

# **THESIS REPORT**

## **ECO RESEARCH CENTRE AT BAREILLY , UTTAR PRADESH**

**A Thesis Submitted in Partial Fulfillment of the Requirements for  
the Degree of**

## **BACHELOR OF ARCHITECTURE**

**by  
ZARISH KANWAL  
(Enrollment No.- 1170101031)**

**Under the Supervision of  
Prof. Mohit Kumar Agarwal  
Ar. Shalini Diwaker**

**Session 2021- 22**

**to the  
School of Architecture**

**BABU BANARASI DAS UNIVERSITY  
LUCKNOW**

**June, 2022**

CERTIFICATE

I hereby recommend that the thesis, entitled “**ECO RESEARCH CENTRE , BAREILLY UTTAR PRADESH** , prepared by Mr/Ms **ZARISH KANWAL** , Roll no. **1170101031** under the supervision, is the bonafide work of the student and can be accepted as a partial fulfilment for the award of Bachelors Degree School of Architecture BBDU, Lucknow.

PROF.MOHIT KUMAR AGARWAL

Dean of department

PROF. SANGEETA SHARMA

Head of department

Recommendation    Accepted  
                                 Not Accepted

.....  
External Examiner

.....  
Internal Examiner



**BABU BANARASI DAS UNIVERSITY, LUCKNOW  
(U.P.).**

**Certificate of thesis submission for evaluation**

1. Name :  
.....
2. Roll No. :  
.....
3. Thesis Title :  
.....
4. Degree for which the thesis is submitted:  
.....
5. Faculty of University to which the thesis is submitted: Yes / No
6. Thesis preparation guide was referred to for preparing the thesis. Yes / No
7. Specification regarding thesis format have been closely followed. Yes / No
8. The content 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 the sources used have been cited appropriately Yes / No
11. The thesis has not been submitted elsewhere for a degree. Yes / No
12. Submitted 3 hard bound copied plus one CD Yes / No

.....  
(Signature(s) of the supervisor)  
Name:

.....  
(Signature of the Candidate)  
Name:  
Roll No.:

## ACKNOWLEDGEMENT

Time demands that I express my gratitude to those who have been a part of my stay in **B.B.D.U.** It's been great, all these years, but life moves On...and so do we...

I express my deepest gratitude to my thesis guide **PROF . MOHIT KUMAR AGARWAL** and **AR.SHALINI DIWAKER** , for her valuable dispassionate guidance, critical discussions, suggestions and continuous support all through my B.Arch. thesis.

I express my gratitude to DEAN,**PROF. MOHIT KUMAR AGARWAL**, Department of Architecture, B.B.D.U., Lucknow, for being there to listen to and solve our problems.

I am grateful to our thesis Coordinator, **AR. ANSHUL SINGH, AR. SHAILESH YADAV** for providing his useful comments at the various stages of submissions.

Thank You' was not the exact phrase on my mind when I wrote this, it was something much deeper, but I am unable to find words for it.

I would also like to express my gratitude to various persons without whose help, this

Thesis would not have been possible Without my senior guide AR. SHAIKH FARAZ and my friend QURRAT , ARPIT.  
All the experiences that I shall relate in the following pages would not have been possible without them.

**My Family**, saying thanks is nothing, just accept this as a tribute to what you have imbibed & inspired in me.

Though words hardly express the true emotions, still I would like to thank all my near and dear ones who helped and guided me.

# MAIN CONTENT

## INTRODUCTION

- AIMS AND OBJECTIVES.....
- METHODOLOGY.....
- SCOPE OF WORK AND LIMITATIONS.....

- SITE ANALYSIS.....
- CLIMATE ANALYSIS.....

## CASE STUDY

- CASE STUDY-1  
(TERI – THE ENERGY AND RESEARCH INSTITUTE ).....
- CASE STUDY-2  
(DEVELOPMENT ALTERNATIVES).....

## LITRETURE STDUY

- LITERATURE STUDY -1  
(SUZLON ONE EARTH).....
- LITERATURE STUDY -2  
(THE VISITOR AND ADMINISTRATION CENTRE).....
- AREA ANALYSIS.....
- CONCEPT SHEETS.....
- DESIGN SHEETS.....
- AREA CALCULATION.....
- CONCLUSION.....
- BIBLIOGRAPHY.....

# INTRODUCTION

## BRIEF OUTLINE AND SHORT DESCRIPTION OF PROJECT

### WHAT IS A ECO CENTRE ?

An Eco-Center is an integrated waste management facility that is equipped with appropriate technologies to recover as much materials as possible prior to final disposal. It allows the development and operation of centralized waste processing systems.

#### □ INTRODUCTION

- As cities are rapidly expanding and their population is increasing, the topic of waste and energy is becoming urgent in terms of defining new innovative and sustainable solutions to manage and reduce the amount of waste, particularly through improving citizens' education and habits.
- To fight the problems connected with global climate change and increasing pollution, the proposed research focuses on one aspect of this problem: to define the role of the architecture and design discipline in waste management as one of the crucial aspects in finding solutions to improve the relation between city users and the city's main infrastructure.
- The main idea is to conceive waste recycling collection centres not only for their service function but for public spaces in the city. The waste collection centres can have new associated functions, such as laboratories, markets, exhibition areas and rooms for educational activities.

#### VALIDITY & JUSTIFICATION

- Garbage is an integral part of people's lives. Household waste and construction waste, medical and industrial waste could become a real problem if there was no organized waste disposal and waste management.
- The core challenge of the project was to ensure the feasibility of unconventional function such as , eco learning Centre , eco innovation Centre amongst others within the context of a developing city Centre.
- To cope up with the issue of overconsumption and waste generation in cities.
- To explore how spaces can be designed to educate and mke the users aware of the amount of waste generated regularly.
- A space which showcase and celebrate the precious resource that waste is , which demonstrates the recyclable value of the domestic waste generated in and around the site.

## **AIMS & OBJECTIVE**

### **AIM**

- To achieve a balance between human beings and nature
- To help people see beyond themselves , their own self and focus on bigger picture
- Seeking to minimize environmental impact
- Seeking to maximize economic benefit at acceptable costs
- Building on existing resources and services
- A co-ordinated approach to decision making based on data and feedback.

### **OBJECTIVE**

- To reduce and eliminate adverse impacts of waste on human health and the environment.
- To increase recycling and reuse and to convert the remaining waste into electricity.
- To minimize the use of landfills for solid waste disposal.
- To ensure the protection of the environment through an effective waste management system.
- To stabilize the quantity of waste disposed to landfill and then reduce this volume.

### **SCOPE OF WORK...**

- To educate and spread environmental awareness amongst the general public. The environmental learning centre hopes to demonstrate the implications of their activities such that they can be mindful of their actions.
- Celebrating waste by incorporating various reuse , recycle and upcycle system within the built.
- Providing employment opportunities for the waste informal sector who are current residents of the site.

### **LIMITATIONS...**

- The sites are often dangerous: As the waste management sites include the landfills to recycling units under its aegis
- These sites are highly susceptible to fungal and bacterial growth thereby leading to various diseases.
- Pollution Issues: There are many recycling factories which involve more pollution. Some gases emitted during the recycling process like Methane can contribute to global warming and the ozone diminution if not managed properly and allowed to leak in the open.

# SITE ANALYSIS

## **ABOUT THE PROJECT:-**

- Site area - 8 acres
- Location - Babia village , Bukhara faridpur road Bareilly , 243004
- Latitude -  $28^{\circ} 22' 32.4984''$  N
- Longitude- $79^{\circ} 26' 9.4524''$  E.
- Land type - Flat surface land with no contour.
- Access road - Bukhara Faridpur Road
  - Soil type -Bareilly type 2 ( khaddar or low-land soil) this type of soil is found in all tehsils in younger alluvial plain or low land along the river courses and characterized by generally ash grey to brownish grey color on the surface and texture is salty loamy sand or sandy.



VIEW 1



VIEW 2

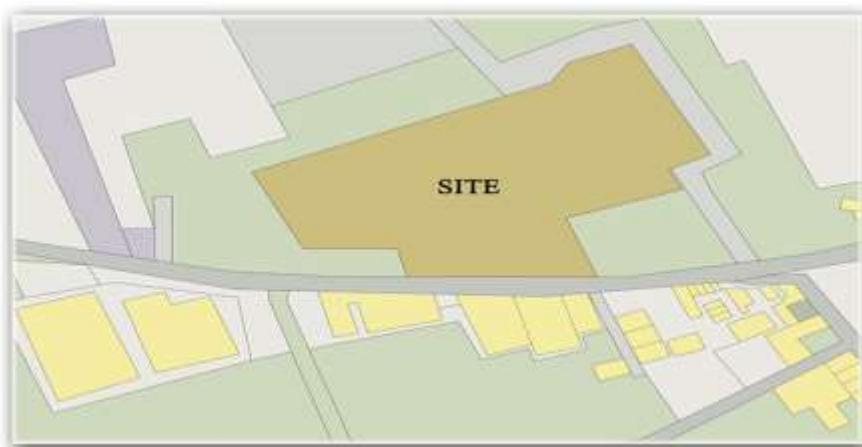


SECTION X-X'



SECTION Y-Y'





Bukhara faridpur road



The site

Site area – 32407 sq mt  
- 8 acres

#### DEMORGRPAHY OF THE AREA

- Hindi is the local language .
- block name - kyara block
- altitude - 168 metres above sea level
- area - 572.63 hectare
- population - 2039
- house hold - 392
- female population- 943

#### CONNECTIVITY

- BUS STATION  
satellite bus station  
nekpur bus stand -5-10 km
- RAILWAY  
Ram ganga railway station ,5- 10 kms

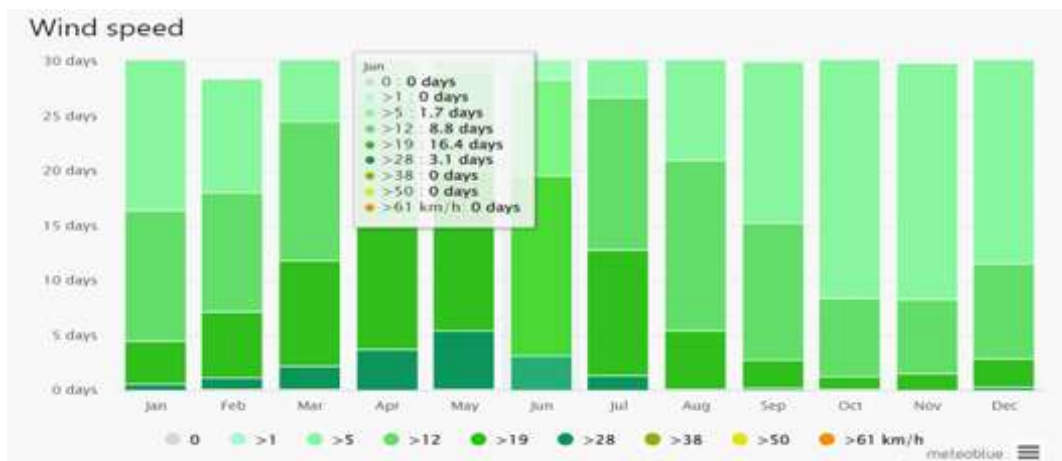
## CLIMATE DETAILS

- Bareilly has humid sub tropical climate with hot summers and cool winters.
  - The average temperature for the year is 25 °C.
- June, the warmest month, with an average temperature of 32.8 °C
- The coolest month of the year is January, with an average temperature of 15 °C.

| Month                                        | Jan            | Feb            | Mar             | Apr             | May             | Jun             | Jul              | Aug              | Sep             | Oct             | Nov            | Dec            | Year               |
|----------------------------------------------|----------------|----------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|-----------------|-----------------|----------------|----------------|--------------------|
| Record high °C (°F)                          | 29.4<br>(84.9) | 34.0<br>(93.2) | 41.6<br>(106.9) | 45.5<br>(113.9) | 46.7<br>(116.1) | 47.3<br>(117.1) | 46.0<br>(114.8)  | 40.6<br>(105.1)  | 38.7<br>(101.7) | 38.3<br>(100.9) | 36.1<br>(97.0) | 30.0<br>(86.0) | 47.3<br>(117.1)    |
| Average high °C (°F)                         | 20.6<br>(69.1) | 24.7<br>(76.5) | 30.5<br>(86.9)  | 37.2<br>(99.0)  | 39.1<br>(102.4) | 38.2<br>(100.8) | 34.2<br>(93.6)   | 33.3<br>(91.9)   | 33.0<br>(91.4)  | 32.2<br>(90.0)  | 28.1<br>(82.6) | 23.0<br>(73.4) | 31.2<br>(88.2)     |
| Average low °C (°F)                          | 8.6<br>(47.5)  | 11.4<br>(52.5) | 15.7<br>(60.3)  | 21.3<br>(70.3)  | 25.1<br>(77.2)  | 28.7<br>(83.1)  | 26.4<br>(79.5)   | 26.0<br>(78.8)   | 24.5<br>(76.1)  | 19.9<br>(67.8)  | 14.3<br>(57.7) | 9.9<br>(49.8)  | 19.2<br>(66.6)     |
| Record low °C (°F)                           | 0.6<br>(33.1)  | 0.0<br>(32.0)  | 5.0<br>(41.0)   | 11.1<br>(52.0)  | 16.1<br>(61.0)  | 18.9<br>(66.0)  | 17.4<br>(63.3)   | 20.9<br>(69.6)   | 16.7<br>(62.1)  | 8.9<br>(48.0)   | 5.1<br>(41.2)  | 1.7<br>(35.1)  | 0.0<br>(32.0)      |
| Average rainfall mm (inches)                 | 18.7<br>(0.74) | 29.0<br>(1.14) | 13.5<br>(0.53)  | 12.0<br>(0.47)  | 32.3<br>(1.27)  | 119.4<br>(4.70) | 335.9<br>(13.22) | 310.0<br>(12.20) | 214.4<br>(8.44) | 35.0<br>(1.38)  | 4.6<br>(0.18)  | 12.2<br>(0.48) | 1,136.9<br>(44.76) |
| Average rainy days                           | 1.4            | 2.1            | 1.8             | 1.0             | 2.3             | 5.6             | 11.9             | 11.9             | 7.4             | 1.3             | 0.4            | 0.9            | 48.0               |
| Average relative humidity (%) (at 17:30 IST) | 65             | 52             | 40              | 27              | 33              | 47              | 70               | 75               | 71              | 60              | 62             | 66             | 56                 |

