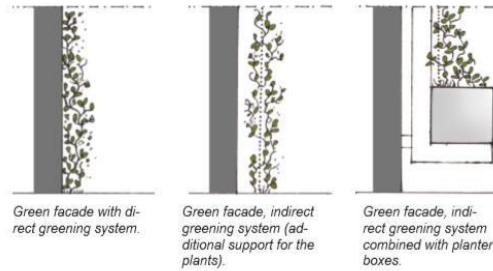


Fig 5.6 Green Facades

5.1.2.4 OUTDOOR SPACES

Outside views and close connection between indoors and outdoors. An opportunity to grow food, tactile contact with nature in addition to the visual. With the proper placement of greenery contributes with shadow during summer and let the sunlight through during winter. It could become a common meeting place and invites for outdoor visits.

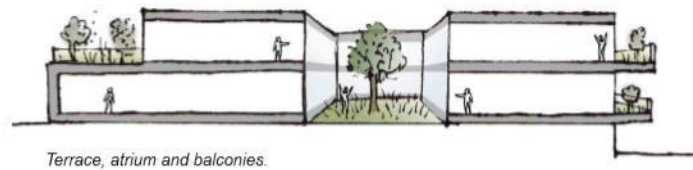


Fig 5.7 Outdoor spaces

5.1.2.5 INTEGRATED INDOORS

Tactile and visual connection between people inside the building and also the greenery. Often easy accessible for maintenance. Capacity for absorbing noise and decreased ventilation need.



Fig 5.8 Integrated Indoors

5.1.3 Balcony Gardening

Things to consider before starting the garden in the balcony.

Light

The amount of sunlight get depends on the exposure from the balcony in its location relative to the rest of the building.

Structural Integrity

Checking how much weight a balcony can hold before putting a lot of planters, gardening containers and other garden setup.

Wind

Consider inclement weather and winter conditions.

Restrictions

Local law may be a limiting factor to the garden space.

Look into what standards are set by the local government about having plants in an outdoor balcony space.

Water

Either cover the plants and hand water them or leave them to soak up rainwater.

TYPES

Keep It Low-Maintenance

Hiding the Wall or Railing

Shady balcony garden

Sunny balcony garden

Hanging baskets

Create a succulent bowl

For smaller balconies → outdoors in
For larger balconies → a place to sit to enjoy some time in the sun with a cup of coffee and a book

THINGS TO CONSIDER BEFORE STARTING THE GARDEN IN THE BALCONY

Light

The amount of sunlight get depends on the exposure from the balcony in its location relative to the rest of the building.

Structural Integrity

Checking how much weight a balcony can hold before putting a lot of planters, gardening containers and other garden setup.



Wind

Consider inclement weather and winter conditions.



Restrictions

Local law may be a limiting factor to the garden space.

Look into what standards are set by the local government about having plants in an outdoor balcony space.



Topsoil

Soil choices are a big part of helping plants thrive.



Water

Either cover the plants and hand water them or leave them to soak up rainwater.

INFERENCES

- Checking of the amount of sunlight balcony gets.
- Overhead trees can also limit light.
- So need to check whether it gets enough light to allow the plants to thrive.

- A south facing balcony will receive ample sunlight
- North facing will receive insufficient.
- East and west facing will receive medium light

Load capacity

Balconies are load-rated to 50-100 kg per square foot.

- Important to grow seasonal plants.
- Need to provide tarp cover for plants to shield them from harsh weather conditions.

- Soil depth - 6 - 12 inches

- Due to weather conditions or plant habits, some plants require two times water.

TYPES OF BALCONY GARDENING

Keep It Low-Maintenance



Hiding the Wall or Railing



Try Compost Tea



Shady Balcony Garden



Sunny Balcony Garden



Avoid Drainage Problems



Create a Succulent Bowl



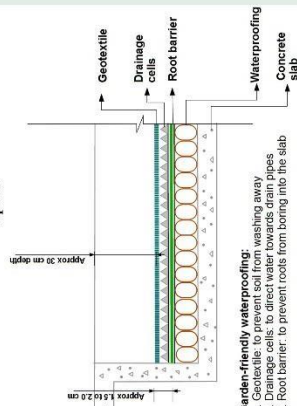
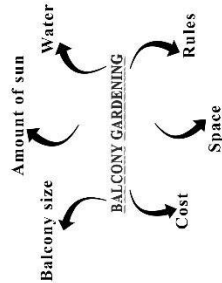
Vertical Gardening



Hanging Baskets



Questions to ask before starting the balcony gardening



SOURCE : indianwaterportal.org



SOURCE : theleaflandscape.com

GARDEN DESIGN:

Arranging the balcony furniture and the pots in a manner which will allow to water the plants easily and others to walk freely.



SOURCE : gratidrains.com

WATER OUTLET:

Confirm in advance the path of water that flows from the pots. It should be diverted to the sewage facility provided by society.

SOURCE : theleaflandscape.com

BIOPHILIC COMMUNITY LIVING

Plate 5.5 Balcony Gardening

5.1.4 Inference

- Checking of the amount of sunlight balcony gets.
- Overhead trees can also limit light.
- So need to check whether it gets enough light to allow the plants to thrive.
- A south facing balcony will receive ample sunlight. North facing will receive insufficient. East and west facing will receive medium light.
- Load capacity - Balconies are load-rated to 50-100 kg per square foot.
- Important to grow seasonal plants.
- Need to provide a tarp cover for plants to shield them from harsh weather conditions.
- Soil depth - 6 - 12 inches
For Vegetable beds - 12-18 inches
- Due to weather conditions or plant habits, some plants requires to water for twice a day.
- For vertical gardening,
Materials - wood pallets, scrap woods which hang plants.

PLANTS

If faces south and receives direct sunlight - Cacti
If faces north or is shaded by other buildings -
low-light plants like ferns, hostas, and begonias.

- Arranging the balcony furniture and therefore the pots in a manner which can allow to water the plants easily and others to walk freely.
- Need to confirm the path of water that flows from the pots in advance. It should be diverted to the sewage facility which has provided by society.

Other types of plant beds

- Gravel bed - Ornamental grasses, shrubs.
- Vermiculite - Shrubs and garden plants like rose, dahlias and tomatoes
- Clay pellets.

5.2 AREA STATEMENT

SITE REQUIREMENTS

- ◆ Entry portal
- ◆ Service entry/ exit
- ◆ Walkways
- ◆ Parking lot
- ◆ Visitors parking
- ◆ Jogging lane
- ◆ Wheel chair assistance
- ◆ Service area

SERVICES

- MAINTENANCE ROOM
- Security room
- Toilet
- Generator room
- Electricity room
- GARBAGE CHUTE
- Elevators
- Staircase
- Emergency exit
- POWER BACKUP
- FIRE ALARM SYSTEM
- Laundry

AMENITIES

OUTDOOR

- Swimming pool
- Kids pool
- Lawn
- Playground
- Outdoor games court
- Outdoor Badminton court
- Basketball court
- Parks
- Kids park
- Outdoor yoga & meditation space
- Park seating
- Amphitheatre
- Outdoor reading space
- Landscape areas
- Children play area
- Terrace garden

INDOOR

- Club house
- Library
- Clinic
- Pharmacy
- Gym
- Indoor games
- Indoor badminton court
- Indoor play area for kids
- Multi-purpose hall

5.3 ZONING



Fig 5.9 Zoning



Fig 5.10 Top view

DESIGN PARAMETERS

Planning according to the sun direction, vegetation, circulation and design aspect.

