

URBAN REGENRATIVE HABITAT, SECTOR 150, NOIDA

**A Thesis Submitted
In Partial Fulfillment of the Requirements
For the Degree of**

**BACHELOR OF ARCHITECTURE
in
ARCHITECTURE**

by

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(1150101054)**

**Under the Supervision of
Prof.- AR. MOHIT SACHAN**

**To the
SCHOOL OF ARCHITECTURE
BABU BANARASI DAS UNIVERSITY
LUCKNOW**

June, 2020

CERTIFICATE

I hereby recommend that the thesis, entitled “**URBAN REGENRATIVE HABITAT**”, prepared by MR. ALOK RANJAN under my supervision, is the bonafide work of the student and can be accepted as a partial fulfillment for the award of Bachelors Degree in Architecture, School of Architecture, BBDU, Lucknow.

.....

.....

Prof.- AR. MOHIT SACHAN, Faculty,BBDU,Lko

(Signatures: Dean)

Recommendation:

Accepted
Not Accepted

.....

Examiner 1

.....

Examiner 2

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5. Faculty of the University to which the thesis is submitted

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8. The contents of the thesis have been organized based on the guidelines.	YES	NO
9. The thesis has been prepared without resorting to plagiarism.	YES	NO
10. All sources used have been cited appropriately.	YES	NO
11. The thesis has not been submitted elsewhere for a degree.	YES	NO
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Prof.- AR. MOHIT SACHAN. (Signature of the Candidate)

Name:.....
Roll No
Enrollment No.:.....

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I would like to express my sincere gratitude towards Ar **Prof.- MOHIT SACHAN** (Guide) for helping me throughout the session and taking genuine interest towards me.

It's a great pleasure to thank my parents Mr. RAM DAS and Mrs. PUSHPA DEVI and my sister for all the support throughout.

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URBAN REGENERATIVE HABITAT

(A PATHWAY BEYOND SUSTAINABILITY)

INTRODUCTION

- Sustainability in architecture, as understood by modern society today, is an inadequate measure for current and future architectural design, for it aims no higher than trying to make buildings “less bad”. The current standard of building requires very little in regard to the environment and the standard that is set for what is considered a “sustainable” building is extremely low. The dynamic in architecture as it pertains to the environment, expects little in order to be deemed a success. When a structure is built, it is celebrated if it employs any level of environmental acknowledgement.

- Regenerative architecture is the practice of engaging the natural world as the medium for, and generator of the architecture. It responds to and utilizes the living and natural systems that exist on a site that become the “building blocks” of the architecture. Regenerative architecture has two focuses; it is an architecture that focuses on conservation and performance through a focused reduction on the environmental impacts of a building. It is embodied in the material selection, reduced energy consumption, and intelligent design. The second, more profound piece of regenerative architecture is the treatment of the environment as an equal shareholder in the architecture. It is a practice that employs a full and comprehensive understanding of natural and living systems in the design of a structure.¹ It is an architecture that embraces the environment and uses the millions of years of engineering and evolution as the foundation for a regenerative structure. Regenerative design is based on the premise that everything we build has the potential for the integration of the natural world as an “equal partner” in the architecture.

NEED OF REGENERATIVE ARCHITECTURE

- The building requires the site for its existence, but we view them as separate elements. Perhaps we can expand the definition of architecture to “the art or practice of designing and constructing place, through the integration of site and building.” This definition is more complete and comprehensive as including the site in architecture is the only way for a building to be “beyond sustainable” or regenerative.
- A building is a static entity devoid of environmental integration, leading to a linear model of consumption and waste as depicted in figure 1. Under our current definition of architecture we remove the place from the architecture, inherently dividing the operation of the structure from the landscape and the biosphere. This requires the synthesis of systems in our buildings, which demands a constant input of energy and resources that are disconnected from the site.

AIM AND OBJECTIVES

- 1. Solutions Grow From Place. Ecological design begins with the intimate knowledge of a particular place. Therefore, it is small scale and direct, responsive to both local conditions and local people. If we are sensitive to the nuances of place, we can inhabit without destroying.
- 2. Ecological Accounting Informs Design. Trace the environmental impacts of existing or proposed designs. Use this information to determine the most ecologically sound design possibility.
- 3. Design With Nature. By working with living processes, we respect the needs of all species while meeting our own. Engaging in processes that regenerate rather than deplete, we become more alive.
- 4. Everyone is a Designer. Listen to every voice in the design process. No one is participant only or designer only. Everyone is a participant-designer. Honor the special knowledge that each person brings. As people work together to heal their places, they also heal themselves.
- 5. Make Nature Visible. Denatured environments ignore our need and potential for learning. Making natural cycles and processes visible brings the designed environment back to life. Effective design helps to inform us of our place within nature.

SCOPE AND LIMITATION

Architecture is regenerative when the term architecture incorporates more than just the building. The architecture is the place, the site, the systems, the energy, the building, the fauna and flora, etc. It is an architecture that is purely embedded into the site. It exists as one piece, one system that co-evolves as one complete entity. Once this understanding of architecture is adopted, the opportunities for regenerative architecture become almost limitless. The health of the ecosystem is improved and the architecture is now producing more than it consumes, having a positive existence; this is called regeneration. Figure 2 is a model that graphically depicts a model of regeneration.

- The expansion of our built world paradigm allows for humans and the environment to exist in integration. It allows humans to return to a place of equilibrium and regeneration in our life places. The upward spiral of environmental health can begin, which ultimately increases the health of the human species as well as the environment, needless to say it is in our best interest to adopt a process of regeneration and integration.
- We can have regenerative architecture when our production output from the system is greater than the net input of resources into the system. The architecture, in its new definition, is producing a surplus of food, more clean water than it consumes, more energy than it consumes, provides richer diversity than was before the structure became part of the system.

SWOT ANALYSIS

- The county's housing stock is aging and diverse.
- Housing is relatively affordable, though geographically concentrated and not affordable for certain groups. There are also concerns of poor housing quality in some areas and a lack of support/funding for affordable housing.
- The county has experienced changing demographics, including population loss, a decline in public housing tenants, and increasing housing needs for elderly households.
- The county has an available supply of developable land through vacant property and Brownfields. These areas are, however, often expensive to develop.
- The county's housing stock includes design variety, both creative and conservative. An identified weakness in the housing stock is the lack of accessible design.
- The county faces aging and inadequate infrastructure.
- Persons with disabilities and aging households experience difficulties locating accessible affordable and market-rate housing. The political and governmental environment has multiple governments and multiple housing authorities. There is a lack of coordination between the city and county.
- The county has a diverse tax structure, high in some areas with others facing a shrinking tax base.
- The county's scattered site and mixed-income housing is a relatively new housing policy, not integrated well in current markets, but can present a better quality of life.

METHODOLOGY

- Housing is one of the basic need of an individual and not all of them do have a shelter for their survival. In India alone 27 million units of housing has been traced to be in shortage. In depth maximum of population who lack housing are the economically weaker section and the middle class. There is a dire need for the country to patch up this large population. If we fail to manage with housing and shelter within this population, the shortage is sure to increase to 38 million units by 2030. A radical change is need of an hour. Though providing shelter to millions is a pretty tough and a huge task, there has to be a remedy for this problem.
- Low Cost Housing is a new concept which deals with effective budgeting and following of techniques which help in reducing the cost of construction through the use of locally available materials along with improved skills and technology without sacrificing the strength, performance and life of the structure. There is a huge misconception that Low Cost housing is suitable for substandard works and they are constructed by utilizing cheap building materials of cheap quality. The fact is that Low Cost housing is done by proper management of resources. Economy is also achieved by postponing finishing works or implementing them in phases

BUILDING BYE LAWS
GROUP HOUSING (FLATTED AND CLUSTER TYPE)

- DEVELOPMENT OF GROUP HOUSING WILL BE UNDER PROVISION OF MASTER PLAN, ENCLAVE DEVELOPMENT PLAN AND LAYOUT PLAN.
- MINIMUM AREA OF PLOT WILL BE 2000SQ.M
- LAND PROPOSED FOR GROUP HOUSING WILL BE LOCATED AT 12M WIDE EXISTING ROAD, BUT THE DISTANCE OF THE PLOT FROM 18M (OR ABOVE) WIDE ROAD WILL NOT BE MORE THAN 100M.
- SILL FLOOR WILL BE PERMITTED FOR THE PURPOSE OF PARKING IN GROUP HOUSING BUILDINGS, HEIGHT OF WHICH OF WHICH BE 2.1M UP TO THE BEAM.
- IF SILL FLOOR IS USED FOR PURPOSE OTHER THAN PARKING THEN IT WILL BE COUNTED IN F.A.R.
- PARK AND OPEN AREA WILL BE PROVIDED AT THE RATE OF 1.0SQ.M. PER PERSON OR 15% OF THE WHOLE AREA, WHICHEVER IS MORE, IN THE PLOT OF AREA 3000SQ.M (OR ABOVE).
- IN GROUP HOUSING BUILDINGS, BUILDINGS WITH HEIGHT OF 12.5 M WILL HAVE A SETBACK OF MINIMUM 5.0 M AROUND.
- IN NEW/UNDEVELOPED PLANS/ALLOTTED PLOTS, MAXIMUM PERMITTED F.A.R. WILL BE 2.5 AND IN BUILT UP AREAS AND PRE-DEVELOPED PLAN/ALLOTTED PLOTS, MAXIMUM PERMITTED F.A.R. WILL BE 1.5
- IN PRE-DEVELOPED PLACELONGS/AREAS, WHOSE LAYOUT PLANS ARE ADEQUATELY APPROVED, USING METHOD OF PLOTS DEVELOPMENT COMBINING ONE OR MORE PLOTS PROPOSED GROUP HOUSING OR OTHER MULTI-STORY CONSTRUCTION WILL NOT BE PERMITTED.
- GUARD ROOM OF 1.6 SQ.M DIMENSIONS
- (WHOSE MIN. WIDTH OR DIA WILL BE 1.2 M) WILL BE ALLOTTED AT THE ENTRY GATE BUT IN ANY CASE FOR FIRE EXTINGUISHING CONSTRUCTION IN DESIRED MINIMUM SETBACK WILL NOT BE PERMITTED.

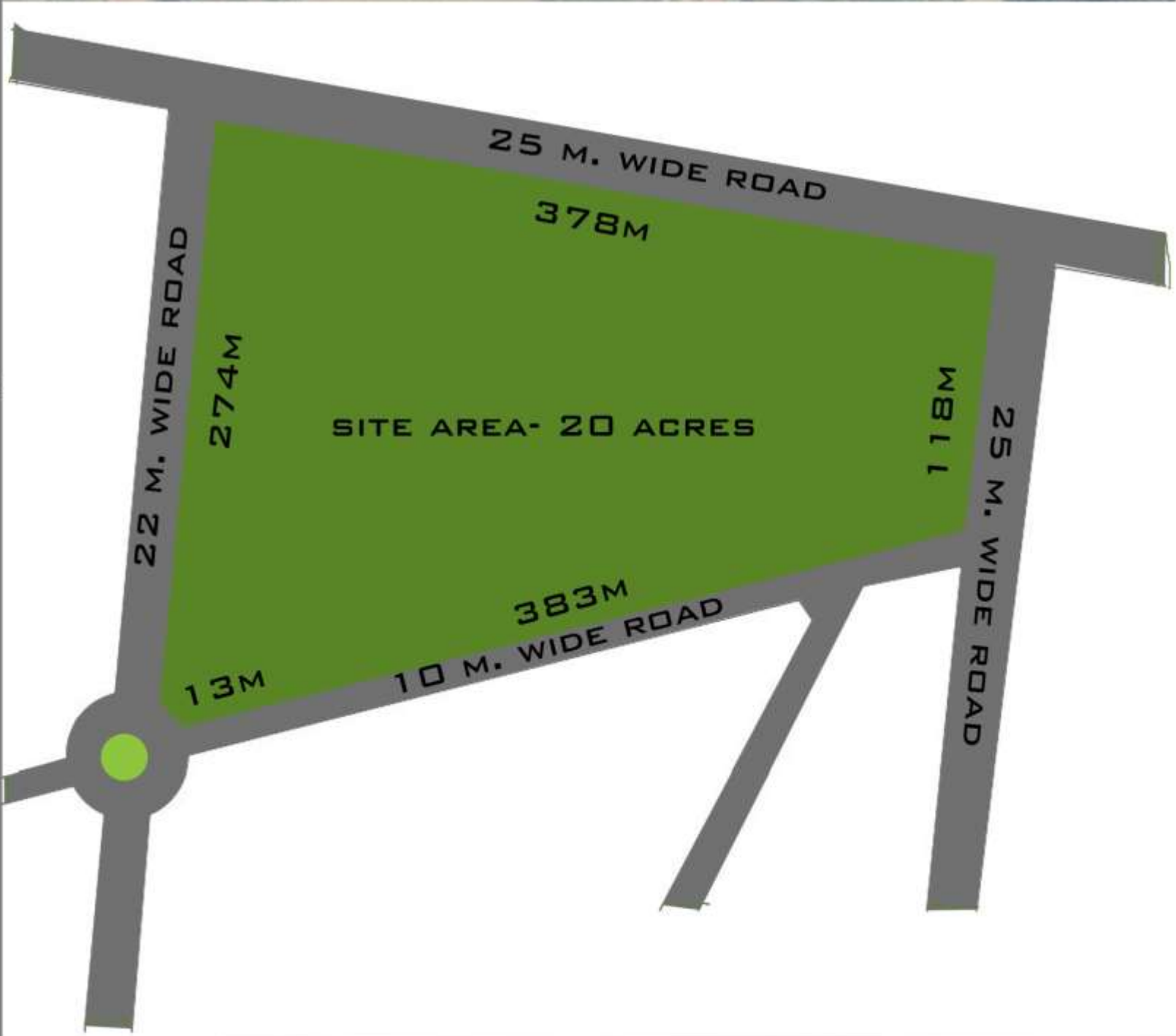
• LIVABLE RPPM :- MAIN AREA 9.5 SQ.M S BREATH 2.4M MAIN HEIGHT OF CEILING 2.75M. HEIGHT UNDER THE BEAM MAIN 2.45M

• KITCHEN:- MAIN, AREA 5.0SQ.M AND BREATH 1.5M. MAIN HEIGHT OF KITCHEN 2.7M KITCHEN USED AS DINNING ROOM, MAIN AREA 9.5SQ.M AND MAIN WIDTH 2.4M.

• PARKING GARAGE:- MAIN SIZE WILL BE 2.5K 5.5SQ.M MAXIMUM HEIGHT WILL BE 2.4M.

• BATHROOM AND TOILETS:- MAIN AREA WILL BE 1.0SQ.M COMBINED TOILETS AND BATHROOM, MIN AREAS 2.8 SQ.M S BREATH 1.2M.

• SERVICE FLOOR :- FOR THE USE OF PIPES SERVICE DUCTS, ETC USED IN MULTISTOREY BUILDING, MAX HT 1.75M INC BEAM.



INTRODUCTION

SECTOR 150 NOIDA HAS ABOUT 1,200 ACRES OF LAND, OUT OF WHICH 600 ACRES HAVE BEEN PLANNED FOR DEVELOPMENT. FLOURISHING AS A GREEN SECTOR, THE NOIDA AUTHORITY HAS DEDICATED 80% OF THE TOTAL LAND AREA AS GREEN COVER. APART FROM THESE, THE AUTHORITY HAS DECIDED TO DEVELOP A 42-ACRE GREEN PARK, WHICH IS BELIEVED TO BE ONE OF THE BIGGEST IN THE COUNTRY AND THE AUTHORITIES HAVE PROPOSED TO MAKE THIS SECTOR FREE OF OVERHEAD WIRING.

SECTOR 150 NOIDA - LOCATION

THE LOCATION IS THE MAIN CENTER POINT OF NOIDA AND THE GREENEST SECTOR WHICH IS SURROUNDED BY VARIOUS RESIDENTIAL, COMMERCIAL HUBS AND GREENERY TO OFFER YOU THE MOST PEACEFUL AND GREAT LIFESTYLE YOU DESERVE. THE ADVANTAGE OF EASY CONNECTIVITY IS ONE OF THE BIGGEST MERITS A LOCALITY CAN BOAST OF AS IT APPEALS TO ALL SECTIONS OF PEOPLE. SURROUNDED BY NOIDA-GREATER NOIDA EXPRESSWAY AND YAMUNA EXPRESSWAY, SECTOR 150 IN NOIDA ALREADY ENJOYS THE BENEFIT OF EASY CONNECTIVITY.

EXTENDED CONNECTIVITY NEAR SECTOR 150 NOIDA AND ITS

NEIGHBORING REGIONS

LOCATED AT THE INTERSECTION OF THE NOIDA-GREATER NOIDA LINK ROAD, YAMUNA EXPRESSWAY AND THE HINDON RIVER, SECTOR 150 NOIDA IS WELL-CONNECTED WITHIN THE REGION. THE 75-METER-WIDE ROAD, FROM NOIDA-GREATER NOIDA EXPRESSWAY TO FARIDABAD, PASSES THROUGH SECTOR 150-152. THIS ROAD ENHANCES THE CONNECTIVITY OF NOIDA AND GREATER NOIDA WITH HARYANA AND OTHER PARTS OF UTTAR PRADESH.

A REGIONAL ROAD LINKAGE HAS ALSO BEEN PROPOSED BETWEEN NOIDA AND FARIDABAD. THIS ROAD WILL CONNECT NATIONAL HIGHWAY 2 WITH THE NOIDA-GREATER NOIDA EXPRESSWAY NEAR SECTOR 150 NOIDA, AS WELL AS NATIONAL HIGHWAY 91 AND FURTHER WITH NATIONAL HIGHWAY 24 NEAR HAPUR THROUGH A PROPOSED 120-METER-WIDE ROAD IN GREATER NOIDA PHASE 2.

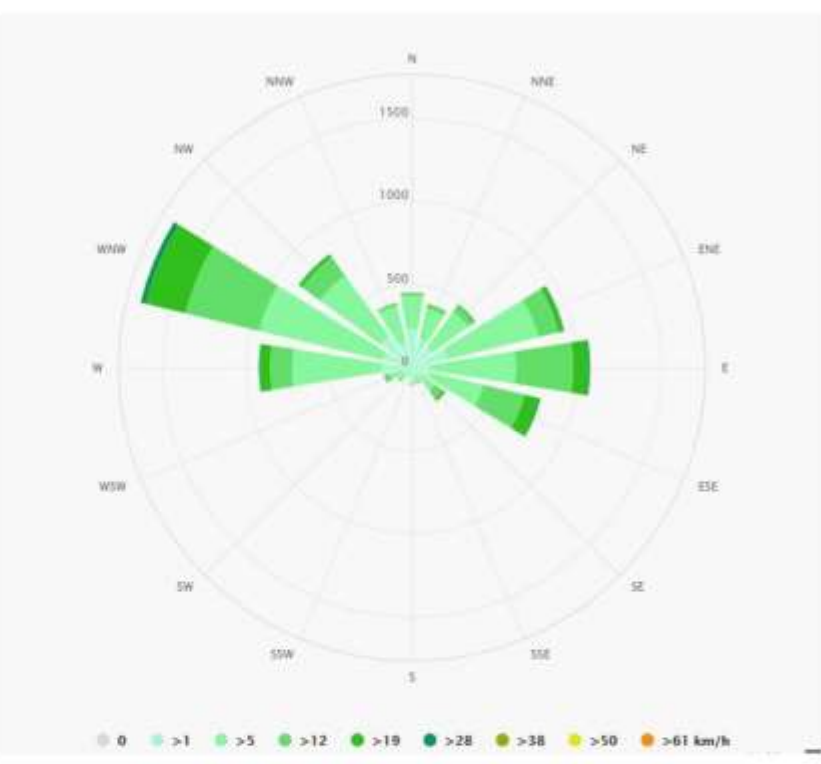
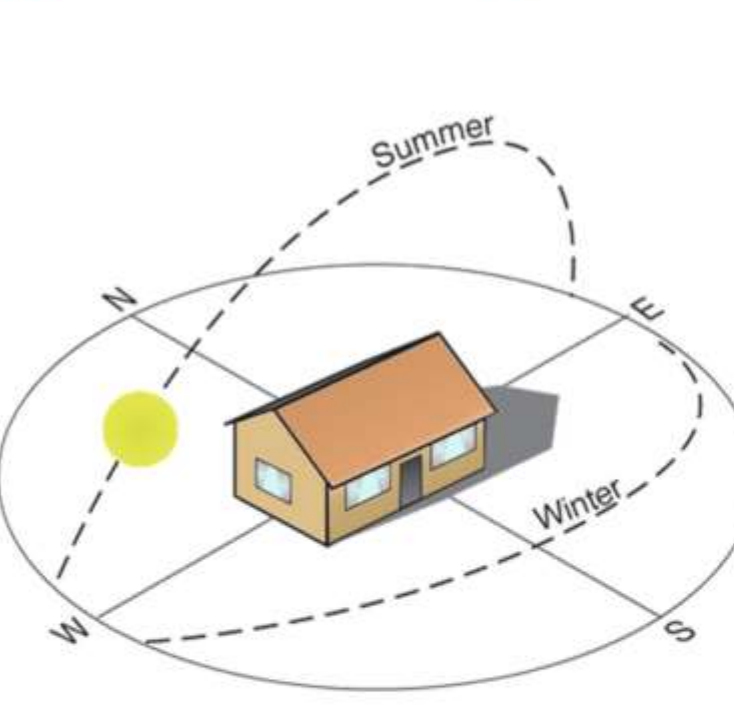
METRO NEAR SECTOR 150 NOIDA

METRO CONNECTIVITY IS THE MOST IMPORTANT THING WHICH DEFINES THE LOCATION. METRO HAS CHANGED THE ENTIRE DIMENSION OF NOIDA AND GREATER NOIDA REAL ESTATE MARKET. THE WORK ON THE PROPOSED METRO STATION, ON THE LINE BEING EXTENDED TO GREATER NOIDA FROM NOIDA CITY CENTRE, IS ALSO IN FULL SWING. THE LINE WILL CONNECT SECTOR 153 AND SECTOR 149 TO NOIDA CITY CENTRE AND SECTOR 71.

RAILWAY STATION NEAR SECTOR 150 NOIDA

THE NEAREST RAILWAY STATIONS ARE AJAIBPUR AND DADRI, 20 KMS AWAY. A METRO CORRIDOR RUNS BETWEEN NOIDA AND GREATER NOIDA. SECTOR 150 NOIDA IS WELL-CONNECTED AND EASILY ACCESSIBLE FROM THE IGI AIRPORT (LOCATED 46 KMS AWAY) VIA THE NOIDA-GREATER NOIDA EXPRESSWAY.

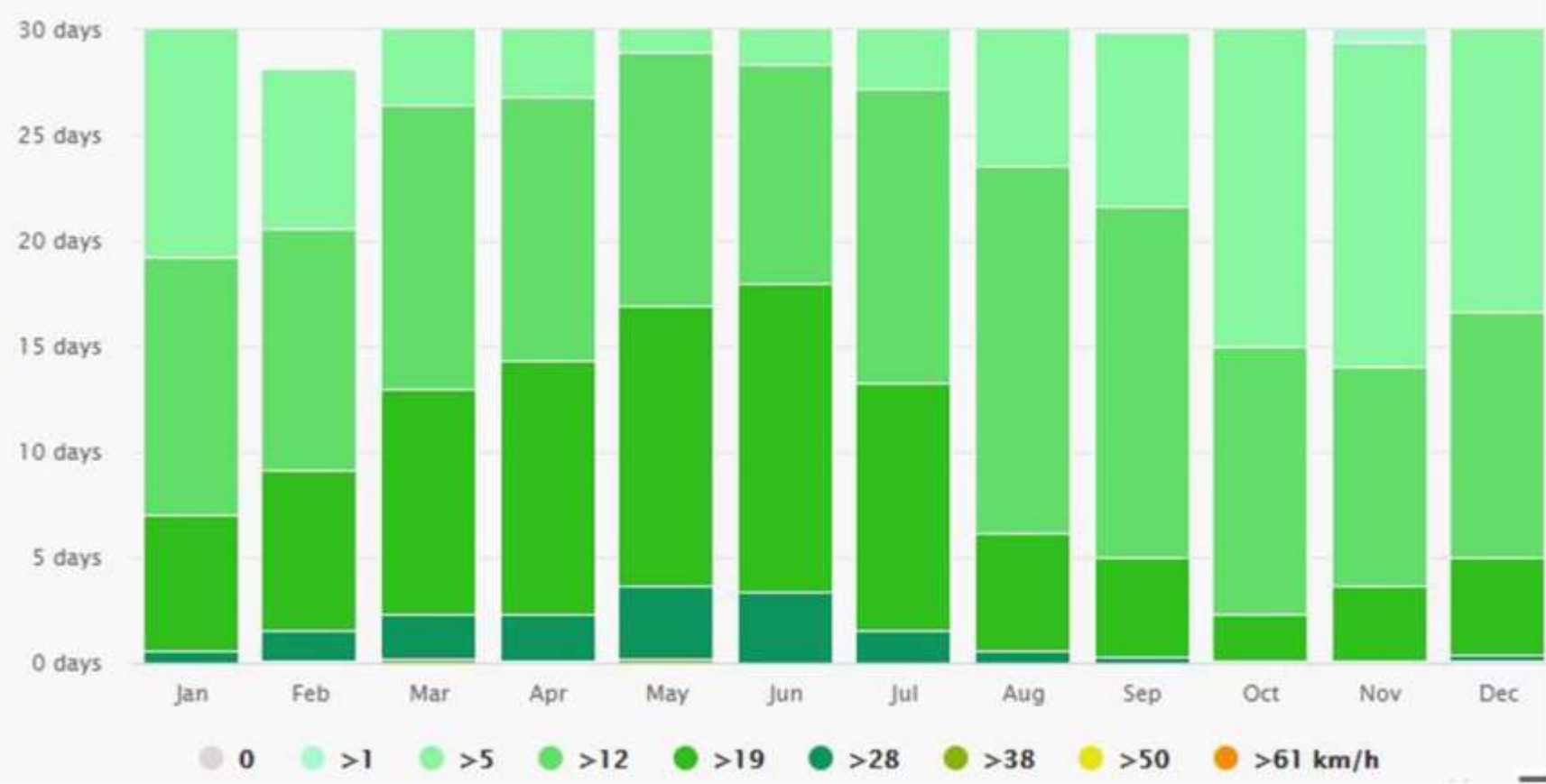
CLIMATE DATA



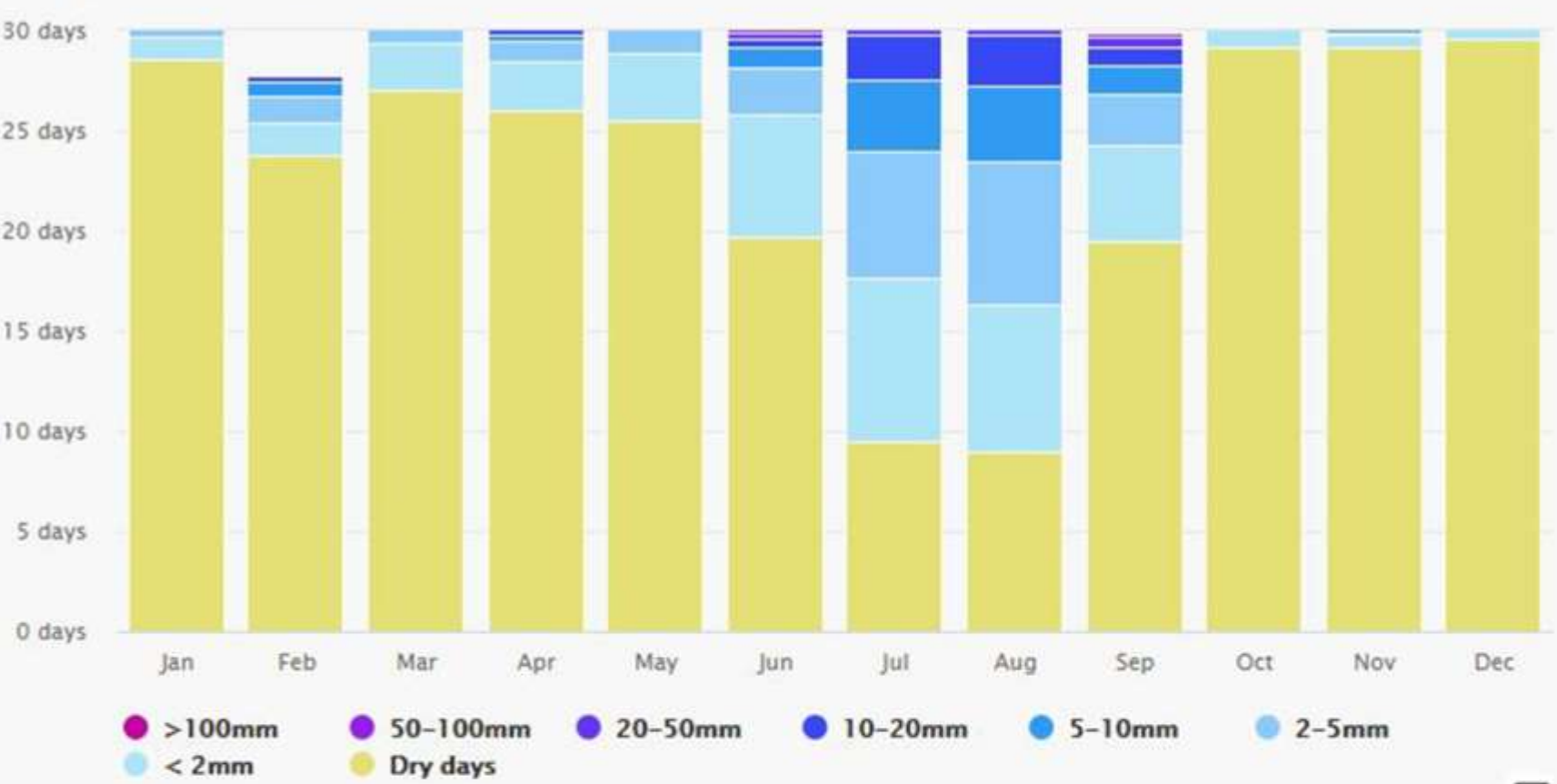
NOIDA WEATHER BY MONTH // WEATHER AVERAGES

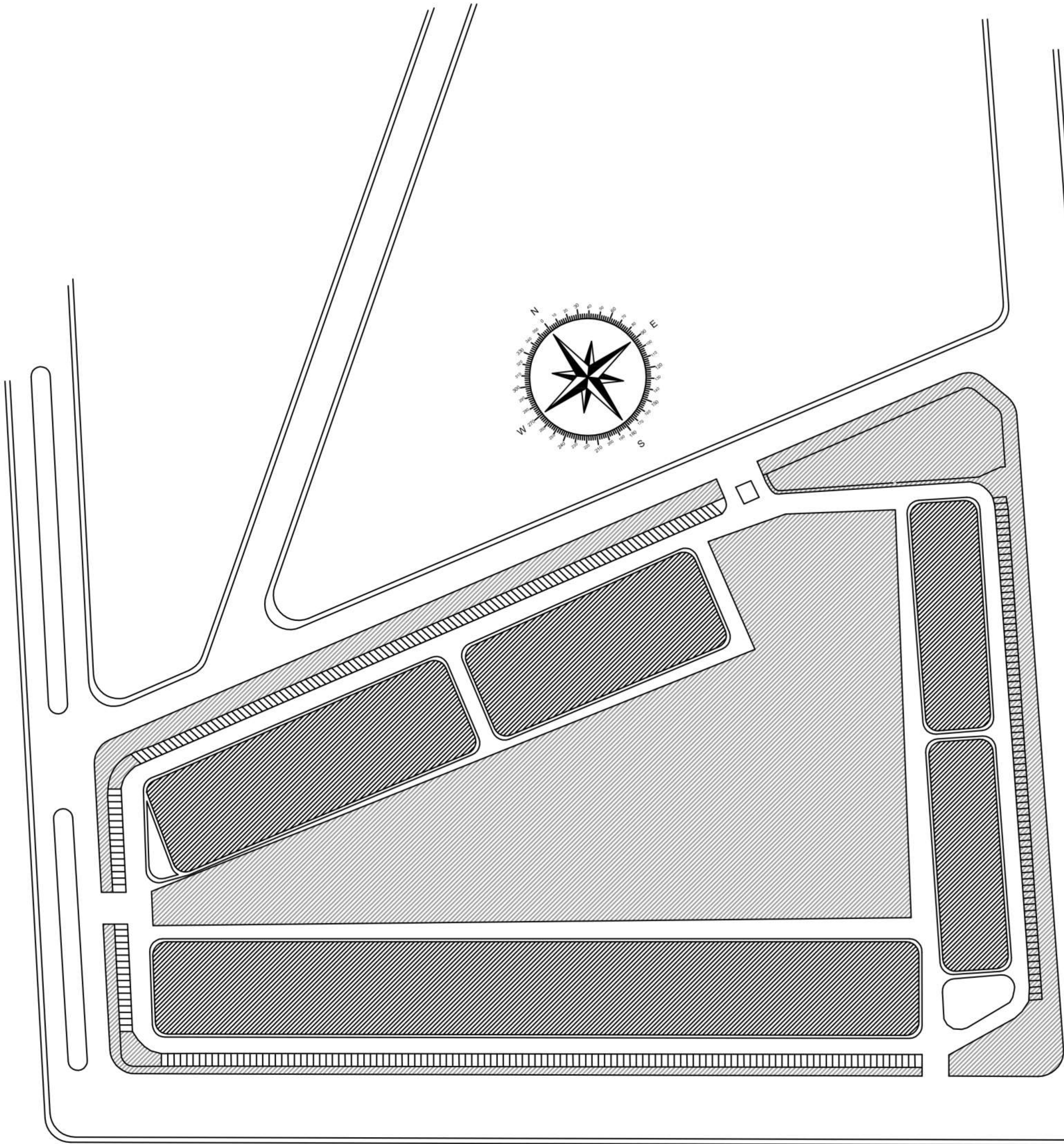
	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature (°C)	14.4	17	22.8	28.6	33.4	34.2	31.1	29.8	29.3	25.8	20.2	15.8
Min. Temperature (°C)	7.5	10.1	15.2	20.9	26.3	28.5	27.1	26.1	24.6	18.7	11.8	8.1
Max. Temperature (°C)	21.3	24	30.4	35.4	40.6	39.9	35.2	33.5	34	32.9	28.7	23.5
Avg. Temperature (°F)	57.9	62.6	73.0	83.5	92.1	93.6	88.0	85.6	84.7	78.4	68.4	60.4
Min. Temperature (°F)	45.5	50.2	59.4	69.6	79.3	83.3	80.8	79.0	76.3	65.7	53.2	46.6
Max. Temperature (°F)	70.3	75.2	86.7	97.5	105.1	103.8	95.4	92.3	93.2	91.2	83.7	74.3
Precipitation / Rainfall (mm)	18	9	16	2	9	45	197	258	131	33	4	8