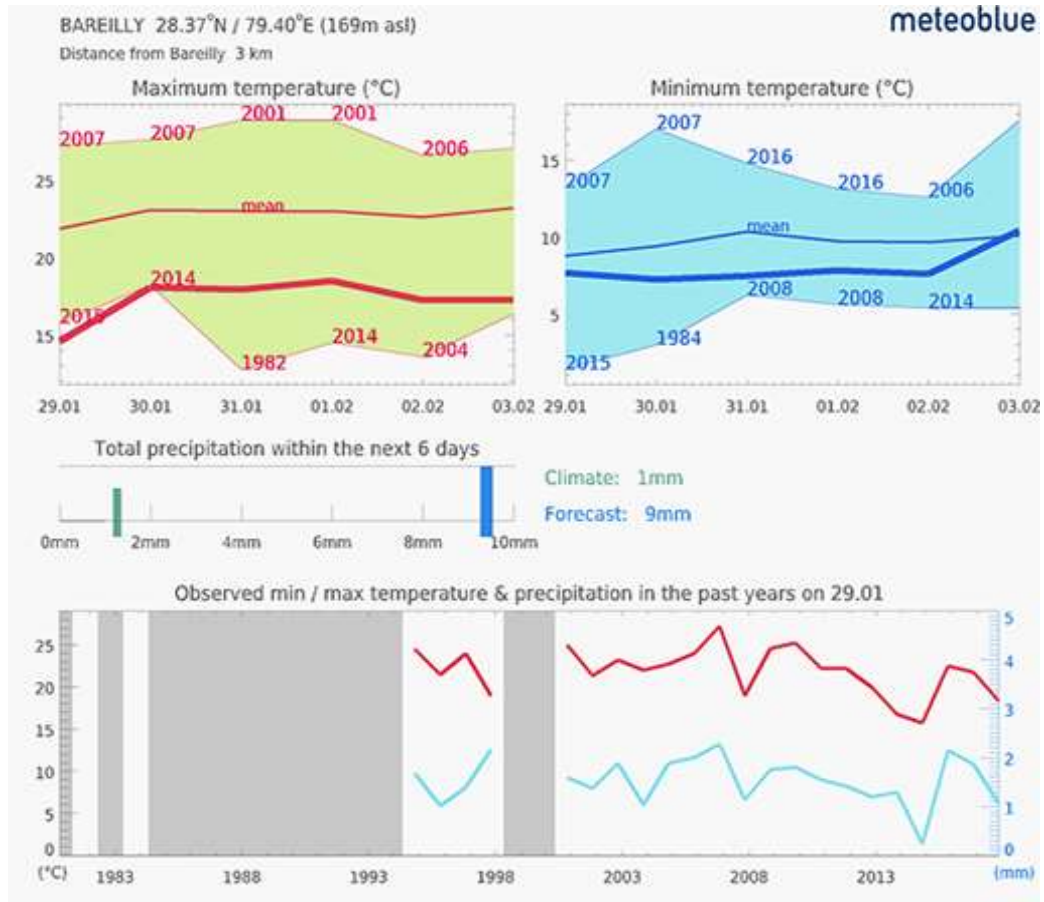
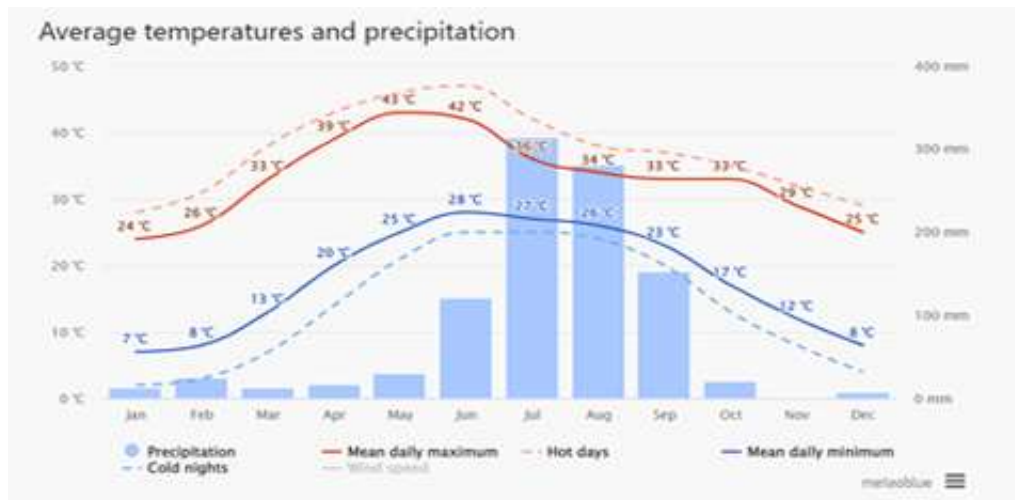
During the peak monsoon period that is august and september and in mid winter season ( december ) the relative humidity is at highest level ranging between 79% and 84% while lowest around 38% during peak summers (april and may)

- The wind speed is generally highest 7.3km /hr and lowest 2.2 km/hr.
- The average annual wind speed is 4.8km/hr.



- The summer monsoon is the major source of rainfall which generally last from mid june to mid october , july and august to be the wettest month receiving about 319.6 mm and 312.1mm rainfall respectively
- The highest annaual rainfall recorded as 1236.8mm and lowest as 979.1 mm

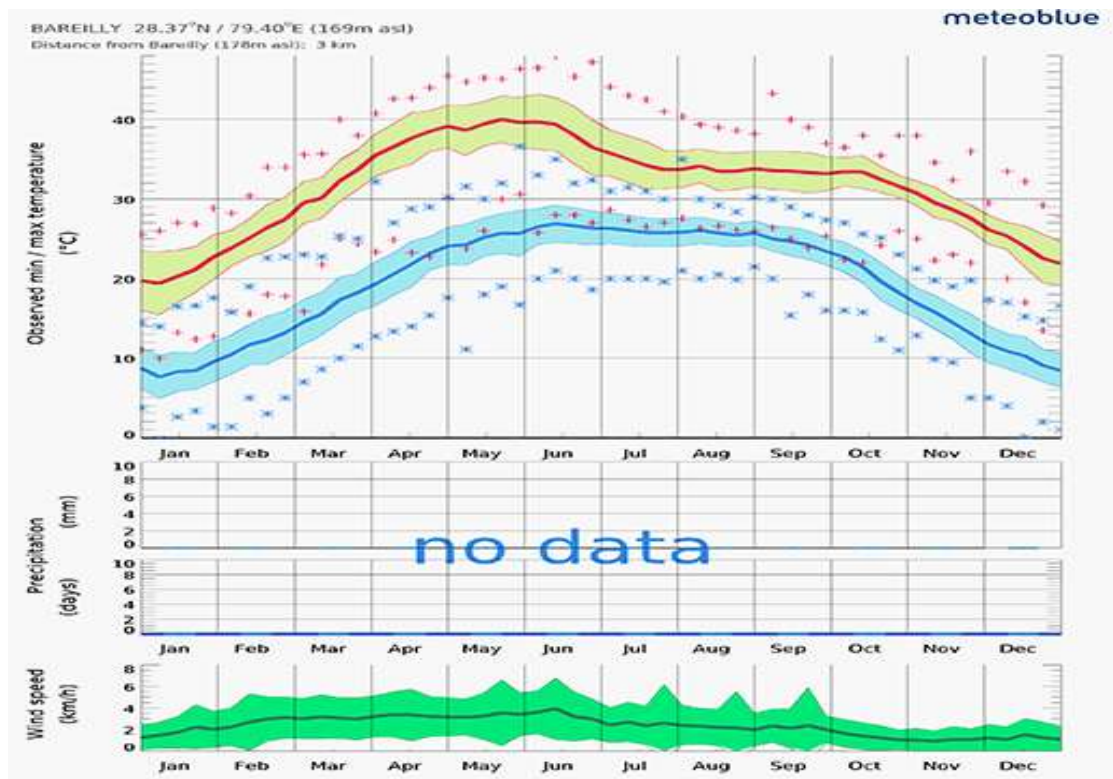
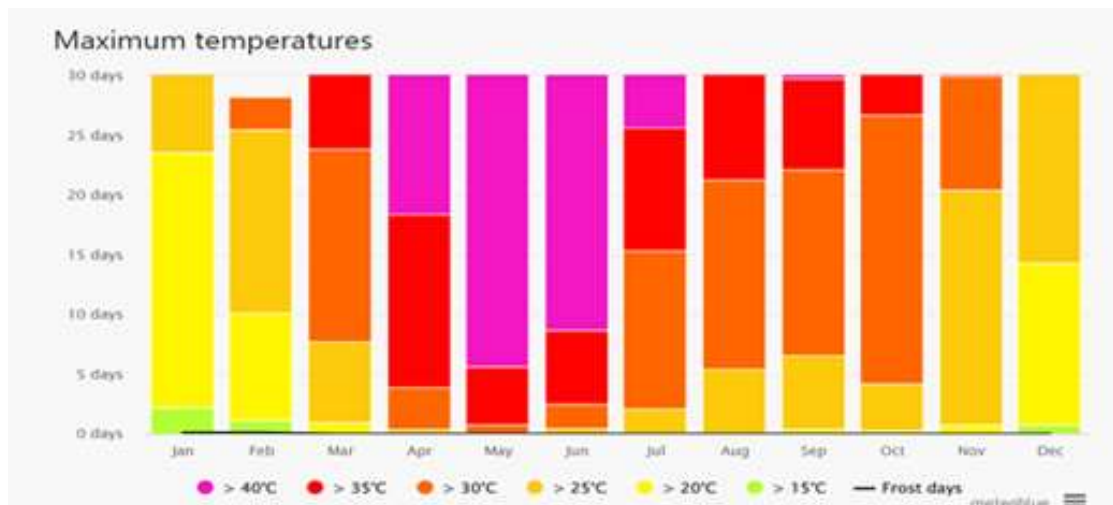
## CLIMATE DETAILS



- The maximum temperature diagram for Bareilly displays how many days per month reach certain temperatures.
- The max mean atmospheric temperature 40°C in the month of may and lowest is 8° C in jan.
- The average annual observed is 31°C and 18.9°C.

## CLIMATE DETAILS

- In Bareilly, the average percentage of the sky covered by clouds experiences *extreme* seasonal variation over the course of the year.
- The *clearer* part of the year in Bareilly begins around *September 7* and lasts for *9.9 months*, ending around *July 3*.
- The clearest month of the year in Bareilly is *October*, during which on average the sky is *clear, mostly clear, or partly cloudy* 93% of the time.
- The *cloudier* part of the year begins around *July 3* and lasts for *2.1 months*, ending around *September 7*.
- The cloudiest month of the year in Bareilly is *August*, during which on average the sky is *overcast or mostly cloudy* 57% of the time.



**CASE STUDIES – 01**  
**TERI – THE ENERGY AND**  
**RESEARCH INSTITUTE**





Year - 2008

Owner - TERI

Location - Vasant Kunj , New Delhi

Latitude - 28.492681

Longitude - 77.141394

Architect - Sanjay mohe architects and TERI

Building type - Institutional

Type - Semi intensive , Test / Research

Size - 74320 sqmt

Access - Semi private / private

## INTRODUCTION

Built in vasant kunj , New Delhi this four storeyed structure in masonry , with stone cladding and glazings , is an example of a sustainable campus responding to the site and environment using energy saving technologies.

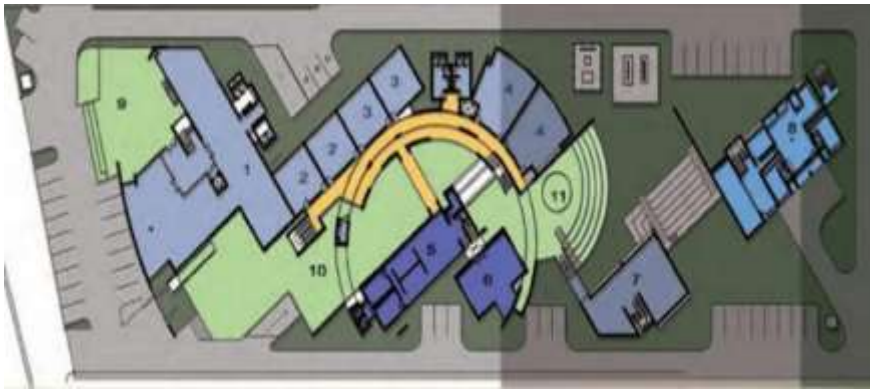
- The north block is made slightly concave towards the front. South forms a hybrid convex surface facing the winter sun.
- The point of the south block broadly falls on the surface of large imaginary cones that generated the slightly free geometry & this allow the architecture to break away the grid iron approach normally associated with solar architecture
- The building is oriented along east west direction . the building is consciously freed from the confines of a strict orientation in order to demonstrate that though energy- conscious architecture needs to be somewhat oriented, the orientation need not be rigid and interesting patterns can be formulated for architectural purposes.

## SITE LOCATION



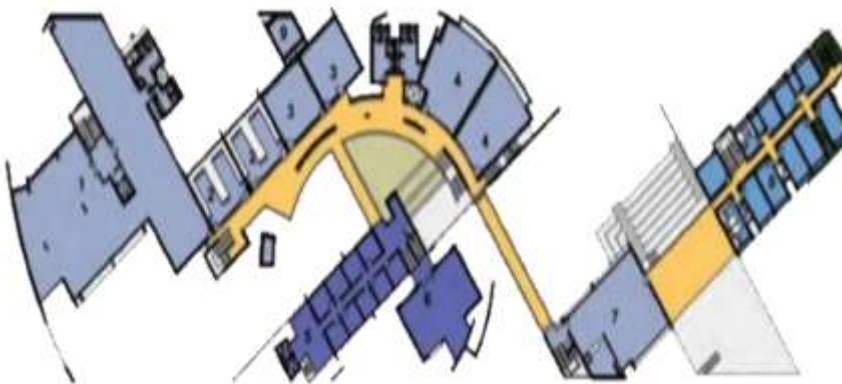
South view of facade

- Winds are generally light but gain force in the summer and monsoon seasons.
- Building designed as such wind direction can be redirected.
- Deciduous trees used in the south to shade the building in summers.
- In winters trees shed their leaves thus letting in winter sun.
- South side partially sunk into ground to reduce heat gains and loses.
- East and west devoid of opening are shaded.
- The sections are designed such that hot air rises to the top and make the building breathe.
- Air in the cavity in the south wall on the south creates negative pressure, thereby enhancing the convection currents in the building.