- View to the pond from the towers.
- Recreational area along with the existing trees in the central part.
- Designing villas along with the existing vegetation present in the northern side.
- View to the waterbody from the towers.
- Existing trees on the southern side provides a barrier from the solar radiation.
- Villas were planned based on the consideration of privacy.
- Playground in north side to get rid of the sun.
- Towers in the southern side creates a shade to the central recreational area.
- Towers in the north eastern side to provide a pleasant view of a pond.
- Towers in the eastern side to provide a pleasant view of a waterbody.

ZONING

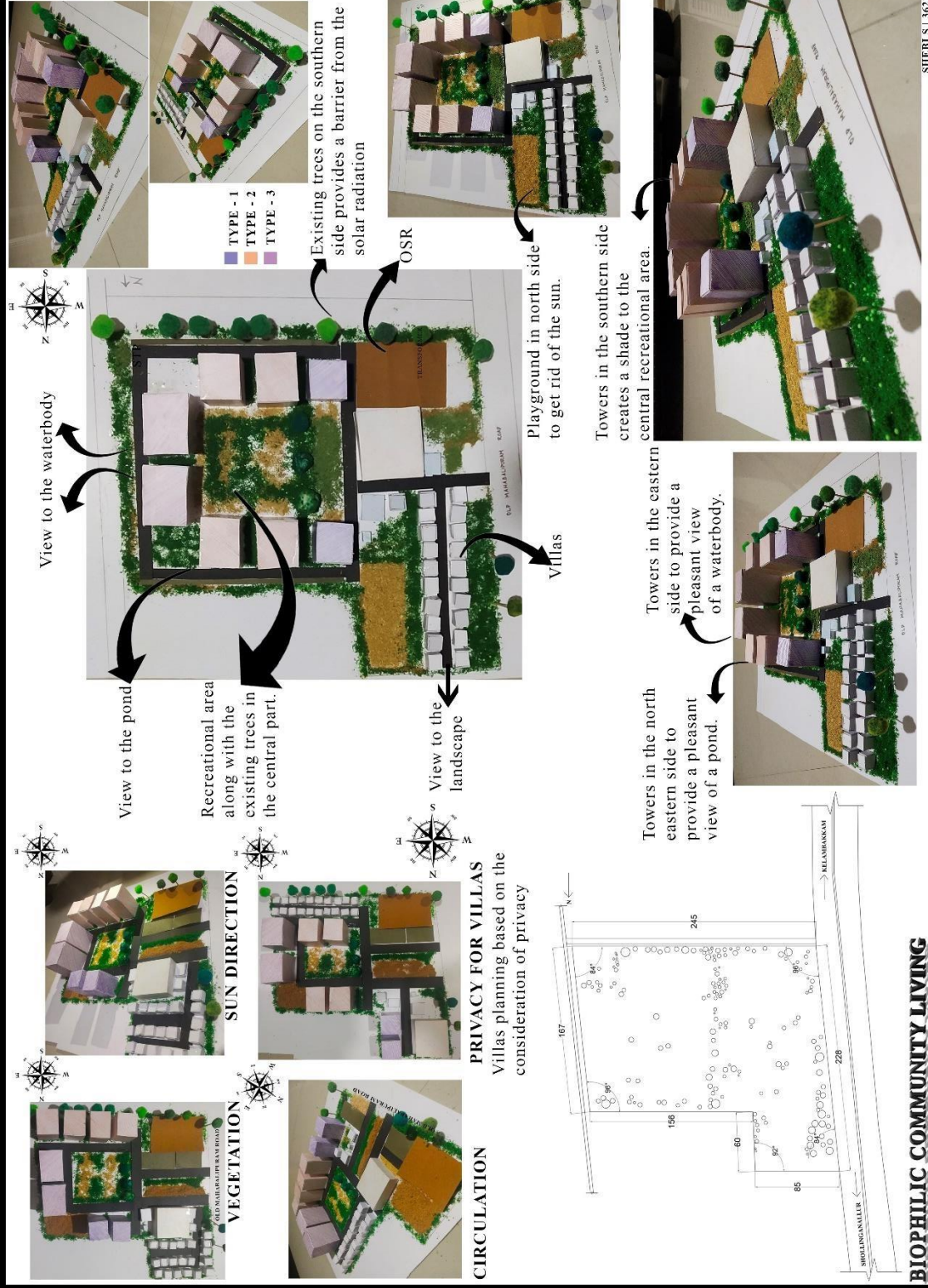


Plate 5.6 Zoning

5.4 RELATIONSHIP BETWEEN GREEN AND INDOOR SPACES

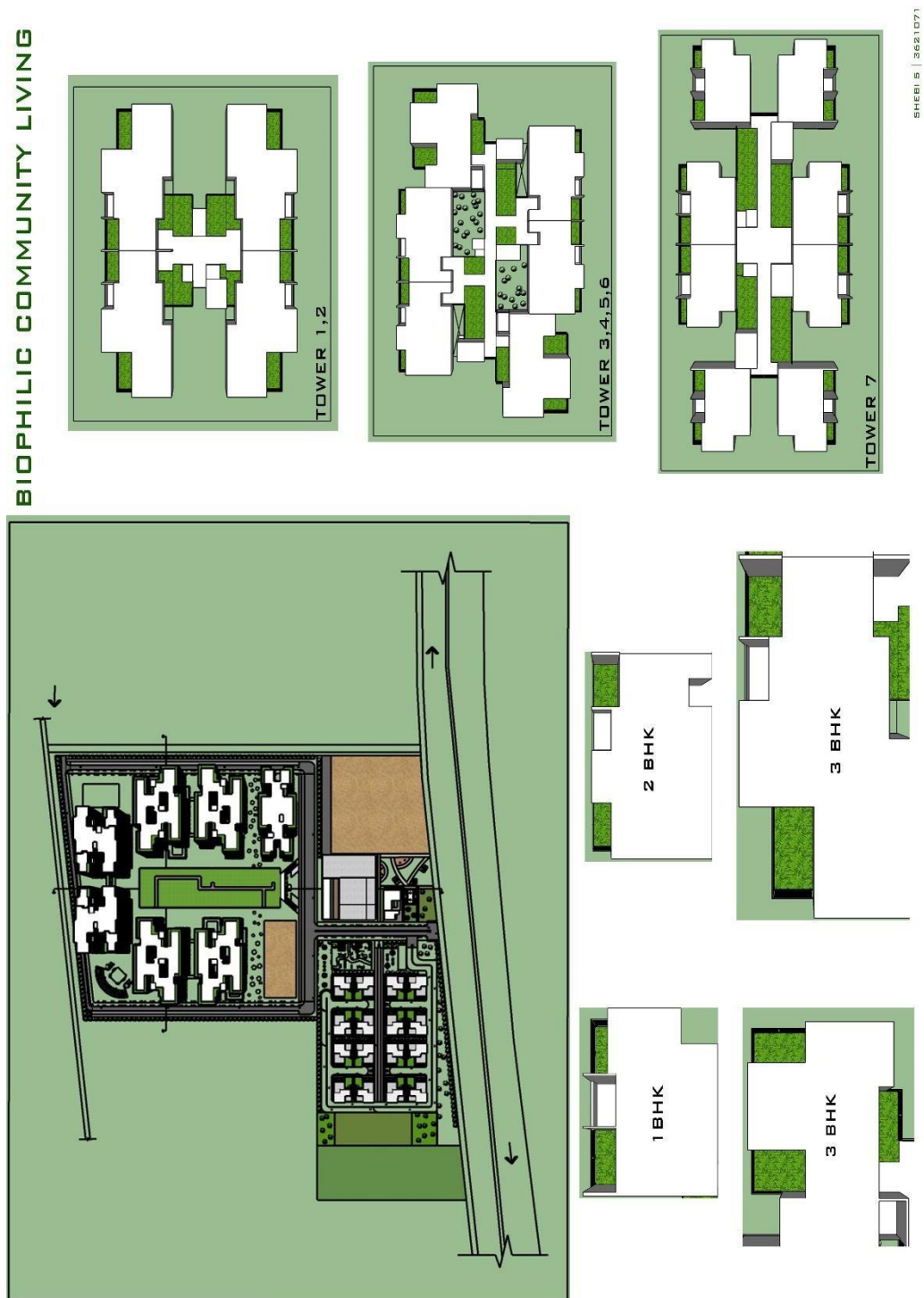


Plate 5.7 Relationship between green and indoor spaces
CHAPTER 6

DRAWINGS

6.1 MASTER PLAN

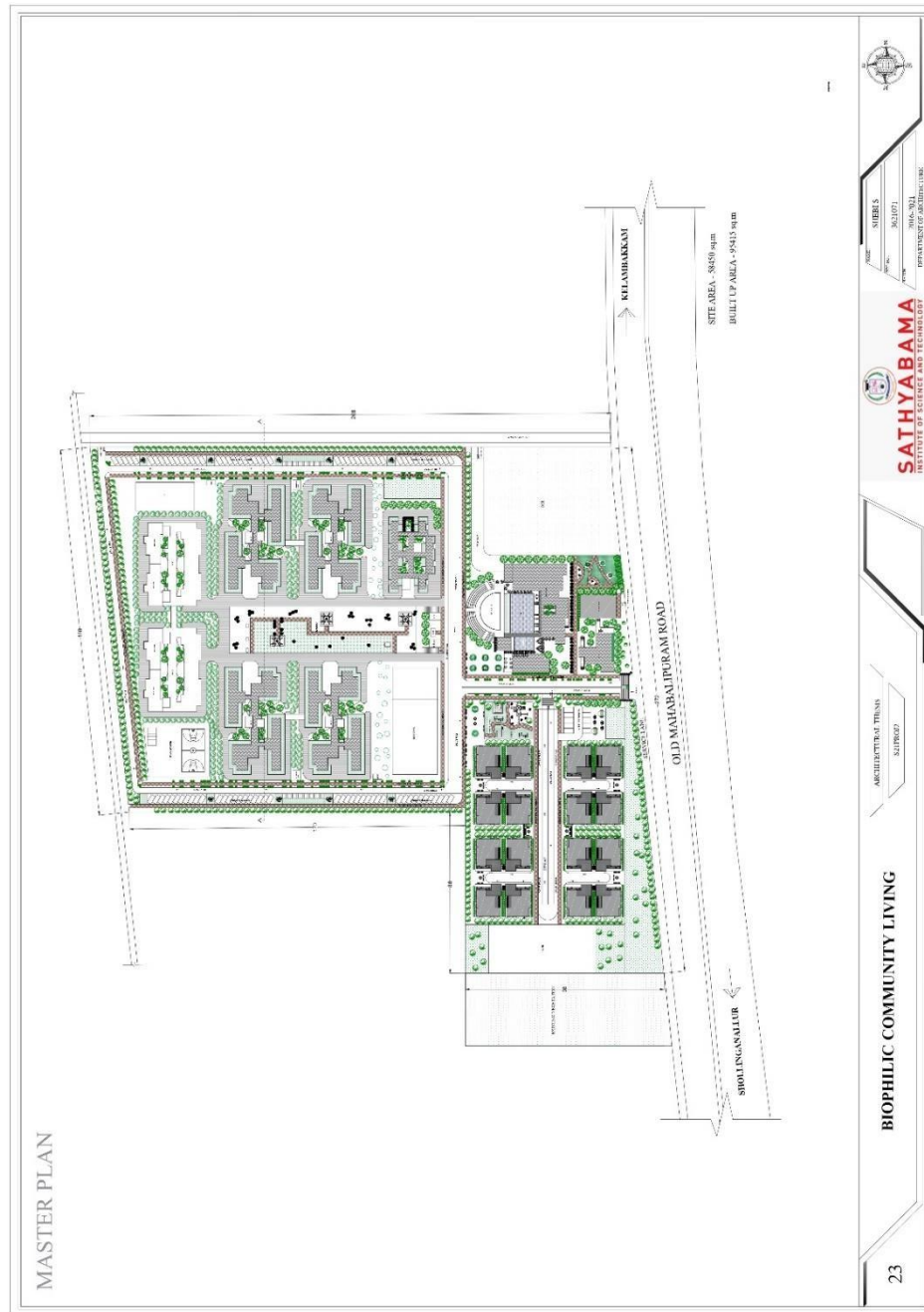


Plate 6.1 Master plan

6.2 STILT LEVEL PLAN

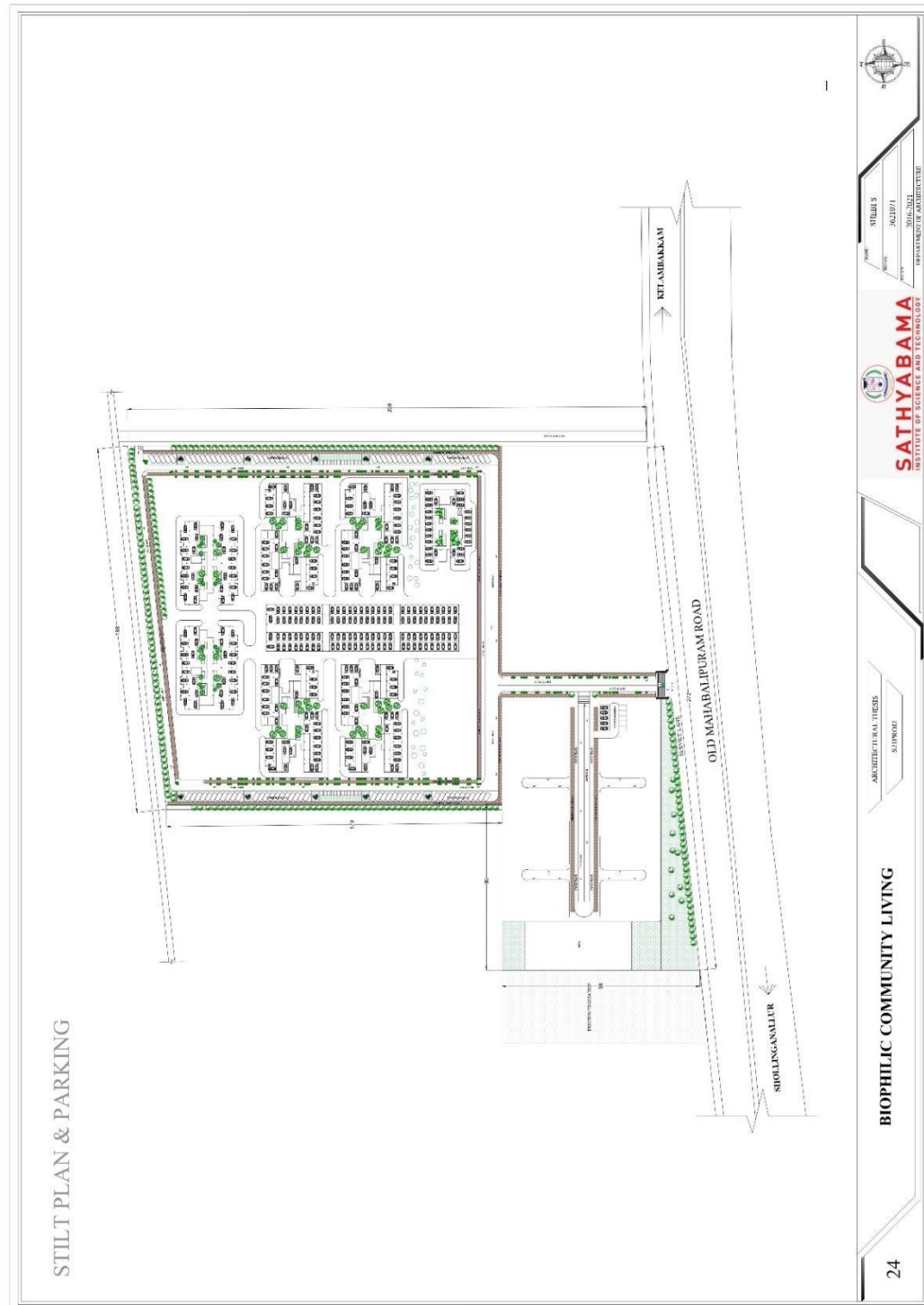


Plate 6.2 Stilt parking

6.3 2BHK & 3BHK (TOWER 3,4,5,6)