Wind speed



Precipitation amounts



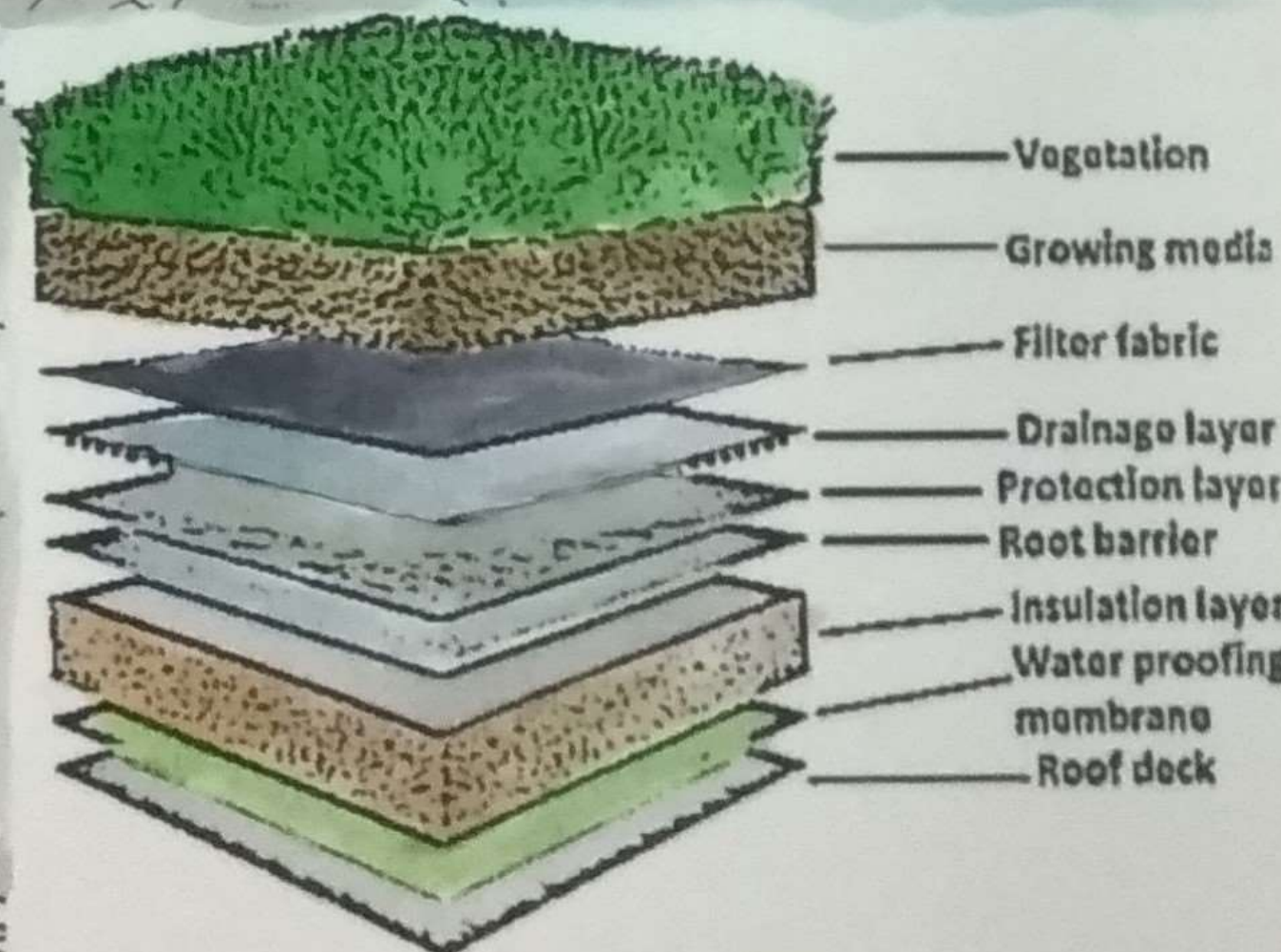
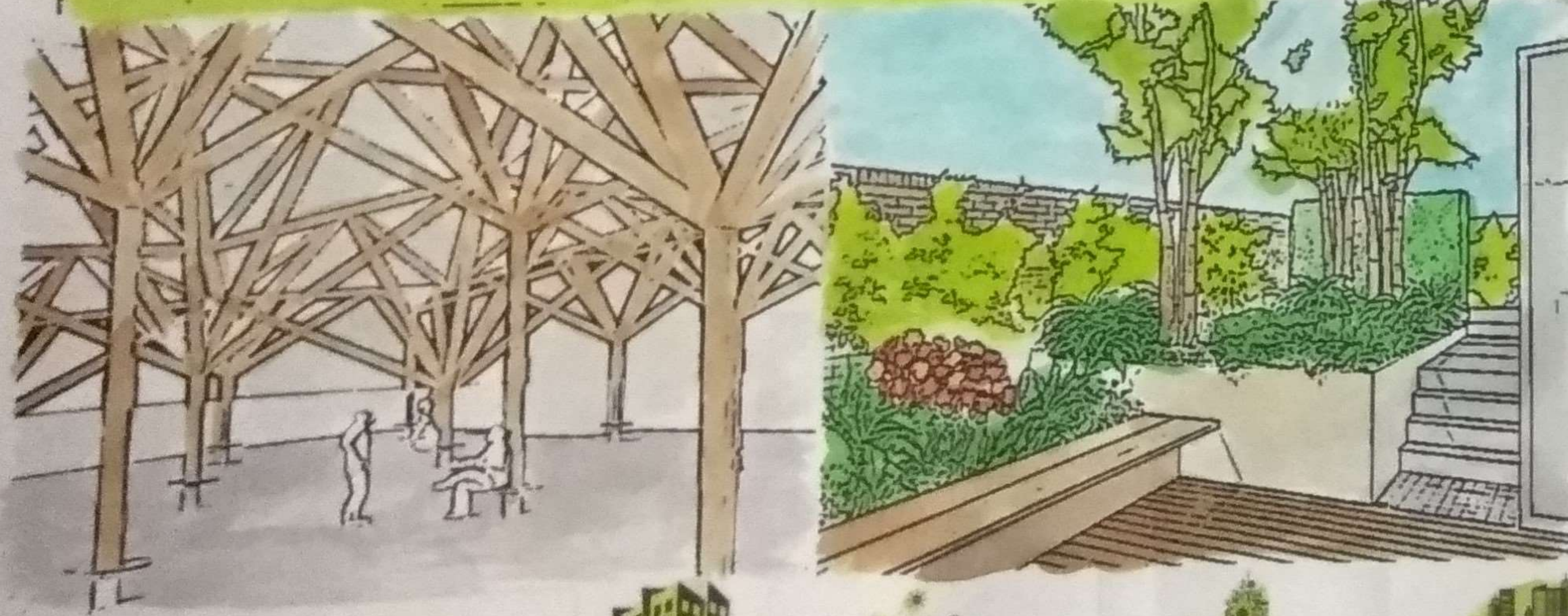
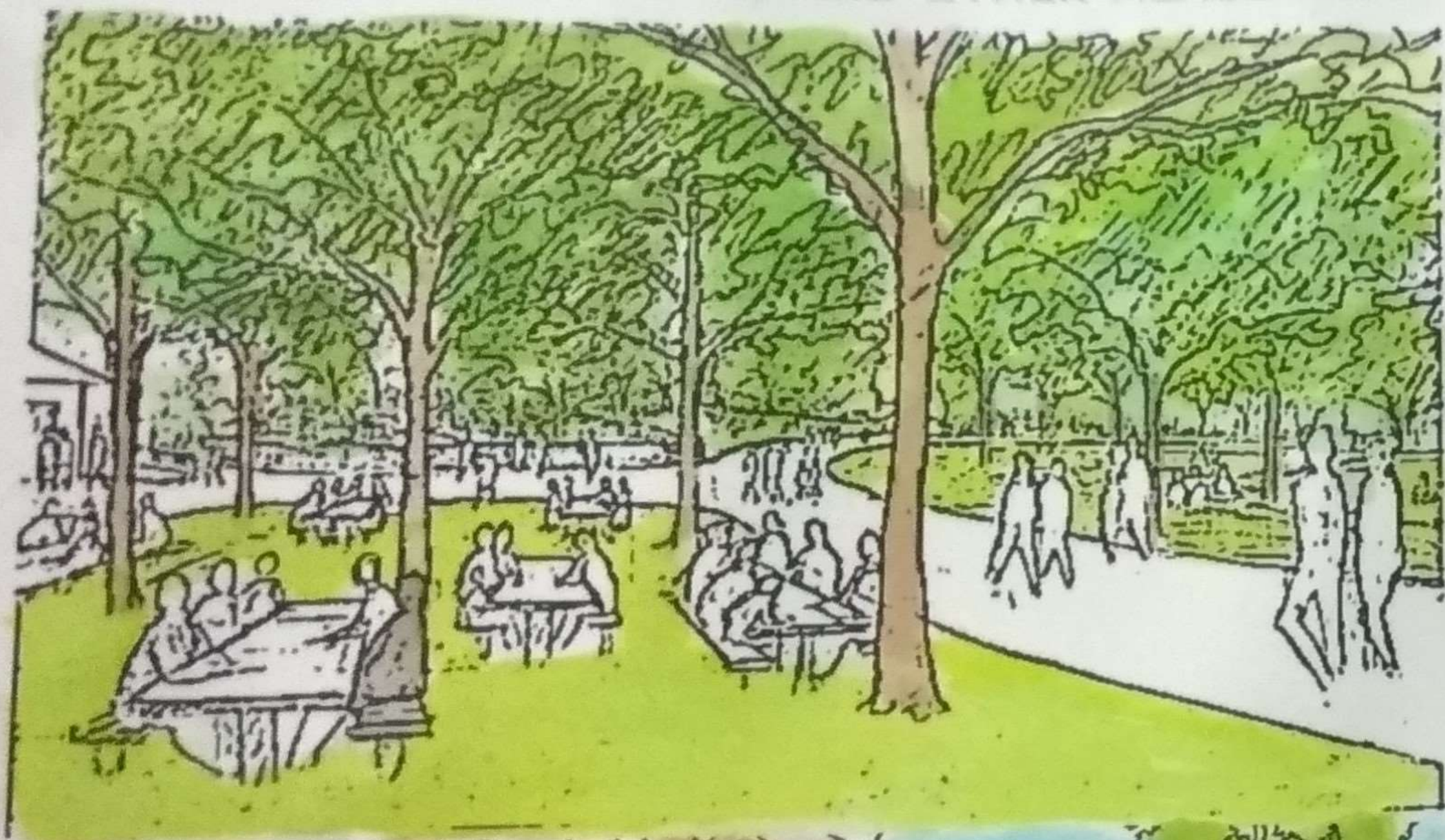


L E G E N D

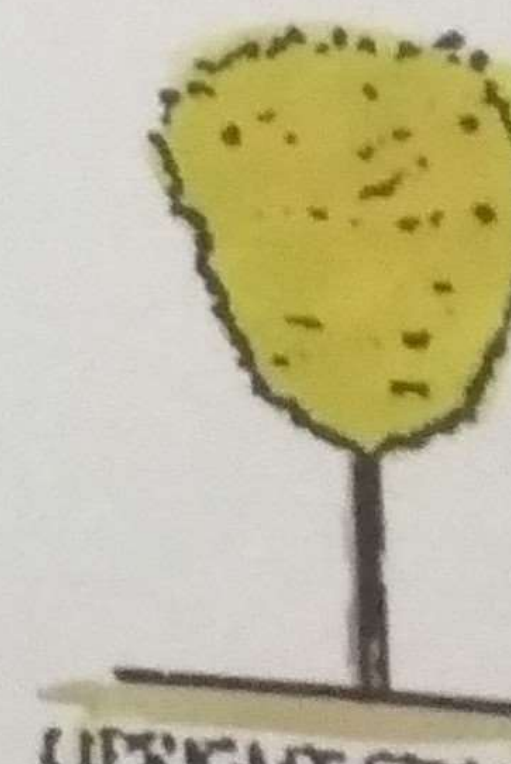
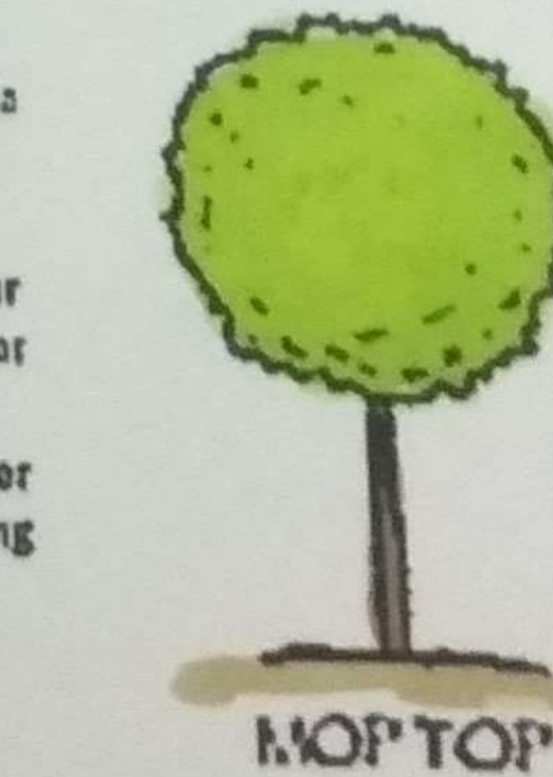
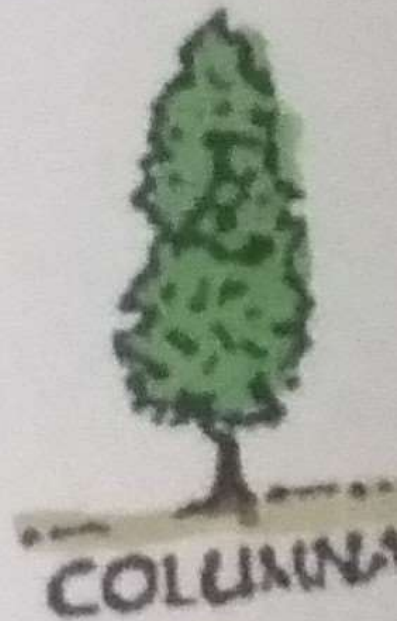
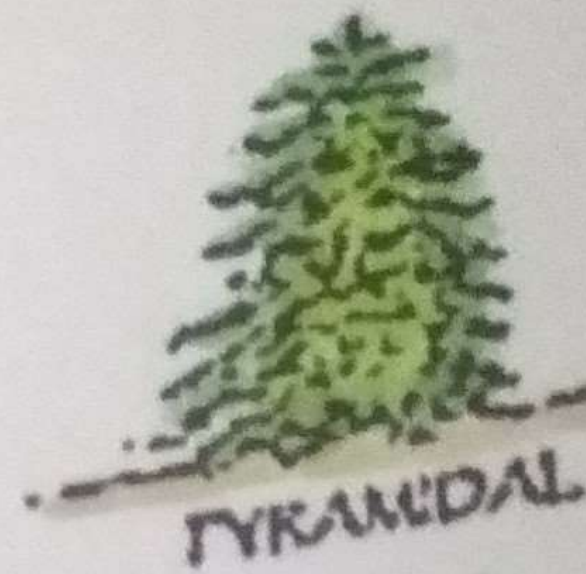
	ASSAM RUBBER FICUS ELASTIA	10	SPREAD (12 -18) HEIGHT (12 -15)
	MANGO TREE.	18	SPREAD (12 -16) HEIGHT (12 -15)
	PALAS BUTEA MONOSPERMA	36	SPREAD (6 -8) HEIGHT (8 -12)
	GULMOHAR.	18	SPREAD (6 -8) HEIGHT (8 -12)
	NEEM / MARGOSA. AZADIRACHIA INDICA	37	SPREAD (12 -18) HEIGHT (12 -15)
	PALM TREE. ROYSTONE REGIA	21	SPREAD (2 -4) HEIGHT (12 -15)
	AMALTAS CASSIA FISTULA.	16	SPREAD (11 -12) HEIGHT (8 -12)
	TAMARIND / IMLI. TAMARINDUS INDICA	21	SPREAD (10 -12) HEIGHT (13 -15)
	YELLOW OLEANDER. THEVITAL PERUVIANA	55	SPREAD (3 -5) HEIGHT (4 -6)
	JUNGLE FLAME. ANTHOCEPHALUS CHINESIS	16	SPREAD (5 -7) HEIGHT (8 -10)
	SITA ASHOKA . POLYATITHIA LONGIFOLIA	82	SPREAD (2 -3) HEIGHT (4-9)
	BAMBOO PLANTS.	21	SPREAD (2 -3) HEIGHT (4 -8)
	THUJA ORIENTALIS		
	DOUBLE CHANDNI.	38	SPREAD (2 -4) HEIGHT (3 -4)
	CLIMBERS-CHINISE TRUMPET CLIMBING HYDRAGEA.		
	ALOE VERA ALOE BARBADENSIS TAGETES ERECTA(MARIGOLD)		

LANDSCAPE DESIGN

THE LANDSCAPE DESIGN PHASE CONSISTS OF RESEARCH, GATHERING IDEAS, AND SETTING A PLAN. DESIGN FACTORS INCLUDE OBJECTIVE QUALITIES SUCH AS: CLIMATE AND MICRO-CLIMATES; TOPOGRAPHY AND ORIENTATION, SITE DRAINAGE AND GROUNDWATER RECHARGE; MUNICIPAL AND RESOURCE BUILDING CODES; SOILS AND IRRIGATION; HUMAN AND VEHICULAR ACCESS AND CIRCULATION; RECREATIONAL AMENITIES (I.E., SPORTS AND WATER); FURNISHINGS AND LIGHTING; NATIVE PLANT HABITAT BOTANY WHEN PRESENT; PROPERTY SAFETY AND SECURITY; CONSTRUCTION DETAILING; AND OTHER MEASURABLE CONSIDERATIONS.



TREE FORMS



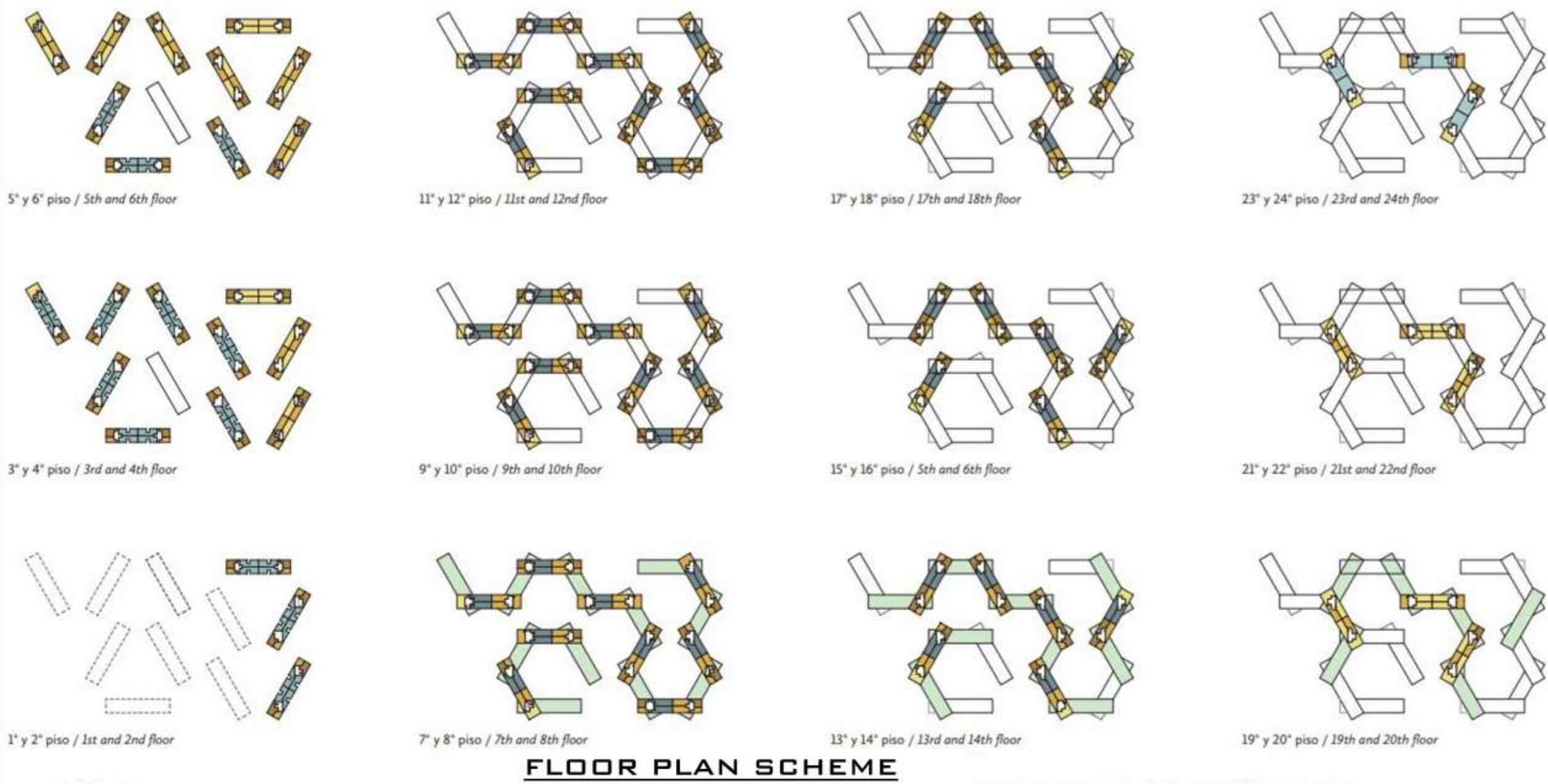
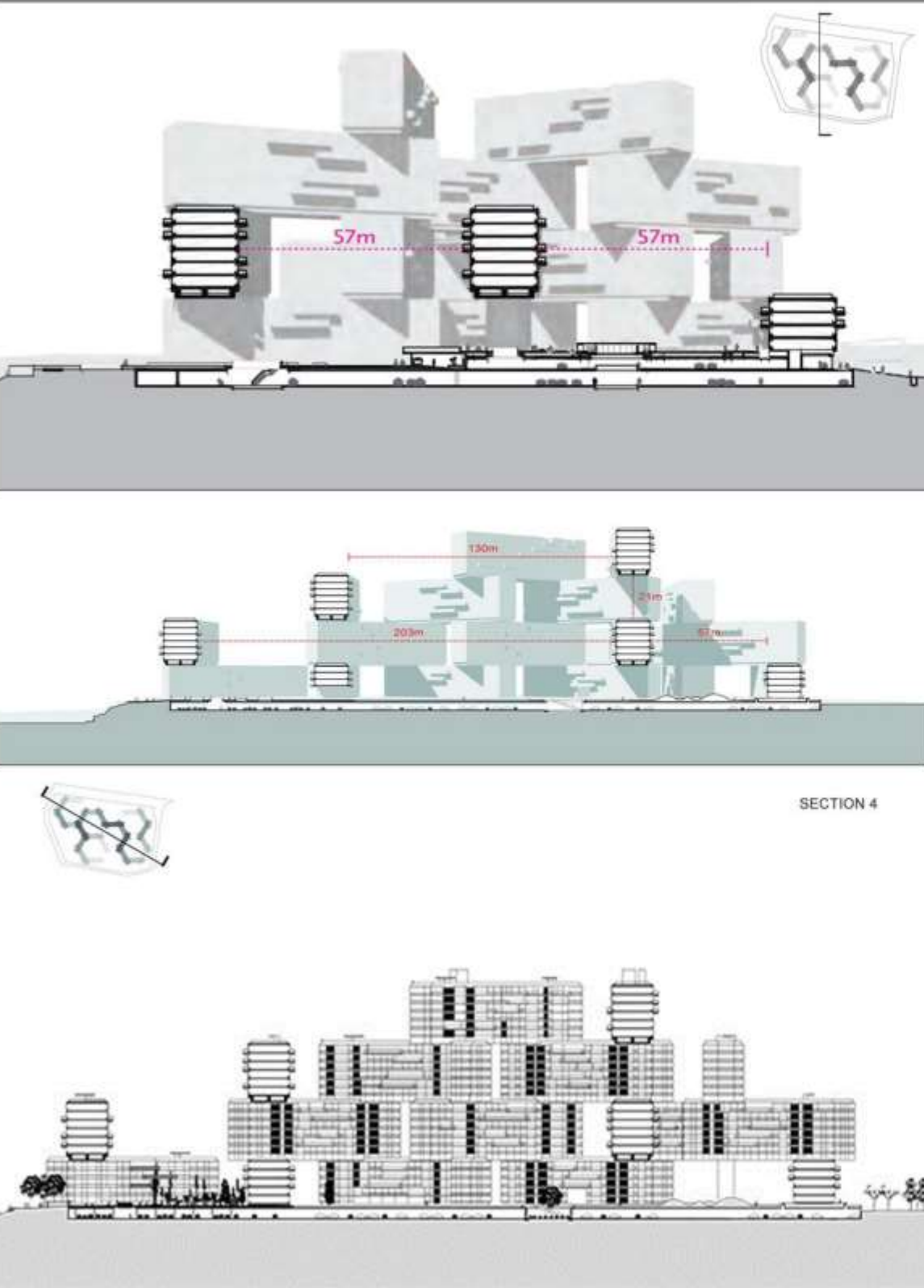
Sustainable Cities



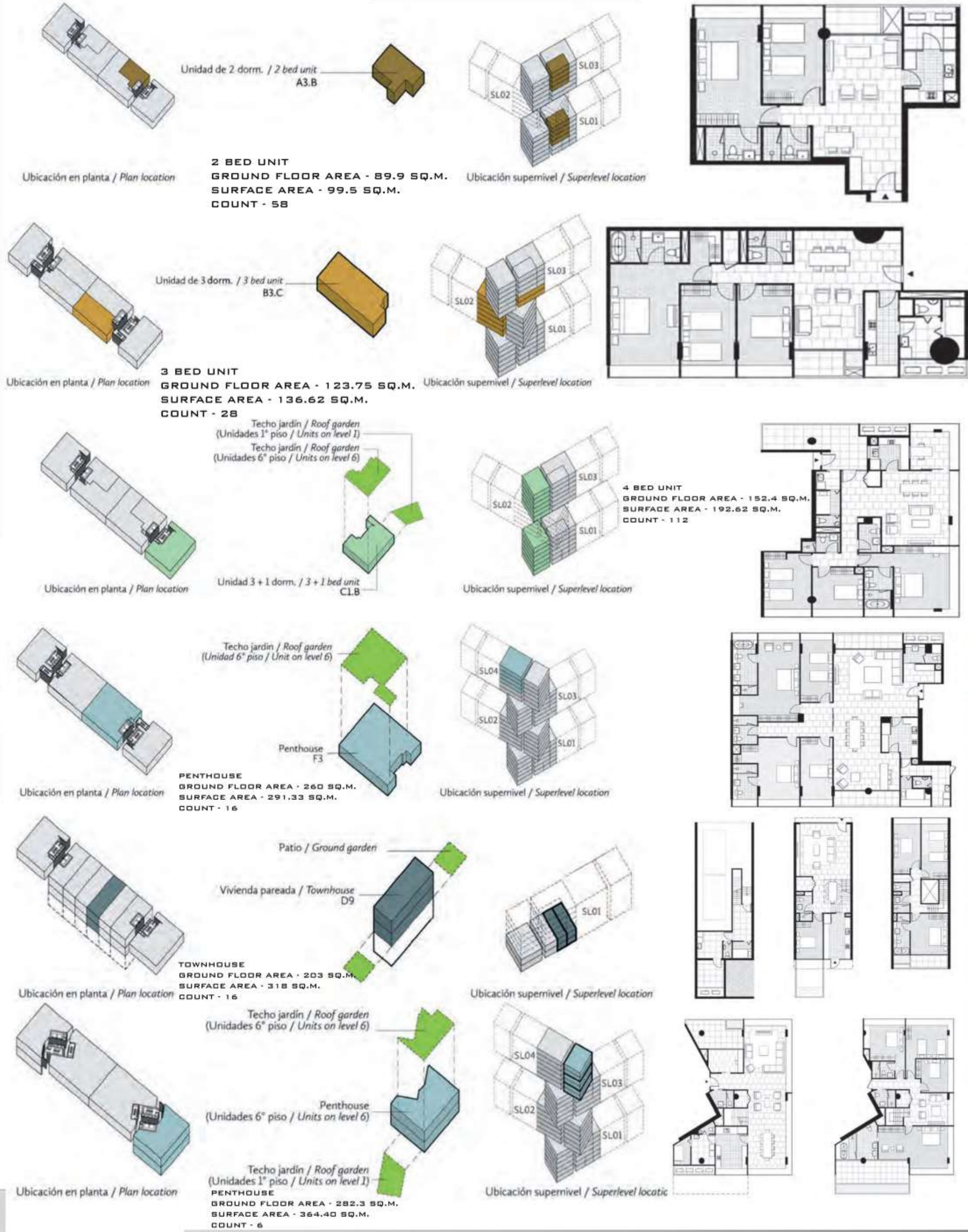
THE INTERLACE, SINGAPORE

A SYSTEM OF THREE CORE TYPES FOR 6, 18, AND 24 STORIES IS LOCATED AT THE OVERLAP OF THE STACKED APARTMENT BLOCKS. CORES TYPICALLY SERVE 3 TO 4 DIFFERENT UNITS PER FLOOR, PROVIDING EFFICIENT CIRCULATION WITHOUT LONG CORRIDORS. CORE LOBBIES ARE NATURALLY LIT AND VENTILATED, BRINGING DAYLIGHT AND FRESH AIR INTO COMMON AREAS. CIRCULAR ‘MEGACOLUMNS’ ARRANGED AROUND THE VERTICAL CIRCULATION IN AN OPTIMIZED HEXAGONAL CONFIGURATION GENERATE THE 3-WAY ROTATION OF THE BLOCKS AND ENABLE A STANDARD SOLUTION FOR ALL CONDITIONS.