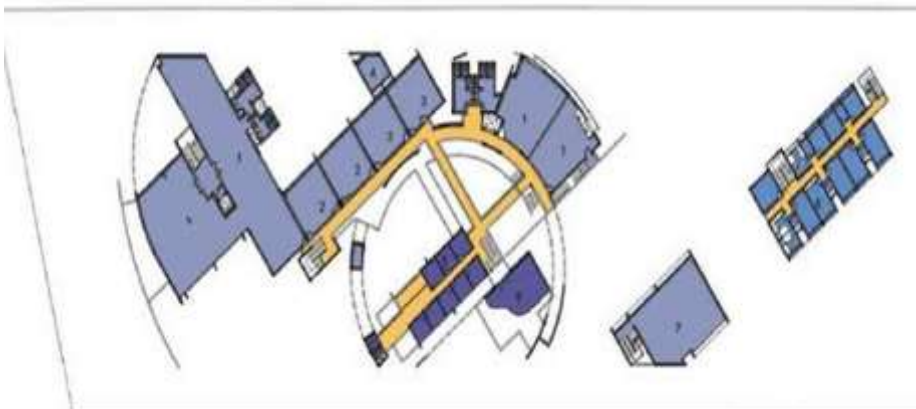
- 1 Commercial Block,
- 2 Classrooms,
- 3, 4 Laboratories,
- 5,6 administrative block,
- 6 accounts,
- 7 dining hall,
- 8 hostel,
- 9, 10, courts,
- 11 Open Air Theatre

Site Plan and Ground Floor Layout (bottom)



- 1 Office
- 2 Lab
- 3 Classroom
- 4 Lecture hall
- 5 Administration hall
- 6 Account
- 7 Staff dining
- 8 Hostel room
- 9 Thermal mass Tower

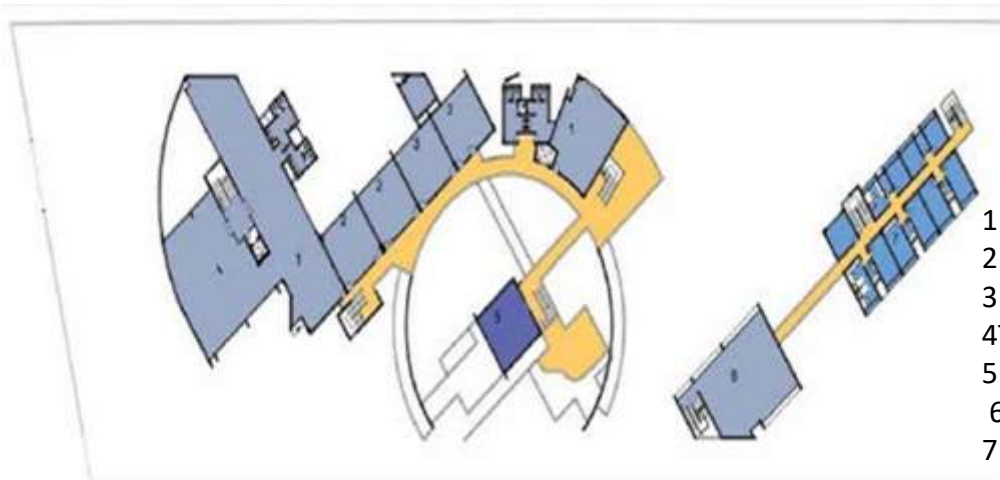
first Floor Plan



- 1 Office
- 2 Lab
- 3 Classroom
- 4 Thermal mass tower
- 5 Administration cabin
- 6 Meeting room
- 7 Office space
- 8 Hostel room

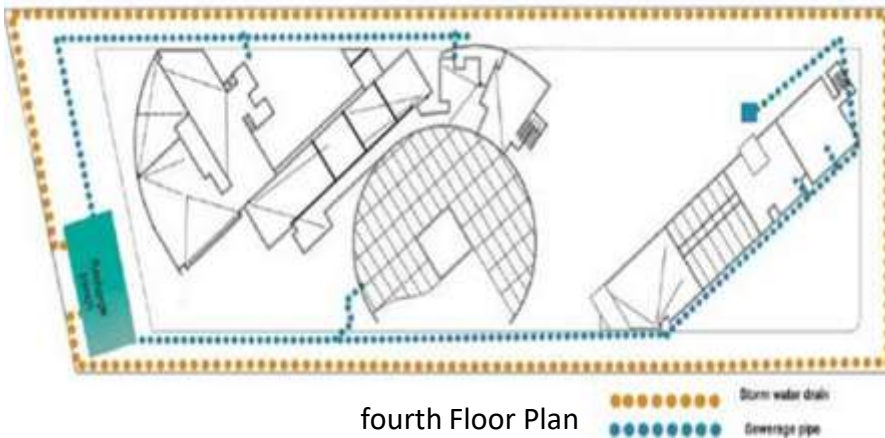
Second Floor Plan

- The logical sequence of positioning the three distinct functioning zones in a hierarchy of public access to restricted entry formed the other key consideration in design development.
- The linear geometry of the site with a narrow frontage and an aspect ratio of almost 1:3 dictated the strong linear axis in the design.



- 1 Office
- 2 Lab
- 3 Classroom
- 4 Thermal mass tower
- 5 Administration cabin
- 6 Office space
- 7 Hostel room

Third Floor Plan



- 1 Office
- 2 Classroom
- 3 Thermal mass tower
- 4 Administration cabin
- 5 Office space
- 6 Recreation area

fourth Floor Plan

## DESIGN FEATURES

- Roof insulated with vermiculite concrete and china mosaic white finish.
- Insulated walls using expanded polystyrene insulation.
- Shading devices and fenestration have been designed to cut off summer I sun & let in winter sun.
- Glare free day lights used through specially designed skylights.

## ENSURING A SUSTAINABLE SUPPLY OF ENERGY

Some of the innovative ways of tapping solar energy and using energy more efficiently at RETREAT are

1. Solar passive design
2. Solar water heater,
3. PV (photovoltaic) panels,
4. Gasifier,
5. Underground earth tunnels
- 6.. Absorption chillers
7. Waste water recycling.
8. Energy efficient lighting



Vermiculture Concrete

- All geometry of the built has been tilted for maximum exposure to the north face.
- The southwest face is treated with thermal insulation and louver system.

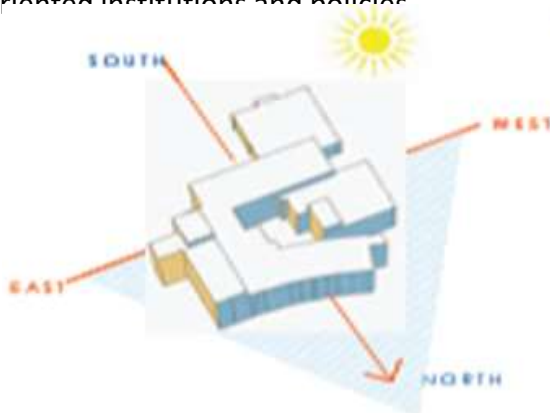


**CASE STUDIES – 02**  
**DEVELOPMENT ALTERNATIVES**

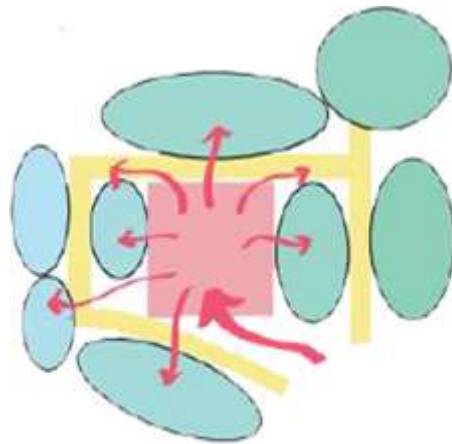


## INTRODUCTION

- The Development Alternatives World Headquarters, located in New Delhi, is one of the first buildings in India that aims at Zero Emissions.
- Development Alternatives (DA), the world's first social enterprise dedicated to sustainable development, is a research and action organisation striving to deliver socially equitable, environmentally sound and economically scalable development outcomes.
- DA's green technology innovations for habitat, water, energy and waste management, which deliver basic needs and generate sustainable livelihoods, have reduced poverty and rejuvenated natural ecosystems in the most backward regions of India.
- Its activities broadly cover three primary areas that underlie any sustainable development process: the design and large-scale dissemination of appropriate technologies, rational environmental management systems, and equitable people-oriented institutions and policies.



- location : New delhi ,Qutab Institutional Area
- climatic zone : tropical , composite.
- type of building use : office resource centre and conference facilities
- Plot size : 3116 sqm
- Building volume: Basement: 5,479 m<sup>3</sup>  
superstructure: 10,160 m<sup>3</sup>
- Gross floor area: 4,775 m<sup>2</sup>
- Number of finished floors: 5 above grade, plus basement.
- Occupancy : 250 - 300
- Longitude : 77°44'11.44"E (77.736508), •Latitude : 11°20'59.39"N (11.349832).



- Operating cost is kept low by natural lighting of all workspaces and a flexible and efficient hybrid cooling system.
- The building is best described as a living ecosystem: as fine balance of natural and man-made processes employing environment- friendly energy, material and water management methods.
- Nearly all interior and exterior walls are built of cement-stabilized compressed-earth block and cement-stabilized fly-ash lime gypsum block, the manufacture of which recycles plentiful local materials in processes that use local labor and low energy.

The built is sprawled accross the site with a central curtyard for proper ventilation and day light

## DESIGN STRATEGIES

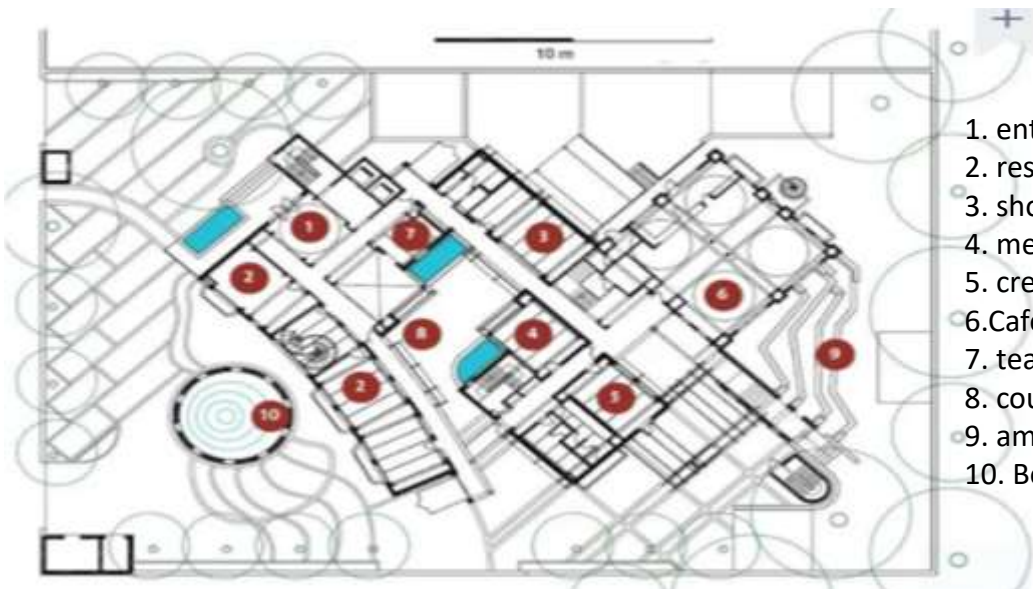
- Decrease exposed surface area
- increased thermal capacity
- increased buffer space
- increase shading
- increase surface reflectivity

## ACHIEVED BY

- Fenestration
- orientation
- glazing
- insulation
- courtyard planning



Fig.42 Circulation  
Source: Offices in India



1. entrance
2. resource centre
3. shop
4. meeting room
5. creche
6. Cafeteria
7. tea / coffee
8. courtyard
9. amphitheatre
10. Boali



1. meeting room
2. tea/coffee
3. offices
4. conference rooms

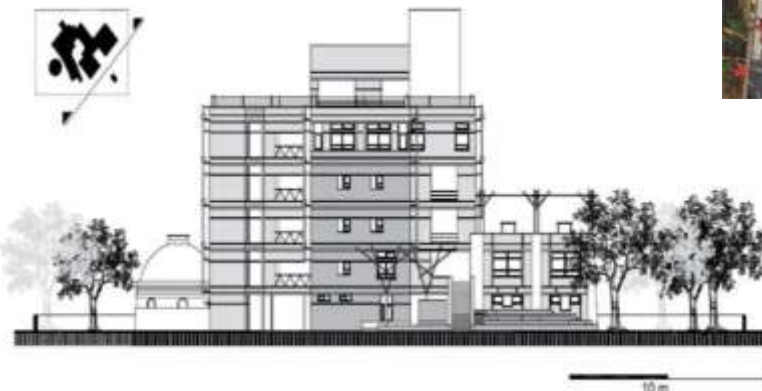


### MERIT

Spaces such as corridors , toilets ,and cafeteria could be naturally ventilated. such design decisions greatly reduced the air conditioning requirement in the building

### DEMERIT

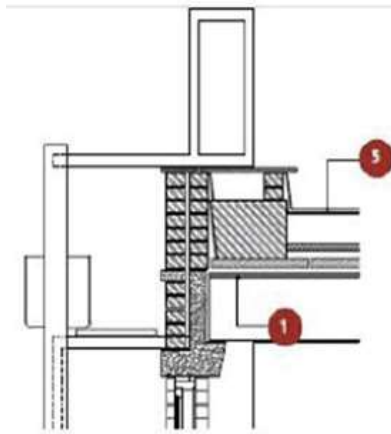
DA staff volunteered to accept a maximum indoor temperature of 28c at 60% relative humidity instead of the industry norm 24 degree



Operational energy for indoor environmental control. it is designed to save 40% in operational energy consumption



## STRUCTURE



### External wall section

1. vaulted precast reinforced concrete deck element
2. Kota stone floor finish with 50 mm Budhpur stone spanning
3. flash cement blocks, expanded polystyrene (industrial waste) and compressed earth block
4. teak wooden window frame and shutters.
5. Broken ceramic tile flooring (scrap) and 40 mm polyurethane insulation.
6. concrete shelf
7. meranti wood frame
8. daylight reflector
9. planter

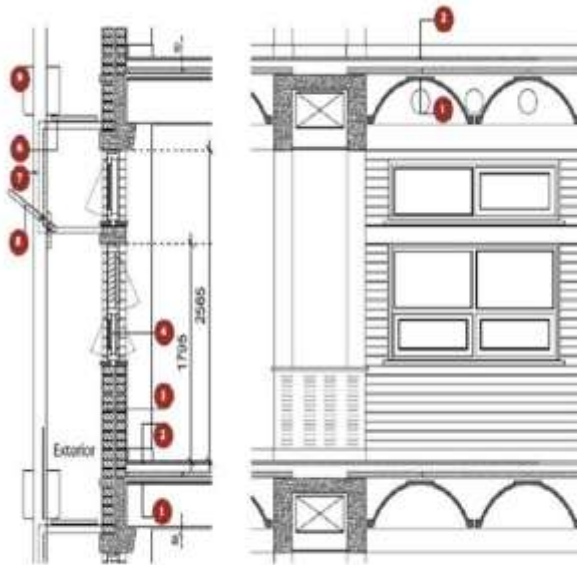


Fig.44 Wall Section  
Source: Offices in India

## FENESTRATION

The design of each facade is different, fenestration in response to solar orientation and view.