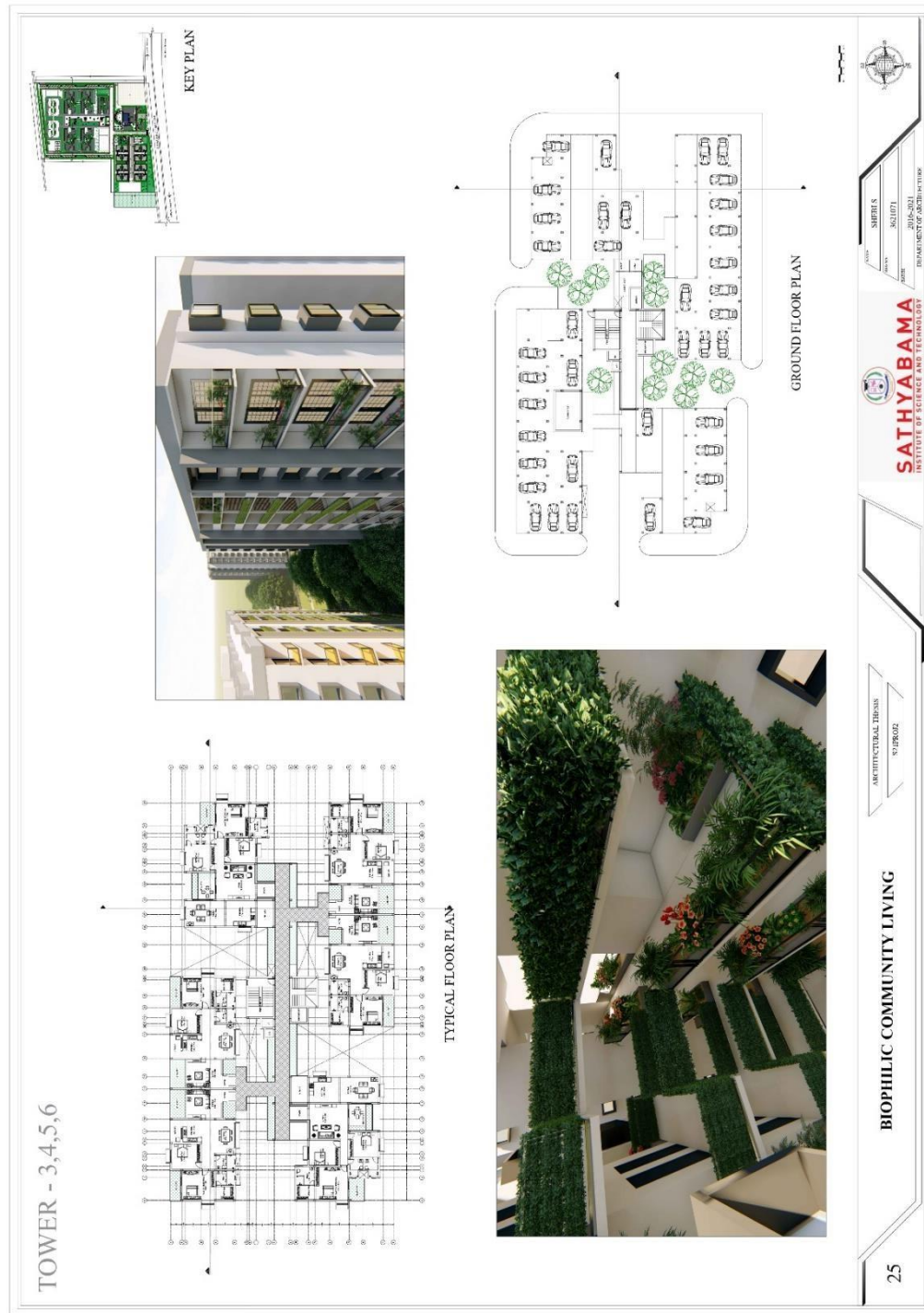


Plate 6.3 2bhk &3bhk (Tower 3,4,5,6)