BY STACKING THE APARTMENT BLOCKS, THE DESIGN GENERATES A MULTIPLICATION OF HORIZONTAL SURFACES POPULATED BY EXTENSIVE ROOF GARDENS AND LANDSCAPED TERRACES THAT IN AGGREGATE PROVIDE 112 % GREEN AREA – MORE THAN THE SIZE OF THE UNBUILT SITE. WATER BODIES HAVE BEEN STRATEGICALLY PLACED WITHIN DEFINED WIND CORRIDORS, WHICH ALLOW EVAPORATIVE COOLING TO HAPPEN ALONG WIND-PATHS, REDUCING LOCAL AIR TEMPERATURES AND IMPROVING THE THERMAL COMFORT OF OUTDOOR RECREATION SPACES IN STRATEGIC MICRO-CLIMATE ZONES. ALL APARTMENTS RECEIVE AMPLE LEVELS OF DAYLIGHT THROUGHOUT THE DAY WHILE THE UNIQUE MASSING OF THE PROJECT PROVIDES A SUFFICIENT LEVEL OF SELF-SHADING IN THE COURTYARDS, WHICH HELPS MAINTAIN COMFORTABLE TROPICAL OUTDOOR SPACES YEAR-ROUND AND CONTINUOUS USAGE OF THE COURTYARDS AND THEIR COMMUNAL FUNCTIONS. EXTENSIVE BALCONIES AND PROTRUDING TERRACES FORM A CASCADING VERTICAL LANDSCAPE ACROSS THE FACADES AND FURTHER CONNECT THE GREEN ROOFS AND SHARED PUBLIC TERRACES BETWEEN THE BUILDING VOLUMES. OVERALL, THE PROJECT APPEARS NOT ONLY SURROUNDED BY THE TROPICAL



FLOOR PLAN SCHEME



EXPERIENCE OF SPACE

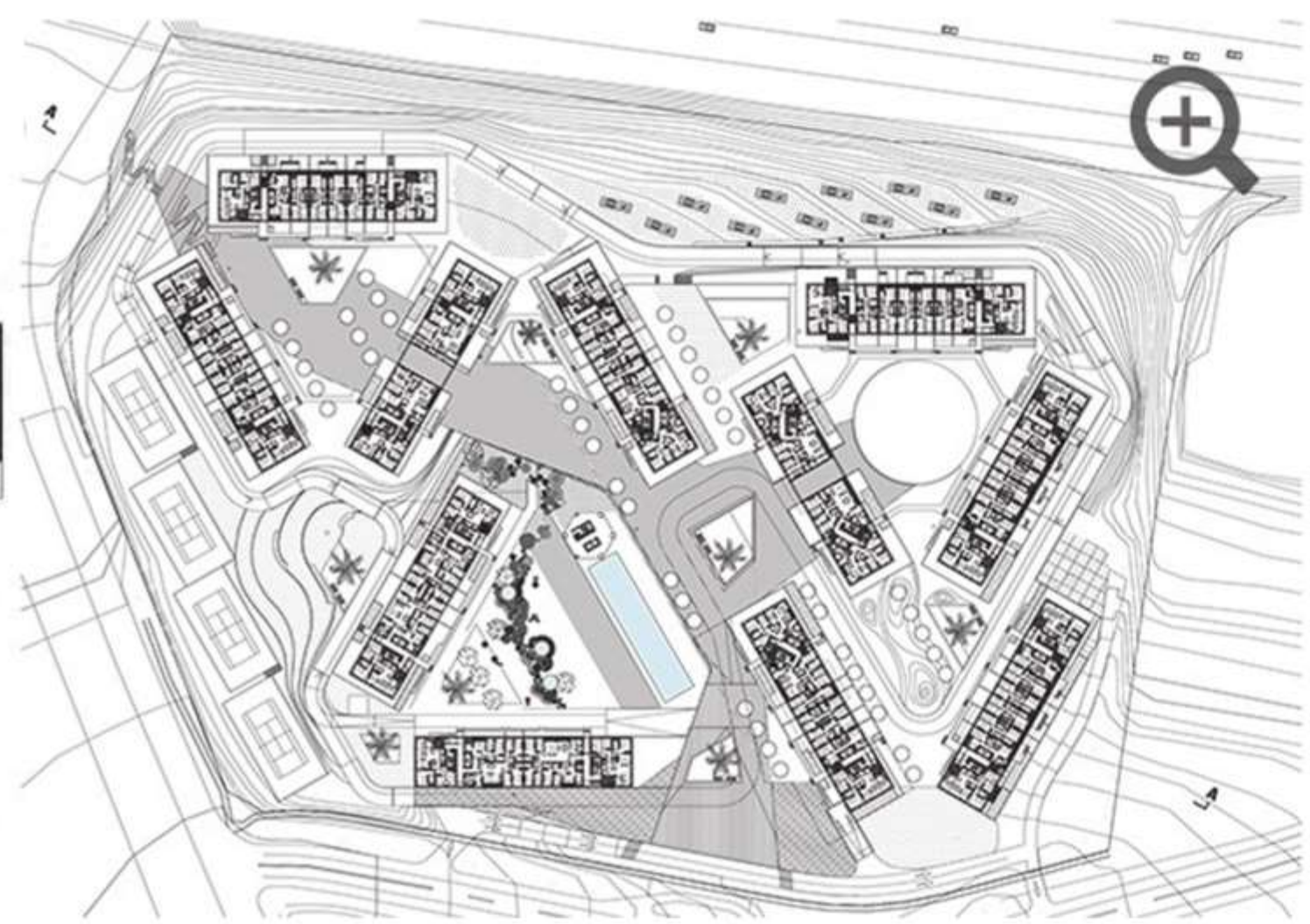


LANDSCAPE COURTYARDS

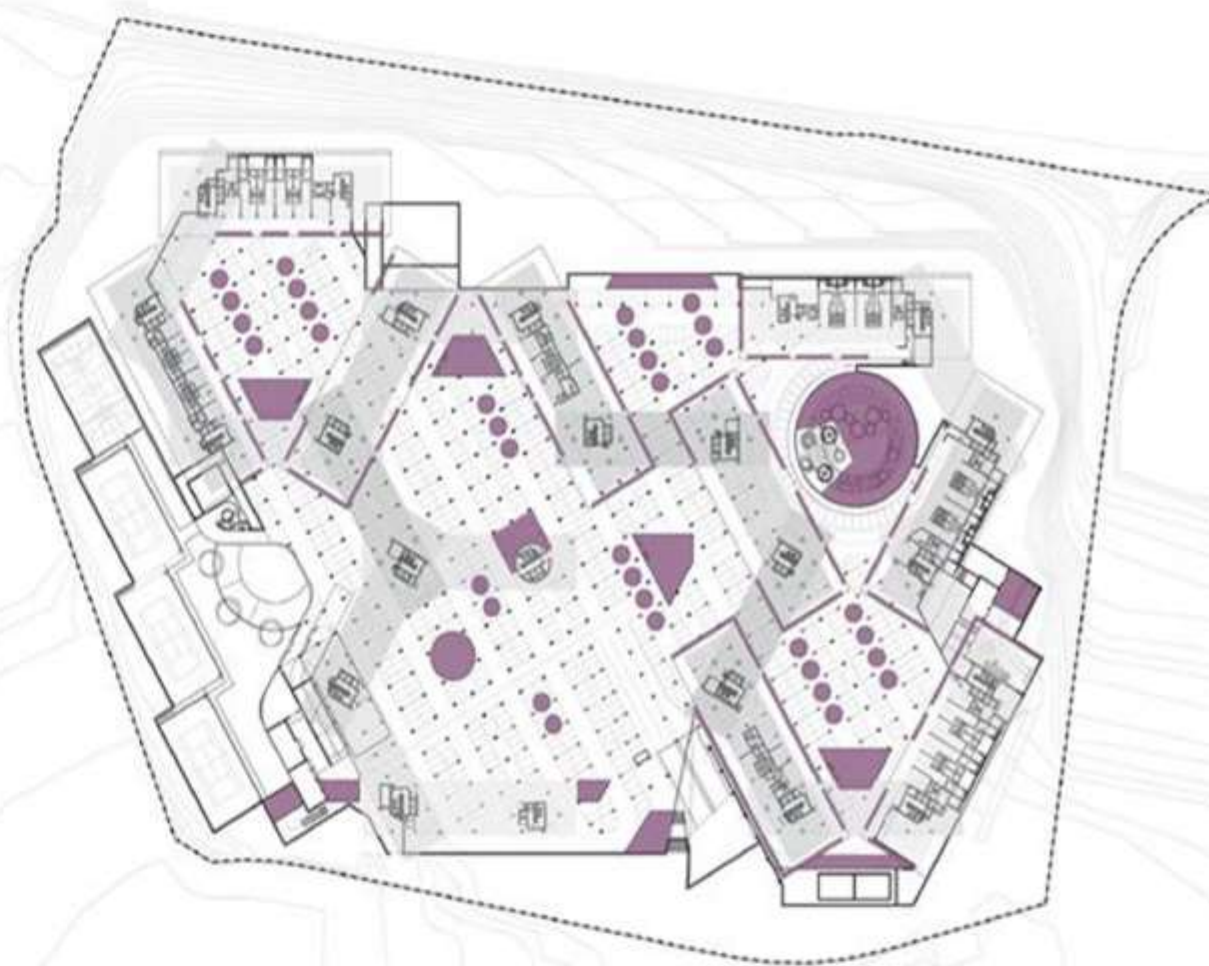
- A. Central Square
- B. Water Park
- C. Play Hills
- D. Spa Valley
- E. Theatre Plaza
- F. Bamboo Garden
- G. Lotus Pond
- H. Waterfall Terrace

FACILITIES

- 1. Main Entrance
- 2. Guard House
- 3. Pedestrian Main Gate
- 4. Pedestrian Side Gate
- 5. Drop-off
- 6. Retail Plaza
- 7. Play Zone
- 8. Outdoor Exercise Station
- 9. BBQ Promenade
- 10. Jogging Track
- 11. Gardening Zone
- 12. Pet Zone
- 13. Party Pavilion
- 14. Tennis Court
- 15. Multi-purpose Court
- 16. Clubhouse (1st Storey)
- 17. Putting Green



SITE PLAN



UNDERGROUND PLAN WITH VOIDS





GENERAL INFORMATION	
LOCATION	MILAN, ITALY
COORDINATES	45.4855°N 9.1905°E
CONSTRUCTION STARTED	2009
COMPLETED	2014
OPENED	17 OCTOBER 2014
HEIGHT	117M(27F) AND 85M(18F)
TECHNICAL DETAILS	
FLOOR AREA	360,000 SQ.M. (3,900,000 SQ FT)
TOTAL AREA	30,501 SQ.M.
DESIGN AND CONSTRUCTION	
ARCHITECT	BOERI STUDIO: GIANANDREA BARRECA, GIOVANNI LA VARRA, STEFANO BOERI
DEVELOPER	HINES ITALIA & COIMA
ASSET MANAGER	COIMA SGR
PROPERTY MANAGER	COIMA
AWARDS AND PRIZES	INTERNATIONAL HIGHRISE AWARD 2014 BEST TALL BUILDING WORLDWIDE 2015

CONTEXT

THE BOSCO VERTICALE IN MILAN SUPPORTS ONE OF THE MOST INTENSIVE LIVING GREEN FAÇADES EVER REALIZED. THE COMBINATION OF ITS SOPHISTICATED PLANT SELECTION, THE DEPLOYMENT OF GREENERY IN ALL ORIENTATIONS, THE STRUCTURAL DESIGN TO ACCOMMODATE THE PLANTS, AND THE MAINTENANCE, SAFETY AND IRRIGATION SYSTEMS, REPRESENTS ONE OF THE MOST INNOVATIVE TALL BUILDING PROJECTS IN RECENT MEMORY. THE BOSCO VERTICALE CONSISTS OF TWO RESIDENTIAL TOWERS, 26 AND 18 FLOORS HIGH RESPECTIVELY, CHARACTERIZED BY THE PRESENCE OF DENSE VEGETATION ALONG THEIR OUTER ENVELOPES. THERE ARE ABOUT 13,000 PLANT SPECIMENS, INCLUDING ABOUT 700 TREES UP TO SIX METERS HIGH, ON BOTH TOWERS. ALL THE PLANTS TAKE ROOT IN CONTAINERS LOCATED ON THE EXTERNAL SIDE OF DEEP CANTILEVERED TERRACES, WHICH ARE ACCESSIBLE FROM EACH APARTMENT. FROM OUTSIDE, THE PLANTS REALIZE AN URBAN VERTICAL REFORESTATION, PROVIDING SEVERAL ENVIRONMENTAL AND MICROCLIMATE BENEFITS PARTICULAR TO TREES' PHYSIOLOGY: DUST ABSORPTION, POLLUTION REDUCTION, BVOC (BIOGENIC VOLATILE ORGANIC COMPOUNDS) PRODUCTION, CARBON SEQUESTERING, AIR TEMPERATURE MITIGATION, AND AIR HUMIDITY ALL INCREASE OR IMPROVE AS AN EFFECT OF EVAPOTRANSPIRATION.

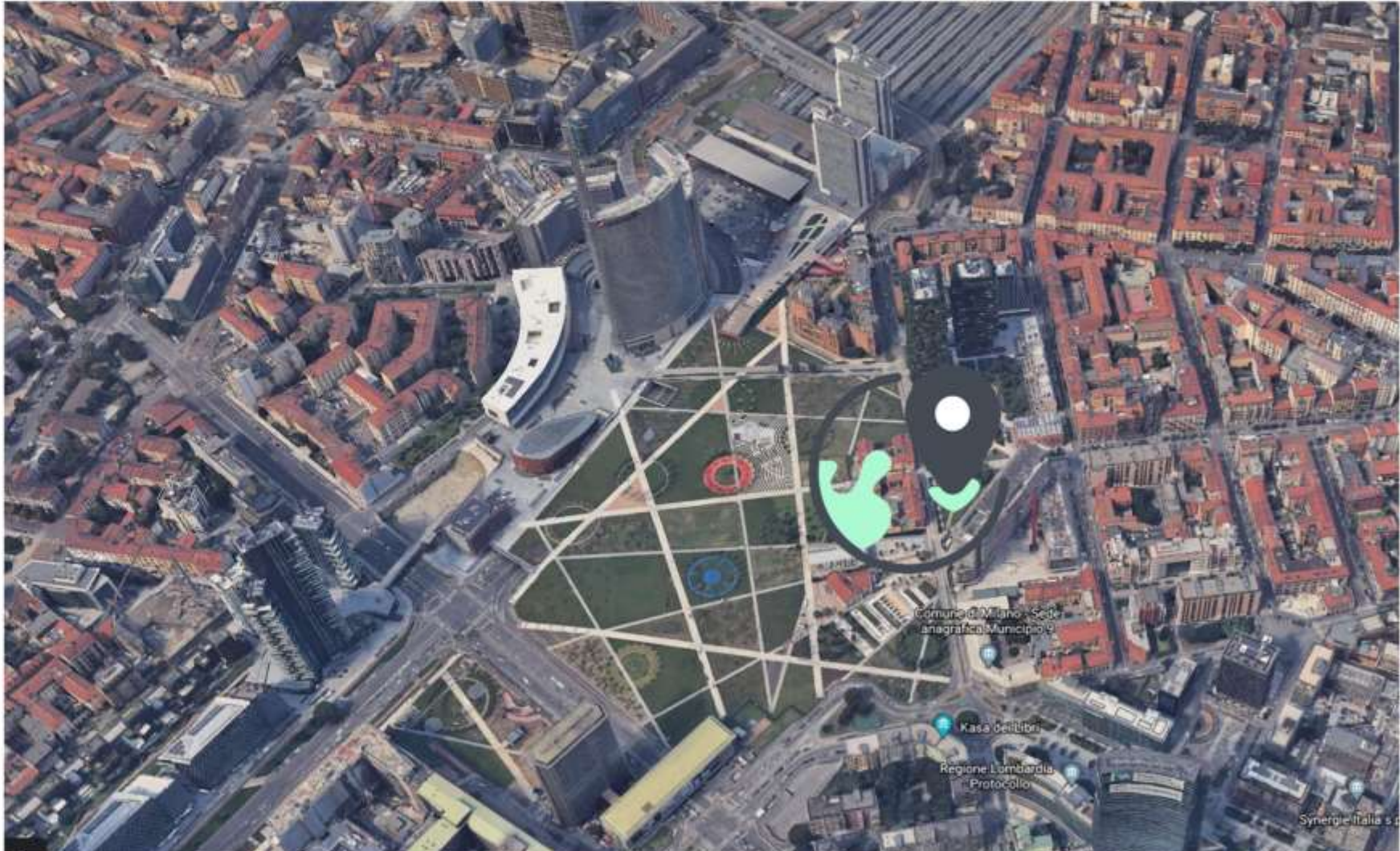
SITE CONDITION

THE BOSCO VERTICALE IS PART OF THE NEW PORTA NUOVA AREA, AN EXTENDED URBAN TRANSFORMATION OF A NEGLECTED AREA OF MILAN. THIS 34-HECTARE AREA IS COMPLETELY NEW; BEFORE THE CONSTRUCTION OF 20 TOWERS IN THE LAST DECADE, IT WAS ONE OF THE LAST UNBUILT SITES IN THE CITY. BEFORE THE PORTA NUOVA PROJECT BEGAN, THE AREA WAS PARTIALLY OCCUPIED BY AN AMUSEMENT PARK; MUCH OF THE REMAINDER WAS ABANDONED, VESTIGIAL LAND.

IN 2004, THE URBANIZATION PROJECT WAS APPROVED AND THE AVAILABLE SURFACE WAS ARRANGED FOR A RADICAL URBAN TRANSFORMATION, COMPRISING AN INVESTMENT OF MORE THAN €2 BILLION (US\$2.51 BILLION) TO CREATE A MIXED-BUSINESS AND RESIDENTIAL DISTRICT. THE NEW PORTA NUOVA PROJECT IS DIVIDED INTO THREE NEIGHBORHOODS: ISOLA, WHERE THE BOSCO VERTICALE IS LOCATED, PORTA GARIBALDI, AND VARESINE, TAKING ADVANTAGE OF ITS PROXIMITY TO THE CITY CENTER.

IN ADDITION TO LYING ABOUT 2,200 METERS FROM THE MAIN CATHEDRAL, EXCELLENT ACCESSIBILITY IS PROVIDED BY TWO NEARBY RAILWAY STATIONS, TWO UNDERGROUND METRO LINES AND A THIRD UNDER CONSTRUCTION, A NEW AUTO TUNNEL UNDER THE PLATFORM OF THE UNICREDIT TOWER, AND SEVERAL TRAM AND BUS LINES.

“THE GREENERY OF THE PLANTINGS IS EMPHASIZE AND UNDERSCORED BY THE GREY COLOR OF THE EXTERIOR WALLS, MAKING THE PLANTS THE PROTAGONISTS OF AN ARCHITECTURAL STORY OF GREAT VISUAL, ENVIRONMENTAL, AND ULTIMATELY, SOCIETAL IMPACT.”



DESIGN CONCEPT

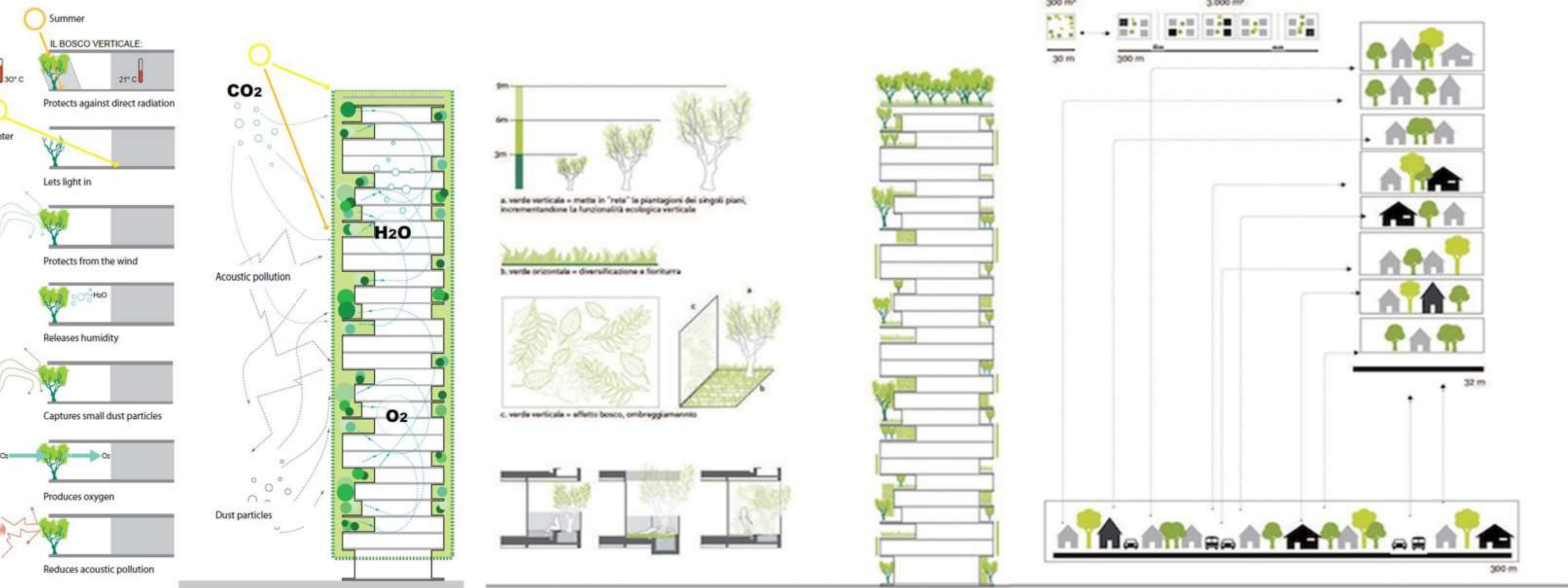
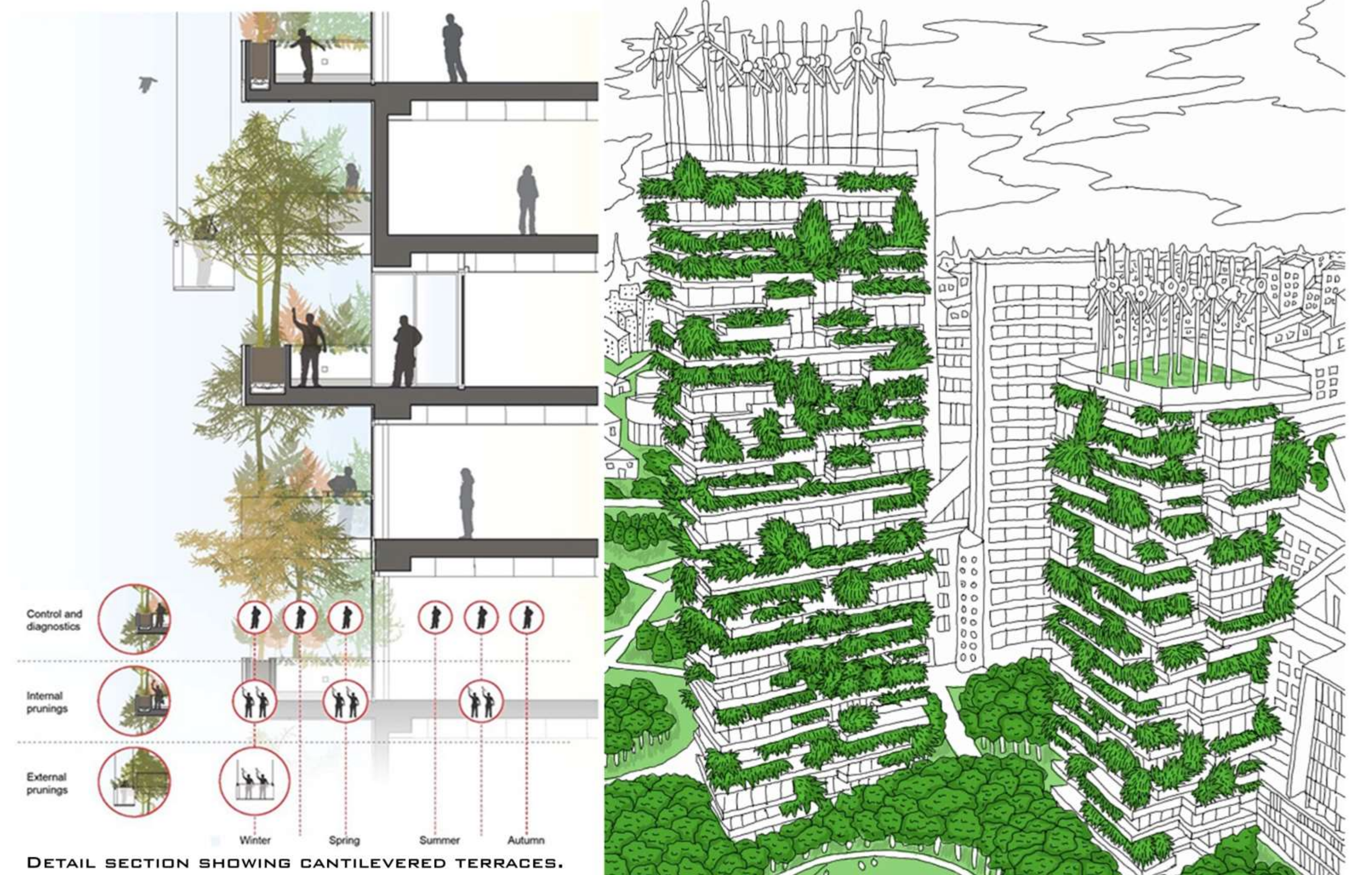


Figure 4. Bosco Verticale life cycle concept. © Stefano Boeri Architetti

BOSCO VERTICALE AREA DISTRIBUTION CONCEPT.

AT BOSCO VERTICALE, THE IMPLEMENTATION OF BIODIVERSITY THROUGH THE USE OF PLANTS INSTALLED ON A TOWER ENVELOPE IS AN INNOVATIVE OPERATION OF A TECHNICAL COMPLEXITY THAT HAS NEVER BEEN ATTEMPTED SO FAR AT SUCH A SCALE. THE DESIGN OF THE PRIMARY SYSTEMS HAS BEEN CONDUCTED THROUGH COLLABORATION BETWEEN THE ARCHITECT AND THE LANDSCAPE DESIGNER WITH AN INTERDISCIPLINARY TEAM THAT HAS WORKED AT THE HIGHEST LEVEL OF PROFESSIONALISM.



DETAIL SECTION SHOWING CANTILEVERED TERRACES.

BOSCO VERTICALE, MILAN, ITALY

LITERATURE STUDY

BY - ALOK RANJAN
ROLL.NO. - 1150101010

B.ARCH. 5TH YEAR (2019-20)
SCHOOL OF ARCHITECTURE
B.B.D.U. LUCKNOW (U.P.)

2

STRUCTURAL PERFORMANCE TESTS

THE RESOLUTION OF THE STRUCTURAL DESIGN OF THE BOSCO VERTICALE WAS ESSENTIAL TO PROVING THAT THE “VERTICAL FOREST” CONCEPT WAS FEASIBLE. THE STRUCTURE IS FASHIONED ENTIRELY IN CONCRETE: THE COLUMNS ARE MADE OF REINFORCED CONCRETE, WHILE THE FLOORS ARE POST-TENSIONED REINFORCED CONCRETE.

THE CHARACTERISTICS OF THE PROJECT REQUIRED A PRECISE CALIBRATION OF THE FOLLOWING FACTORS:THE GRAVITY LOADS OF TREES AND THE SOIL, THE 3.3-METER-DEEP CANTILEVERED TERRACES THE UNSUPPORTED CORNERS, WITH A MAXIMUM SPAN OF SEVEN METERS, AND THE DYNAMIC LOADS OF THE WIND AND ITS EFFECT ON THE TREES’ STABILITY AND SECURITY. TO MEET THESE CRITERIA, DEFINING THE DYNAMIC LOADS BECAME A MAJOR PART OF THE DESIGN PROCESS, INCLUDING SCALE-MODEL TESTS AND FULL-SCALE TESTS ON REAL TREES IN THE FIELD.

BEYOND THE STANDARD STRUCTURE, THE GEOMETRICAL AND DIMENSIONAL CHARACTERISTICS OF THE PLANTS AT THEIR LIKELY FULLEST EXTENT NEEDED TO BE TAKEN INTO CONSIDERATION. A BOTANIC ANALYSIS OBTAINED THE HEIGHT OF THE TRUNK, THE SURFACE AREA AND CENTER OF GRAVITY OF THE CANOPY, AND THE AIR PERMEABILITY OF EACH OF THE SELECTED SPECIES. EXPERIMENTAL TESTS WERE PERFORMED IN A WIND TUNNEL AT THE POLITECNICO DI MILANO, WITH THE OBJECTIVE OF DEFINING LOCAL WIND PHENOMENA AROUND THE BOSCO VERTICALE FAÇADES.

FOR THIS PURPOSE, THE TOWER WAS MODELED AT 1:100 SCALE, WITH PRESSURE SENSORS. A DYNAMOMETER WAS INSTALLED ON THE BASE OF SOME TREES IN ORDER TO BALANCE AND EVALUATE FORCES, MOMENTS, AND AERODYNAMIC COEFFICIENTS.

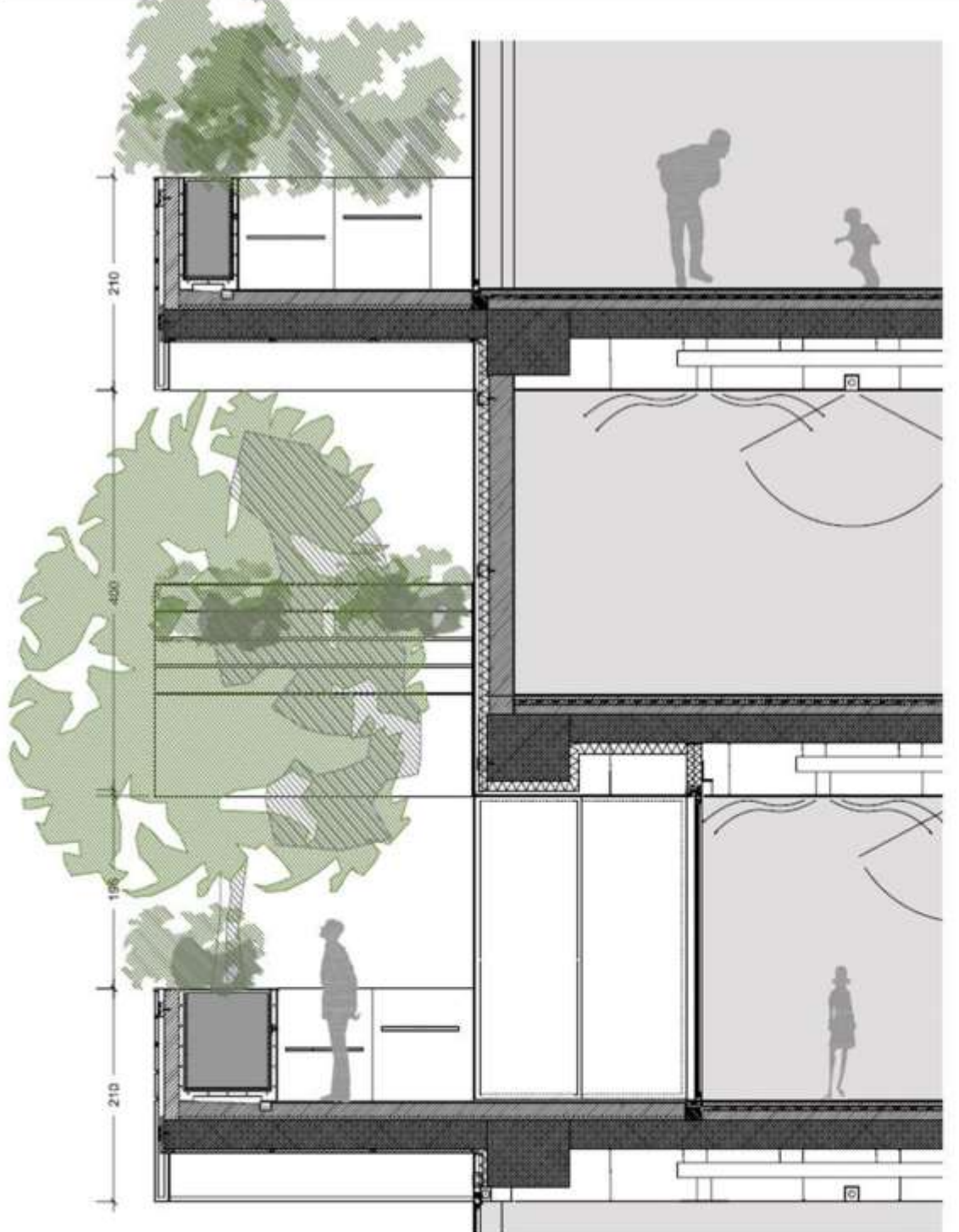


Figure 6. Detail section showing cantilevered terraces. © Stefano Boeri Architetti



BASIC BIND



TEMPORARY BIND



REDUNDANT BIND

RESTRAINT SYSTEM

LINKED TO THE STRUCTURAL DESIGN IS THE RESTRAINT SYSTEM, WHICH PROVIDES THREE PROTECTIONS AGAINST FALLING TREES:

1. **TEMPORARY BIND:** THE ROOT BALL OF EACH TREE IS ANCHORED TO THE PLANT CONTAINER THROUGH TEXTILE BELTS (SEE FIGURE). THIS SYSTEM IS REQUIRED IN THE EARLY LIFE OF THE TREES, UNTIL THE ROOTS HAVE GROWN TO TAKE HOLD.
2. **BASIC BIND:** EACH TREE IS FIXED, WITH THREE ELASTIC BELTS, TO A RETAINING STEEL CABLE, ANCHORED TO THE TERRACE ABOVE (SEE FIGURE). THIS IS THE MAIN FALL-ARREST DEVICE FOR GROWN TREES.
3. **REDUNDANT BIND:** A #1 STEEL CAGE FIXES THE ROOT BALL TO THE PLANT CONTAINERS (SEE FIGURE). THIS BIND IS USED FOR THE TREES LOCATED IN THE WINDIEST POSITIONS AND ON THE TOP FLOORS OF THE TOWERS.