those facing east and west, which takes the burnt of morning and afternoon sun, are kept small and shaded by sunscreen or by building volume itself.

windows are shaded during warm season. vines climb the pergolas and east and west walls to reduce heat gain

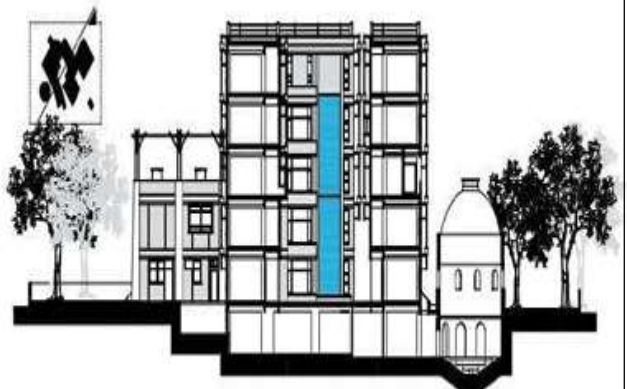


Earthenware for nesting birds and squirrels

- Vaulted precast concrete deck element are used to span most spaces.
- 5 metre spacing between columns makes for flexible office spaces while reducing steel consumption
- the shells are 30 mm thick, have a pitch of 1.2 metres and can span upto 5.5 metres
- one column is designed as 2 units with air gap to allow ducting to pass unhindered centrally in the floor plate this is treated with a panel finish

## COURTYARD PLANNING

- Central courtyard takes the hot air from the surrounding areas and gives it vertical column to rise (shaft effect).
- allows daylight to enter in the building.
- the three story trickle fountain in the courtyard moderates the air temperature and does not allow excess heat gain.



**LITERATURE STUDY- 01**  
**SUZLON ONE EARTH , PUNE**



Campus for world's largest integrated wind turbine manufacturers.  
 a. Office Complex b. Corporate learning center  
 Site area : 10.4 acres , 42047 sq mt.  
 Built up area- 70,865 sqm  
 Capacity – 3000 employees  
 Principle Architect : christopher charles beginner.  
 Year of construction : 2006-2009

## INTRODUCTION

The campus highlights the suzlon is into renewable energy and the sustainability is at the core of the organization. Sustainability has been addressed in all stages and processes.

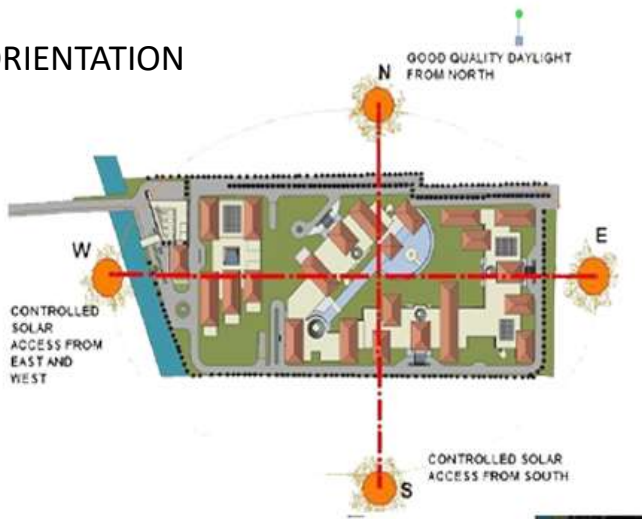
The architect relied exclusively on non toxic and recycled materials.

It has become the need of the hour for global corporations to have sensitively designed buildings which reflect their values and concern for environment.

Suzlon one earth derive its inspiration from large indian historical campuses like fatehpur sikhri and the meenakshi temple complex in madurai.



## ORIENTATION



- The orientation of the building is in north-south direction
- the water feature is placed in the east side of the plot
- the center brahamastra of the building is open to sky to get enough light

the vehicular movement is restricted to the periphery of the campus thus avoiding vehicular interruption in the inner landscape

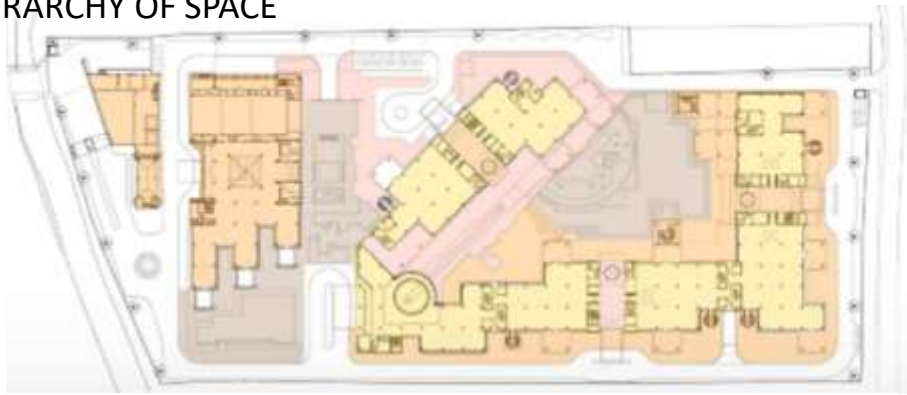
## ANALYSIS BASED ON THE GREEN PLANNING

- waste management
- water management
- electricity and HVAC system
- planning and landscape
- internal building , zoning and circulation.

a series of served and server spaces were created to adopt to the transformational nature of the business over the year. the served spaces cover the lion'sshare of people work that can accomodate modular wall and furniture system.

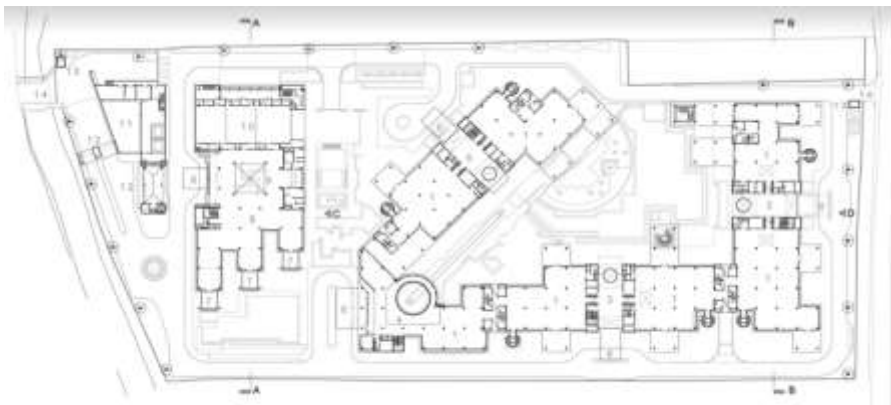


## HIERARCHY OF SPACE



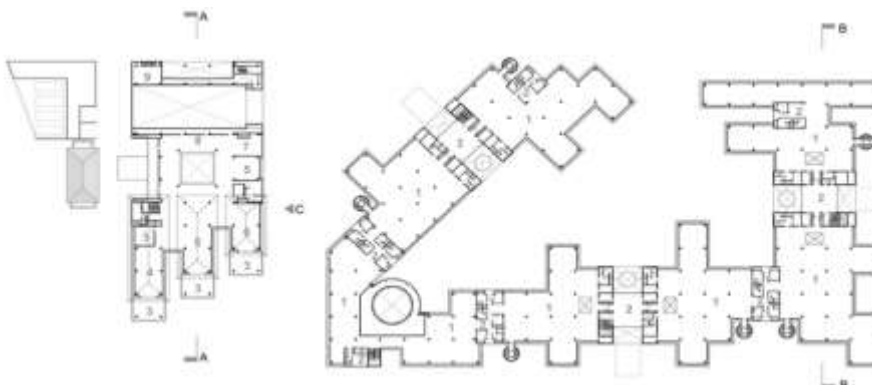
SITE PLAN

- 1.sun lounge
- 2.sky lounge
- 3.tree lounge
- 4.aqua lounge
- 5.waterbody
- 6.sky cylinder
- 7.suzlon excellence academy
- 8.welcome lounge
- 9.electrical service yard



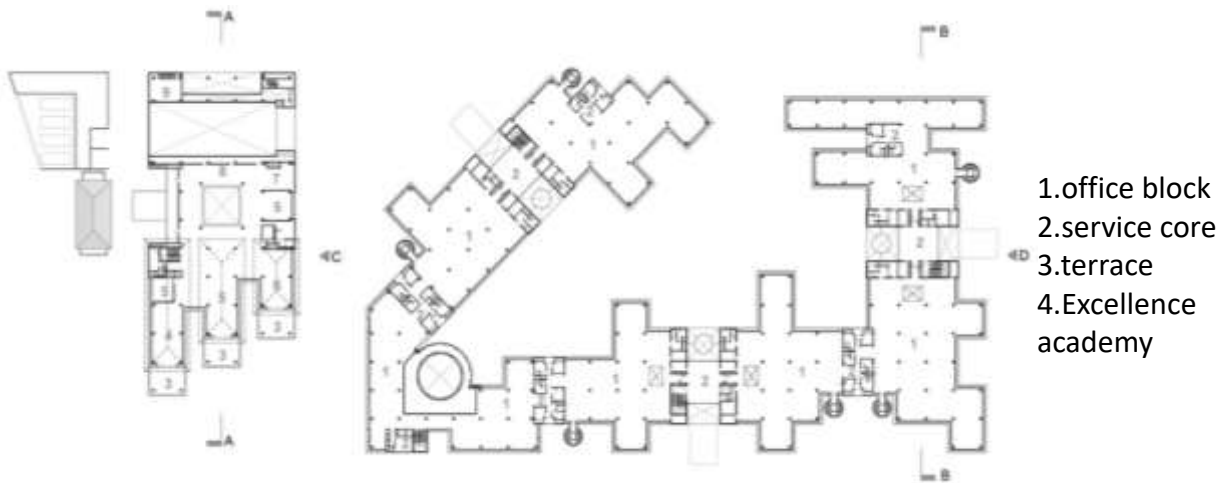
GROUND FLOOR PLAN

- 1.office block
- 2.aqua lounge
- 3.wind lounge
- 4.sky lounge
5. sun lounge
- 6.entry
- 7.pavillion
- 8.suzlon excellence
- 9.court
- 10.business halls
11. service yard
12. welcome lounge
13. security cabins
- 14.site entry

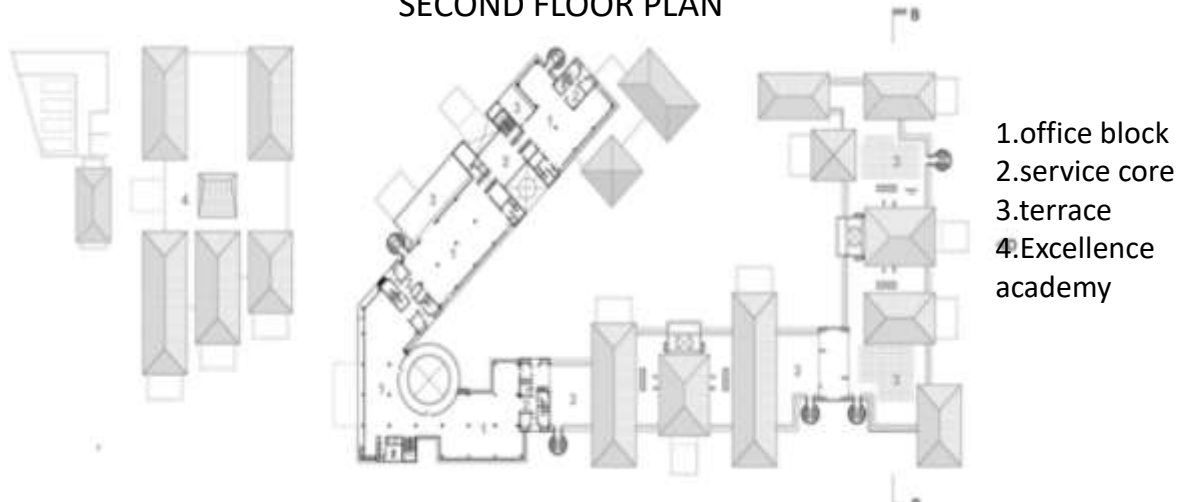


FIRST FLOOR PLAN

- 1.office block
- 2.service core
- 3.terrace
- 4.faculty room
- 5.meeting room
- 6.multipurpose hall
- 7.theatre
- 8.record room
- 9.store



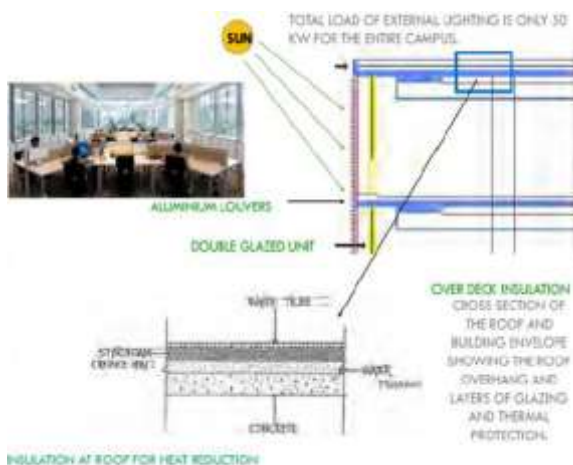
SECOND FLOOR PLAN



THIRD FLOOR PLAN

## PASSIVE TECHNIQS

Majority of the campus facade faces .  
The south side thus , heat gain is  
avoided by using specially designed  
louvers and a double glazed glass with  
air gap in between , without  
disturbing the outside view.