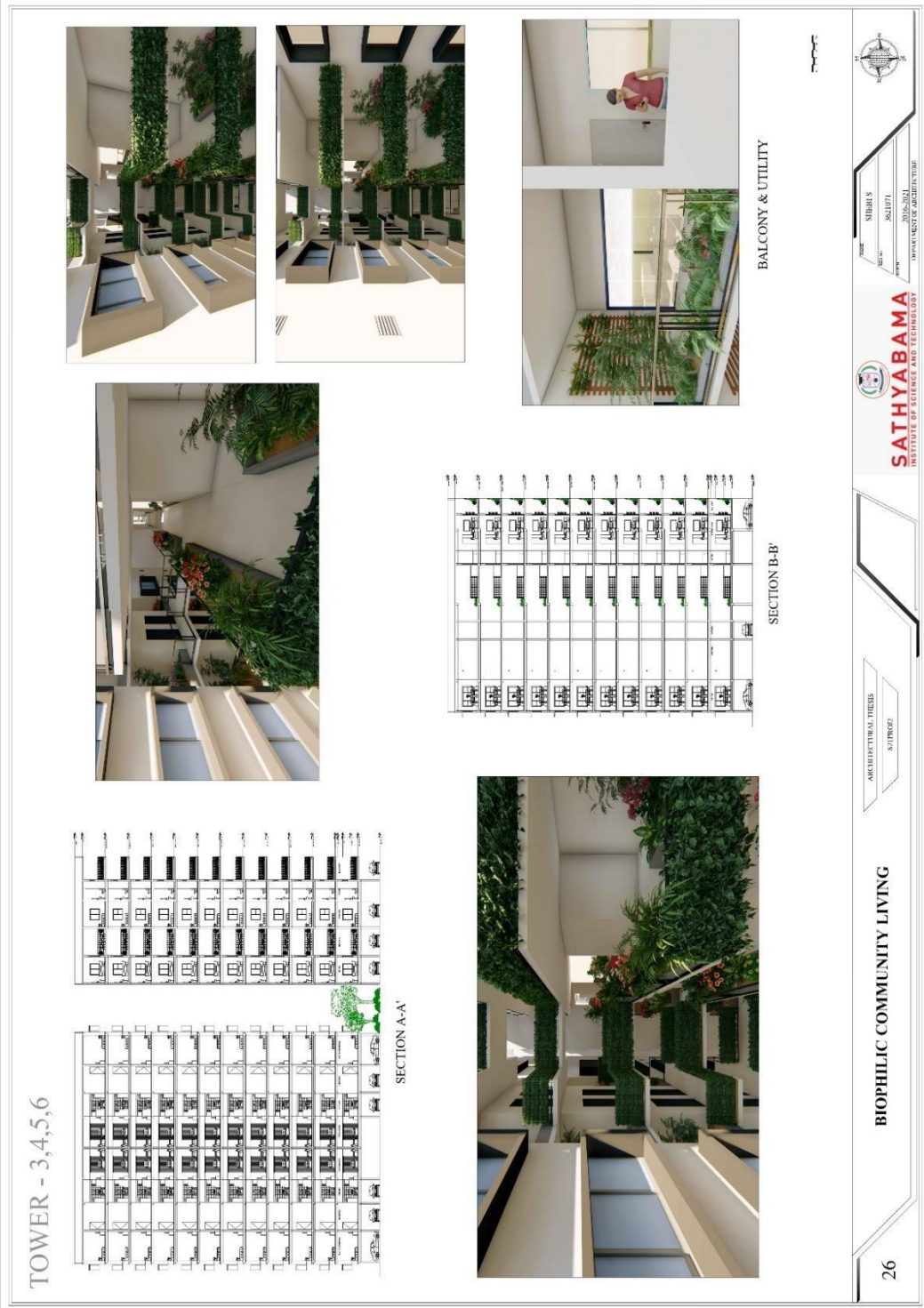


Plate 6.4 2bhk & 3bhk

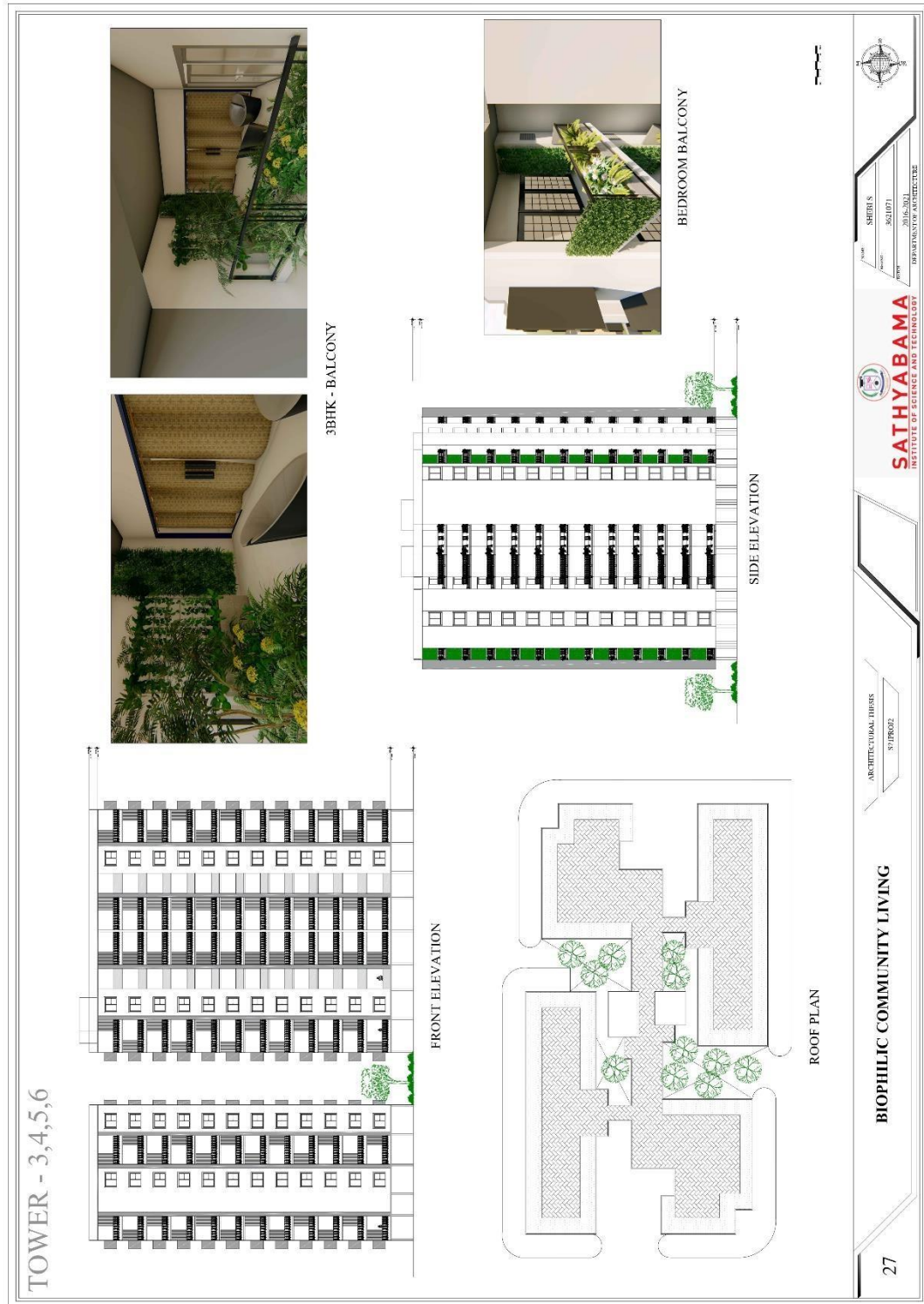


Plate 6.5 2bhk & 3bhk

6.4 3BHK, DUPLEX & PENTHOUSE