PLANT CONTAINER

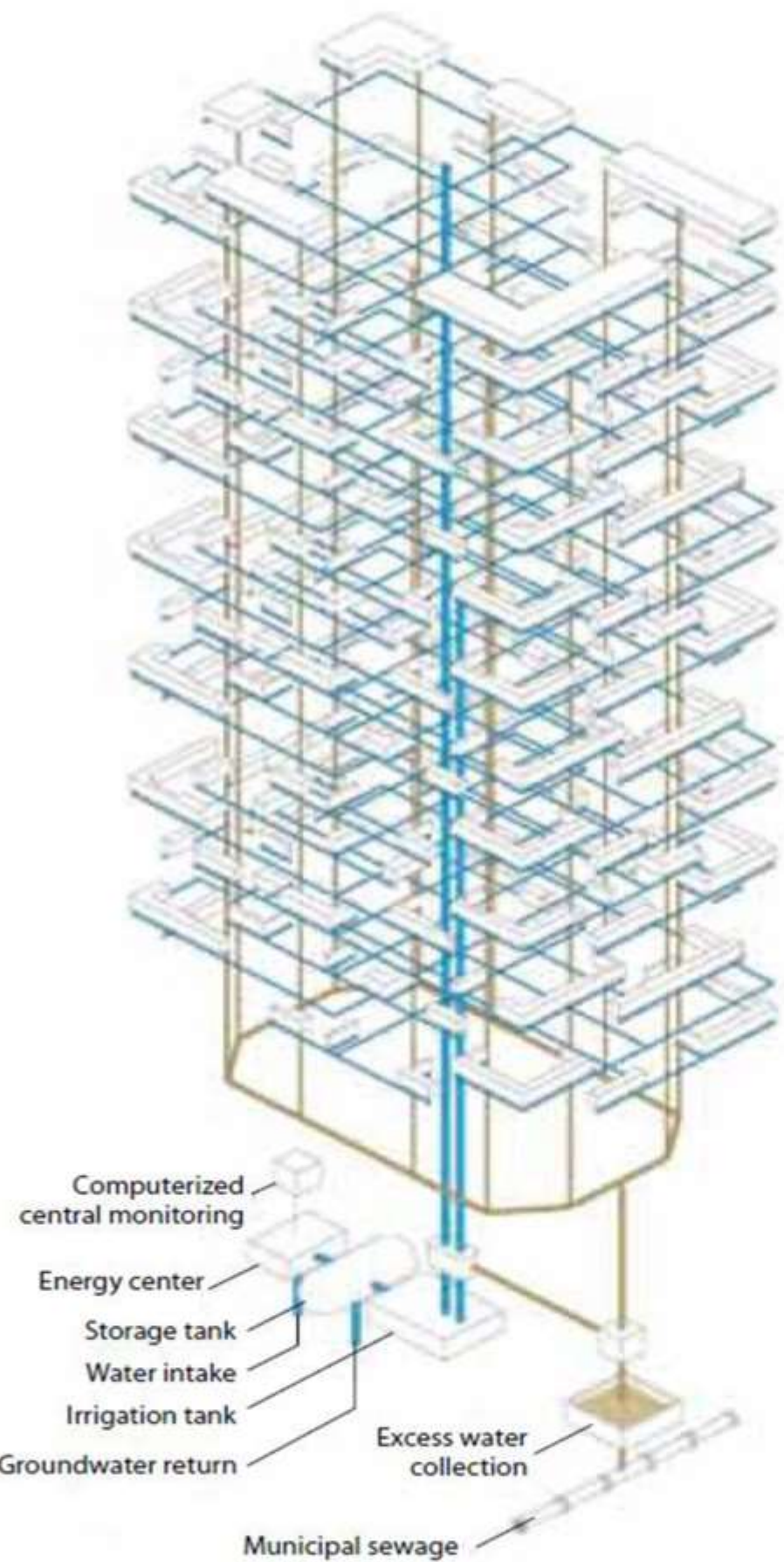
THE PLANT CONTAINERS OF THE BOSCO VERTICALE ARE LOCATED ON THE SIDE OF THE TERRACES FURTHEST FROM THE EXTERIOR WALL. THE VOLUME OF THE CONTAINERS VARIES TO PROVIDE THE BEST ADAPTATION OF A GIVEN PLANT’S ROOTS TO THE ARTIFICIAL CONTEXT OF THE FAÇADE. DEPENDING ON THE PLANT, THE DIMENSIONS OF THE CONTAINERS ARE: IN THE CASE OF A TREE, 1.10 METERS DEEP AND 1.10 METERS WIDE; IN THE CASE OF SHRUBS AND BUSHES, A MINIMUM 0.5 METERS’ DEPTH AND 0.5 METERS’ WIDTH WAS SPECIFIED. THE STRUCTURE OF THE CONTAINER IS ENTIRELY PROTECTED WITH A BITUMINOUS WATERPROOFING MEMBRANE, PRESERVED BY PROTECTIVE SHEETING AGAINST ROOT PENETRATION .

NEXT IN THE SEQUENCE IS THE WELDED-STEEL NET THAT ANCHORS THE ROOT BALL OF THE TREES. ABOVE THE LAYER OF SEPARATION AND THE WELDED-STEEL NET LIES THE VEGETATION SUPPORT COURSE. THE INTERNAL STRATIGRAPHY (SOIL LAYERING) IS UNIFORM FOR ALL PLANTS, AND WAS COMPOSED ACCORDING TO THE STANDARD FOR GREEN ROOFS. THE STRATIGRAPHY IS CAREFULLY DESIGNED TO ACCOMMODATE THE ROOTS OF THE PLANTS AS THEY GROW OVER TIME, AND TO PROTECT THE CONSTRUCTED ELEMENTS OF THE CONTAINER.

IRRIGATION

THE WATER DISTRIBUTION NETWORK FOR IRRIGATION IS COMPOSED OF FOUR MAIN ELEMENTS: THE PRINCIPAL NETWORK, WHICH BRINGS UNDER- GROUND WATER TO THE TERRACES; THE CONTROL GROUP IN EACH PLANT CONTAINER, WHICH REGULATES THE WATER SUPPLY; THE WIDE-SPREAD DISTRIBUTION IN THE PLANT CONTAINERS (THE DRIP LINE), AND THE HUMIDITY CONTROL SYSTEM (THE HUMIDITY SENSORS).

THE COMBINED FERTILIZATION AND IRRIGATION (“FERTIGATION”) OCCURS BETWEEN THE WATERSTORAGE TANK AND THE GROUPS OF WATER LIFTING PUMPS. EACH PLANT CONTAINER HAS ONE “CONTROL GROUP” OF IRRIGATION.



VIEW INTO A PLANT CONTAINER WITH MEMBRANE AND PROTECTIVE SHEETING.



PLANT CONTAINERS’ DRAINAGE SYSTEM



SITE PLAN

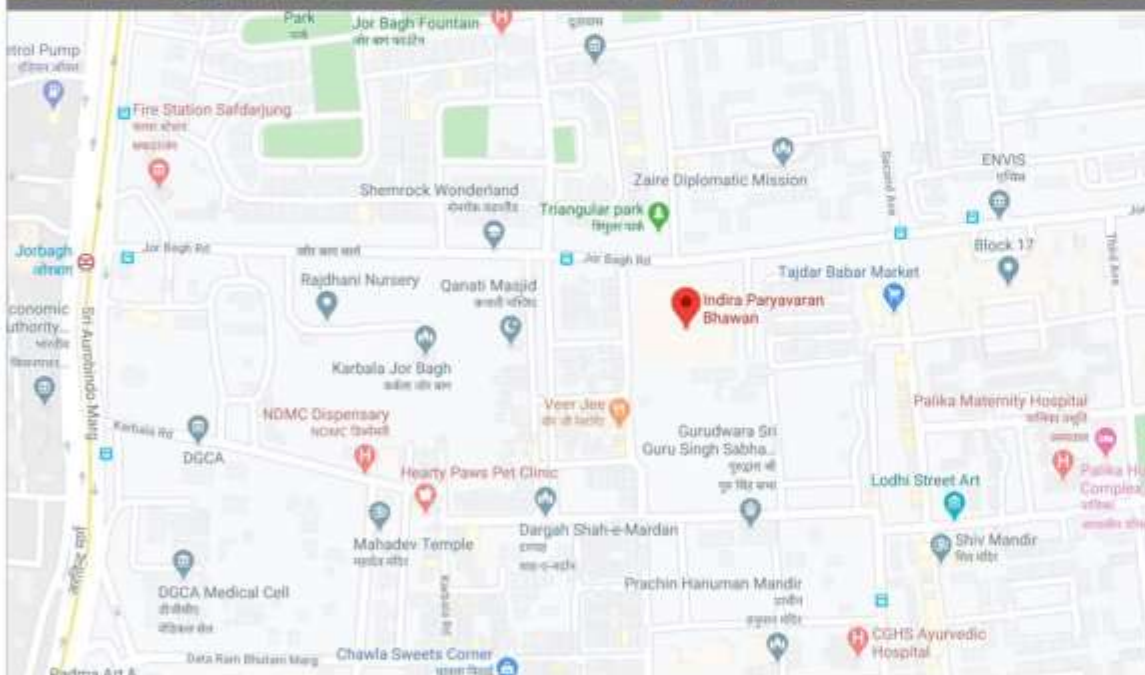


TYPICAL PLAN SHOWING THE TERRACES CANTILEVERED FROM THE MAIN TOWER PLANS



PLANTERS ARE LOCATED ON EACH BALCONY.





GENERAL INFORMATION	
ARCHITECTURAL STYLE	GREEN BUILDING
ADDRESS	166, JOR BAGH RD, BLOCK 17, LODI COLONY, DELHI 110003
TOWN OR CITY	NEW DELHI
COUNTRY	INDIA
COORDINATES	28.5851°N, 77.2182°E
CONSTRUCTION STARTED	2011
COMPLETED	2013; 7 YEARS AGO
HEIGHT	
ARCHITECTURAL	35 M
TECHNICAL DETAILS	
FLOOR COUNT	7+3, 8+3
LIFTS/ELEVATORS	7
DESIGN AND CONSTRUCTION	
ARCHITECTS	DEEPPENDRA PRASHAD AND SASWATI CHETIA
ENGINEERS	P. BHAGAT SINGH DR. K M SONI
ACHIEVEMENTS	
	5-STAR GREEN BUILDING CERTIFICATION BY GRIHA (LEED) INDIA PLATINUM RATING
OTHER INFORMATION	
PLOT AREA	9565SQ M
MAXIMUM GROUND COVERAGE	30%
F.A.R.	1:200
BUILT-UP AREA	30914 SQ.M.
SUPERSTRUCTURE	19088 SQ.M.
BASEMENT	11826 SQ.M.
PARKING	330 FOUR WHEELER

INDIRA PARYAVARAN BHAWAN IN NEW DELHI IS THE FIRST ZERO NET ENERGY BUILDING CONSTRUCTED IN INDIA WITH PASSIVE SOLAR POWER GENERATION. DUE TO INADEQUACY OF ROOF-TOP AREA, ADDITIONAL AREA WAS PROVIDED THROUGH CANTILEVER STRUCTURAL ARRANGEMENT. NET ZERO ENERGY BUILDING IS THE OUTCOME OF ENERGY EFFICIENT ARCHITECTURAL, STRUCTURAL, MATERIAL, ELECTRICAL AND AIR-CONDITIONING DESIGN.

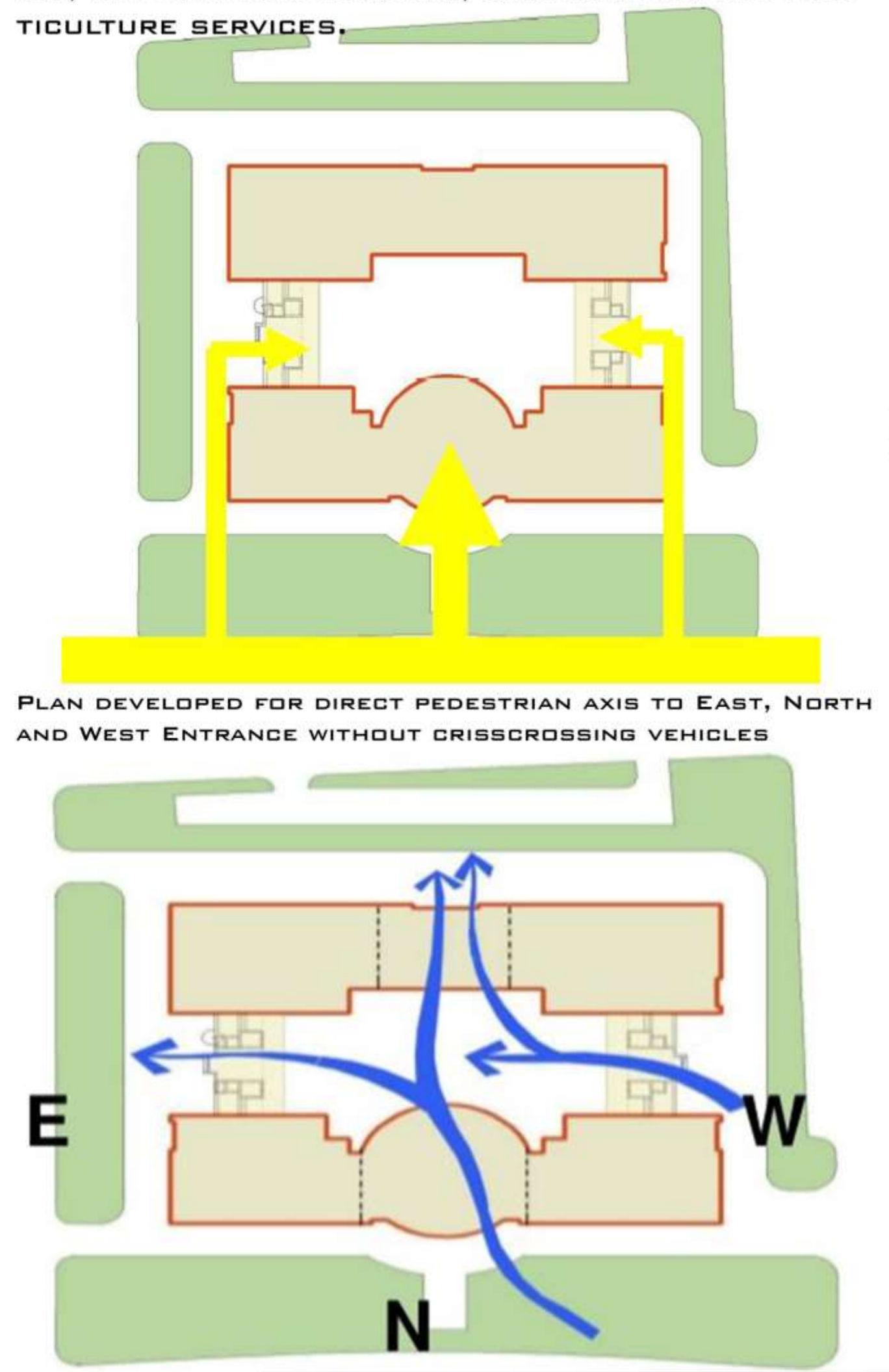
LOCATION AND ACCESSIBILITY

THE SITE IS SURROUNDED ON EAST BY NDMC HOUSING AND 15M. ROW, ON WEST BY 12M ROW AND ON NORTH LODHI COLONY AND 12M ROW, ON SOUTH GPRA COLONY OF ALIGANJ.

- THE PLOT IS EASILY APPROACHABLE FROM AUROBINDO MARG AND LODHI ROAD.
- A METRO STATION "JORBAGH" IS AT WALKABLE DISTANCE OF ABOUT 300M FROM THIS PLACE

ARCHITECTURAL CONCEPT

INDIRA PARYAVARAN BHAWAN, THE HEADQUARTERS OF THE MINISTRY OF ENVIRONMENT, FORESTS AND CLIMATE CHANGE, IN JORBAGH, NEW DELHI, WAS CONSTRUCTED BY THE CENTRAL PUBLIC WORKS DEPARTMENT (CPWD) AS PROJECT MANAGEMENT AGENCY, IN THE G+7 STOREYED STRUCTURE WITH 3 BASEMENTS, HAS A PLINTH AREA OF 32,000 SQM, IS CENTRALLY AIR-CONDITIONED WITH 400 TR CAPACITY (HVAC), HAS 7 LIFTS, AND ALL ESSENTIAL SERVICES LIKE DG SETS, UPS, IBMS, FIRE DETECTION AND FIRE-FIGHTING SYSTEMS, CCTVS, ACCESS CONTROL, AUTOMATED PARKING, AND OTHER ELECTRICAL, LANDSCAPING AND HORTICULTURE SERVICES.

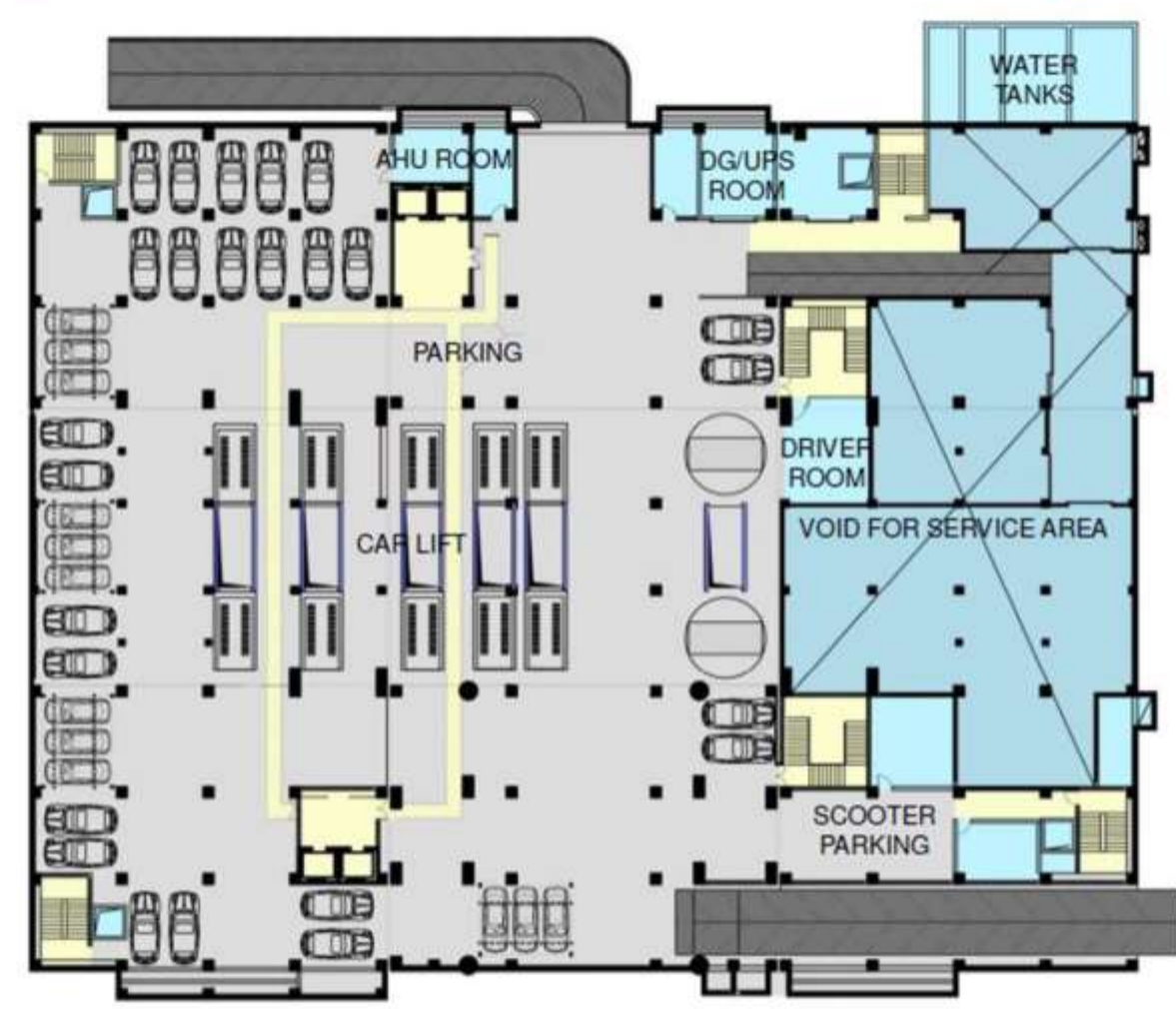


PLAN DEVELOPED FOR DIRECT PEDESTRIAN AXIS TO EAST, NORTH AND WEST ENTRANCE WITHOUT CRISSCROSSING VEHICLES



THE COURTYARD ALSO HELPS IN AIR MOVEMENT BESIDES BEING A SHADED INTERACTION SPACE

DEVELOPING THE PLAN - UPPER BASEMENT



- Zero tolerance to surface parking to reduce heat island

FIRST BASEMENT PARKING WITH AUTOMATED PARKING BELOW. HELPS REDUCE VOLUME OF PARKING / EXCAVATION / EMBODIED ENERGY OF STRUCTURE

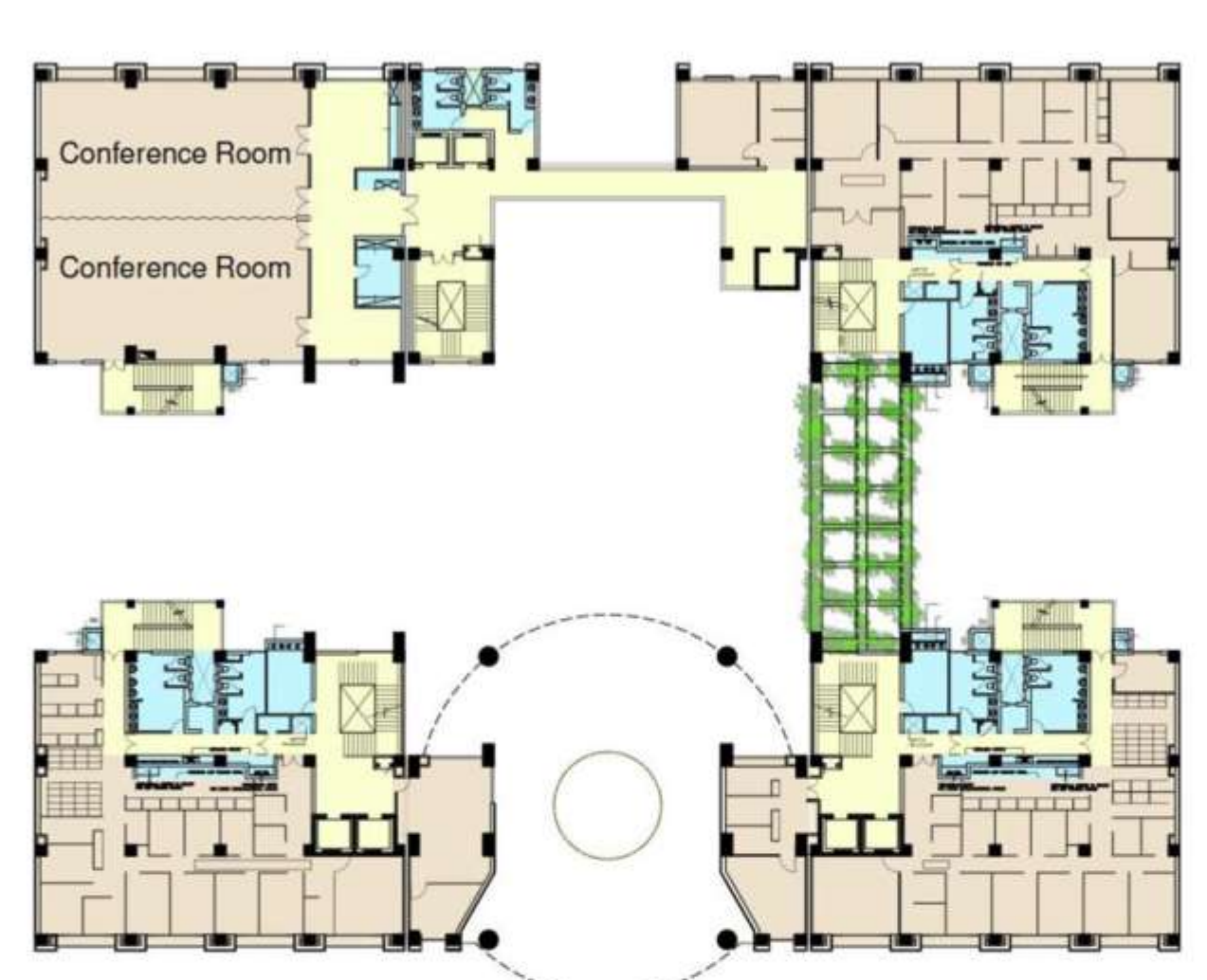
DEVELOPING THE PLAN - LOWER BASEMENT



AUTOMATED PARKING WITH 19SQM/CAR INSTEAD OF 35SQM/CAR IN MANUAL PARKING

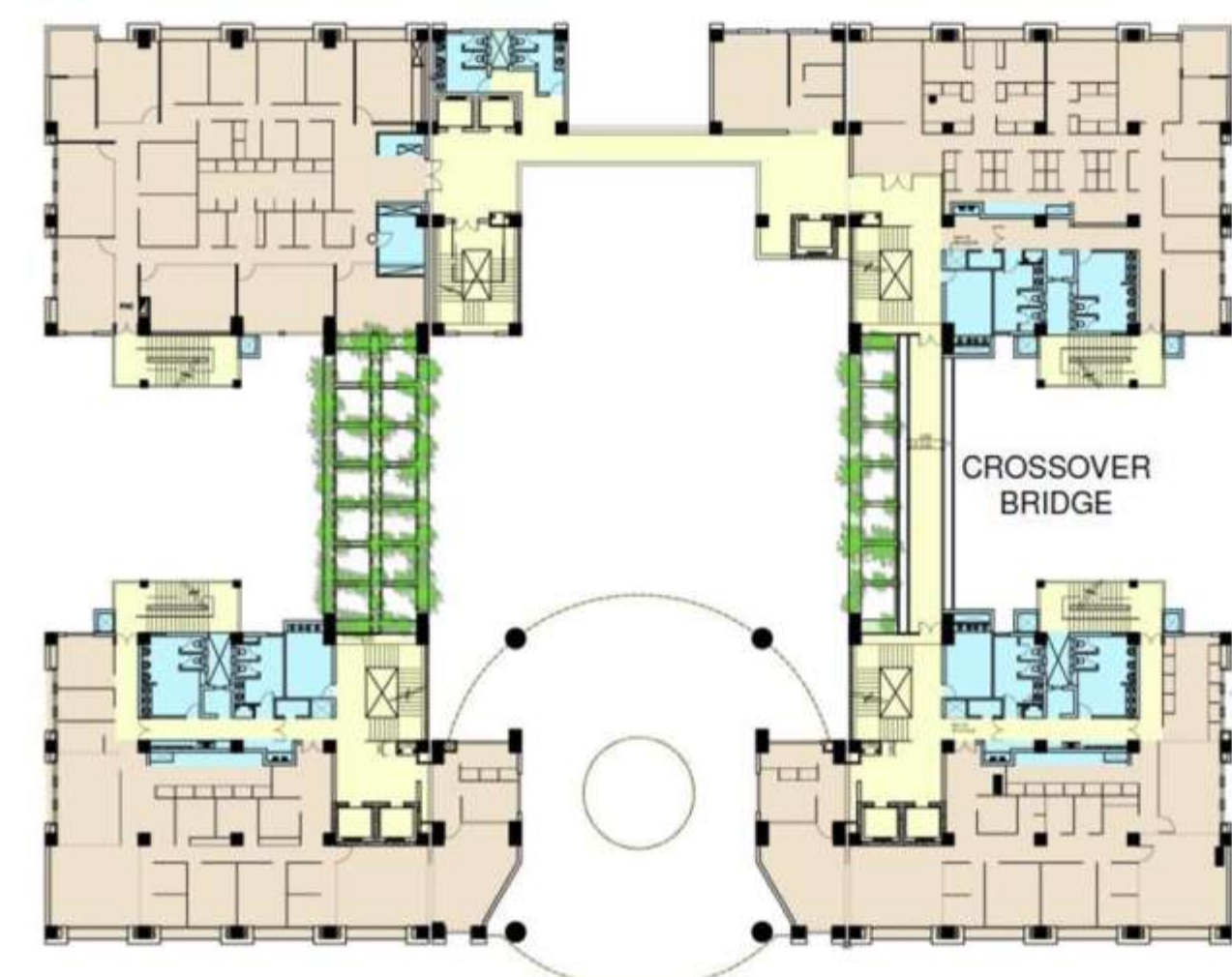
- OFFICE
- RECREATION
- CIRCULATION
- SERVICES

Ground Floor populated by Common and Public facilities which are Ok with limited natural light

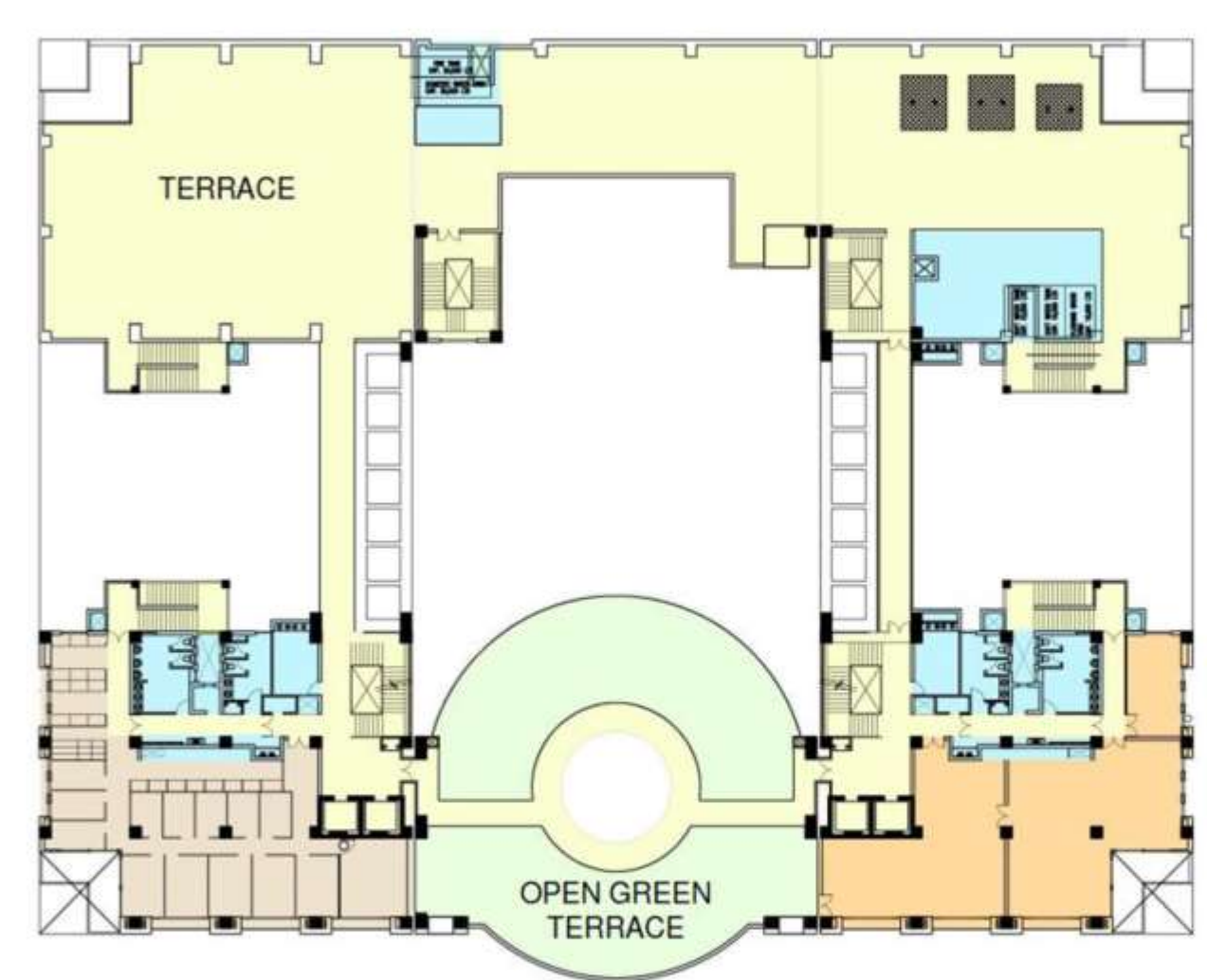


KEEPING SERVICE AREAS, STAIRCASES ON LOW LIGHT AREAS. EFFICIENT USAGE OF THE PERIMETER TO MAXIMIZE SUNLIT AREAS AND VIEWS FOR THE USERS

DEVELOPING THE PLAN - THIRD FLOOR



DEVELOPING THE PLAN - SEVENTH FLOOR



- OFFICE
- RECREATION
- CIRCULATION
- SERVICES



CASE STUDY 1

BY - ALOK RANJAN
ROLL.NO. - 1150101010

B.ARCH. 5TH YEAR (2019-20)
SCHOOL OF ARCHITECTURE
B.B.D.U. LUCKNOW (U.P.)

INDIRA PARYAVARAN BHAWAN, NEW DELHI

ENERGY EFFICIENCY

THE BUILDING HAS BEEN MADE ENERGY EFFICIENT THROUGH ONSITE SOLAR POWER GENERATION, REDUCTION OF CONVENTIONAL LIGHTING LOAD BY ENABLING 75% DAY LIGHT USE, GENERATION OF ENERGY BY DEPLOYING THIN FILM TRANSPARENT PV MODULES ON SPACE FRAME OVER THE TERRACE AND CENTRAL COURTYARD, USE OF HIGH EFFICIENCY LIGHTING FIXTURES, ASTRONOMICAL/TIME SWITCHES AND OCCUPANCY SENSORS.

#ABOUT 40% ENERGY SAVING ACHIEVED

#ABOUT 55% SAVING IN USE OF WATER

#AGAINST THE CONVENTIONAL ENERGY DEMAND OF 22 LAKH UNITS PER YEAR, ACTUAL ENERGY DEMAND WAS BROUGHT DOWN TO ONLY 14 LAKH UNITS PER YEAR.