The openable fenestrations which are  
provided in most areas allow for  
natural cross ventilation

Waste like grasses , plant branches etc is put into the organic waste convertor and manure generated is used in its own landscape and excess is sold out to vendors.

the construction waste is handled in such a way that

- reduction in waste during construction .
- waste at the time of construction could be use whenever needed.
- leftover materials are returned to vendor

#### DESIGN FEATURES



The glass cylinder connecting the earth and the sky at various entry portals



The deep stampth or the central oblix reaching out to the sky as the symbol of excellence and hope

reflective pool not only connect the campus but also create the micro environment in the campus , helps in cooling the air around the site



solar photovoltaic panels form the roof of the atrium of the learning centre , generating green power

- The solid waste collected from different places are collected in tanks through drainage line in pump rooms.
- The waste collected in the tank are separated into slurry and waste water , and further waste water is sent to sewage treatment plant for further process.
- Waste water is passed through sand tanks where sand layers are there , waste in the •water is treated and processed water is pass through another line for next process
- Now sent in chlorine tank , then to water softener tank where hard water is converted to soft water and finally water is recycled

**LITERATURE STUDY- 02**  
**THE VISITOR AND**  
**ADMINISTRATION**  
**CENTRE**





YEAR - 2007

Owner - queens botanical garden

Architect - BSKS architect

location - Flushing , NY USA

Building type - park

Type - semi intensive , test /research

Size -39 acre

Slope - 8 %

Access - Accessible , open to public

## INTRODUCTION

- The queens botanical gardens is located at the former world's fair grounds the flushing meadows park. The master plan was formulated with water as a major design theme.

- the buildings auditorium has a planted green roof that reduces urban heat island effect.

It has solar panels that generates 17% of the building's electricity and a geothermal heating and cooling system that uses water pumped from an aquifer for building's climate control.

- The project is made up of three interconnected spaces: a forecourt and roof canopy, a linear central reception and administration building clad in wood and glass, and an auditorium space tucked into the landscape, sheltered by a sloping green roof.

The Visitor and Administration Center was designed to celebrate the relationship between diverse cultures and the environment and to showcase water management, landscape integration, and energy conservation and generation.

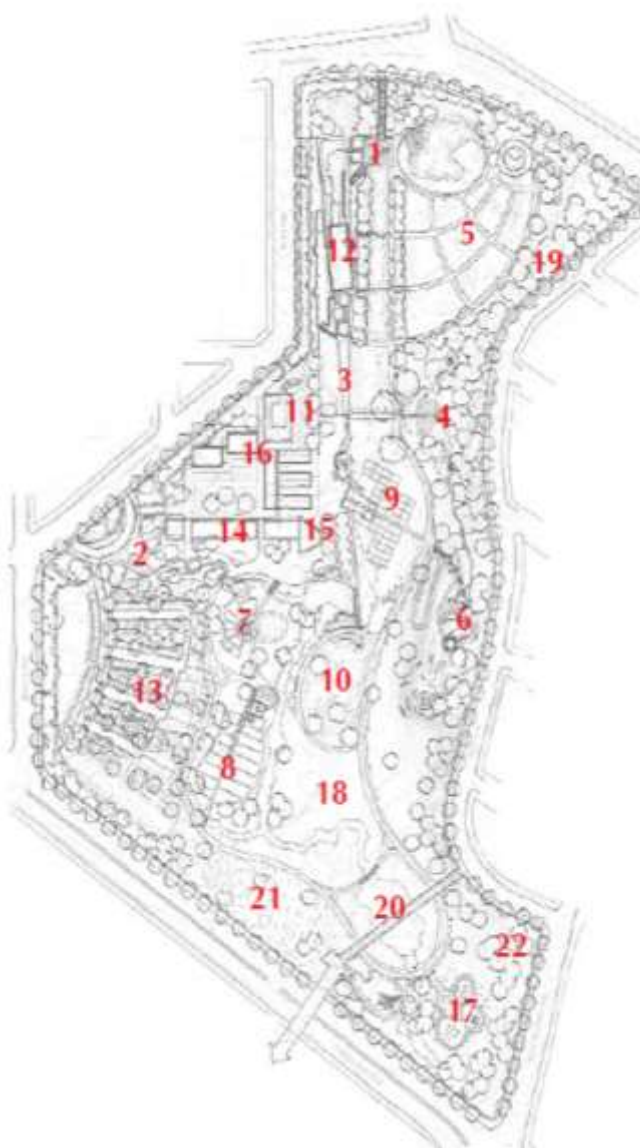


- The project relied on concrete, steel and glass for much of the project's structure in order to enhance durability and reduce maintenance requirements. Approximately 90% of construction waste, by weight, was recycled and diverted from landfills.



## SITE PLANNING DIAGRAMS

The initial workshop resulted in the identification of several important planning issues based upon the observations of the design team and comments from participants. The following diagrams summarize the key points, which are the basis of the Master Plan site concept.



The following is a list of the various gardens and program elements being implemented within the Master Plan. Each garden, building, plaza, or element will be developed to reflect the four interrelated themes - a water synthesis, the cultural connection, the green connection, and plants in community - in order to form a cohesive vision.

1. Main Street Entry Plaza and Pin Oak Allée
2. Welcome Garden
3. Central Plaza/Water Play
4. Couples Garden
5. Gardens on Parade and Cherry Circle
6. Sun and Moon Garden
7. ...Children's Garden
8. ...Senior Garden
9. Horticultural Heritage Garden
10. Celebration Green
11. The Events Center
12. The Administration Building
13. The Parking Garden
14. The Education Center
15. The Visitor Center and Café
16. The Maintenance Facility and Greenhouses
17. ...Bee City/Bird Garden
18. ...Prairie
19. ...Woodland
20. ...Wetland
21. ...Ridge and Swale Garden
22. ...Savanna



Vehicular Circulation



Pedestrian Circulation

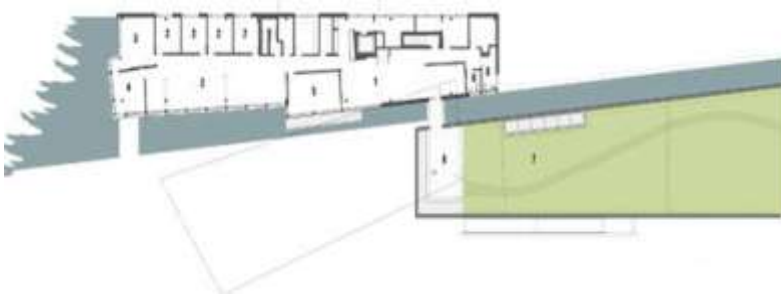
The Master Plan concept consists of four interrelated themes - A Water Synthesis, The Cultural Connection, The Green Connection (or sustainability), and Plants in Community (or plants in natural associations or ecosystems). Each of these themes is really a facet of the same underlying idea; together they form a cohesive vision.





#### FIRST FLOOR PLAN

1. Gallery /reception
2. board room
3. wedding rental
4. visitors centre
5. auditorium vestibule
6. auditorium
7. water channel
8. cleansing biotope
9. rainwater collection



#### SECOND FLOOR

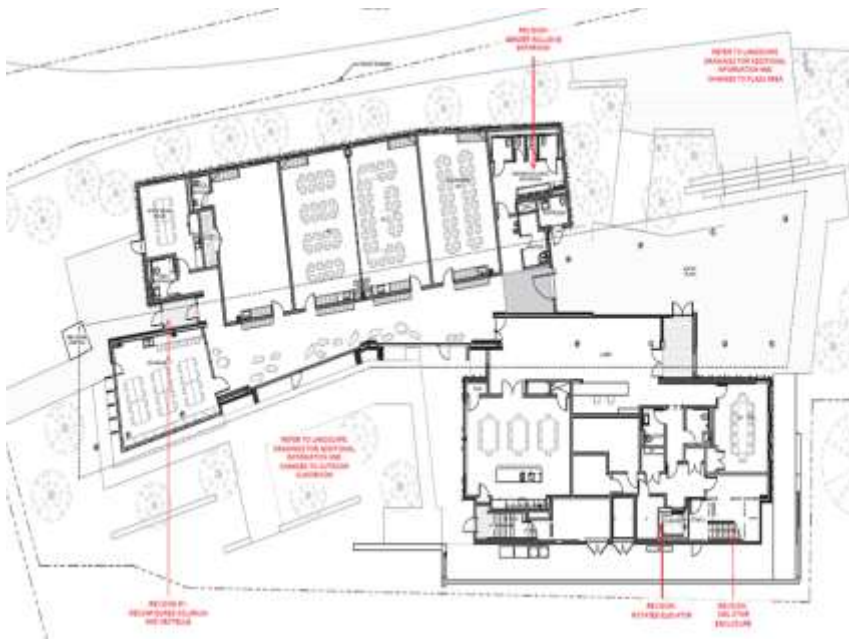
1. staff lounge
2. office
3. director room
4. conference room
5. staf conference room
6. roof terrace
7. public green roof
8. composting washroom

- The building will employ materials found in nature, such as wood and stone. Rooms will be oriented to take full advantage of sun exposure, enhancing the quality of space through the changing seasons. Sustainable principles, such as a green roof, rainwater collection devices, cleansing biotopes, and water features that are completely rainwater derived will be highly visible and aesthetic.
- The wallboard, tile, carpet, office systems and bathroom partitions all contain recycled content, and the concrete used for cast-in-place and architectural applications includes blast furnace slag and recycled steel reinforcing



On rainy days, water cascades off of the sheltering canopy, as shown in this photo, and into the cleansing biotope pools below. The second-floor administration spaces provide a close-up view.





1. classroom
- 2.spine
- 3.janitor room
- 4.rest room
- 5.gender inclusive bathroom
- 6.lobby
- 7.teaching kitchen
- 8.conference
- 9.elevator
- 10.trash
- 11.Emr
12. telecom
- 13.family restroom
- 14.child rest room
- 15.solarium
- 16.closet
- 17.staff work room
18. compost



## FACADE MATERIAL



## INFERENCE

- Site palnning desicion based on water harvesting.
- Landscape desicon :selection of plants and elements to create eco friendly environment throughout the site
- Deriving from their detailed area program for better understanding of service spaces

# **COMPARATIVE ANALYSIS**

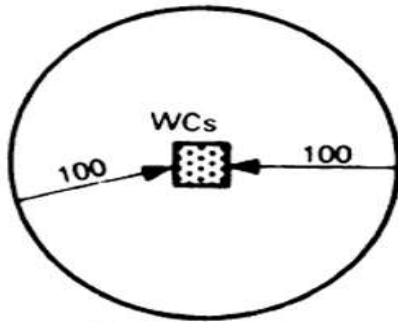
|                    | TERI INSTITUTE ,NEW DELHI                                                                                                                                                                                                                                                                                                                                                           | DEVELOPMENT ALTERNATIVES<br>NEW DELHI                                                                                                                                                                                                                                                                                                                                                                                                            | SUZLON ONE EARTH ,PUNE                                                                                                                                                                                                                                                                                    | QUEENS BOTANICAL VISITOR AND<br>ADMINISTRATION CENTRE , NY                                                                                                                                                                                                                                                                                                |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AREA               | site area- 8000 sqmt<br>built up- 7432 sq mt                                                                                                                                                                                                                                                                                                                                        | site area - 3116 sqmt<br>built up - 3096 sq mt superstructure<br>1526 sq mt basement<br>composite                                                                                                                                                                                                                                                                                                                                                | site area - 10.9 acre<br>built up area - 70865 sq mt                                                                                                                                                                                                                                                      | site area - 36 acre<br>built up - 7443 sq mt                                                                                                                                                                                                                                                                                                              |
| CLIMATE            | composite                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                  | tropical                                                                                                                                                                                                                                                                                                  | humid temperate                                                                                                                                                                                                                                                                                                                                           |
| TYPOLOGY           | institutional resource and<br>development                                                                                                                                                                                                                                                                                                                                           | institutional resource and<br>development                                                                                                                                                                                                                                                                                                                                                                                                        | commercial building                                                                                                                                                                                                                                                                                       | institutional                                                                                                                                                                                                                                                                                                                                             |
| PUBLIC/PRIVATE     | public                                                                                                                                                                                                                                                                                                                                                                              | public                                                                                                                                                                                                                                                                                                                                                                                                                                           | public                                                                                                                                                                                                                                                                                                    | public                                                                                                                                                                                                                                                                                                                                                    |
| DESIGN STRATEGIES  | <ul style="list-style-type: none"> <li>•public - private transition</li> <li>•segregation of vehicular and pedestrian movement on site.</li> <li>•pedestrian spine as the main connector through built.</li> <li>•triangular niches as efficient service</li> <li>•entries for service intensive function</li> <li>•orientation of the built to solar and wind direction</li> </ul> | <ul style="list-style-type: none"> <li>•orientation of the building to the north</li> <li>•porous ground floor , webbed with open courtyard , semi open ( corridors , cafeterias ) and closed (office ) spaces</li> <li>•paving design for maximum rainwater harvesting</li> <li>•open space design to allow for hands on activities to take place</li> <li>•vehicular movement restricted to the periphery</li> <li>landscape design</li> </ul> | <ul style="list-style-type: none"> <li>•external landscape brought into indoors along with perimeter of building bring fresh air , nature and natural light</li> <li>•central plaza encourage communication , interaction and innovation .</li> <li>•sky court and glass cylinder main feature</li> </ul> | <ul style="list-style-type: none"> <li>•site planning based on water harvesting and other natural system</li> <li>•concept of using gardens as education and therapy spaces</li> <li>•detailed design of plant and landscape design</li> <li>•segregated vehicular and pedestrian</li> <li>•network with multiple service entries in the site.</li> </ul> |
| AREA PROGRAM       | office , education block with<br>research labs , computer centre ,<br>hostel accomodation , oas                                                                                                                                                                                                                                                                                     | office , resource centre and<br>conference facility                                                                                                                                                                                                                                                                                                                                                                                              | operation , maintenance ,<br>education                                                                                                                                                                                                                                                                    | administration centre , education<br>centre and learning resource                                                                                                                                                                                                                                                                                         |
| STRUCTURE          | RCC frame structure                                                                                                                                                                                                                                                                                                                                                                 | ferro cement slab with split column<br>design , large span achieved with shallow<br>domes and filler slabs ( earthen pots )                                                                                                                                                                                                                                                                                                                      | low V.O.C paints ,bamboo flooring ,<br>natural wood , low heat cement                                                                                                                                                                                                                                     | RCC shell structure                                                                                                                                                                                                                                                                                                                                       |
| PASSIVE STRATEGIES | <ul style="list-style-type: none"> <li>•buildings aligned towards north</li> <li>•shaded pedestrian pathway with adjustable louvers</li> <li>•facade treatment</li> <li>•efficient daylight achieved with window placement</li> </ul>                                                                                                                                               | <ul style="list-style-type: none"> <li>•buildings aligned towards north</li> <li>•traditional courtyard design</li> <li>•facade treatment</li> <li>•locally sourced material</li> <li>•use of sustainable material like compressed earth blocks and fly ash</li> </ul>                                                                                                                                                                           | <ul style="list-style-type: none"> <li>•facade of the building face north , south , north-west and south-east.</li> <li>•insulated roof.</li> <li>•external louvers on the first and second floor</li> </ul>                                                                                              | <ul style="list-style-type: none"> <li>•facade treatment (horizontal louver system )</li> <li>•design retain the natural feature of the site like water bodies and drainage system.</li> <li>•detailed water harvesting system</li> <li>•landscape design</li> </ul>                                                                                      |
| ACTIVE STRATEGIES  | HVAC water cooled chiller system                                                                                                                                                                                                                                                                                                                                                    | hybrid HVAC design using both<br>evaporative and refrigerant cooling                                                                                                                                                                                                                                                                                                                                                                             | daylight sensors ,occupancy<br>sensors ,motion sensors are installed at<br>each workstation , which reduces energy<br>consumption and wastage                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                           |