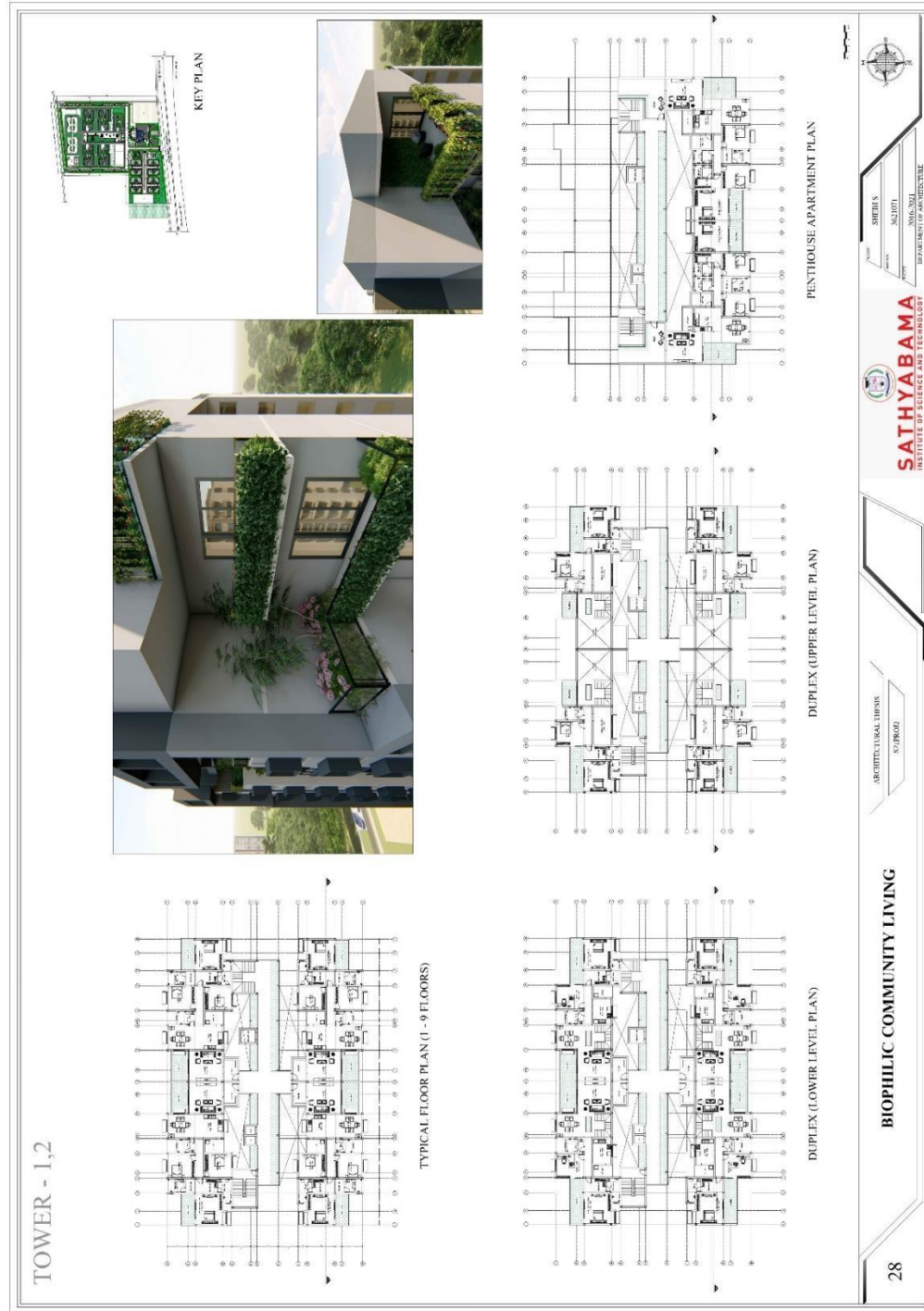


Plate 6.6 3bhk, duplex, penthouse plans

6.5 1BHK (TOWER 7)

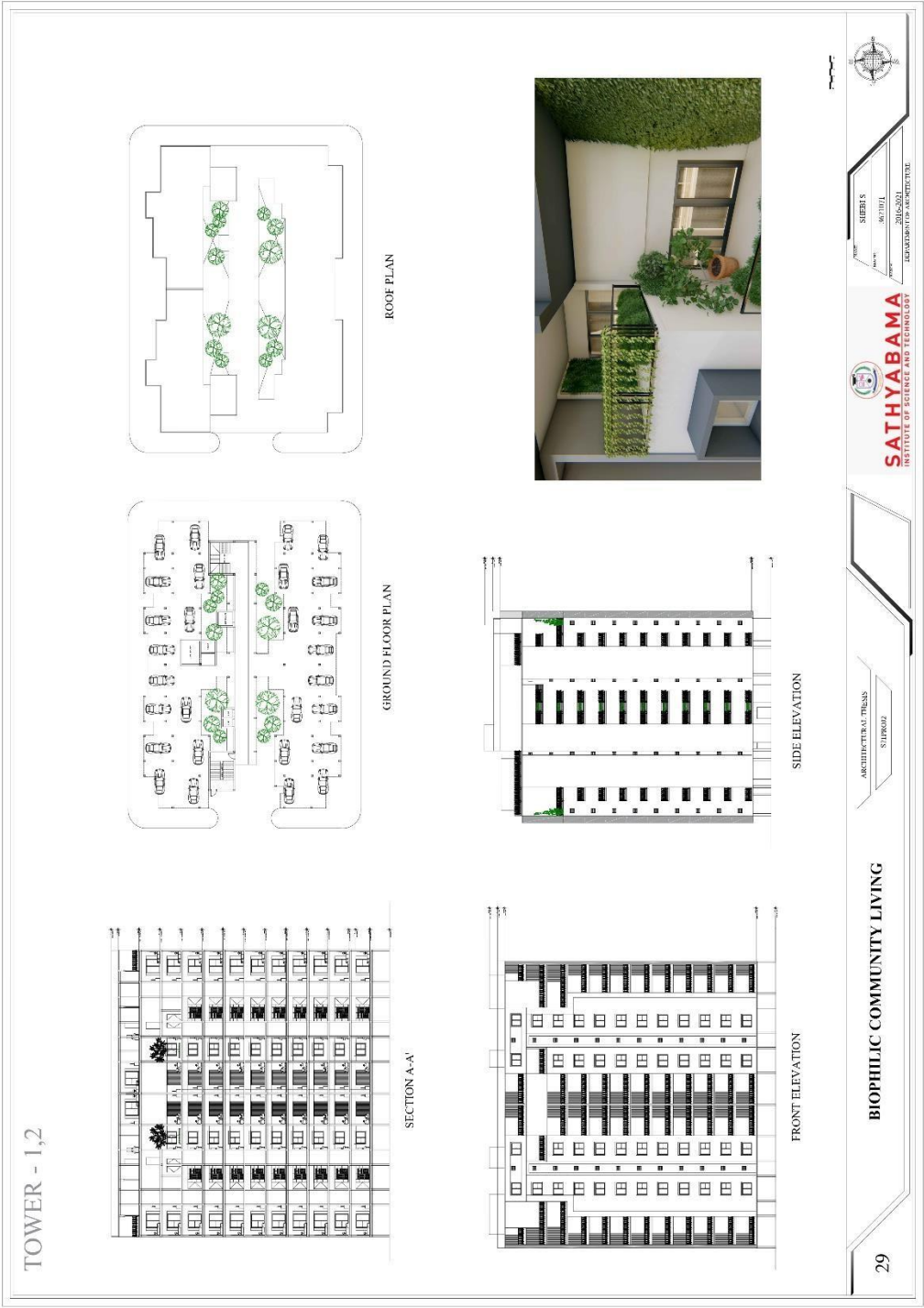