#ENTIRE ENERGY DEMAND OF 14 LAKH UNITS GENERATED THROUGH HIGHEST EFFICIENCY MONO CRYSTALLINE SPV PANELS

#ENERGY GENERATION STARTED FROM 19.11.2013

#ENERGY GENERATED FED TO NDMC GRID FROM WHERE SUPPLY IS TAKEN, THEREBY OFFSETTING TOTAL ENERGY DEMAND

#THUS, ANNUAL ELECTRICITY BILL IS ZERO OR NEGATIVE I.E. NET REVENUE ON ACCOUNT OF EXCESS SOLAR POWER GENERATION.

ZERO NET ENERGY CONCEPT

THIS BUILDING IS THE FIRST EVER ZERO NET ENERGY MULTI STOREYED BUILDING WITH 100% ONSITE RENEWABLE SOLAR POWER GENERATION. IT HAS THE HIGHEST GREEN RATING BY GRIHA AS 5 STAR AND PLATINUM RATING BY LEED INDIA. WITH A SOLAR POWER SYSTEM OF INSTALLED CAPACITY 930 KWP, IT HAS THE LARGEST ROOFTOP SOLAR SYSTEM IN A MULTI STOREYED BUILDING IN INDIA.

BRIEF DETAILS OF SOLAR POWER ARE GIVEN IN THE FOLLOWING;

CAPACITY OF POWER GENERATION : 930KWP

ANNUAL POWER DEMAND : 14 LAKH UNITS (KWH)

ANNUAL POWER GENERATION : 14 LAKH UNITS(KWH)

TOTAL AREA OF SOLAR PANELS : 4600 SQM

TOTAL AREA OF THE SYSTEM INCLUDING CATWALKS : 6000 M2

PHOTO VOLTAIC PANELS : MONO CRYSTALLINE, 20% EFFICIENCY

INTANGIBLE OR TANGIBLE BENEFIT

OVERALL 67 PER CENT REDUCTION IN ENERGY CONSUMPTION WITH REFERENCE TO GRIHA BENCHMARK OF 140kWh/SQM/YEAR HAS BEEN ACHIEVED

THE BUILDING IS AN ENERGY POSITIVE BUILDING AS THE ENERGY GENERATED THROUGH 930 KWP OF SOLAR PV SYSTEM INSTALLED AT IPB IS MORE THAN THE ENERGY REQUIREMENT OF THE BUILDING.

THE BUILDING HAS ALSO ACHIEVED LEED INDIA PLATINUM RATING AND GRIHA FIVE-STAR RATING.

STRUCTURAL CONCEPT

STRUCTURAL CONCEPT

RCC FRAMED STRUCTURES, STEEL STRUCTURES AND COMPOSITE STRUCTURES HAVE BEEN USED. THE BUILDING IS DESIGNED FOR EARTHQUAKE FORCES OF SEISMIC ZONE IV, AND IT HAS A RAFT FOUNDATION.

ENERGY EFFICIENT LIFTS AND FIRE SERVICES

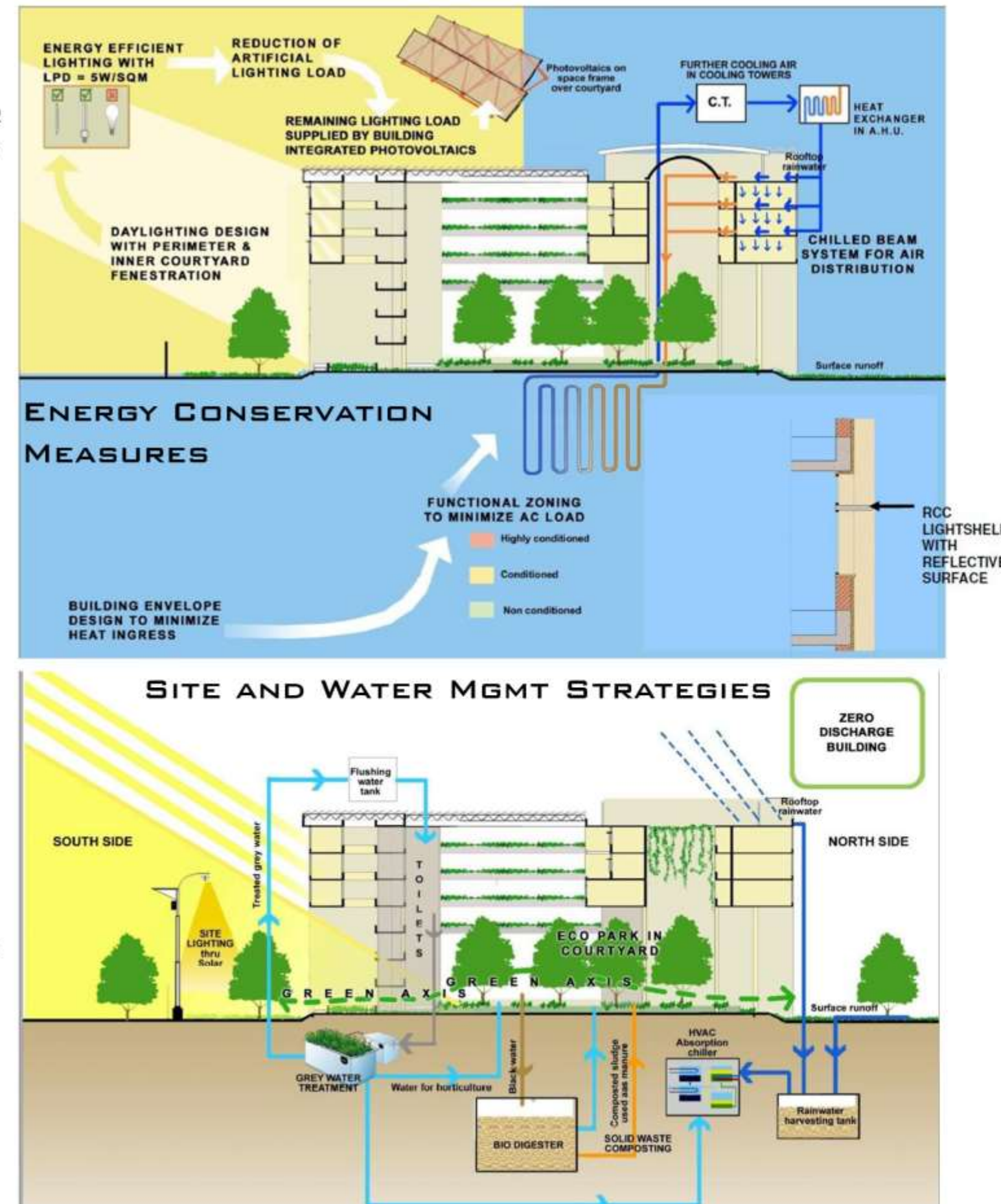
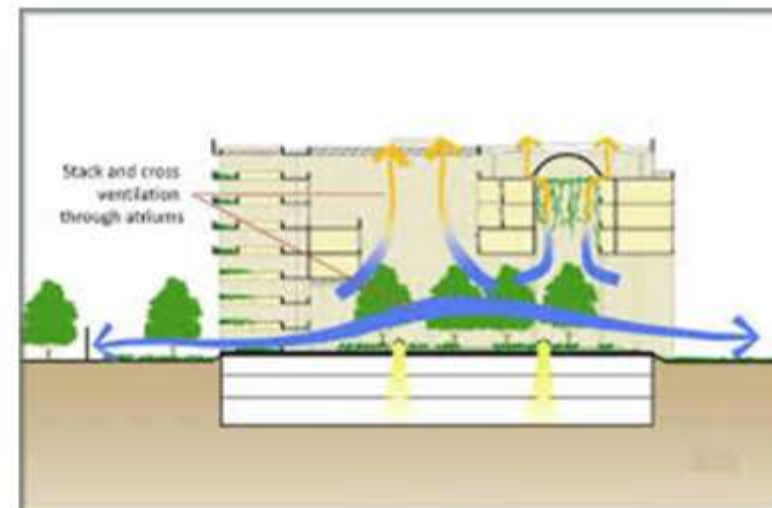
ENERGY EFFICIENT ELEVATORS WERE PROVIDED WITH A REGENERATIVE DRIVE OPTION, WORKING AS A GENERATOR WHEN A HEAVY CAR RETURNS TO GROUND FLOOR OR AN EMPTY CAR GOES UP. INSTEAD OF TURNING THE BRAKING ENERGY TO HEAT, THE ELECTRICITY HAS BEEN FED BACK TO THE NETWORK. IT COULD SAVE UP TO 25% OF THE ENERGY CONSUMED BY A TYPICAL 13-PERSON ELEVATOR. THE POWER REGENERATED FROM THE ELEVATOR WAS TO BE USED FOR POWER REQUIREMENT OF THE ELEVATORS. HOWEVER, SUITABLE TAPPING POINT FOR REGENERATED POWER OF EACH ELEVATOR WAS PROVIDED FOR OTHER USES.

AN ADDRESSABLE FIRE ALARM DETECTION SYSTEM WAS INSTALLED FOR THE ENTIRE COMPLEX. THE COMPLEX WAS UNDER "A" CATEGORY OF FIRE ZONING AS PER NATIONAL BUILDING CODE. ACCORDINGLY, THE PROJECT WAS DESIGNED WITH 200 KL OF FIRE TANK, SPRINKLER SYSTEM, HYDRANT SYSTEM, CO2 EXTINGUISHING SYSTEM, HAND HELD EXTINGUISHERS AND CLEAN AGENT FIRE PROTECTION SYSTEM.

ALL SERVICES WERE CONTROLLABLE AND COULD BE MONITORED USING IBMS FOR GREATER RELIABILITY AND TO EFFECT OPTIMUM LEVEL OF OPERATING ENGINEERING SERVICES SYSTEM.

GEOTHERMAL HEAT EXCHANGE SYSTEM

THE SYSTEM UTILISES ADVANTAGE OF DIFFERENCE BETWEEN AMBIENT TEMPERATURE AND THE TEMPERATURE BELOW GROUND LEVEL. THE SYSTEM HAS VERTICAL CLOSED LOOP SYSTEM DONE WITH 32 MM DIAMETER HDPE U - LOOPS, 180 IN NUMBER AND 80M DEEP EACH. IT RESULTED INTO REDUCTION OF 160 TR LOAD ON COOLING TOWER AND CONSEQUENT REDUCTION IN CONSUMPTION OF WATER.



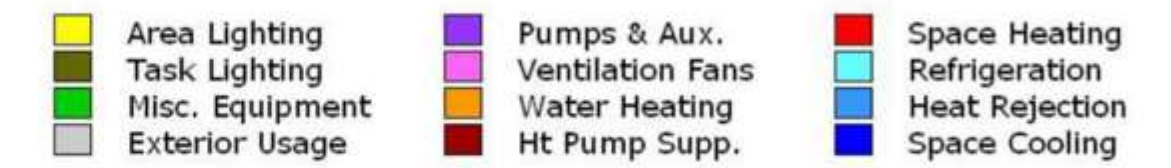
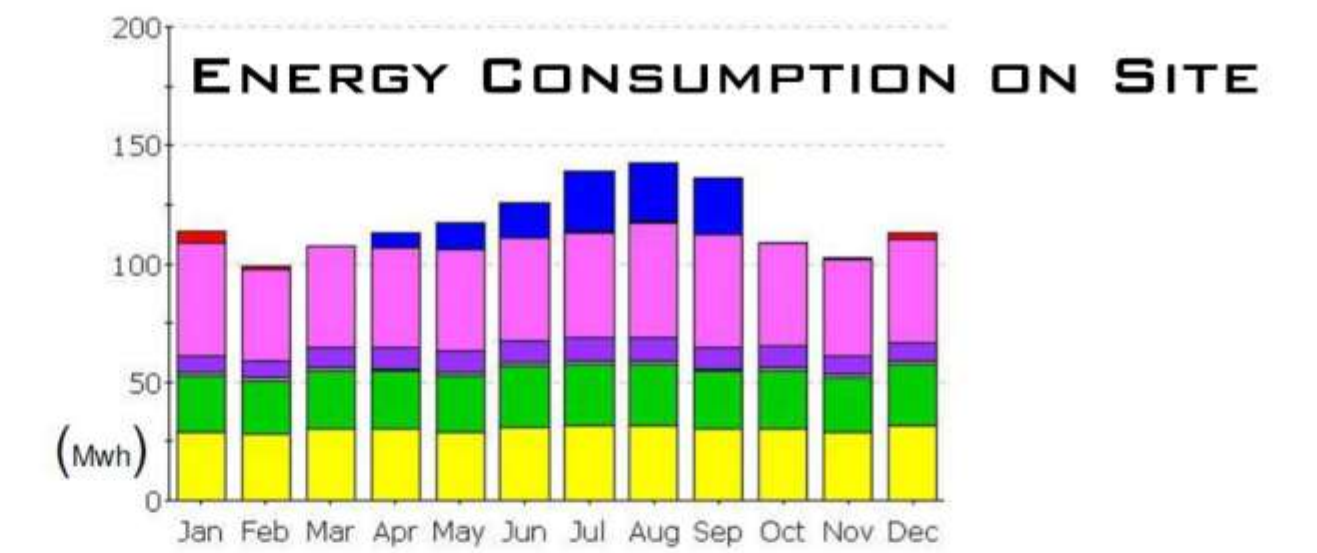
ECO-FRIENDLY FEATURES

- # CHILLED BEAM SYSTEM OF HVAC
- # GEOTHERMAL HEAT EXCHANGE SYSTEM
- # REGENERATIVE LIFTS
- # FULLY AUTOMATED CAR PARKING IN BASEMENTS
- # BUILDING ORIENTATION IN E-W DIRECTION
- # BLOCKS CONNECTED WITH CORRIDORS AND CENTRAL COURTYARD
- # BUILDING ENVELOPE DESIGNED TO ENSURE DAYLIGHT IN 75% OCCUPIED AREAS
- # PLANTATION AND GRASSING IN MORE THAN 50% AREA
- # GRASS PAVERS IN CIRCULATION AREAS
- # TERRACE GARDEN
- # ENERGY EFFICIENT AIR CONDITIONING SYSTEM AND LIGHTING
- # CONVERSION OF BRAKING ENERGY INTO ELECTRICITY IN LIFTS
- # CHILLERS AND AHUS WITH VFDs, HEAT RECOVERY WHEELS AND THERMOSTAT CONTROLS FOR HVAC
- # LED LIGHTS, OCCUPANCY AND LUX LEVEL SENSORS
- # 930 KWP ROOFTOP SOLAR POWER PLANT
- # LOW DISCHARGE WATER FIXTURES
- # LANDSCAPING WITH NO HARD PAVING ELIMINATING HEAT ISLAND EFFECT
- # FLY ASH-BASED PRODUCTS IN CONSTRUCTION
- # SEWAGE TREATMENT PLANT OF 30 KLD CAPACITY.

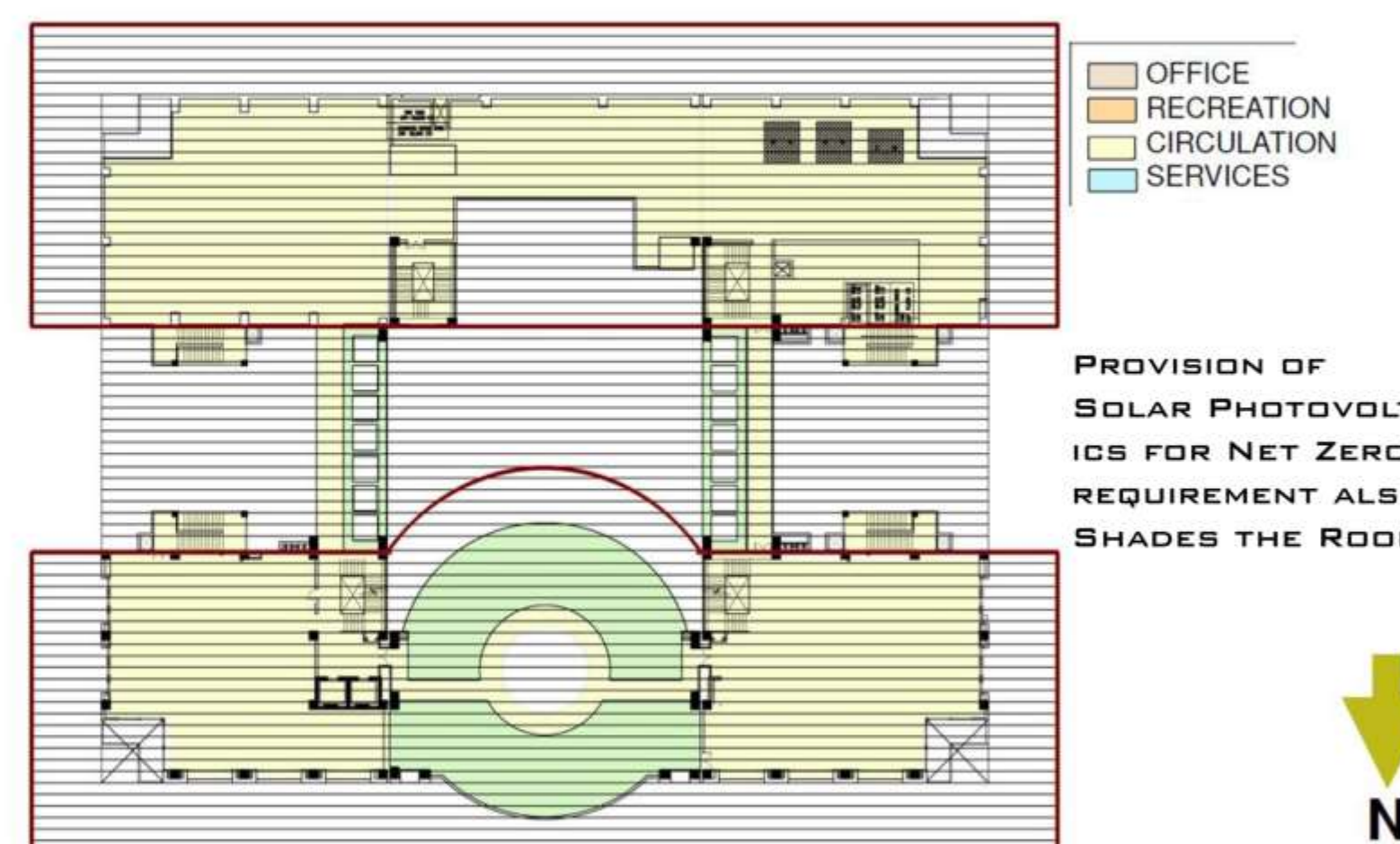
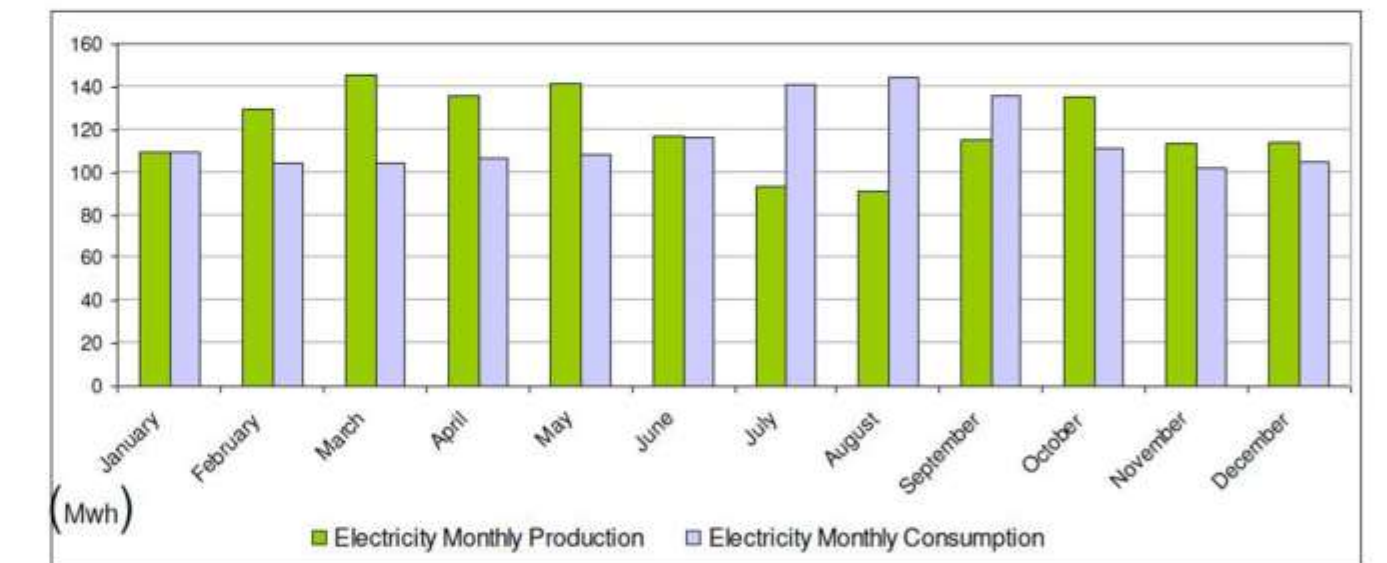
PROJECTED COST

	RS. IN CRORES
• A A & E S	128.63
- CIVIL INCL WS SI	67.96
- ELECTRICAL	22.08
- SOLAR	8.50
- FURNITURE	8.35
- MECHANISED PARKING	14.00
- LOCAL BODIES CHARGES	1.15
- CONSULTANCY SERVICES	0.70
- MISC INCL CONTIGENCIES & LABOUR CESS	5.89

UNIT COST Rs 41,610 / SQM.



ANNUAL ENERGY PRODUCTION & CONSUMPTION (KWH)



PROVISION OF SOLAR PHOTOVOLTAICS FOR NET ZERO REQUIREMENT ALSO SHADES THE ROOF



INTRODUCTION

THE KANCHENJUNGA APARTMENTS IS A DIRECT RESPONSE TO THE PRESENT SOCIETY, THE ESCALATING URBANISATION, AND THE CLIMATIC CONDITIONS FOR THE REGION.

THE KANCHENJUNGA APARTMENTS IS A TWENTY EIGHT STOREY 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 HARBOURS

• THE ORIENTATION IS ALSO TROUBLESOME BECAUSE IT EXPOSES THE BUILDING TO THE HOT SUN AND THE MONSOON RAINS

• THIS WAS MEDIATED THROUGH THE UNIT DESIGN IN THE TRADITIONAL BUNGALOW STYLE

• THE BUNGALOW WRAPPED A PROTECTIVE LAYER OF VERANDAH AROUND THE MAIN LIVING SPACE PROVIDING TWO LINES OF DEFENCE AGAINST THE CLIMATE OF THE AREA.

□ AREA

: 441 SQM

□ SITE AND SITUATION

: CITY LANDSCAPE SURROUNDED BY MID-RISE AND HIGH-RISE STRUCTURES.

CLIMATOLOGY

CLIMATE- WARM AND HUMID

SINCE MUMBAI IS A COASTAL CITY, THE WEATHER IS MOSTLY HUMID YEAR ROUND. ALSO AS IT IS IN TROPICS, IT NEVER GETS VERY COLD AND THE YEARLY EXTREMES LIE WITHIN A 30 DEGREE CELSIUS RANGE.

MUMBAI'S WEATHER CAN BE DIVIDED INTO 4 SEASONS - WINTER (DEC - FEB), SUMMER (MAR - MAY), MONSOON (JUNE - SEPT), WITHDRAWAL SEASON (OCT - DEC).

DURING WINTERS THE TEMPERATURE GOES DOWN TO THE MINIMUM OF 15 DEGREE CELSIUS. SUMMER TEMPERATURE RANGES FROM 20 DEGREE CELSIUS TO 35 DEGREE CELSIUS. MONSOONS AFFECT THE RESIDENTS OF BOMBAY WITH HEAVY SHOWERS. WATER LOGGING IS A MAJOR PROBLEM IN THE CITY DURING THIS SEASON.

ORIENTATION

IN BOMBAY

A BUILDING HAS TO BE ORIENTED EAST - WEST TO CATCH THE PREVAILING SEA BREEZES AND OPEN UP THE BEST VIEWS IN THE CITY : THE ARABIAN SEA ON ONE SIDE AND THE HARBOUR ON THE OTHER. BUT THESE UNFORTUNATELY ARE ALSO THE DIRECTIONS OF THE HOT SUN AND THE HEAVY MONSOON RAINS.

THE TOWER HAS A PROPORTION OF 1:4 (BEING METRES SQUARE AND 84 METRES HIGH). ITS MINIMALIST UNBROKEN SURFACES ARE CUT AWAY TO OPEN UP THE DOUBLE HEIGHT TERRACE GARDENS AT THE CORNERS, THUS REVEALING SOME HINT OF COMPLEX SPATIAL ORGANISATION OF LIVING SPACES THAT LIE WITHIN THE TOWER.

THUS PROVIDING THE OCCUPANTS WITH TWO LINES OF DEFENCE AGAINST THE ELEMENTS. KANCHENJUNGA, AN ATTEMPT TO APPLY THESE PRINCIPLES TO HIGH RISE BUILDINGS IS A CONDOMINIUM OF 32 LUXURY APARTMENTS OF FOUR DIFFERENT TYPES VARYING FROM 3 TO 6 BEDROOMS EACH.

MODULARITY

LOT SIZE APPROX : 5260 SQ M

FOOTPRINT OF THE TOWER : 441 SQ M

NUMBER OF RESIDENCES : 32

NUMBER OF FLOORS: 28 - A UNIT 3 BEDROOMS X 10 : 294 SQM - B UNIT 3 BEDROOMS X 12 : 242 SQM - C

UNIT 5 BEDROOMS X 8 : 373 SQ M - D UNIT 4 BEDROOMS X 4 : 361 SQM

32 FLATS

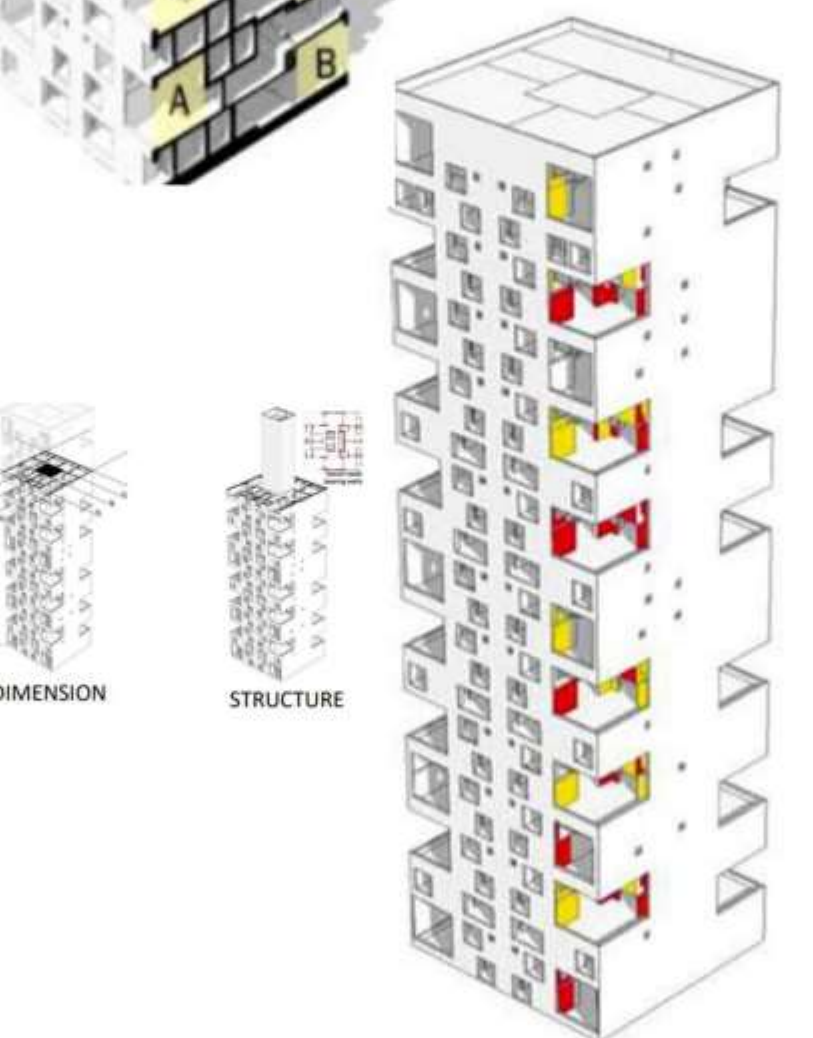
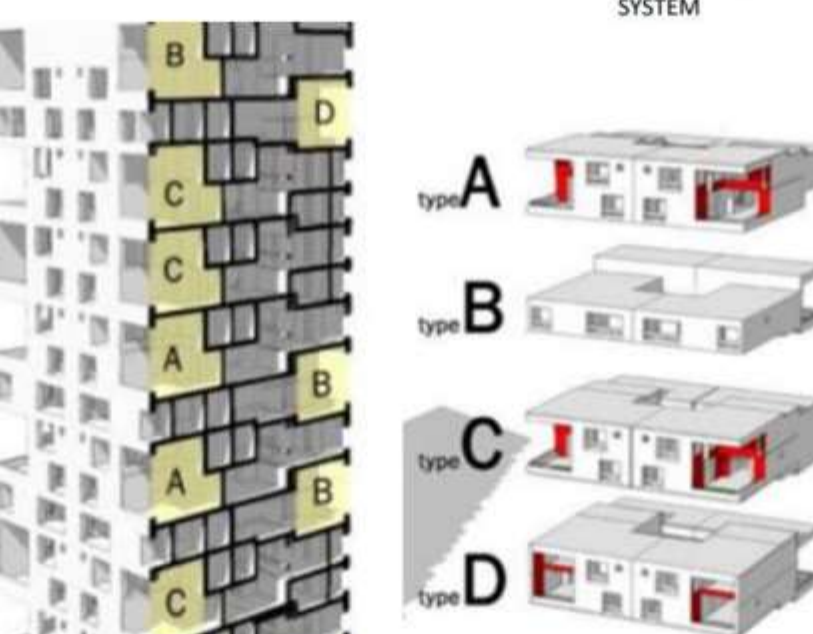
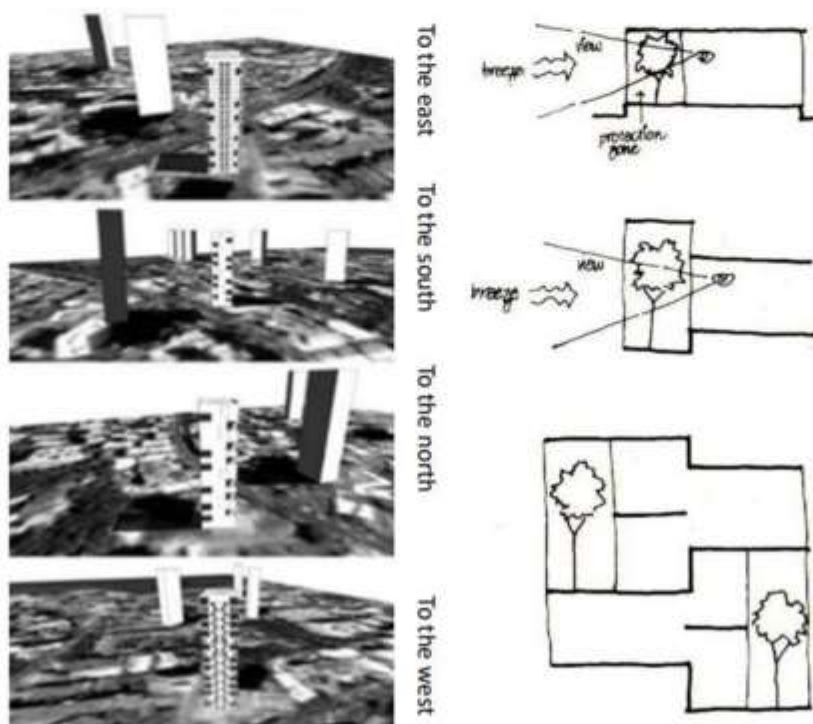
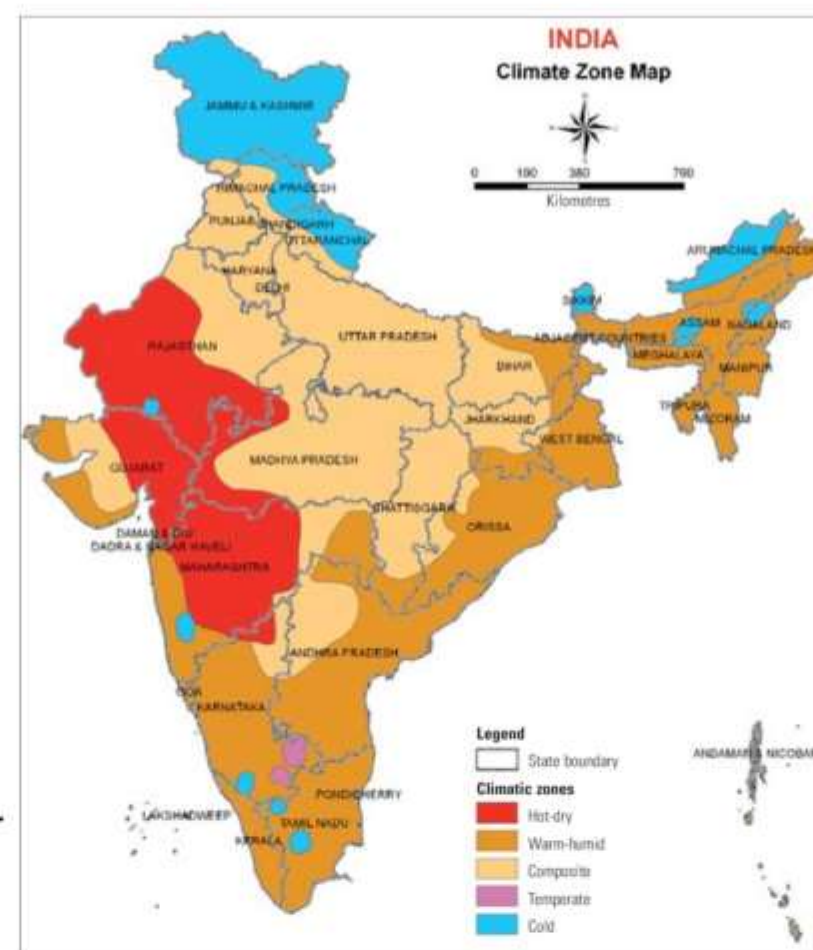
- 200 PEOPLE

MATERIALS AND COLOURS

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 VERANDAH. IN A BUNGALOW, THE VERANDAH WRAPS THE MAIN LIVING AREA.