| REQUIREMENT            | Area in case study 1 | Area in case study 2 | Area in literature study 1 | Area in literature study 2 | Area in norm                            | Remark |
|------------------------|----------------------|----------------------|----------------------------|----------------------------|-----------------------------------------|--------|
| FUNCTION OF SPACE      |                      |                      |                            |                            |                                         |        |
| Administration         | 88 sq mt             |                      |                            | 90 sq mt                   | 135 sq mt                               |        |
| classroom              | 41 sq mt             |                      | 92 sq mt                   | 110 sq mt                  | 95 sq mt                                |        |
| meeting room           | 56 sq mt             | 60 sq mt             | 90 sq mt                   |                            | 90 sq mt                                |        |
| multipurpose hall      |                      | 145 sq mt            | 120 sq mt                  |                            | 300 sq mt                               |        |
| cafeteria              |                      | 220 sq mt            |                            | 120 sq mt                  | 1.4- 1.6 sq mt space allowance per seat |        |
| office                 | 290 sqmt             | 173 sq mt            | 55 sq mt                   |                            |                                         |        |
| open air theatre       | 170 sq mt            |                      |                            |                            | as per capacity                         |        |
| lecture hall           | 144 sq mt            | 140 sq mt            | 92 sq mt                   |                            | 1.4 sq mt-2.0 sq mt                     |        |
| amphitheatre           |                      | 156 sq mt            | 110 sq mt                  |                            | space allowance                         |        |
| auditorium             |                      |                      |                            | 480 sq mt                  | 4.5 cu.m/p                              |        |
| shop                   |                      | 170 sq mt            |                            | 230 sq mt                  |                                         |        |
| resource centre        |                      |                      |                            |                            |                                         |        |
| /learning centre       |                      | 61 sq mt             |                            | 100 sq mt                  |                                         |        |
| computer hall          |                      |                      |                            | 200 sq mt                  |                                         |        |
| toilet                 | 64 sq mt             | 40 sq mt             | 80 sq mt                   | 100 sq mt                  | 0.8 x1.5 sq mt for 1 user               |        |
| CIRCULATION +LANDSCAPE | 44 592 sq mt         | 1869.6 sq mt         | 25228 sq mt                | 263,045 sq mt              |                                         |        |
| SERVICE AREA           | 4607.8 sq mt         | 308.4 sq mt          | 1194.7 sq mt               | 5872 sq mt                 |                                         |        |
| UTILITY AREA           | 2971 sq mt           | 233.7 sq mt          | 1871 sq mt                 | 2913 sq mt                 |                                         |        |



# STANDARDS

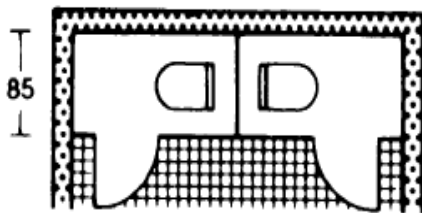
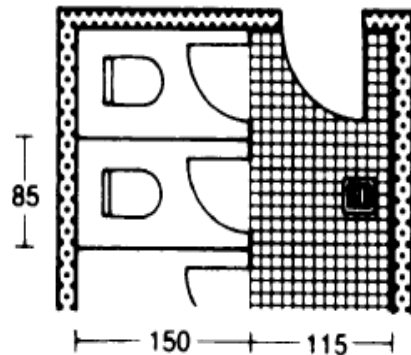
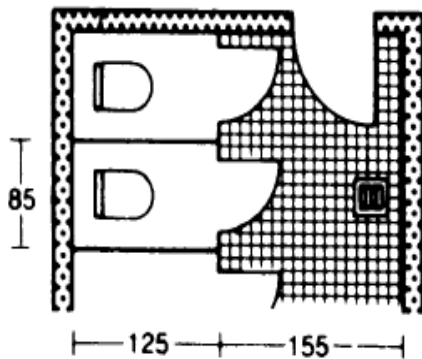
area served  $\leq 100$  m



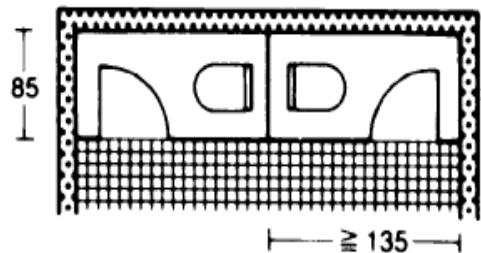
unit  $\leq 250$  men;  
WC  $\leq 160$  women

Toilets should be approximately 100m from each workstation

- all ventilated lobbies are required in front of toilet facilities
- should have one washbasin per 5 WC's minimum
- the minimum height for toilet with 4 or fewer WC'S is 2.20 m .



commercial buildings -  $\geq 110$   
max ground coverage - 25%-30%  
floor area ratio - 1.00



## LIFT PROVISION

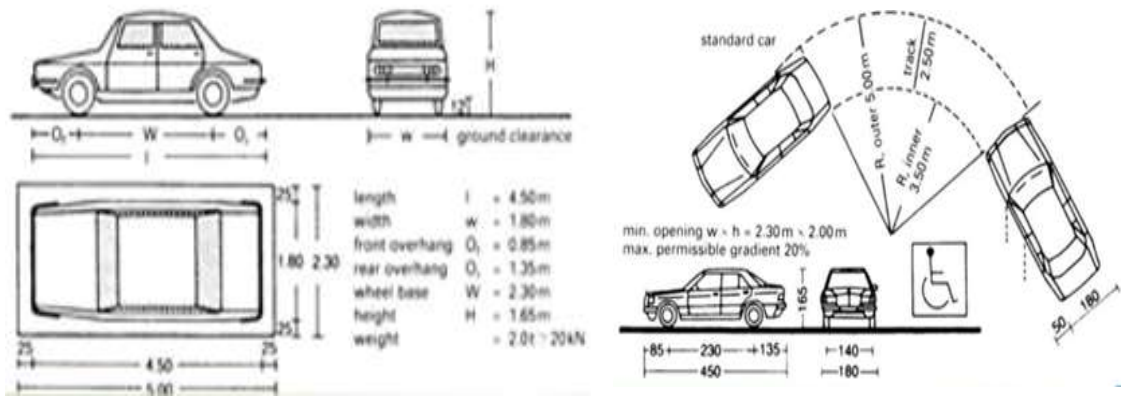
### PARKING

1. Commercial Buildings : 3 ECS per 100 Sq.mts covered area on all the floors.

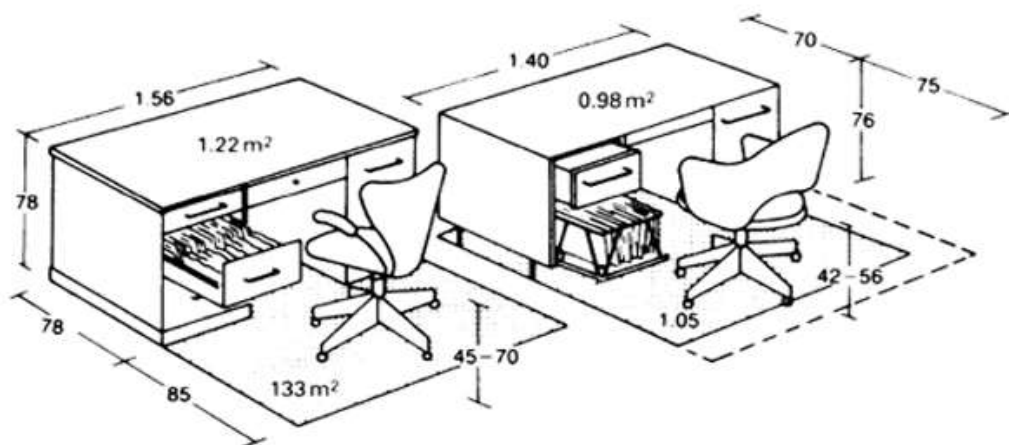
NOTE: The one ECS shall be counted as below:- a. 23 Sq.mts for open parking. b. 28 Sq.mts for parking in the stilts or ground floor. c. 32 Sq.mts for parking in the basement.

a) Walls of lift enclosures shall have a fire rating of two hours. Lift shafts shall have a vent at the top of area not less than 0.2 sq m.

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



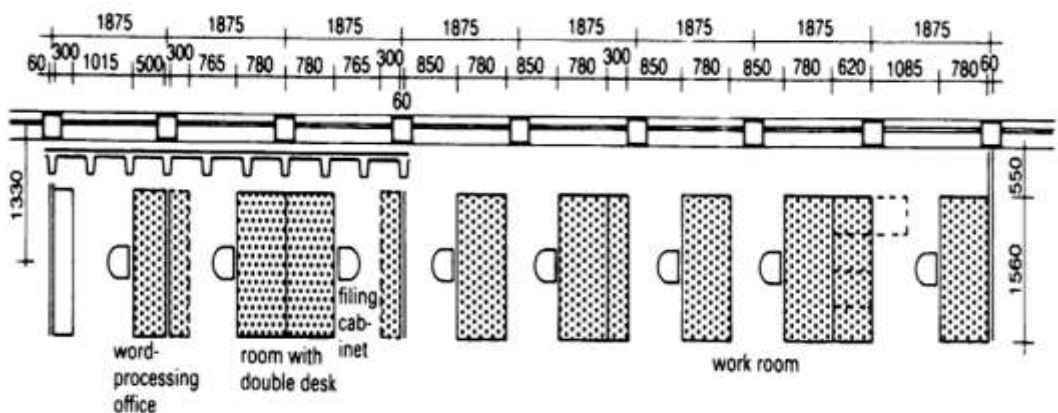
## FURNITURE STANDARD



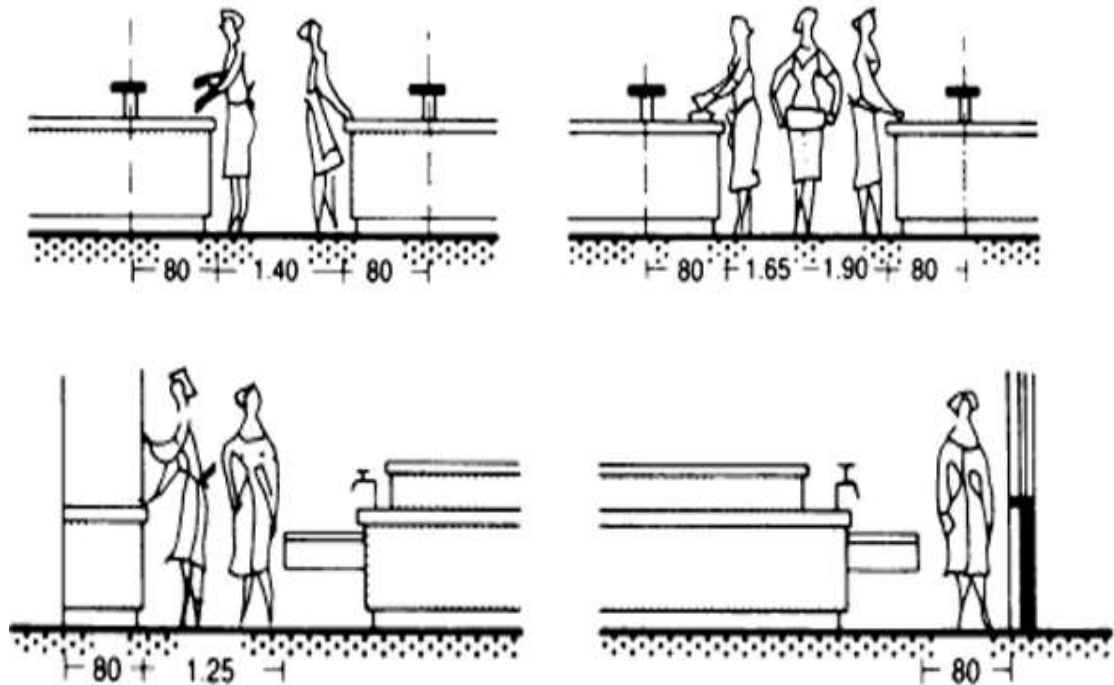
Office area is calculated in two parts

1. people space is calculated as (standard individual space x no. of people ) + allowance + a factor for primary collection
2. non people space should be calculated by informed estimates based on existing goods practice + additional factor for primary circulation

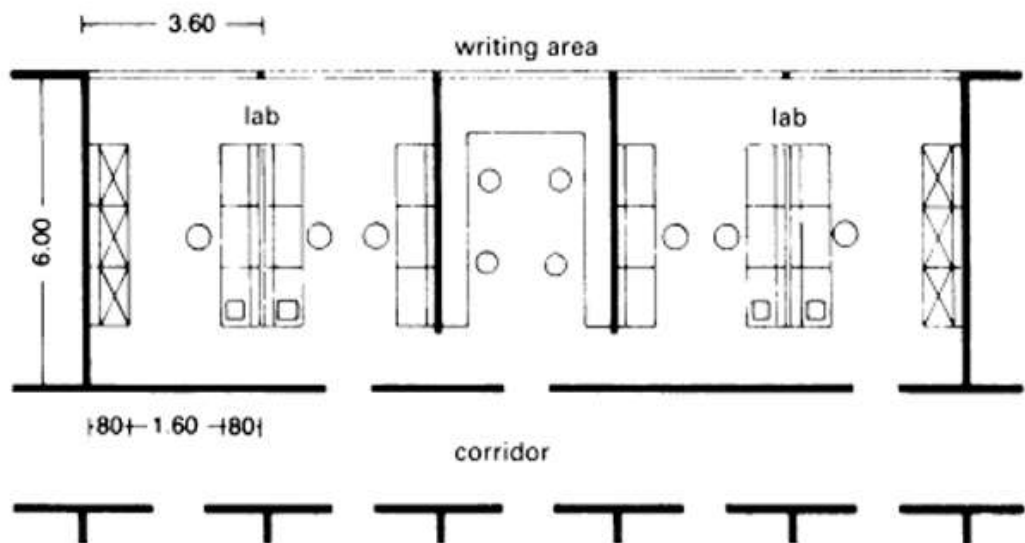
## DIVISION OF SPACE



## RESEARCH LABORATORIES



miniumum passage width between work stations



Research lab are usually in smaller spaces with special equipment and additional room for activities  
 normal measurement for standard workbench :120cm width for practical ,  
 several times with research lab ,80 cm depth for work surface