Plate 6.7 3bhk section & elevation

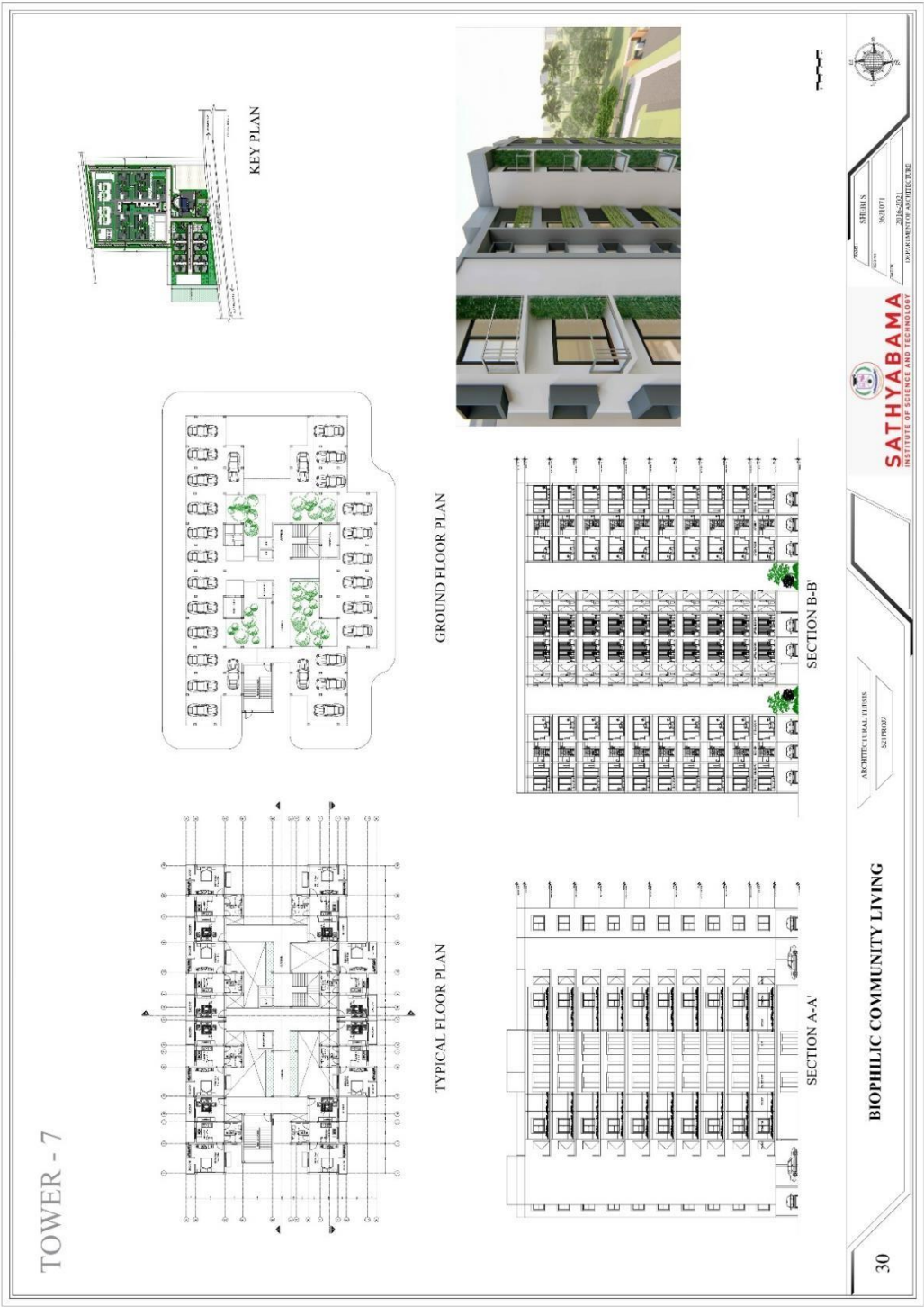
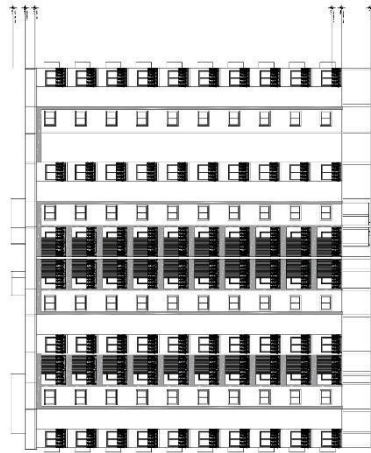
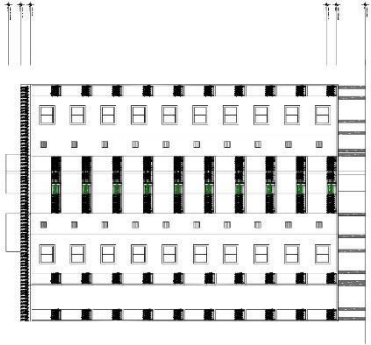