THE COLOR EXPERT SAYS THAT THE QUALITY OF SUNLIGHT, CLIMATE AND CULTURE INFLUENCE COLOR CHOICES: HENCE ONE WOULD OBSERVE A PREFERENCE FOR BLUE AND ITS SHADES IN THE WEST WHILE IN INDIA AND OTHER ASIAN COUNTRIES ONE FINDS A PRE DOMINANCE OF REDS AND YELLOWS.

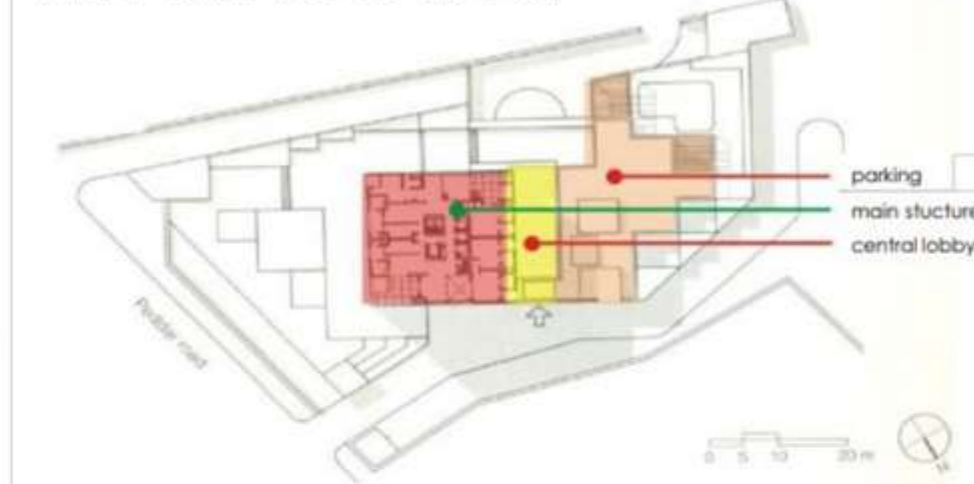


MATERIALS AND COLOURS

APPROACH

□ THE SITE HAS A SEPARATE ROAD FOR INDIVIDUAL APPROACH WHICH IS CONNECTED TO THE MAIN ROAD.

□ BUILDING IS APPROACHABLE FROM TWO OPPOSITE SIDES, ONE FROM EAST AND ONE FROM WEST.

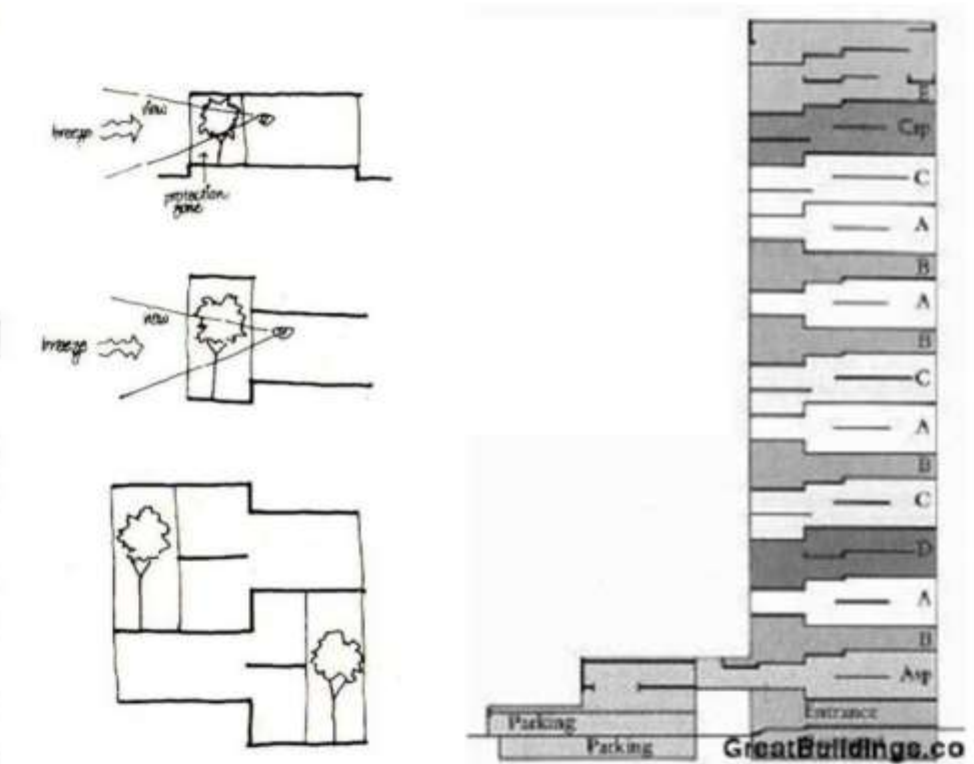


CONCEPT

□ HE MAINLY WORKED ON THE SECTIONAL DISPLACEMENT BY BRINGING CHANGES IN 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.



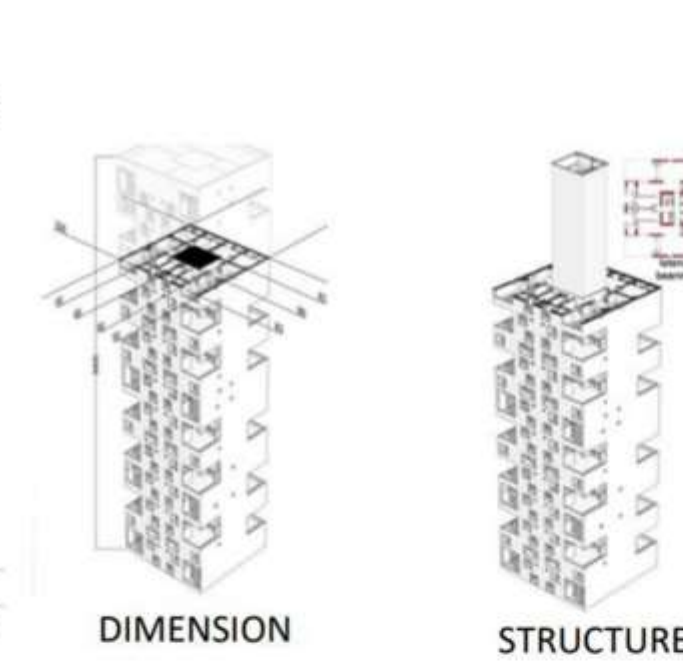
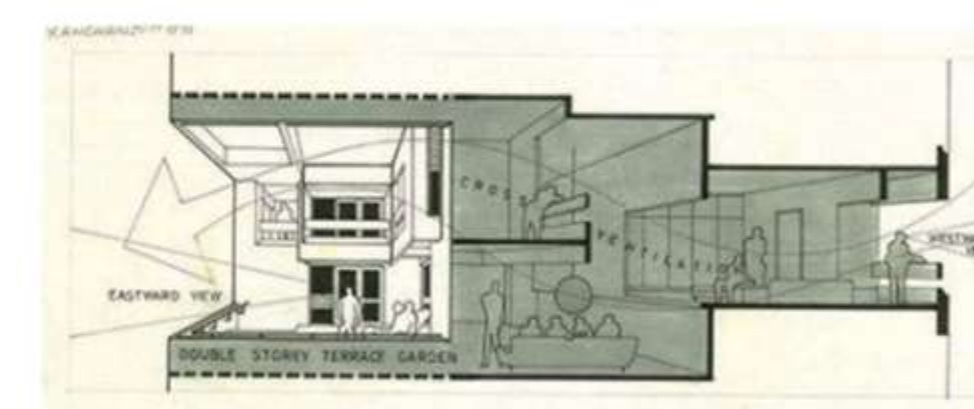
TRANSPARENCY &

CIRCULATION

□ GREAT DEAL OF TRANSPARENCY HAS BEEN ACHIEVED BY USE OF TERRACE GARDENS AND LARGE OPENINGS ON EVERY FLOOR.

□ 10% TO 15% OF EACH FLOOR AREA HAS BEEN PROVIDED AS COMMON CIRCULATION.

□ MAX. FACILITIES PROVIDED USING MIN. CIRCULATION.



STRUCTURAL OVERVIEW

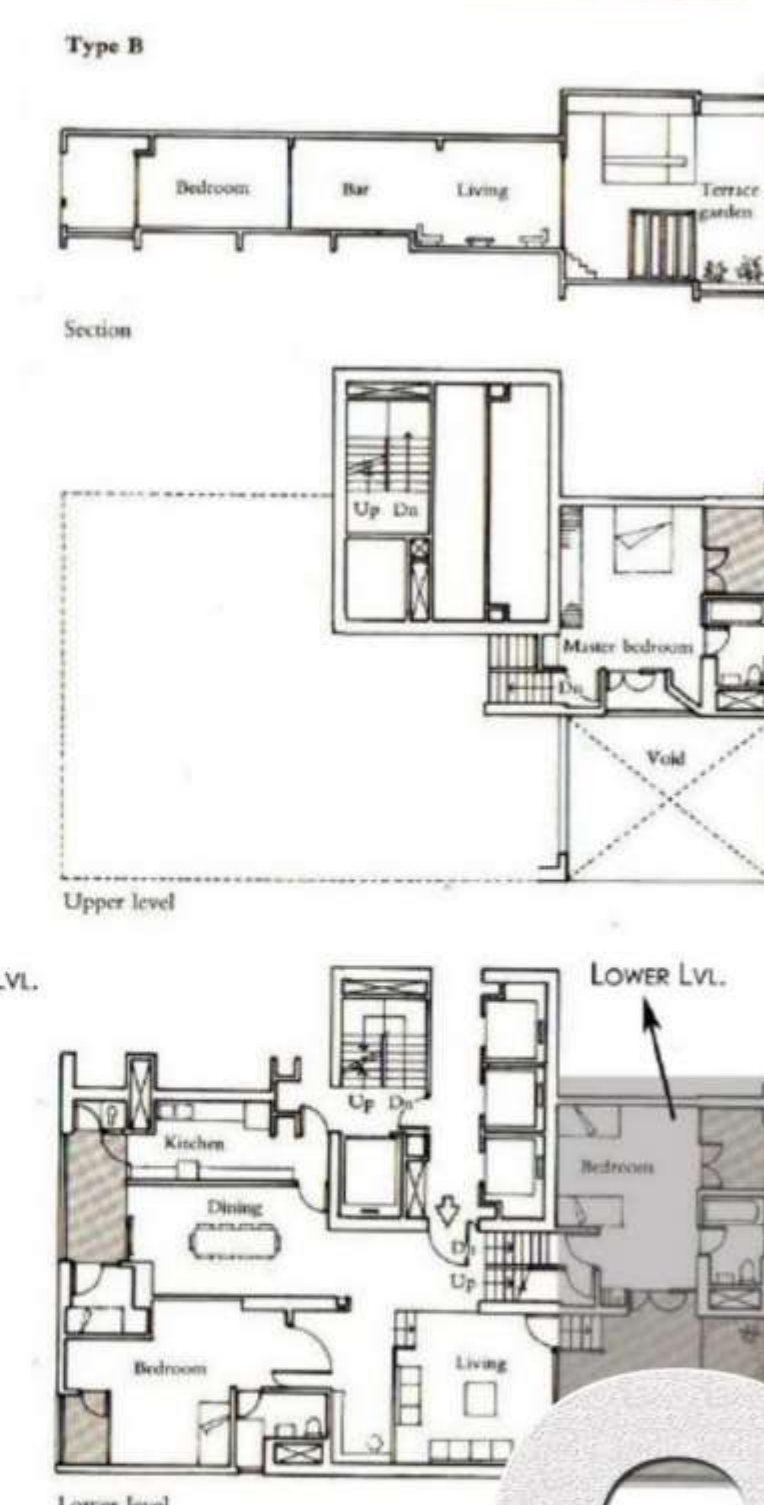
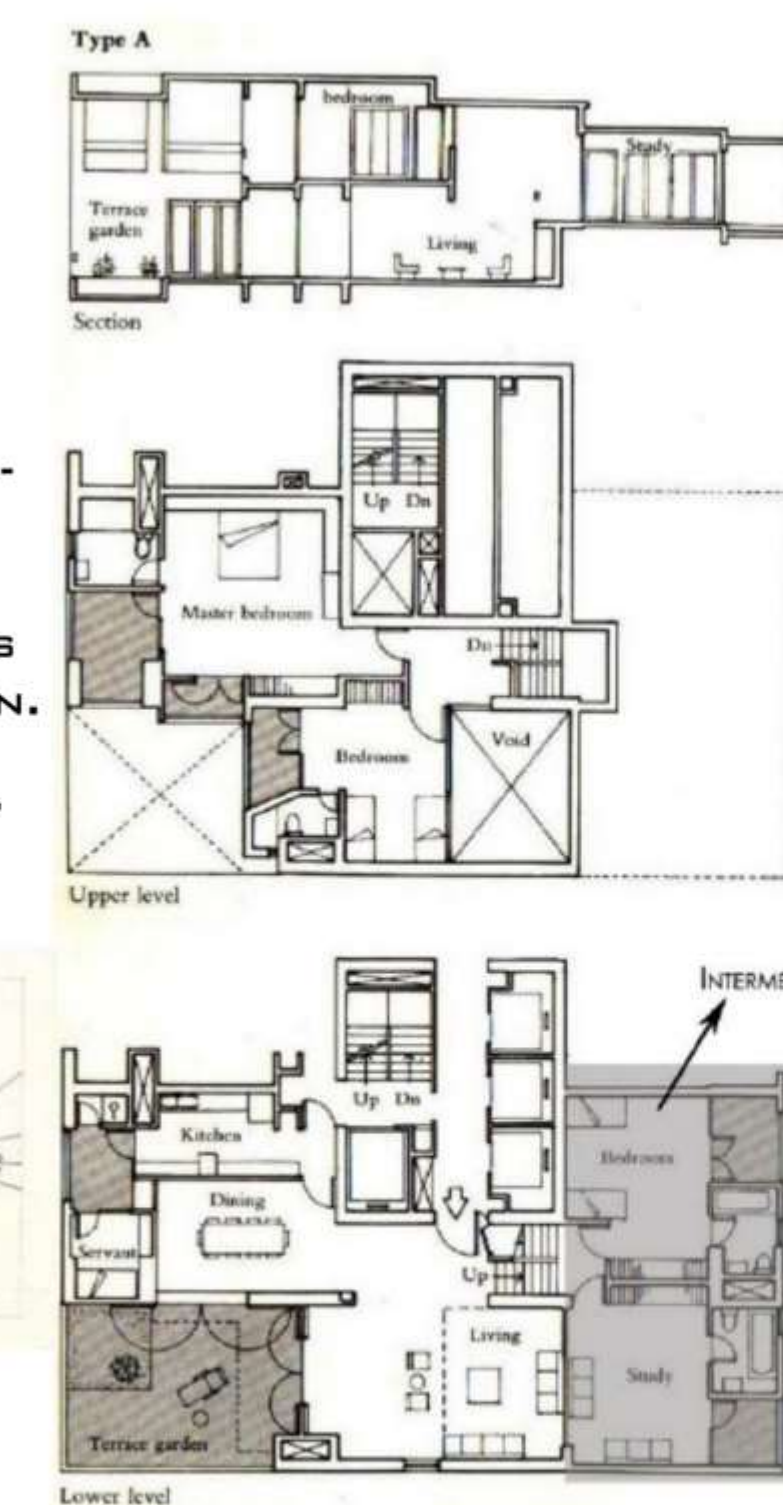
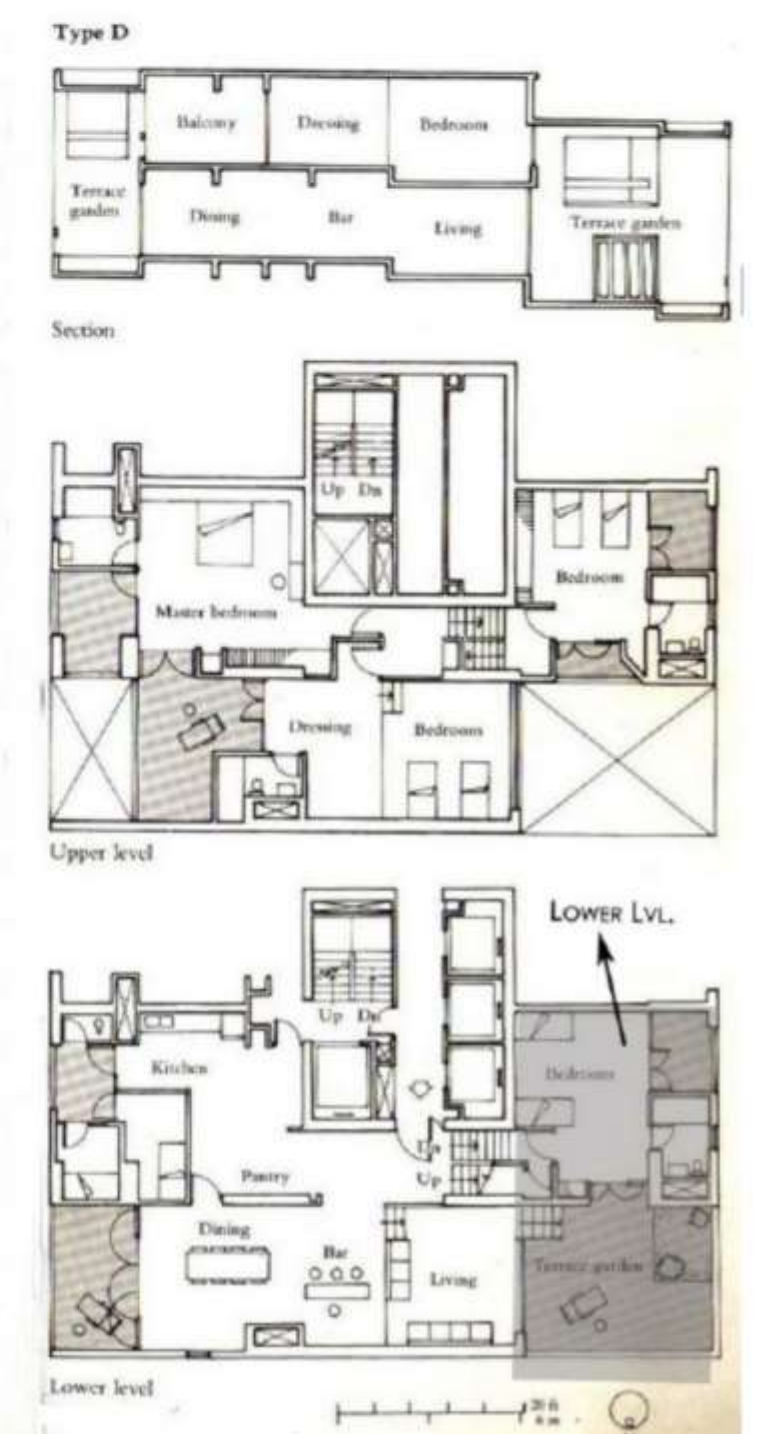
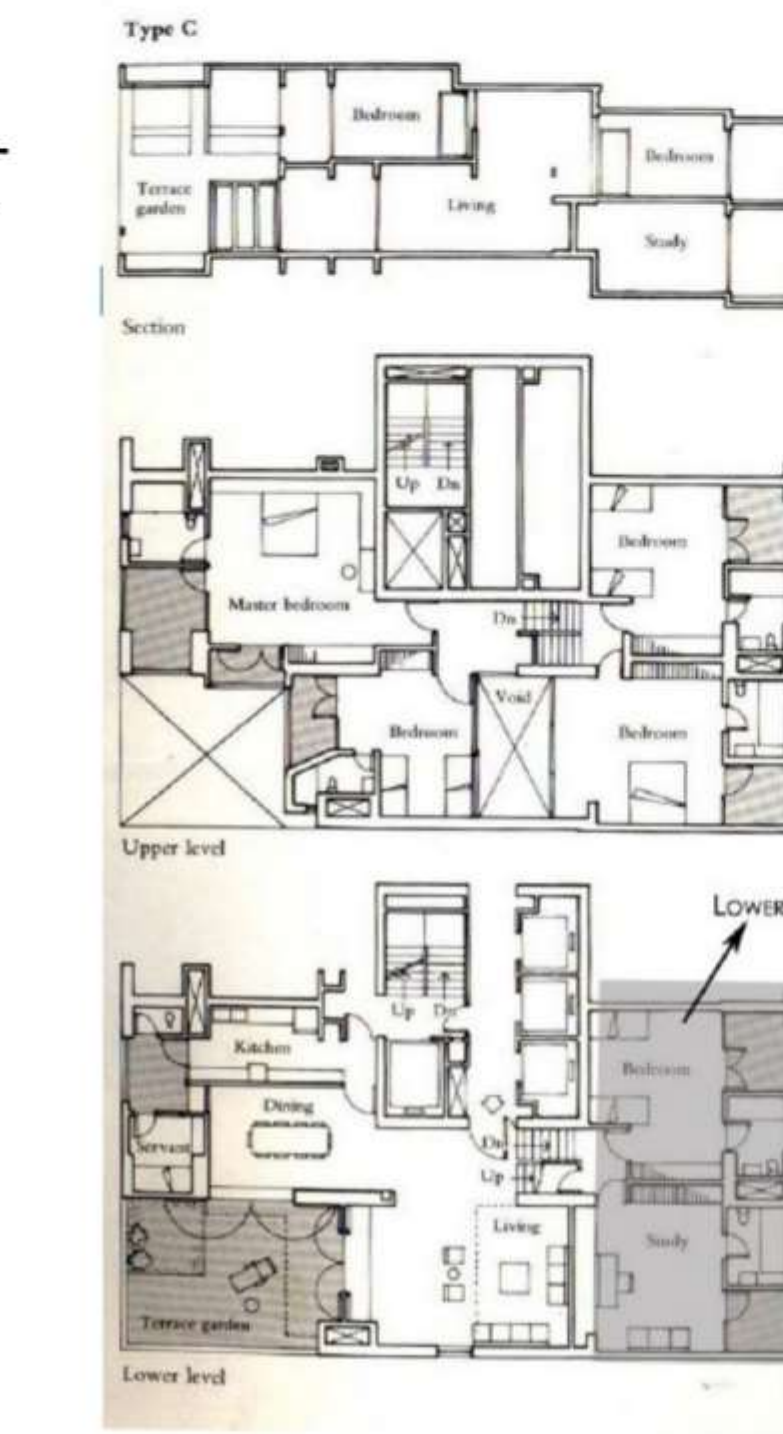
□ IT IS MADE FROM REINFORCED CONCRETE.

□ 32 STORIES HIGH WITH 6.3 M CANTILEVERED TERRACE GARDEN.

□ 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.

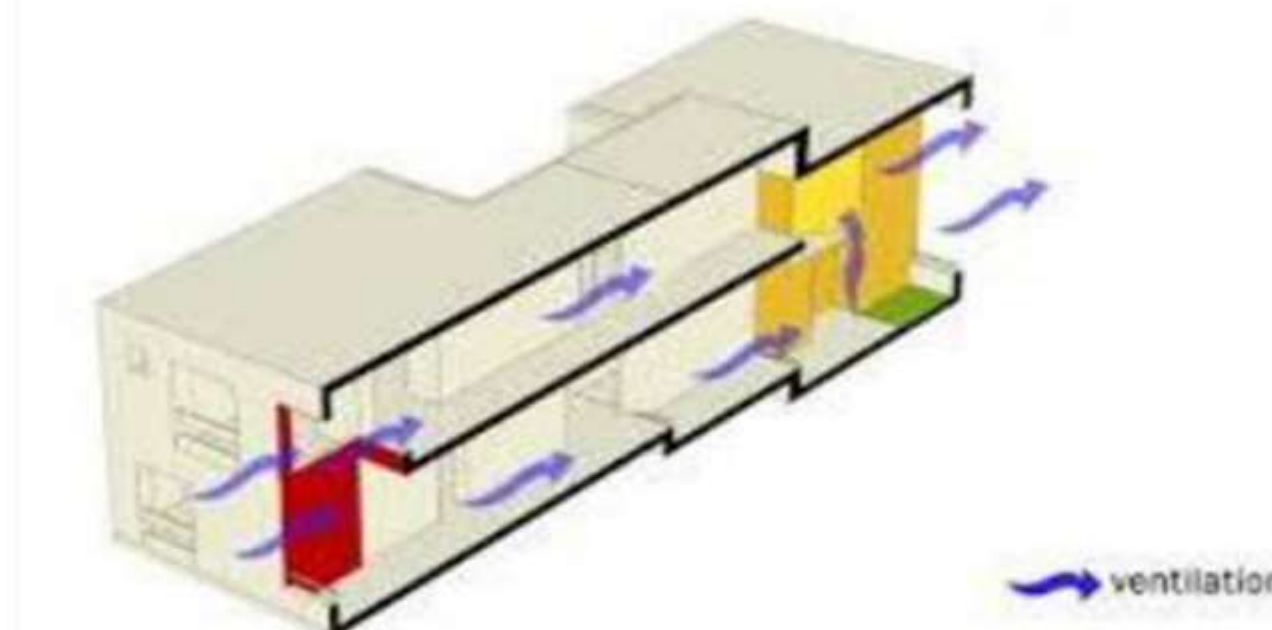
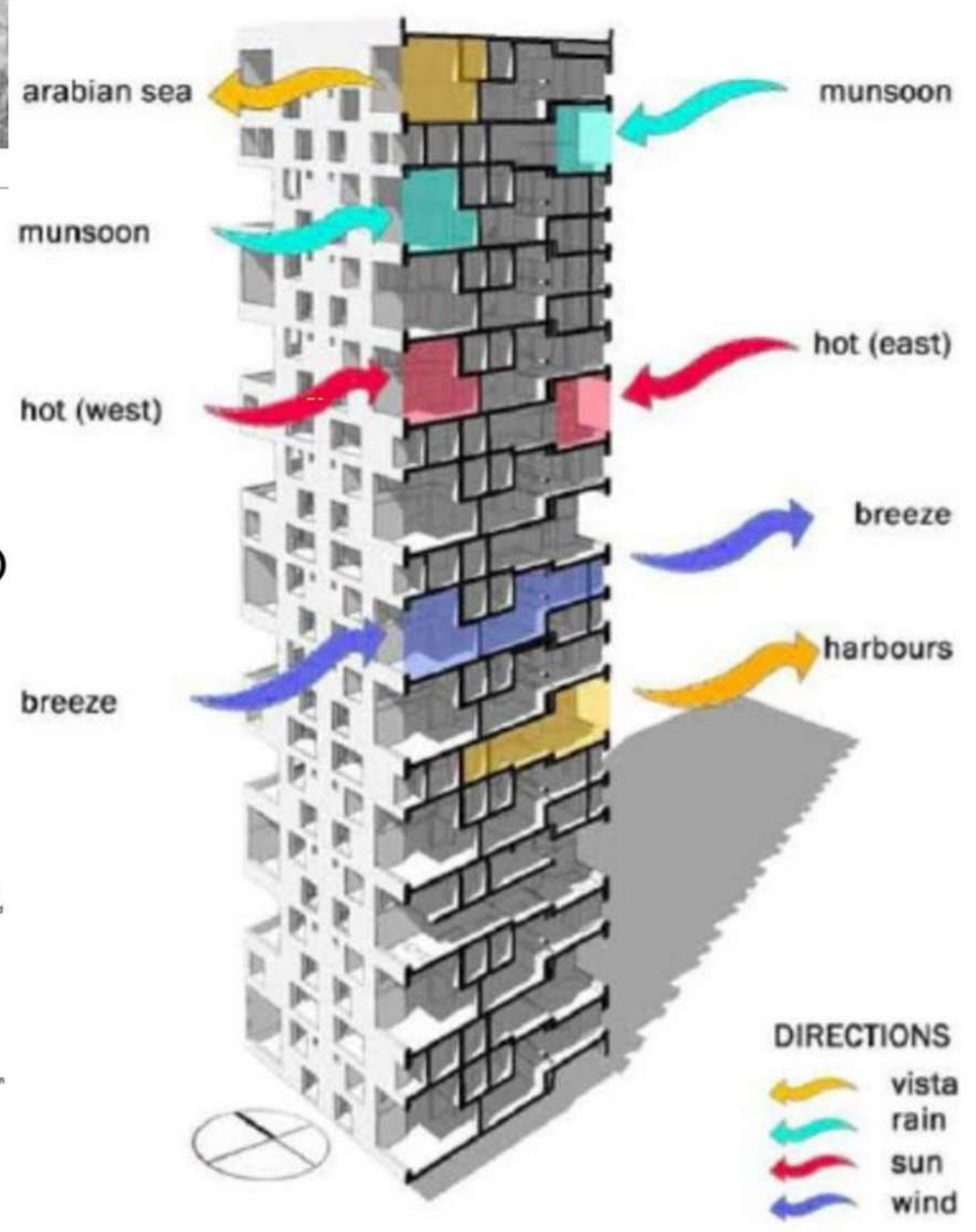
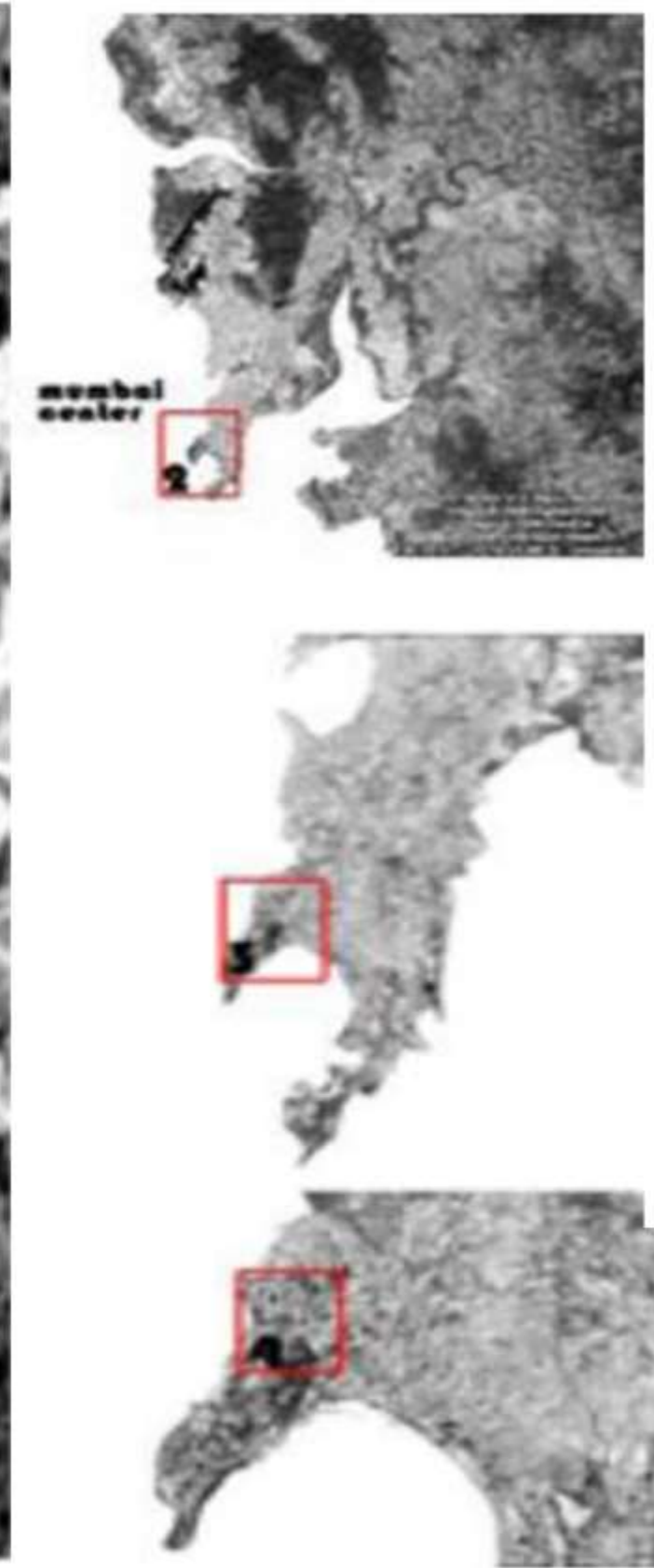
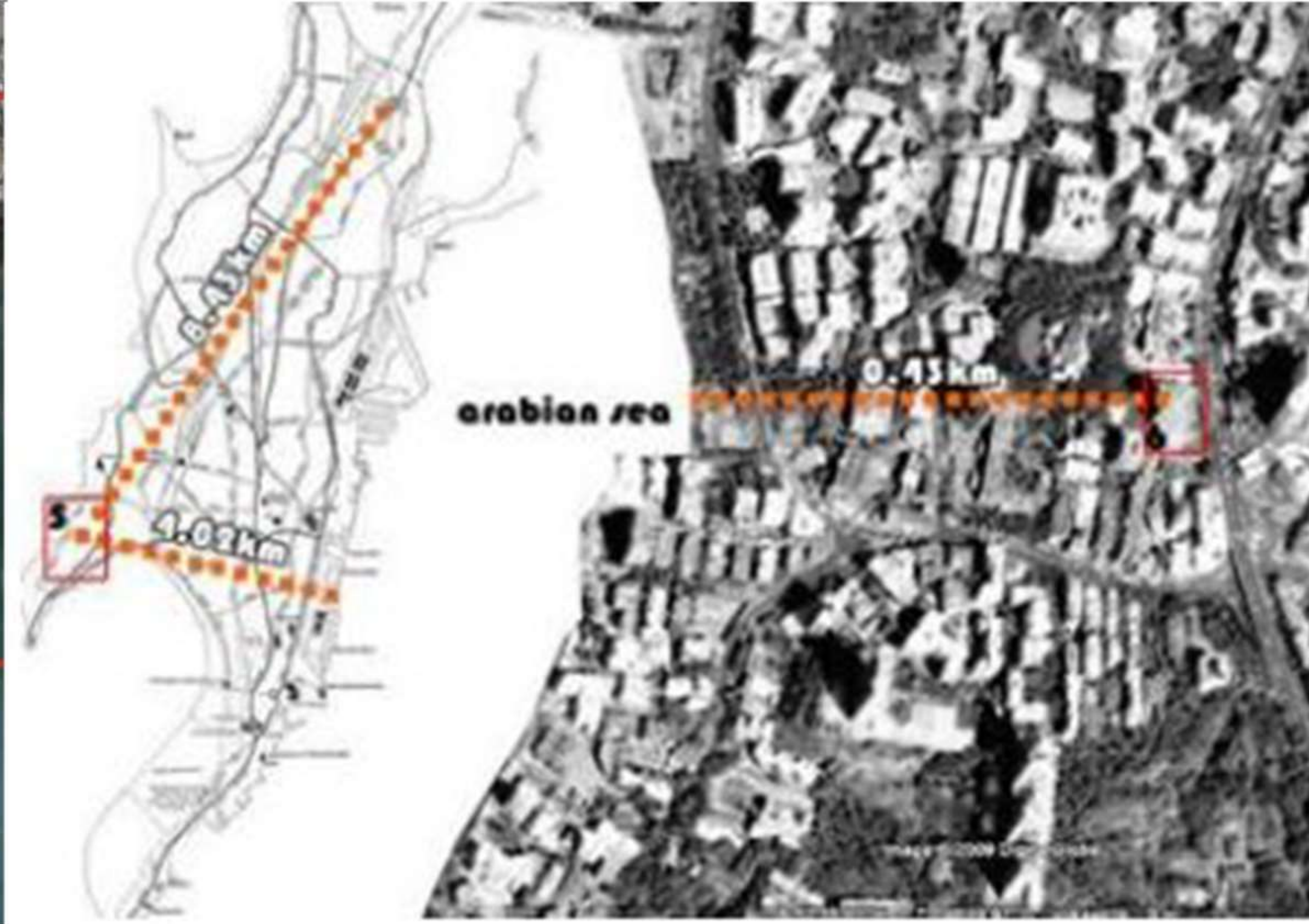
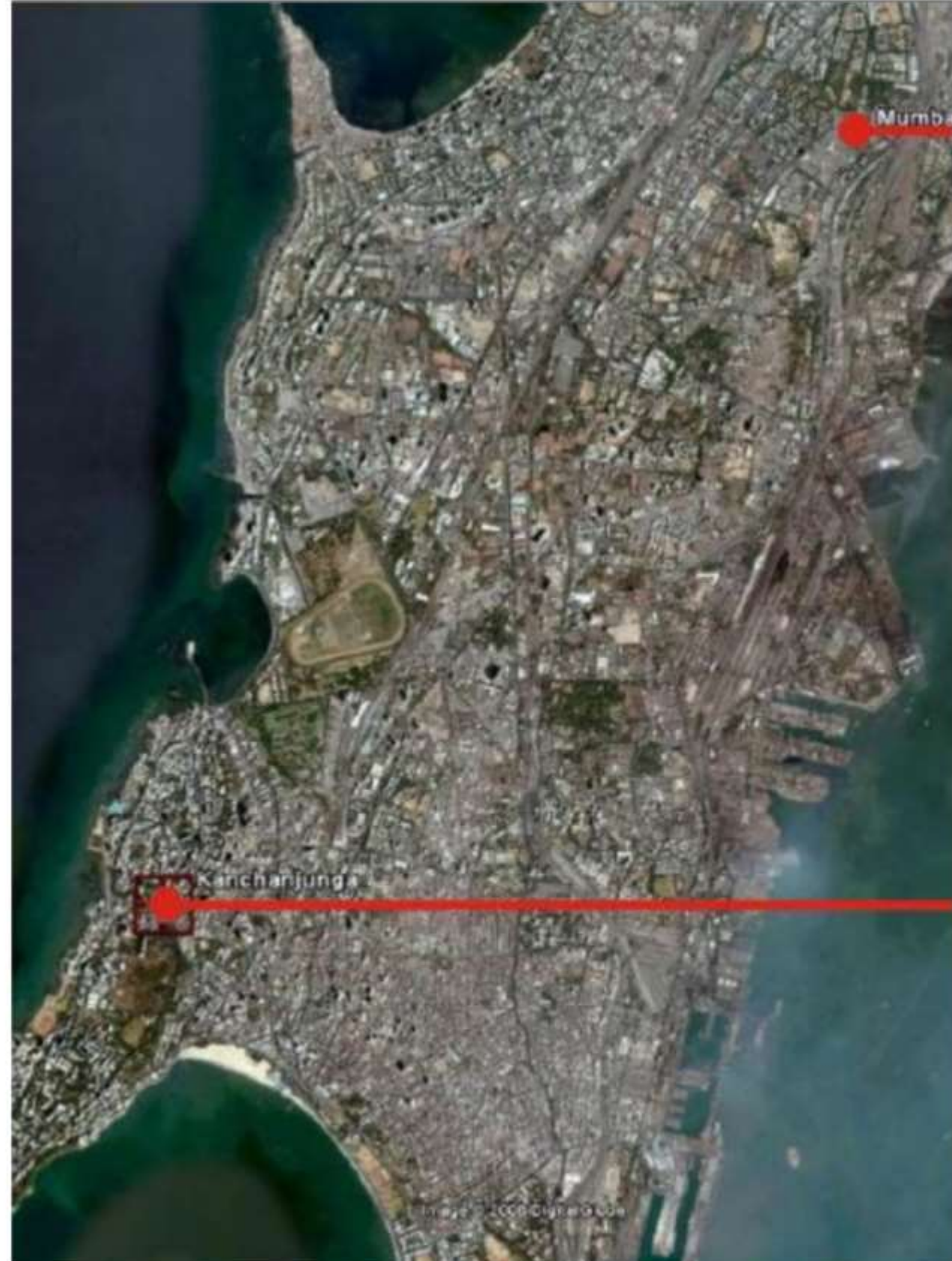
□ CENTRAL CORE WAS CONST. AHEAD OF THE MAIN STRUCTURE USING SLIP METHOD OF CONSTRUCTION.