# **AREA ANALYSIS**



| S.N | FUNCTION                          | AREA     | QTY | OCCUPANT LOAD     | TOTAL AREA IN SQ.M |
|-----|-----------------------------------|----------|-----|-------------------|--------------------|
|     | ECO LEARNING CENTRE               |          |     |                   |                    |
| 1   | RECEPTION                         | 200      | 1   | AROUND 25 PERSONS | 200                |
| 2   | RECYCLING WORKSHOPS               | 200      | 4   | 10                | 800                |
| 3   | UPCYCLING STUDIOS                 | 100      | 8   |                   | 800                |
| 4   | ARTISTS STUDIO                    | 75       | 6   |                   | 450                |
| 5   | ELECTRONIC AND FURNITURE WORKSHOP | 50       | 3   |                   | 150                |
| 6   | STORES                            | 25       | 6   |                   | 150                |
| 7   | CURATOR AND OFFICE                | 50       | 1   | 1                 | 50                 |
| 8   | STORES                            | 50       | 4   | -                 | 200                |
| 9   | SEMINAR ROOMS                     | 100, 300 | 3,1 | -                 | 600                |
| 10  | LIBRARY AND DIGITAL LEAR. SPACE   | 400      | 1   |                   | 400                |
| 11  | MULTI PURPOSE HALL                | 700      | 1   | 1200              | 700                |
| 12  | AV ROOM                           | 50       | 1   | 20                | 50                 |
| 13  | STORAGE                           | 100      | 1   | -                 | 100                |
| 14  | TOILET:                           |          |     |                   |                    |
| 15  | MEN                               | 25       | 4   |                   | 200                |
| 16  | WOMEN                             | 25       | 4   |                   | 200                |
| 17  | VISITOR INFORMATION CENTRE        | 100      | 1   | -                 | 100                |
| 18  | WASTE SHOWCASE ROOM               | 100      | 3   | -                 | 300                |
|     | TOTAL                             |          |     |                   | 5450               |

|    |                      |     |    |  |      |
|----|----------------------|-----|----|--|------|
|    | ADMINISTRATION BLOCK |     |    |  |      |
| 1  | ENTRANCE FOYER       | 30  |    |  | 30   |
| 2  | RECEPTION            | 100 | 1  |  | 100  |
| 3  | OFFICE               | 300 | 15 |  | 4500 |
| 4  | CONFERENCE ROOM A    | 200 | 1  |  | 200  |
| 5  | CONFERENCE ROOM B    | 100 | 1  |  | 100  |
| 6  | SEMINAR ROOM         | 200 | 2  |  | 400  |
| 7  | MEETING ROOM         | 50  | 3  |  | 150  |
| 8  | FINANCE OFFICE       | 100 | 1  |  | 100  |
| 9  | MANAGEMENT OFFICE    | 30  | 1  |  | 30   |
| 10 | EXECUTIVE OFFICE     | 50  | 1  |  | 50   |
| 11 | GENERAL MANAGER + PA | 30  | 1  |  | 30   |
| 12 | DIRECTORS OFFICE     | 35  |    |  | 30   |
| 13 | CRECHE               | 30  | 1  |  | 30   |
| 14 | CANTEEN              | 100 | 1  |  | 100  |
| 15 | STAFF LOCKERS        | 60  |    |  | 60   |
| 16 | TOILETS              | 50  |    |  | 50   |
|    | TOTAL                |     |    |  | 5960 |

|    |                              |     |    |  |      |
|----|------------------------------|-----|----|--|------|
|    | RESEARCH LABS                |     |    |  |      |
| 1  | TESTING LABS                 | 100 | 1  |  | 100  |
| 2  | RESEARCH LABS                | 200 | 3  |  | 600  |
| 3  | DRY LABS                     | 200 | 2  |  | 400  |
| 4  | WET LABS                     | 200 | 2  |  | 400  |
| 5  | HEAVY EQUIPMENT LAB          | 200 | 1  |  | 200  |
| 6  | LOUNGE (STUDENT AND FACULTY) | 100 | 2  |  | 200  |
| 7  | TESTING LAB                  | 100 | 3  |  | 300  |
| 8  | COMPUTER LAB                 | 200 | 1  |  | 200  |
| 9  | MAINTAINANCE OFFICE          | 75  | 3  |  | 225  |
| 10 | UTILITY ROOMS                | 50  | 3  |  | 150  |
| 11 | STORAGE                      | 100 | 2  |  | 200  |
| 12 | RESEARCH SCHOLAR'S ROOMS     | 50  | 10 |  | 500  |
| 13 | SEMINAR ROOMS                | 100 | 2  |  | 200  |
| 14 | MEETING/CONFERENCE ROOMS     | 50  | 3  |  | 90   |
| 15 | CENTRAL DATA+SERVER ROOM     | 150 | 1  |  | 150  |
| 16 | DATA CENTRE +UPS ROOM        | 50  | 1  |  | 50   |
| 17 | CANTEEN                      | 200 | 1  |  | 200  |
| 18 | ADMIN                        | 150 | 1  |  | 150  |
| 19 | EXECUTIVE OFFICES            | 100 | 1  |  | 100  |
|    | TOTAL                        |     |    |  | 4415 |

|    |                          |                |    |           |      |
|----|--------------------------|----------------|----|-----------|------|
|    | HOSPIATLITY + EXHIBITION |                |    |           |      |
| 1  | RESTAURANT               | 600            | 1  |           | 600  |
| 2  | FOOD KIOSK               | 20             | 20 | 20 KIOSKS | 400  |
| 3  | RECREATION ROOM          | 200            | 1  |           | 200  |
| 4  | SHOPS                    | 30             | 10 |           | 300  |
| 5  | LARGE HALL               | 300            | 1  |           | 300  |
| 6  | SMALL HALL               | 200            | 2  |           | 400  |
| 7  | TOILETS                  | AS<br>REQUIRED |    |           |      |
| 8  | STORE                    | 50             | 2  |           | 100  |
| 9  | RESTROOM                 | 50             | 1  |           | 50   |
| 10 | RECEPTION                | 50             |    |           | 50   |
| 11 | ENVIRONMENTAL CLUB       | 75             | 1  |           | 75   |
| 12 | KITCHEN                  | 300            | 1  |           | 300  |
| 13 | KITCHEN GARDEN           | 100            |    |           | 100  |
| 14 | TOTAL                    |                |    |           | 2875 |

|   |                 |      |    |  |     |
|---|-----------------|------|----|--|-----|
|   | ACCOMODATION    |      |    |  |     |
| 1 | ROOM            | 13.5 | 30 |  | 405 |
| 2 | KITCHEN         | 50   |    |  | 50  |
| 3 | TOILET          | 50   |    |  | 50  |
| 4 | COMMON ROOM     | 75   |    |  | 75  |
| 5 | WARDEN ROOM     | 20   | 1  |  | 1   |
| 6 | RECREATION ROOM | 80   | 1  |  | 80  |
|   | TOTAL           |      |    |  | 661 |

|                                                |             |  |
|------------------------------------------------|-------------|--|
| TOTAL BUILT UP ACHIEVED                        | 20025       |  |
| TOTAL BUILTUP = PLOT AREA X F.A.R = 32374 X1.5 | 48561       |  |
| F.A.R                                          | 1.5         |  |
| GROUND COVERAGE                                | 25%         |  |
| SITE AREA                                      | 8 ACRES     |  |
|                                                | 32374 SQ MT |  |
|                                                |             |  |
|                                                |             |  |

**CONCEPT**

# **DESIGN SHEETS**

## **CONCLUSION**

In this project this is observed that the requirements of ECO RESEARCH CENTRE project is so important in the modern era of concepts as the main idea developed on the basis of the requirement with facilities. Lots of opportunities in term of designs and facilities. This is an design approach to making design decisions to encourage desirable design practices. The transparency of waste management process will allow for a better understanding of what happens to a product once it is discarded. A green building in itself is a positive effect on its occupants.

**ZARISH KANWAL**

(2021- 22)

**PROF. MOHIT KUMAR AGARWAL  
AR . SHALINI DIWAKER**

( THESIS GUIDE )



## **BIBLIOGRAPHY**

- All the study of activity and users study done by nuefert , time saver and S.B.C STANDARD.
- All the standards of area taken from TIME SAVER , N.B.C AND S.B.C.
- [http://www.gcpcenviis.nic.in/PDF/Sustainable Industrial Design and Waste Management.pdf](http://www.gcpcenviis.nic.in/PDF/Sustainable%20Industrial%20Design%20and%20Waste%20Management.pdf)
- [http://www.eco-innova.eu/publications@lwlt\\_338cmd=download&lwlt\\_338id=292](http://www.eco-innova.eu/publications@lwlt_338cmd=download&lwlt_338id=292)
- <https://www.google.com/url?sa=t&source=web&rct=j&url=http://www.webpages.uidaho.edu/arch464/Hall%2520of%2520Fame/Arch464/Spring2009/QueensBotanicalGarden.pdf&ved=2ahUKEwjD8fPbxv1AhXrwYsBHcuLA7AQFnoECBkQAQ&usg=AOvVaw3Y4gjQwoImaTQTND39BYCx>
- <https://www.arch2o.com/sustainable-life-eco-recycling-center-mohamed-mohy-el-deen/>
- <https://www.ebiqc.com/en/what-is-an-ecocentre/#:~:text=An%20ecocentre%2C%20also%20known%20as%20an%20ecopark%20or,dispose%20of%20materials%20not%20accepted%20during%20regular%20collection>
- [https://www.google.com/url?sa=t&source=web&rct=j&url=http://www.upecp.in/assets/air\\_pollution\\_action\\_plan/MicroPlan/Bareilly%2520City%2520Micro%2520plan.pdf&ved=2ahUKEwiA4PvG7tb1AhVBSmwGHZV3A3gQFnoECBsQAQ&usg=AOvVaw1a9Xcsw\\_ID8fRUPjWoCtet](https://www.google.com/url?sa=t&source=web&rct=j&url=http://www.upecp.in/assets/air_pollution_action_plan/MicroPlan/Bareilly%2520City%2520Micro%2520plan.pdf&ved=2ahUKEwiA4PvG7tb1AhVBSmwGHZV3A3gQFnoECBsQAQ&usg=AOvVaw1a9Xcsw_ID8fRUPjWoCtet)
- [https://issuu.com/ankit\\_pokar/docs/architectural\\_programming - suzlon one earth](https://issuu.com/ankit_pokar/docs/architectural_programming_-_suzlon_one_earth)
- <https://architecture.live/house-of-five-elements-manasaram-architects/#:~:text=At%20any%20point%20in%20the%20house%2C%20one%20will,courtyard%2C%20open%20kitchen%20and%20dining%20with%20double%20height>



## PROJECT DESCRIPTION

- The centre creates a sustainability driven innovation centre where various ventures along with research facilities come together in a symbiotic affiliation such that one company's waste is the raw material for the others. This leads to design innovations in a variety of products.

- The centre hopes to set an example of an alternative form of commercial development which is more inclusive in nature.

- The public spheres, the WTE facility and the sustainable design strategies are some of the building components that can be adopted by any other building type.

## SITE LOCATION



## ABOUT THE SITE

- Site area - 8 acres
- Location - Babia village, Bukhara Faridpur Road, Bareilly, 243004
- Latitude - 28° 22' 32.4984" N
- Longitude - 79° 26' 9.4524" E.
- Land type - Flat surface land with no contour.
- Ground water level - The ground water level of Bareilly in 2017 was recorded at 17.79 meters.
- Soil type - Bareilly type 2 (kharad or low-land soil) this type of soil is found in all tehsils in younger alluvial plain or low land along the river courses and characterised by generally ash grey to brownish grey colour on the surface and texture is silty loamy sand or sandy.

## DESIGN FOR BEHAVIOUR CHANGE

### WHAT....?

The process of designing which instigates the end user to change his decision making patterns, basically to encourage desirable human practices through the process of designing.

### EXAMPLES

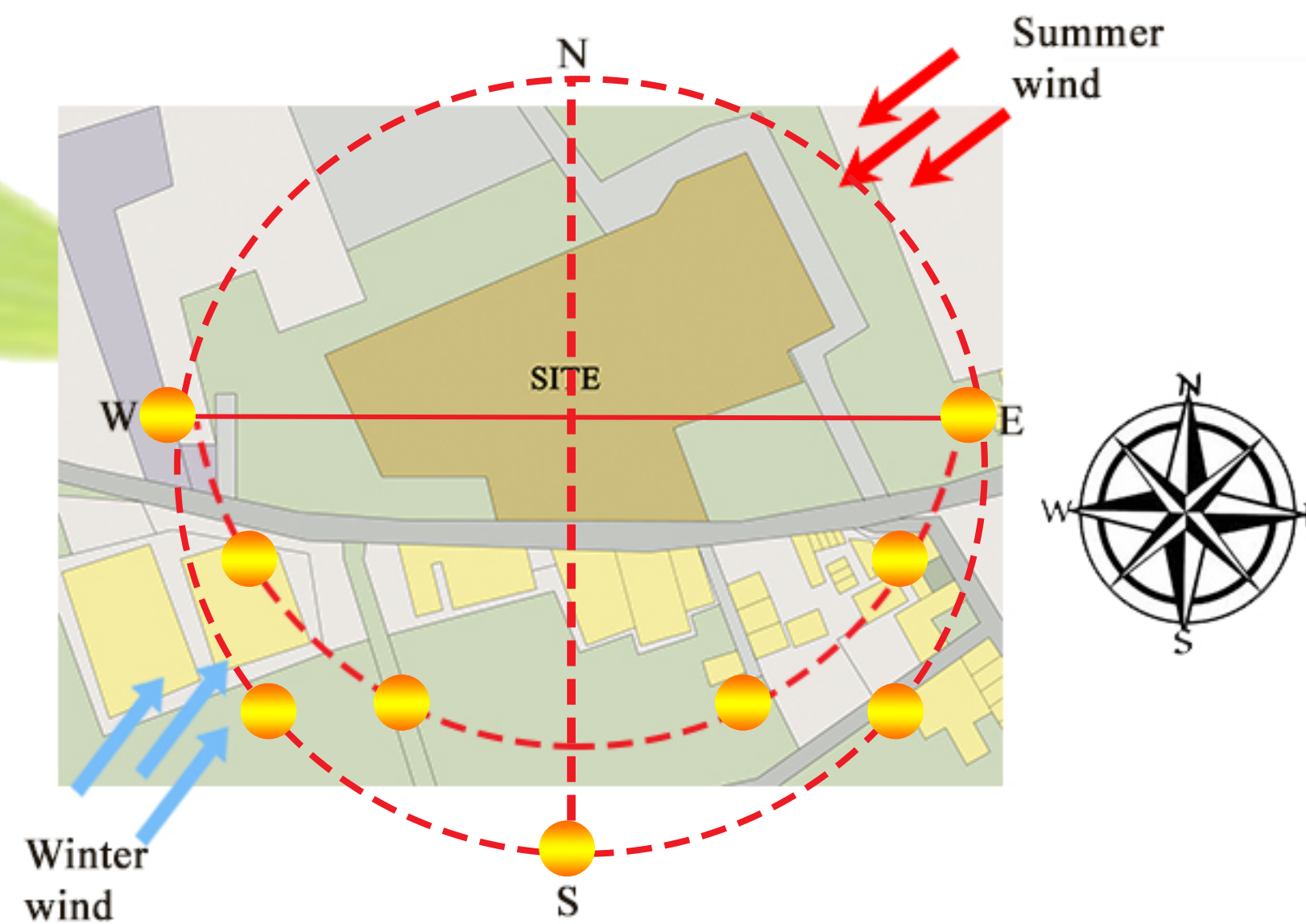


In Austria to segregate the pedestrian and cycle paths, a material difference was chosen instead of a divider.