Plate 6.8 1bhk (tower 7)

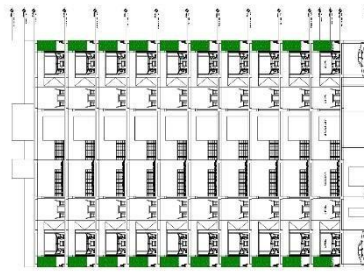
TOWER - 7



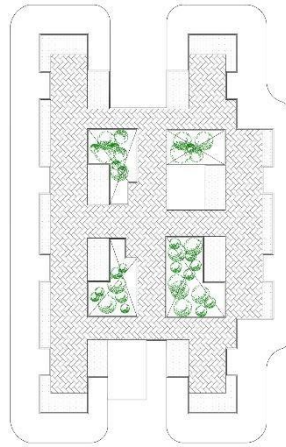
FRONT ELEVATION



SIDE ELEVATION



SECTION C-C'



ROOF PLAN



81



Plate 6.10 villa - plans



6.7 CLUB HOUSE



Plate 6.12 Club house

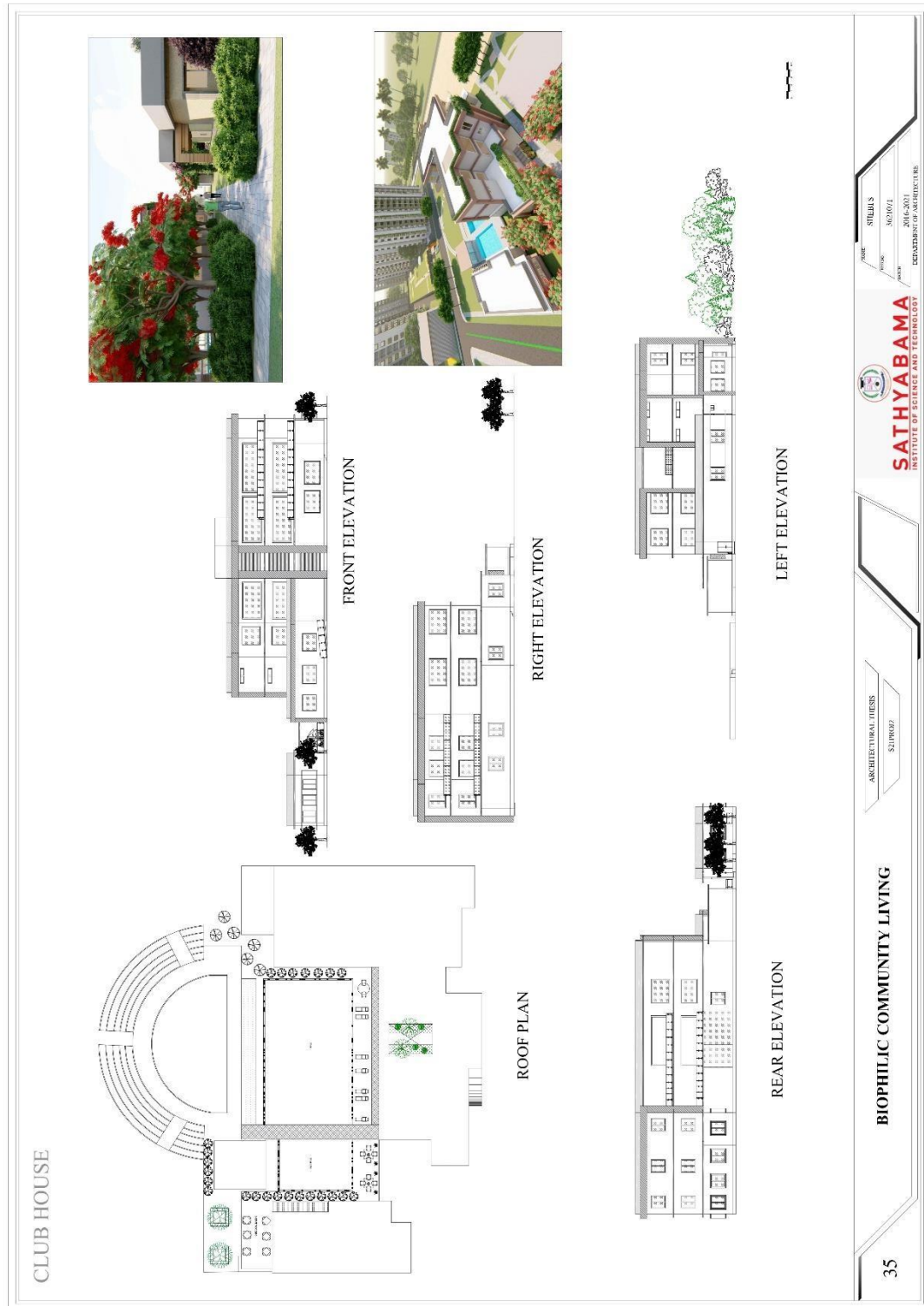
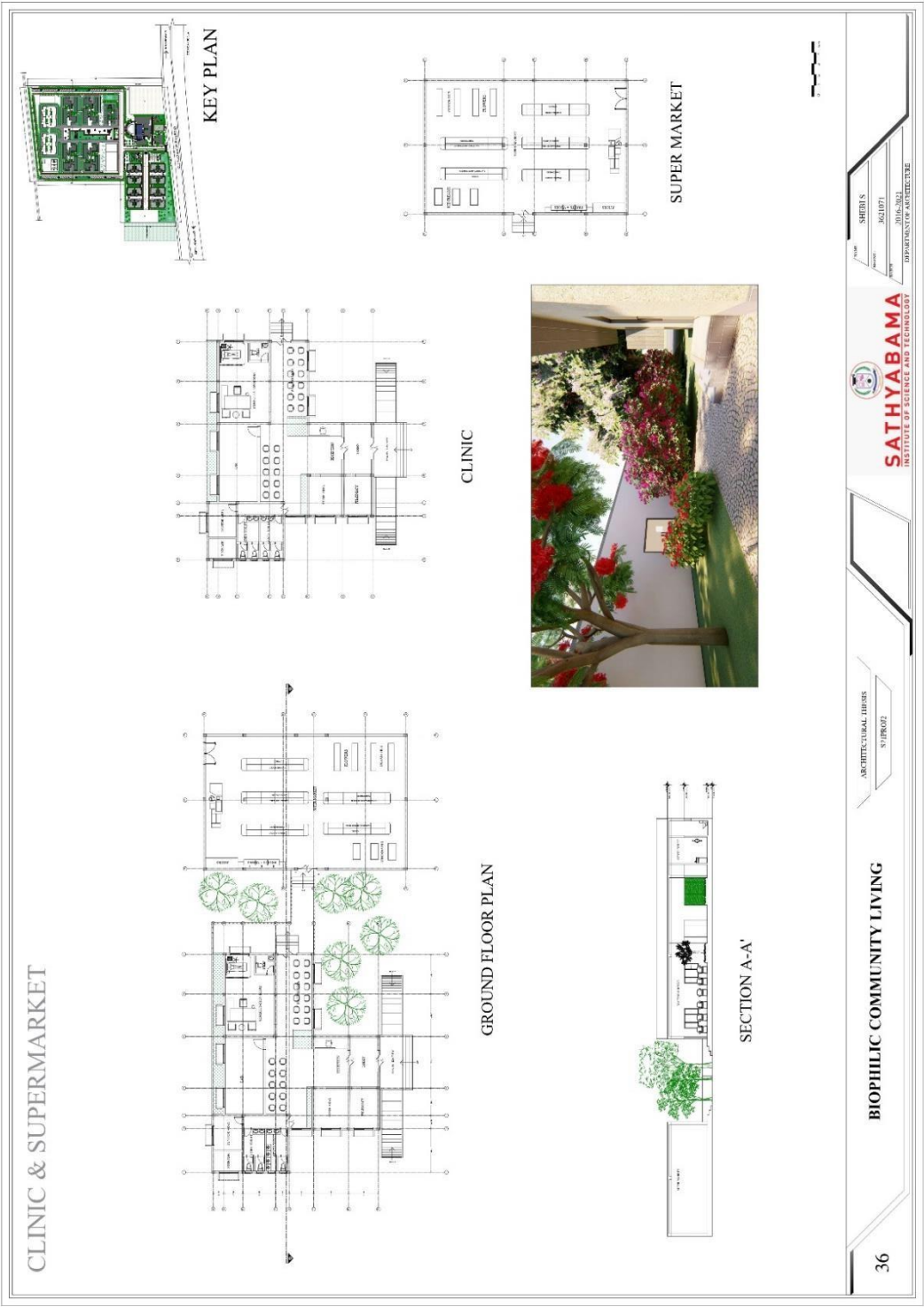
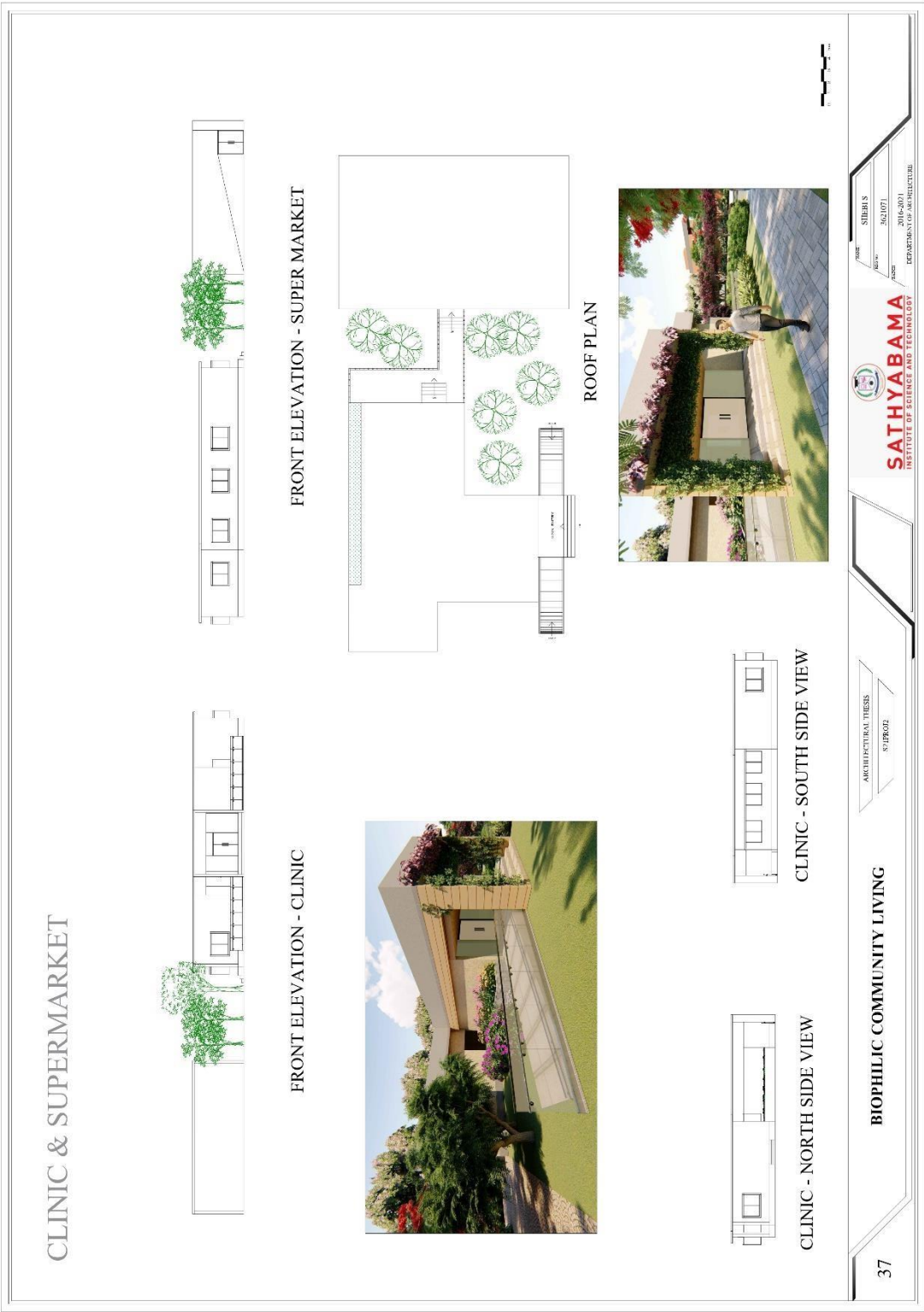


Plate 6.13 Elevations

6.8 CLINIC & SUPERMARKET





6.9 SITE VIEWS



Fig 6.1 entrance view



Fig 6.2 view



Fig 6.3 view



Fig 6.4 view



Fig 6.5 top view



Fig 6.6 top view - villa REFERENCES

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