CASE STUDY 2

BY - ALOK RANJAN
ROLL.NO. - 1150101010

B.ARCH. 5TH YEAR (2019-20)
SCHOOL OF ARCHITECTURE
B.B.D.U. LUCKNOW (U.P.)

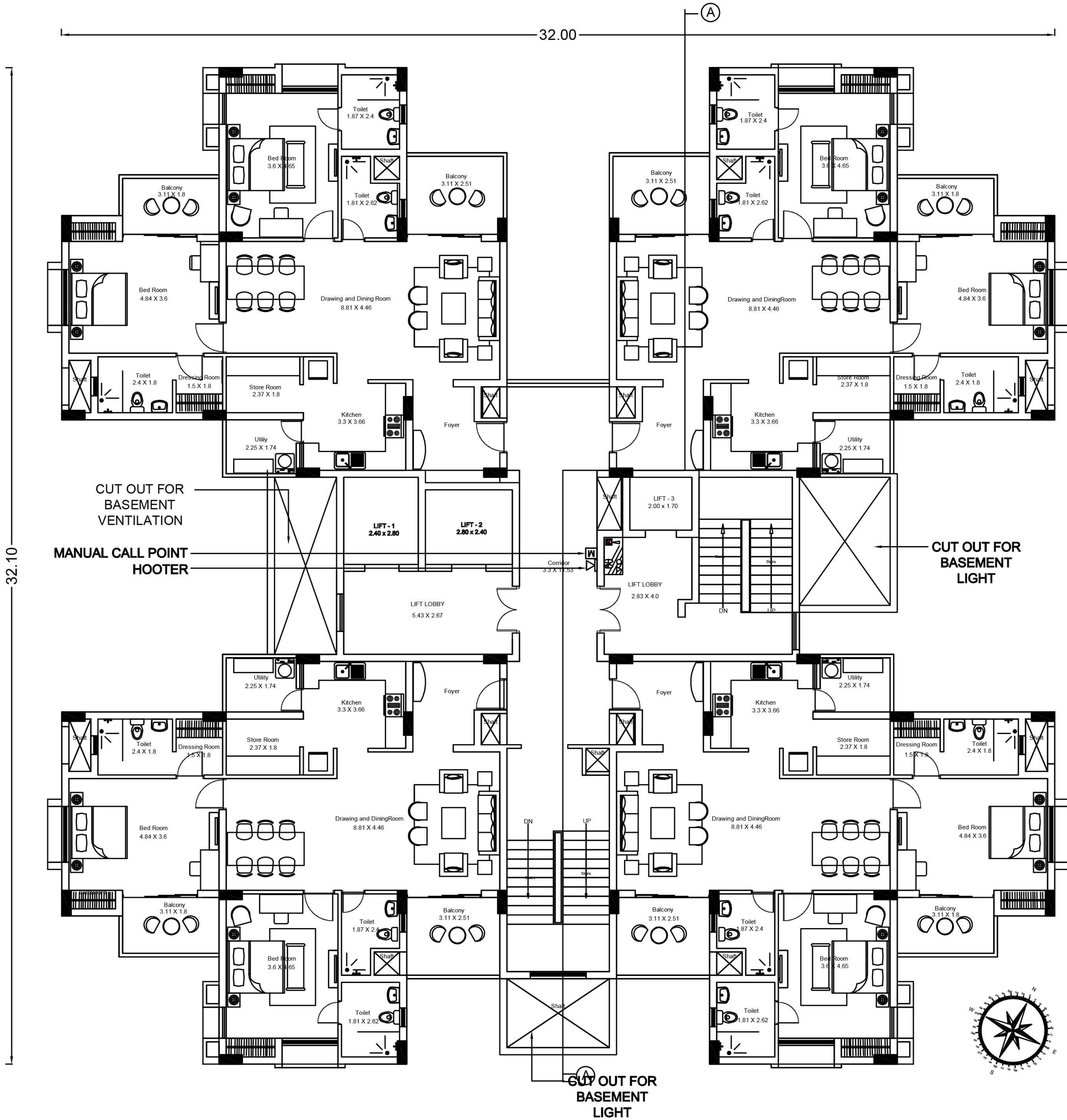


KANCHENJUNGA APARTMENTS, MUMBAI

CASE STUDY 2

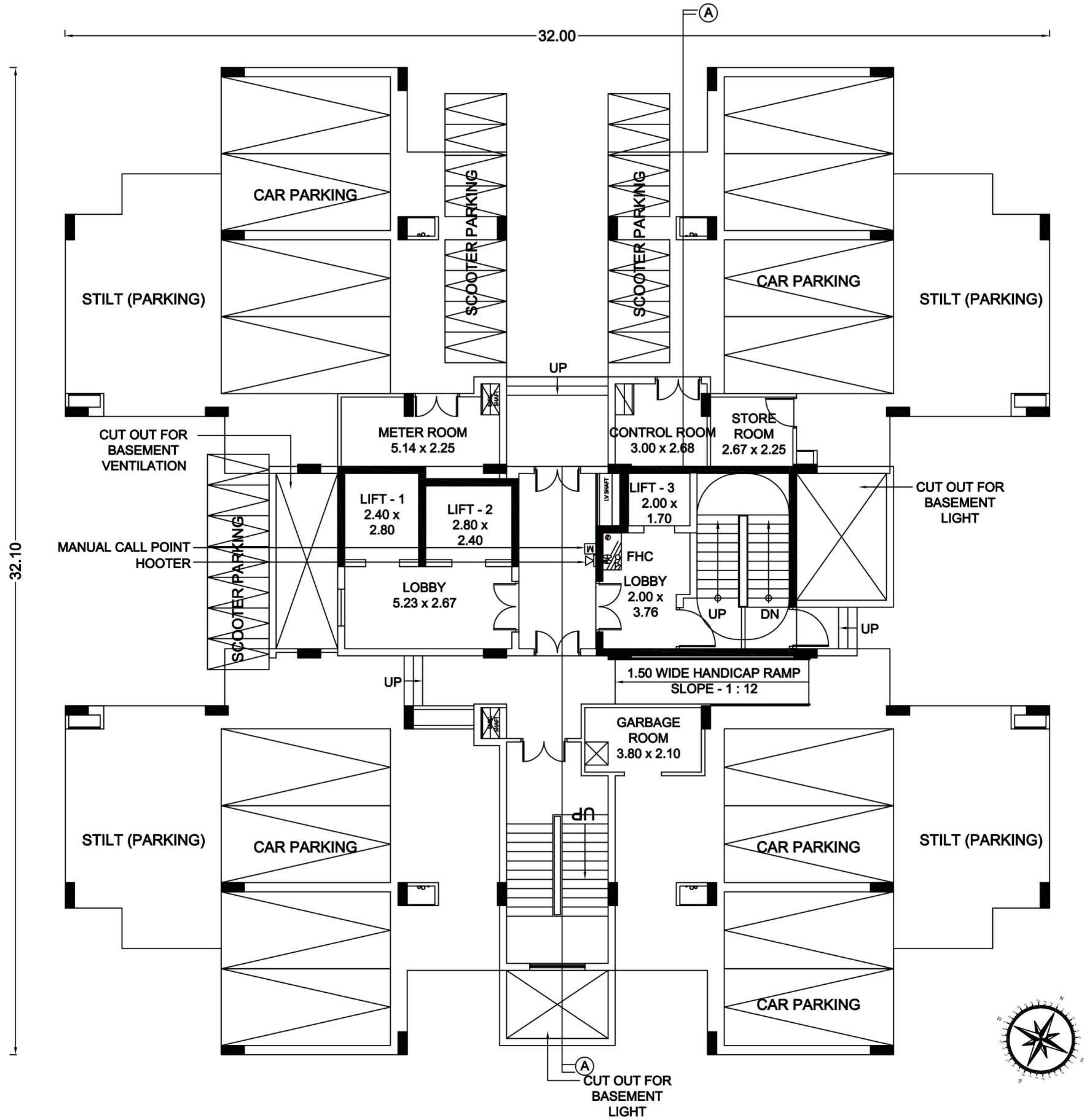
BY - ALOK RANJAN
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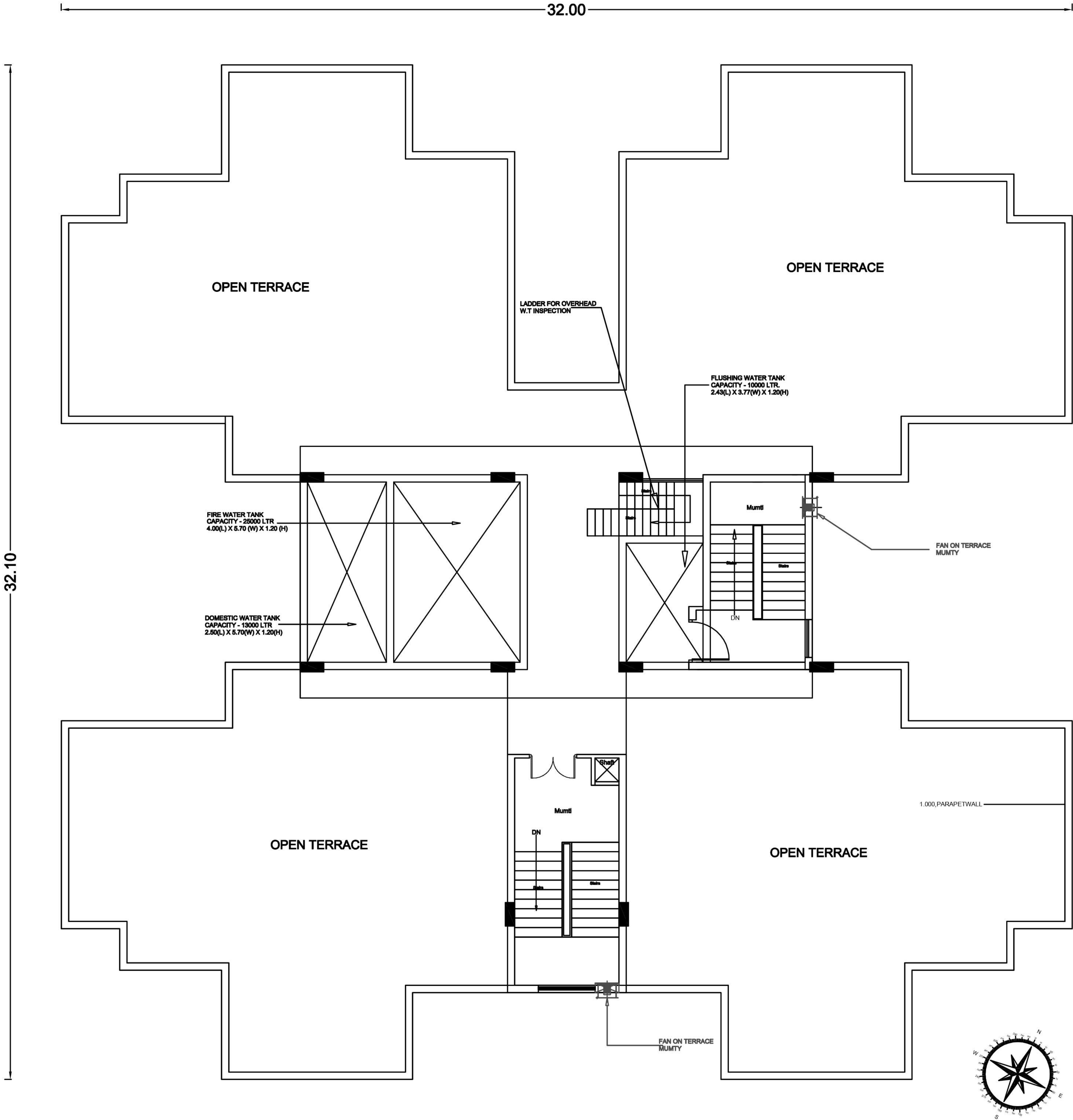


TYPICAL FLOOR PLAN (2 BHK)
FIRST TO TENTH FLOOR

AREA ANALYSIS (2BHK)	
NO. OF 3BHK UNITS IN A TOWER	40
TOTAL NO. OF 3BHK UNITS	40 x 8 = 320
CARPET AREA OF SINGLE UNIT	118 sq.m.
BUILTUP AREA OF SINGLE UNIT	137.8 sq.m.
SUPER BUILTUP AREA OF SINGLE UNIT	692 sq.m.



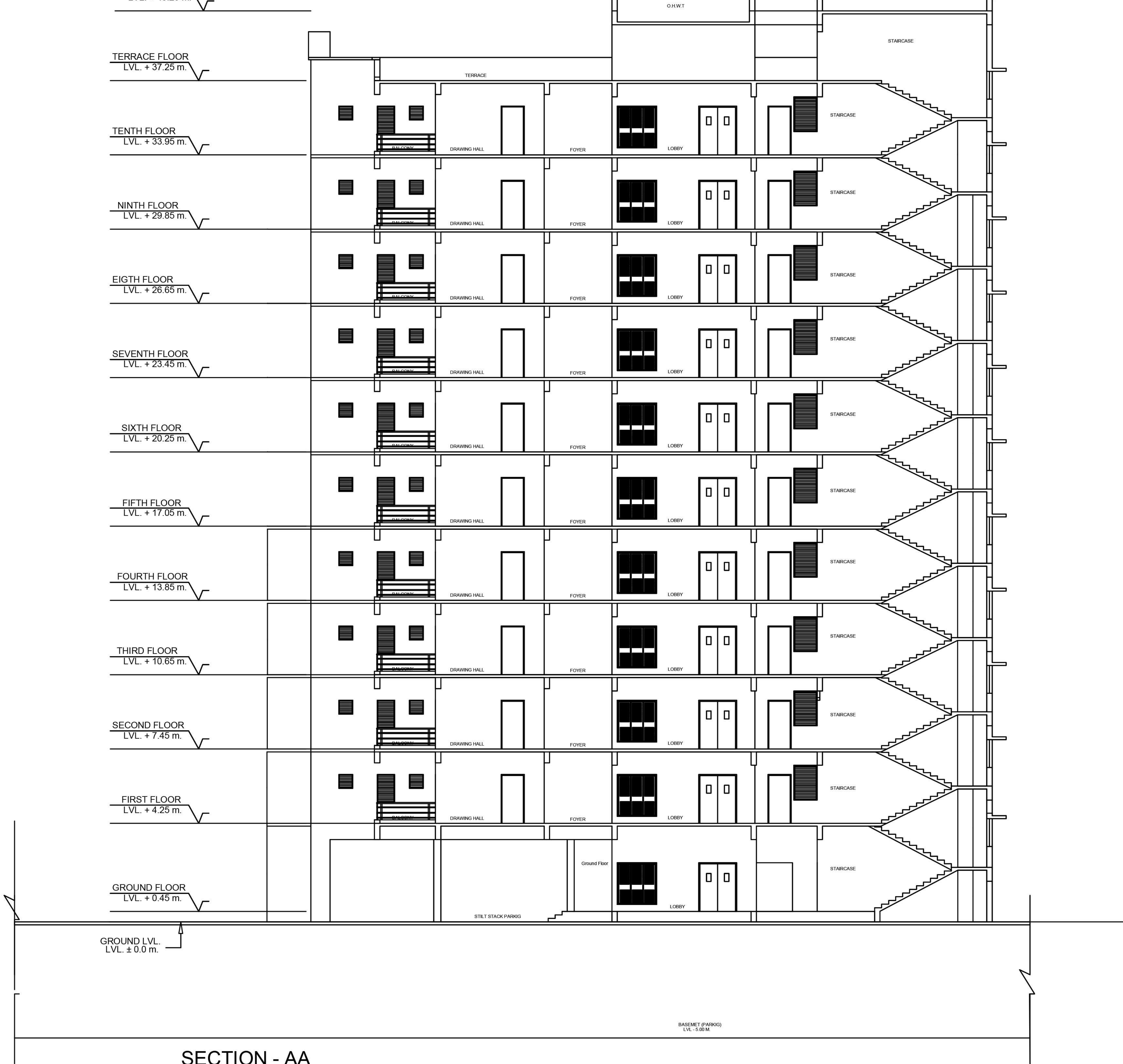
GROUND (STILT PARKING) FLOOR PLAN (2bhk)



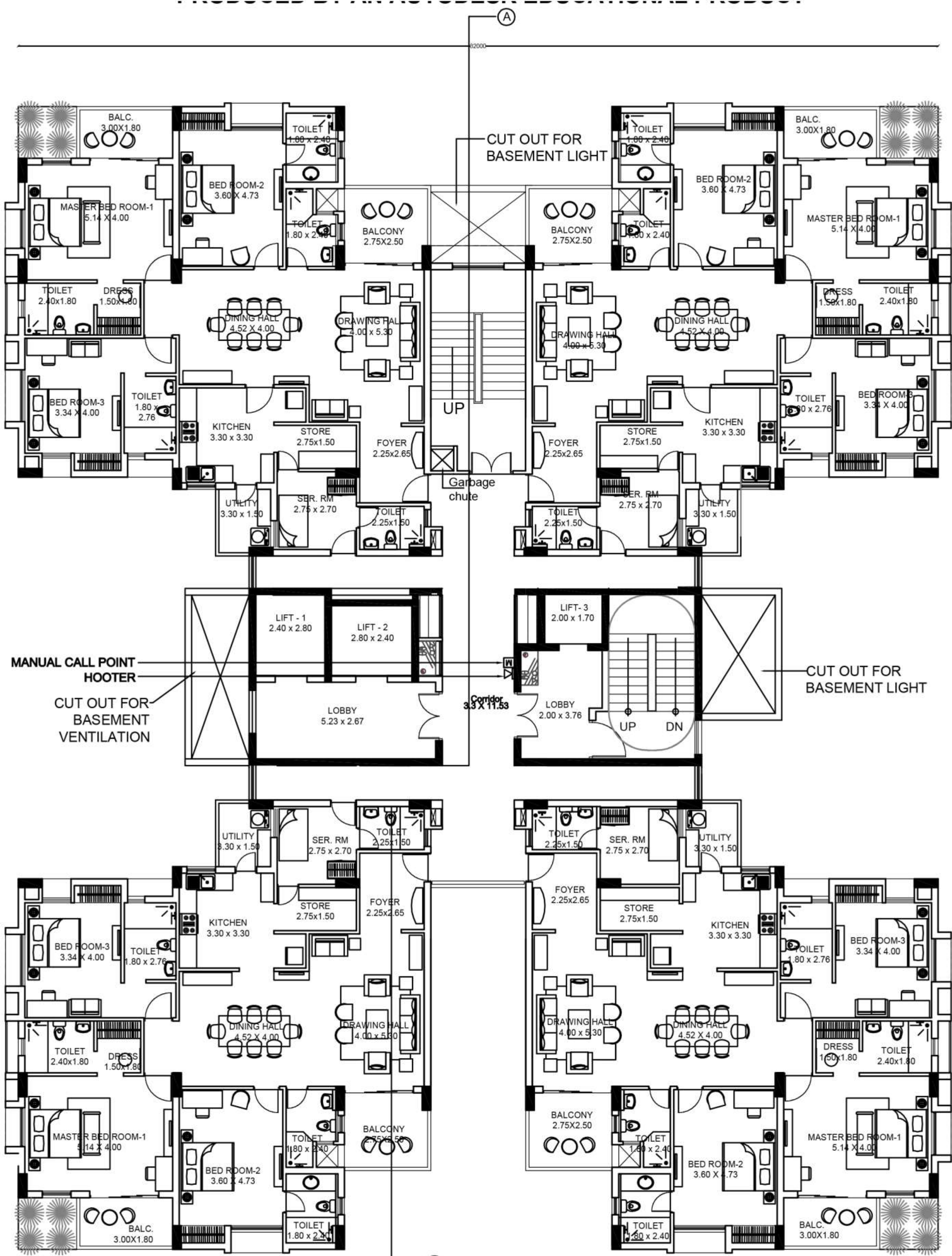
TERRACE PLAN (2 BHK)





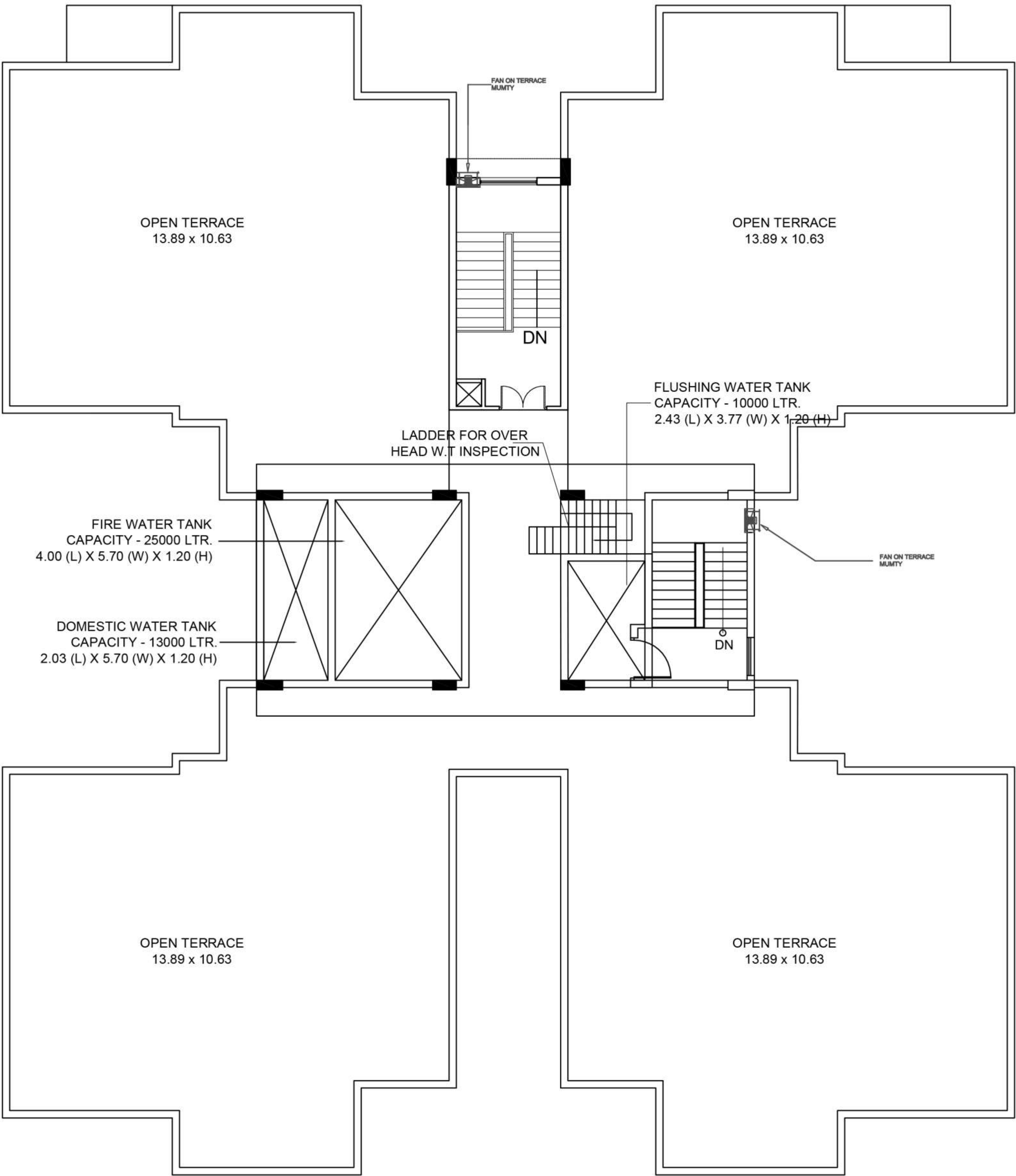


SECTION - AA



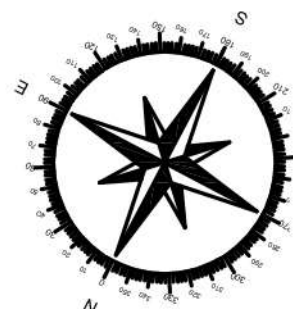
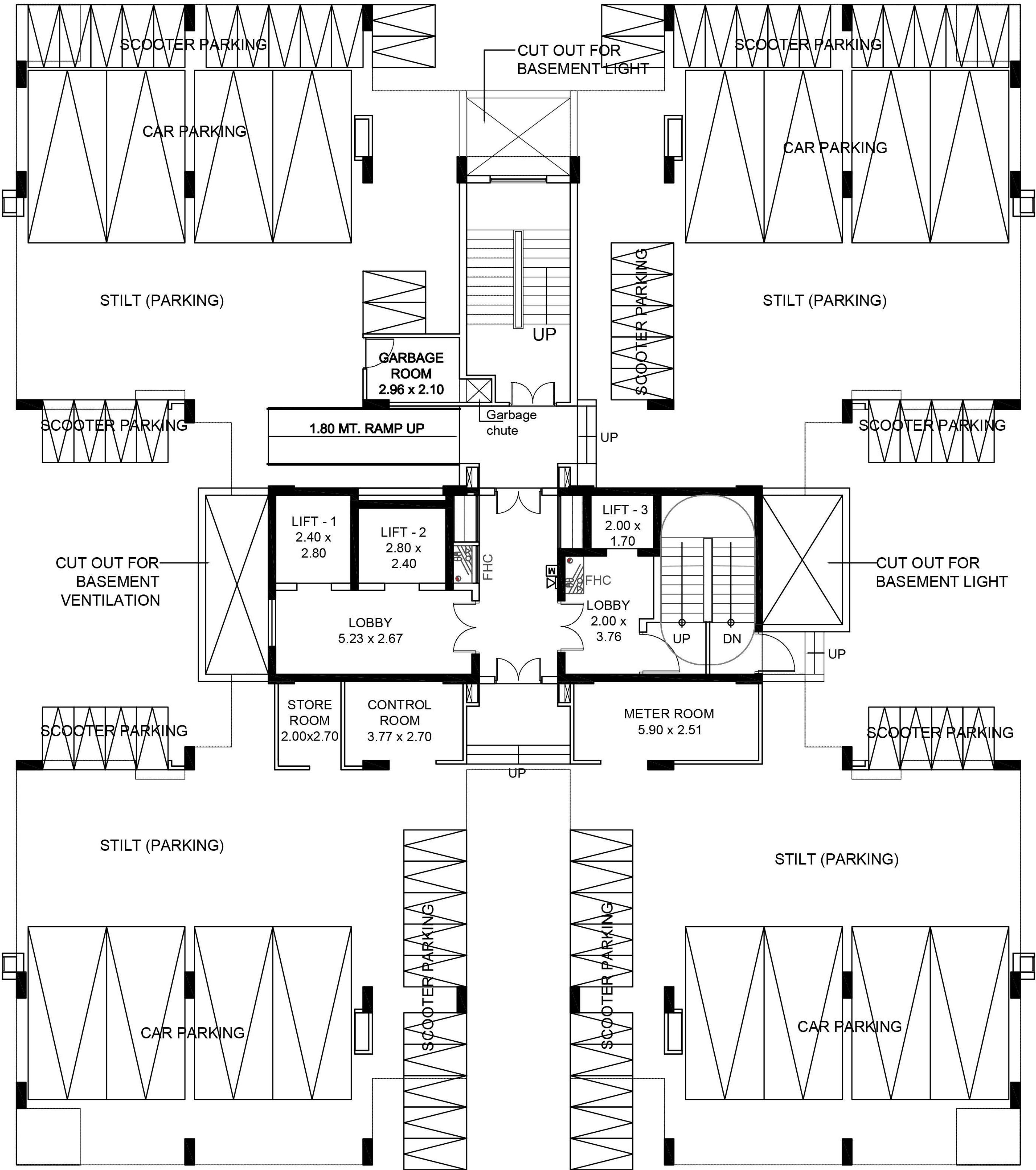
TYPICAL FLOOR PLAN (3 BHK)
FIRST TO TENTH FLOOR

AREA ANALYSIS (3BHK)	
NO. OF 3BHK UNITS IN A TOWER	40
TOTAL NO. OF 3BHK UNITS	40 x 5 = 200
CARPET AREA OF SINGLE UNIT	148 sq.m.
BUILTUP AREA OF SINGLE UNIT	175 sq.m.
SUPER BUILTUP AREA OF SINGLE UNIT	942 sq.m.



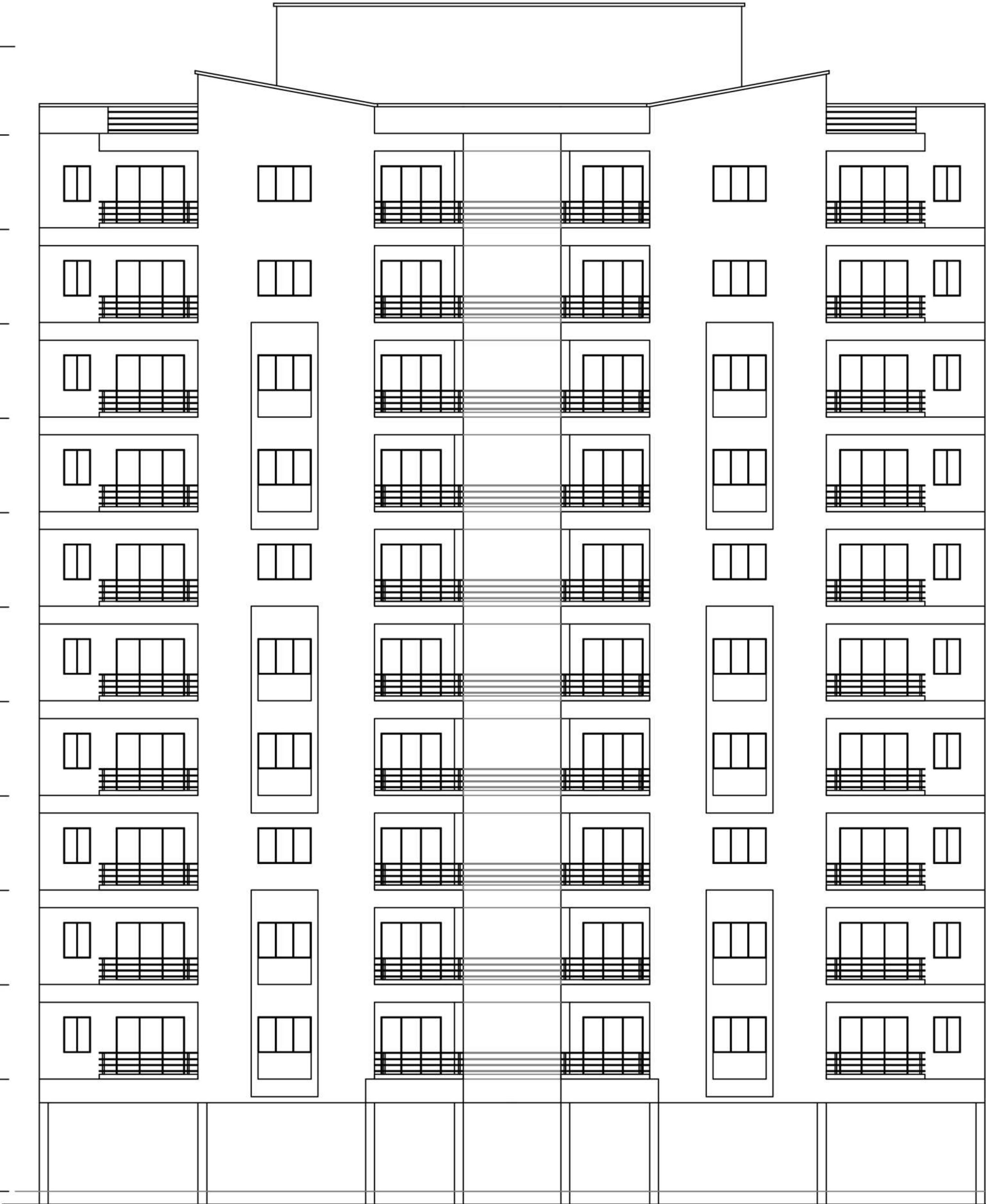
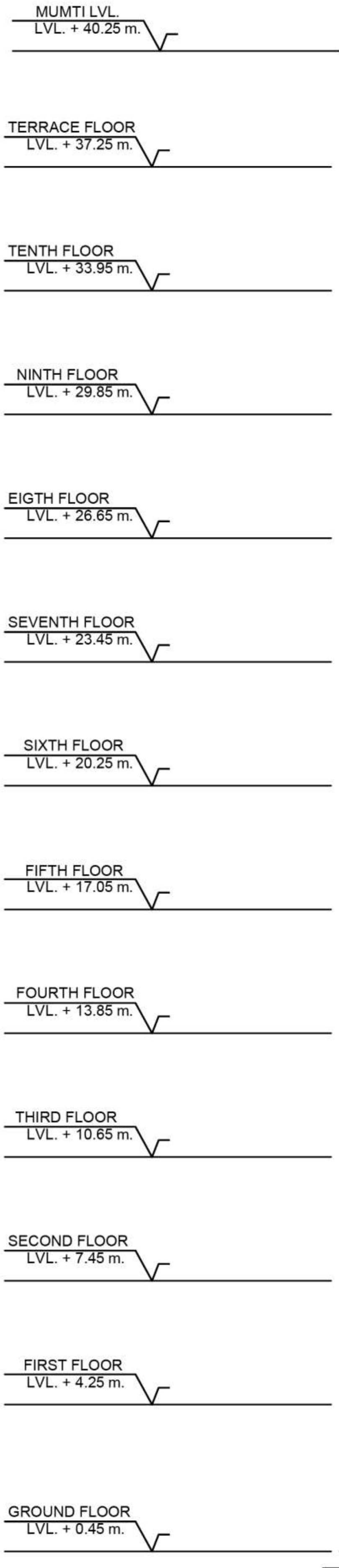
TERRACE PLAN (3 BHK)





STILT (PARKING) FLOOR PLAN

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

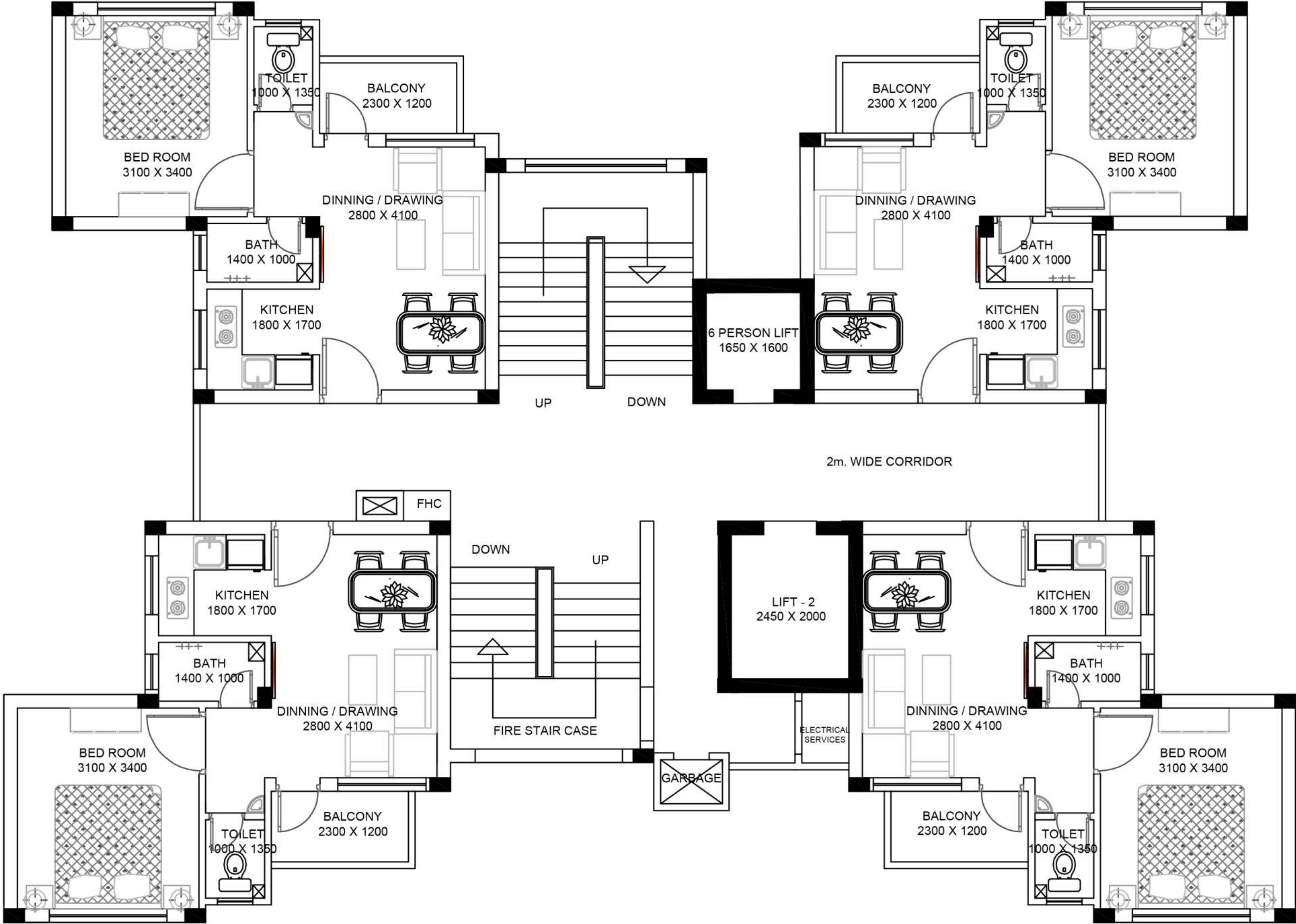


FRONT ELEVATION

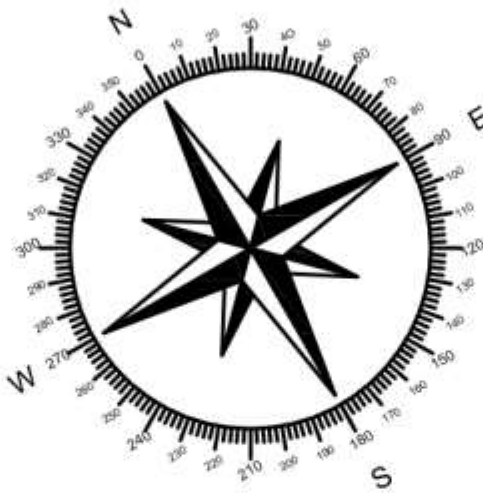


SIDE ELEVATION

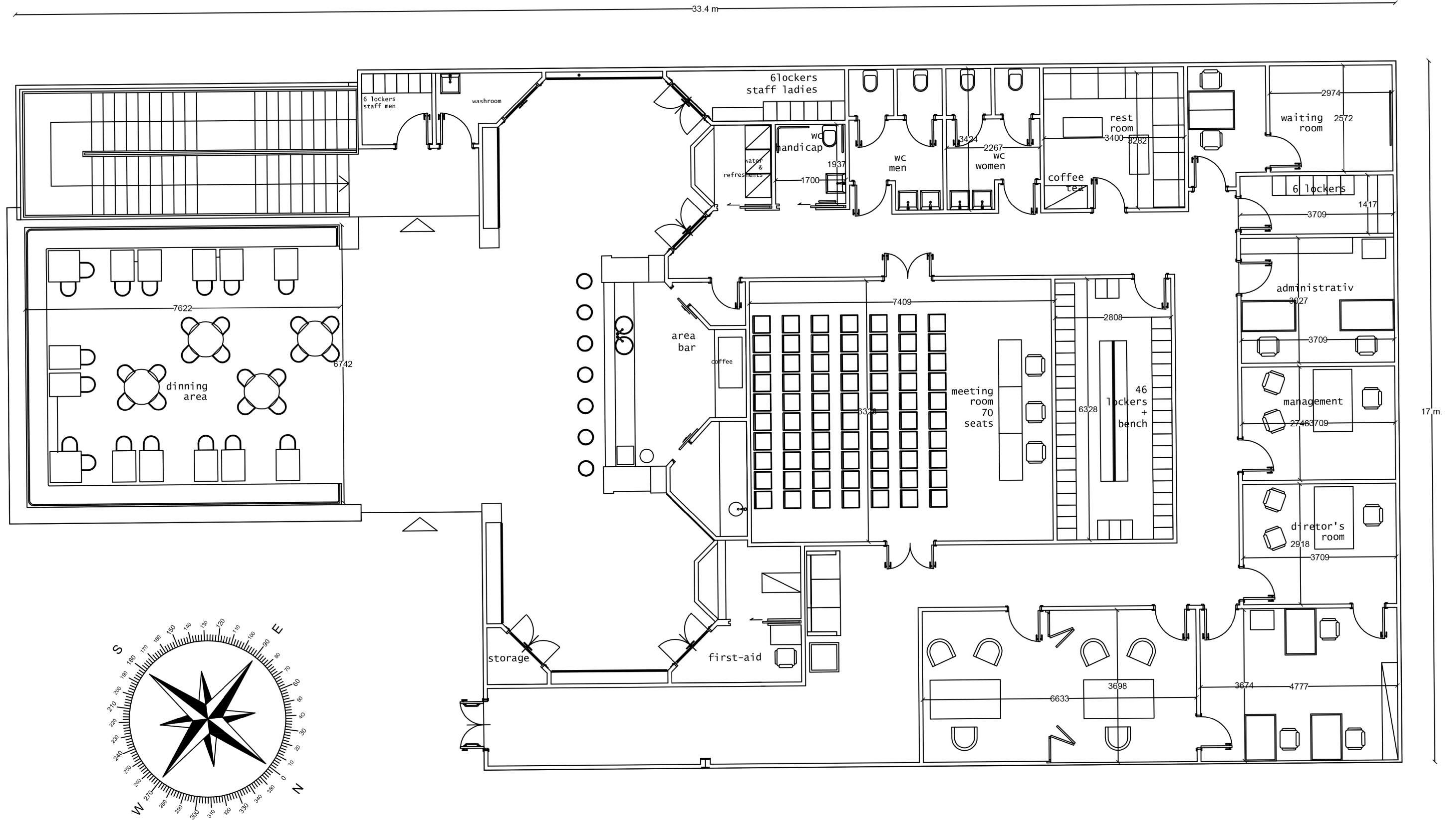




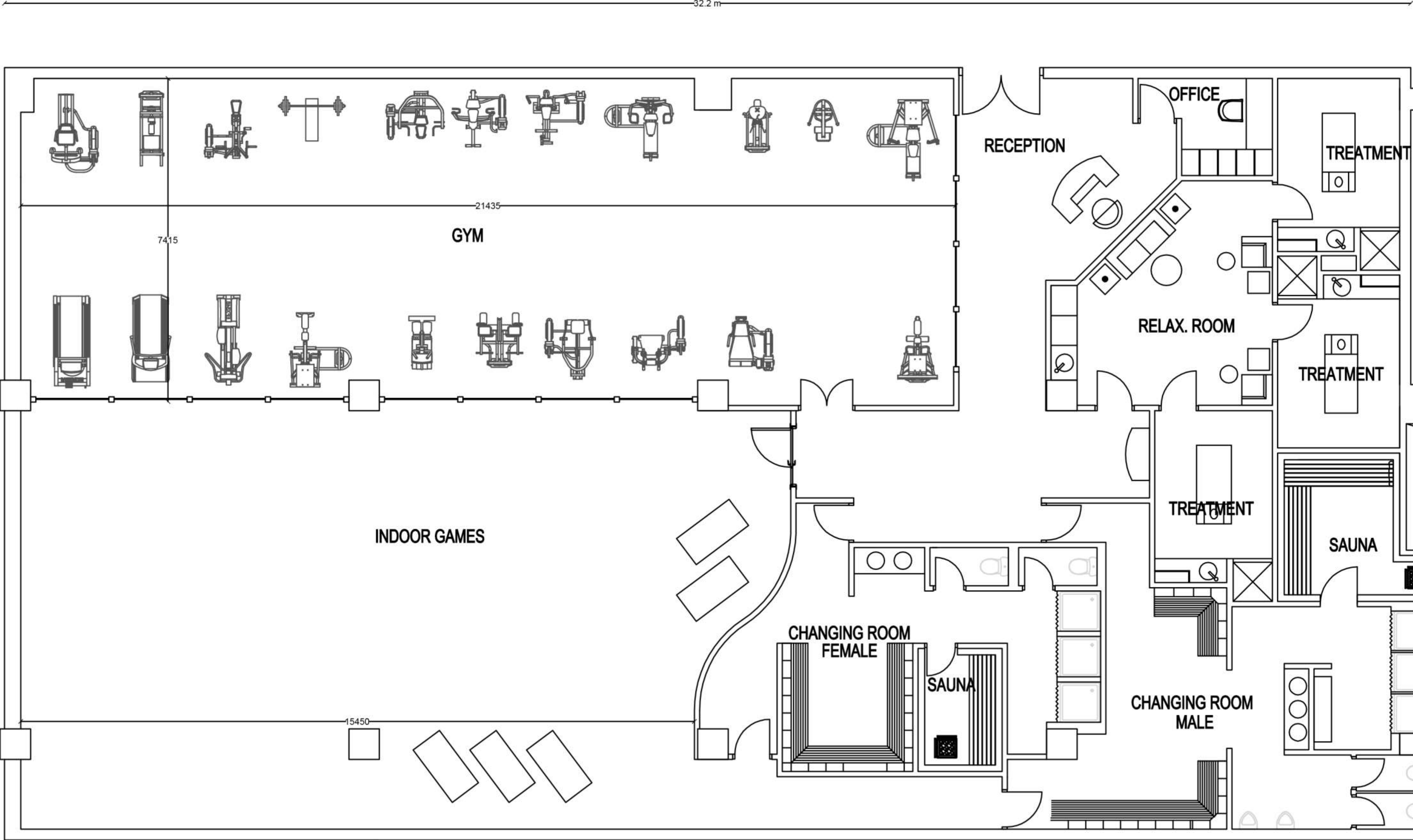
AREA ANALYSIS (EWS/LIG)	
NO. OF EWS/LIG UNITS IN A TOWER	40
TOTAL NO. OF EWS/LIG UNITS	40 X 7 = 280
CARPET AREA OF SINGLE UNIT	30 sq.m.
BUILTUP AREA OF SINGLE UNIT	40 sq.m.
SUPER BUILTUP AREA OF SINGLE UNIT	240 sq.m.



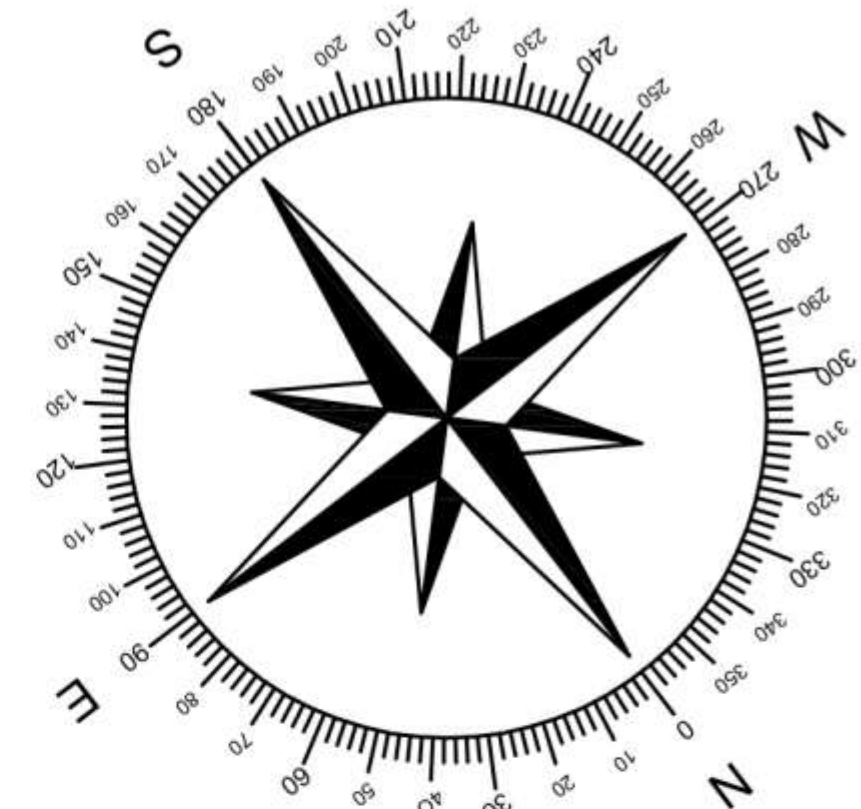
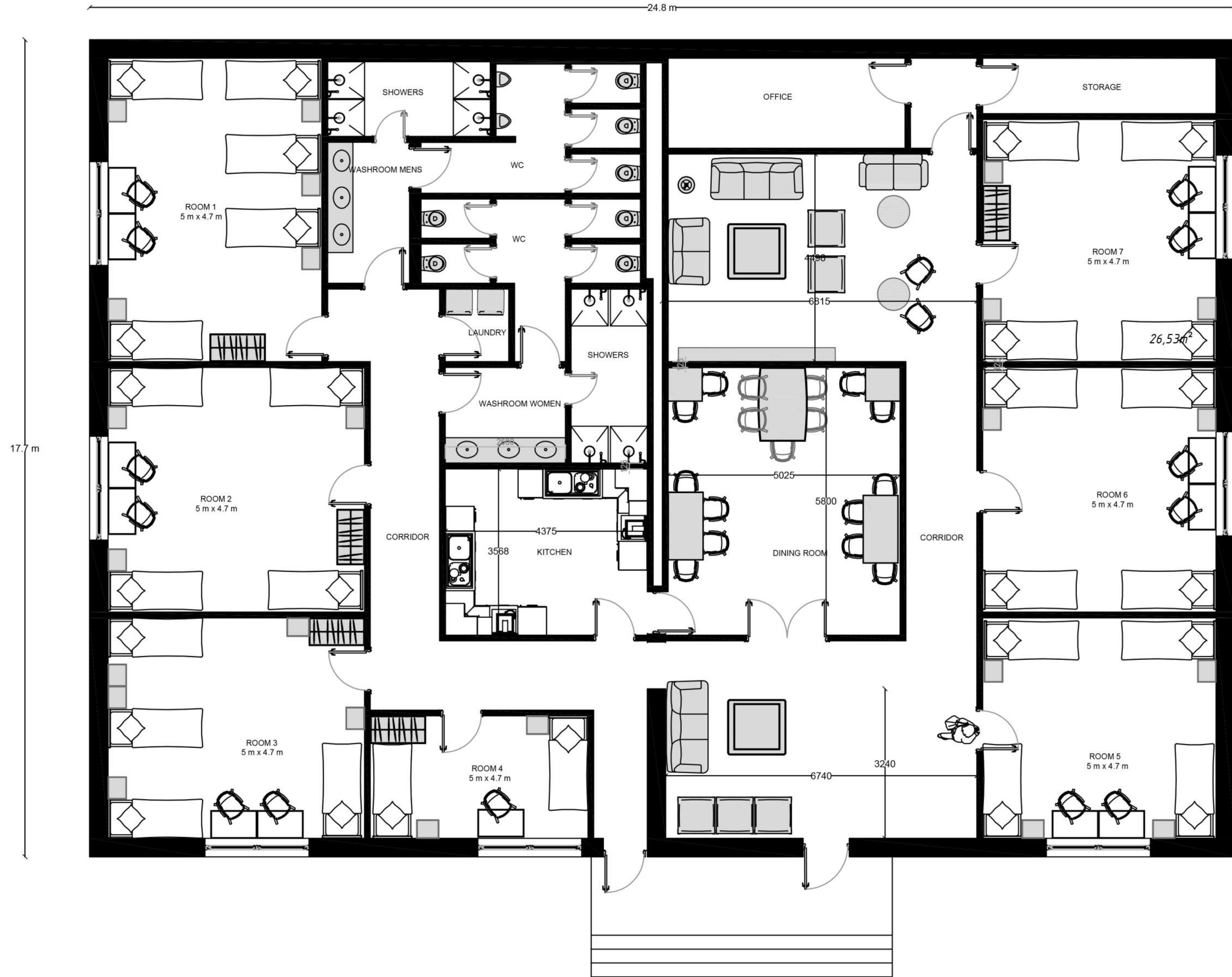
TYPICAL FLOOR PLAN (EWS/LIG)



COMMUNITY HALL AND OFFICE PLAN

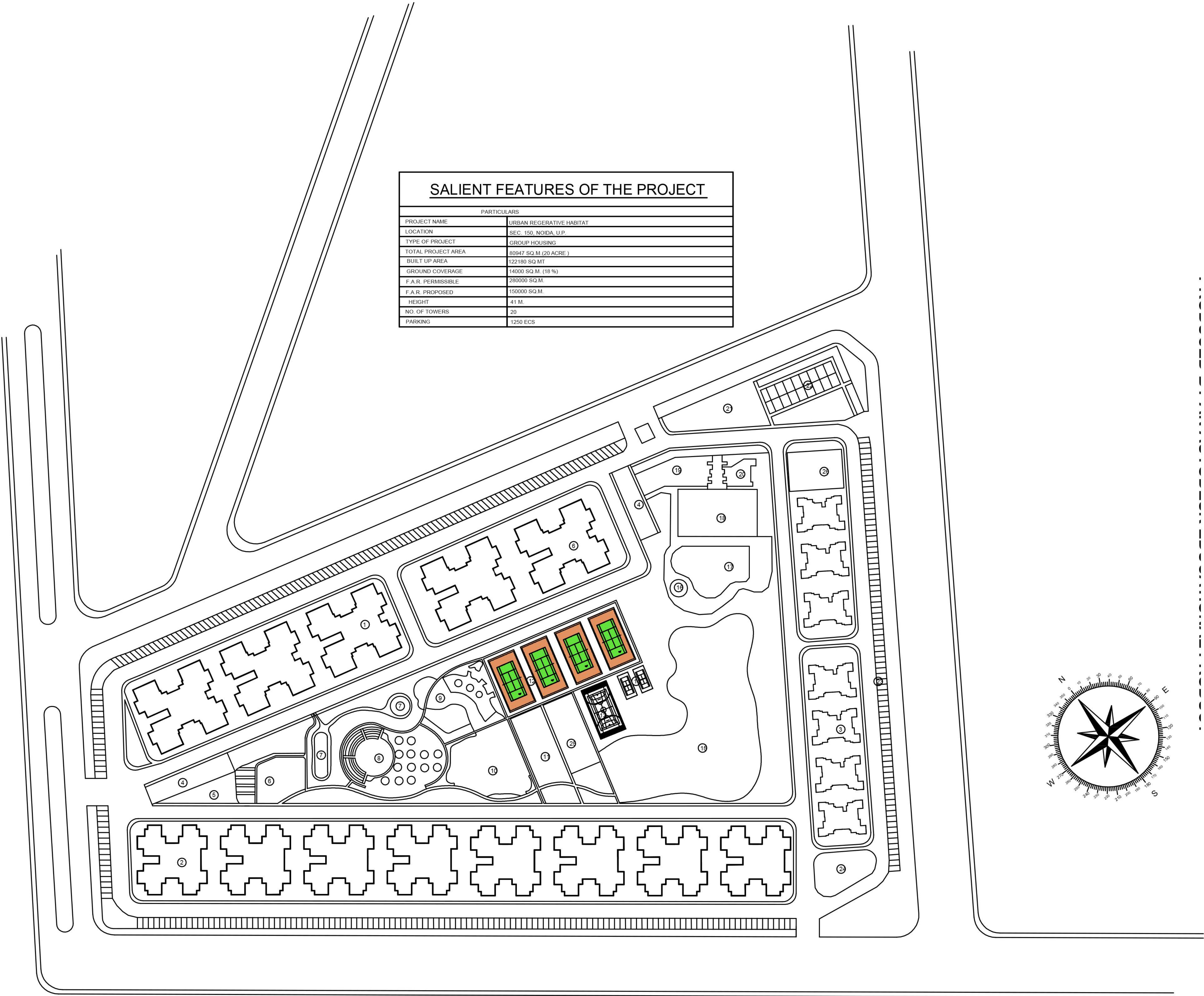


CLUB HOUSE PLAN

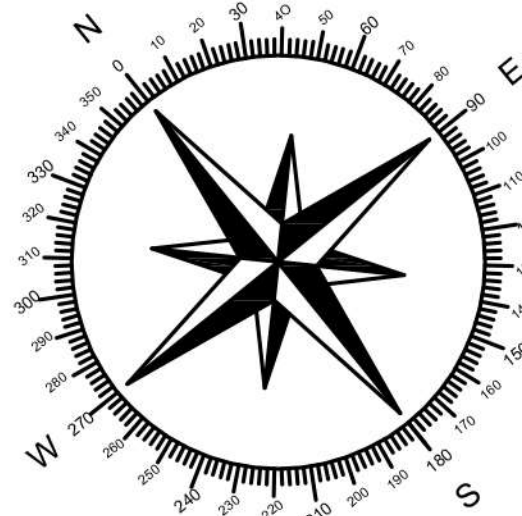


SERVANT'S QUATER PLAN

S.NO	AREA CALCULATION CHART	
	PARTICULARS	AREA
1	3BHK TOWERS	47100 SQ.M.
2	2BHK TOWERS	55360 SQ.M.
3	EWS/LIG TOWERS	16800 Sq mt.
4	SLOPE TOWARS BASEMENT	1:10
5	GREEN SPACE	275 SQ.M.
6	GARDEN	1000 Sq mt.
7	WATER BODY	170 Sq mt.
8	O.A.T.	1144 Sq mt.
9	CHILDREN PLAY AREA	1225 Sq mt.
10	GARDEN WITH SITTING	1051. Sq mt.
1 1	GREEN SPACE	632 SQ MT
12	TENNIS COURT	18945 SQ.M.
13	BASKETBALL COURT	281. Sq mt.
14	BEDMINTON COURT	146. Sq mt.
16	JACUZI	50. Sq mt.
17	SWIMMING POOL	650 SQMT.
18	CLUB HOUSE	584. Sq mt.
19	PARTY LAWN	415. Sq mt.
20	CHILDREN SWIMMING POOL	152. Sq mt.
21	SERVICES SPACE	664. Sq mt.
22	SHOPPING COMPLEX	1032. Sq mt.
23	OPEN PARKING	4375. Sq mt.
24	SERVICES AREA	386. Sq mt.
25	COMMUNITY CENTRE	561. Sq mt.
26	SERVANT QUATER	442. Sq mt.



SALIENT FEATURES OF THE PROJECT	
PARTICULARS	
PROJECT NAME	URBAN REGENERATIVE HABITAT
LOCATION	SEC. 150, NOIDA, U.P.
TYPE OF PROJECT	GROUP HOUSING
TOTAL PROJECT AREA	80947 SQ.M.(20 ACRE.)
BUILT UP AREA	122180 SQ.MT
GROUND COVERAGE	14000 SQ.M.(18 %)
F.A.R. PERMISSIBLE	280000 SQ.M.
F.A.R. PROPOSED	150000 SQ.M.
HEIGHT	41 M.
NO. OF TOWERS	20
PARKING	1250 ECS



- THANK YOU