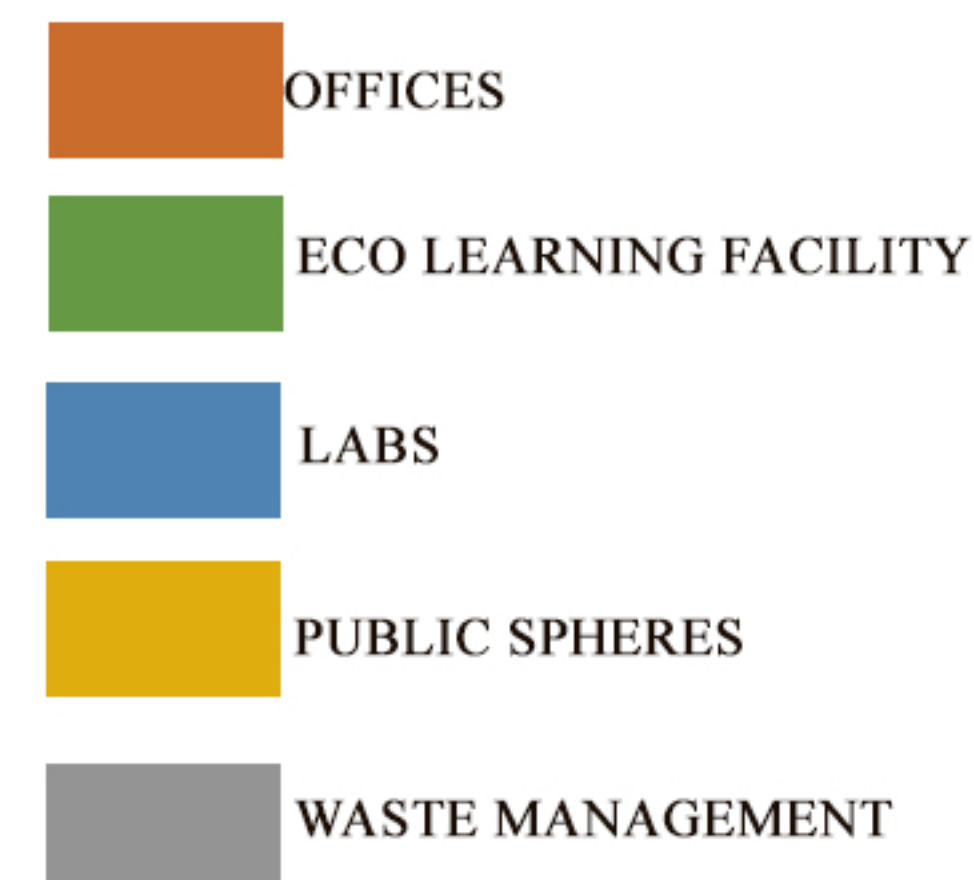
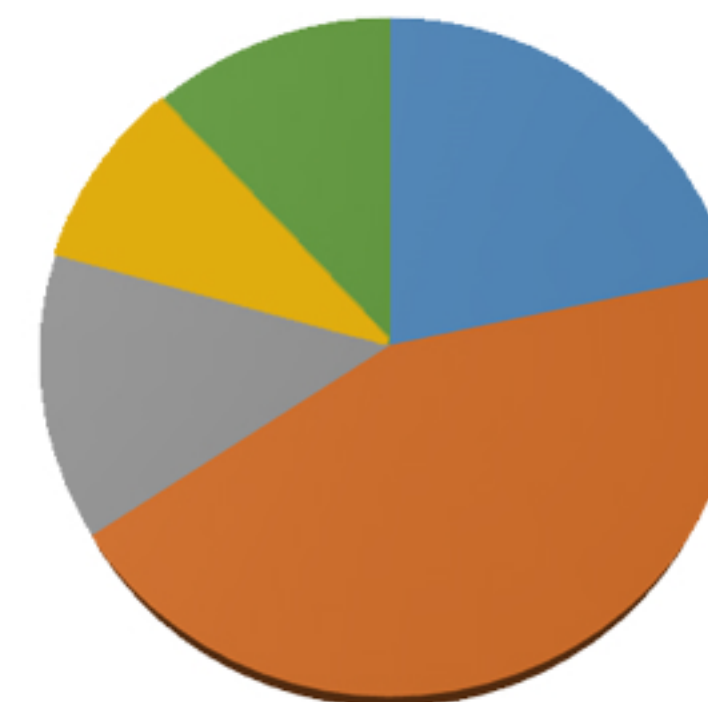
In Stockholm, Sweden a team from Volkswagen transformed the subway stairs into a giant functioning piano keyboard, applying pressure on each step played a musical note.

## CLIMATE



climate - Humid sub tropical  
Average temperature - 25°C to 40°C  
Average rainfall - 1282.70 MM  
Summer wind - WNW  
Winter wind - ESE

## FUNCTION DISTRIBUTION



## ACTION

CLEARING UP OF INFORMAL WASTE SECTOR.



## CONSEQUENCE

LESS RECYCLING. MORE WASTE IN LANDFILL..





**“Nature is my manifestation of God. I go to nature every day for inspiration in the day’s work. I follow in building the principles which nature has used in its domain.”**

**-FRANK LLOYD WRIGHT**

## CONCEPT

### THE GREEN ----- GAP

The “green -----gap” is defined as the gap between consumers green intentions and green actions . It is the designer’s duty to reduce this gap in order to develop a consumerist economy which helps in increasing and energy efficiency of the building and justifies the concepts of sustainability , waste management and waste re-utilization .

#### Principles of a Sustainable Society



**MINERAL RESOURCES**  
Substance from earth’s crust  
must not increase in nature



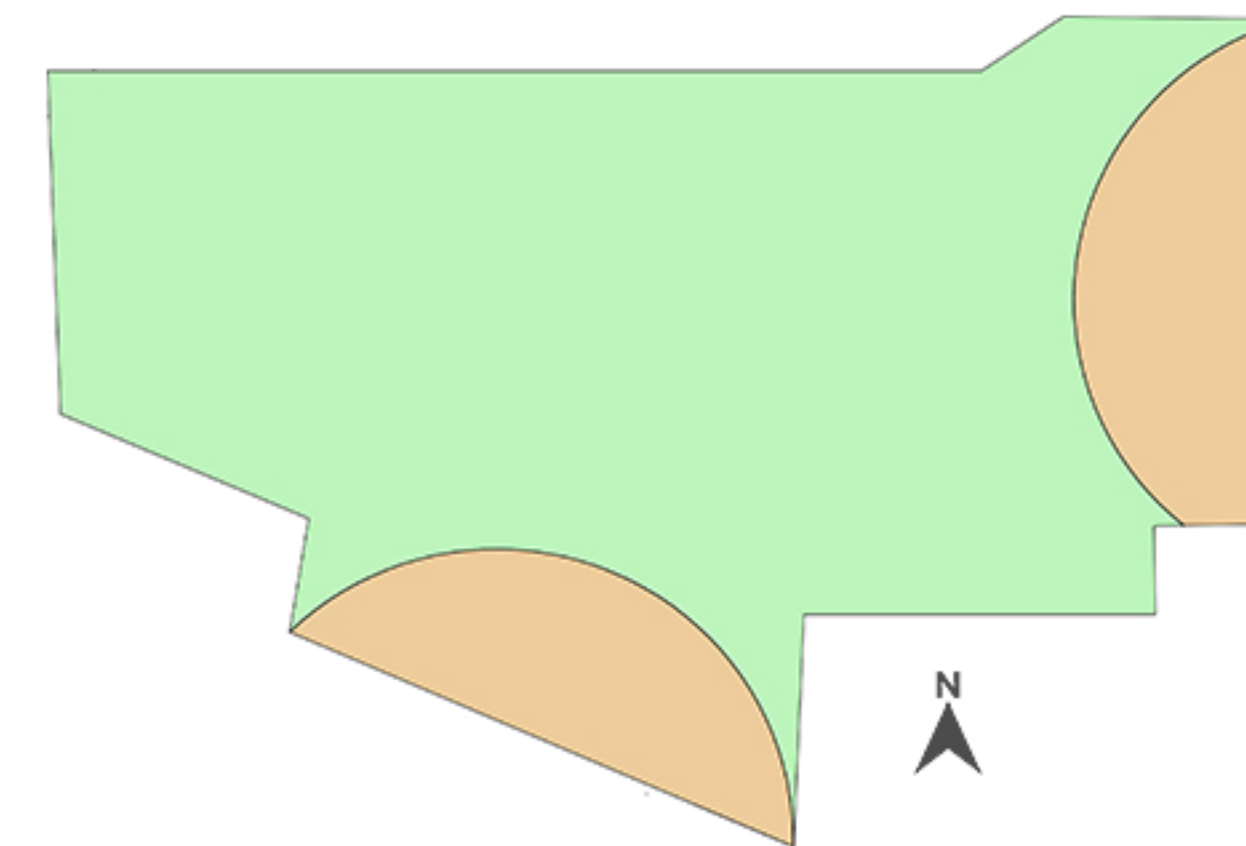
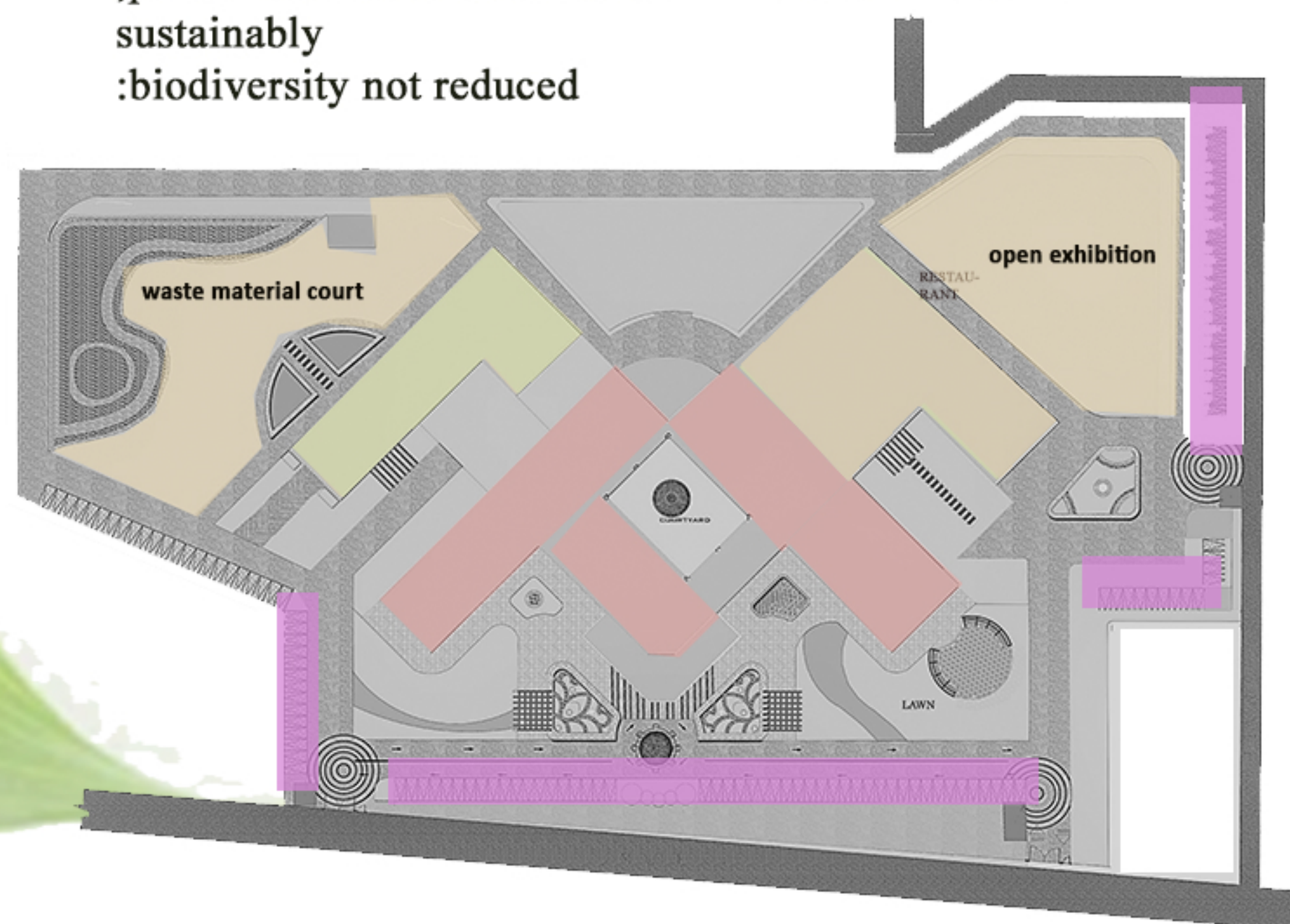
**SYNTHETIC MATERIAL**  
Substance produce by society  
should not accumulate in nature



**BIOLOGICAL PRODUCTIVITY**  
no physical degradation by nature  
;plants and animals harvested  
sustainably  
:biodiversity not reduced



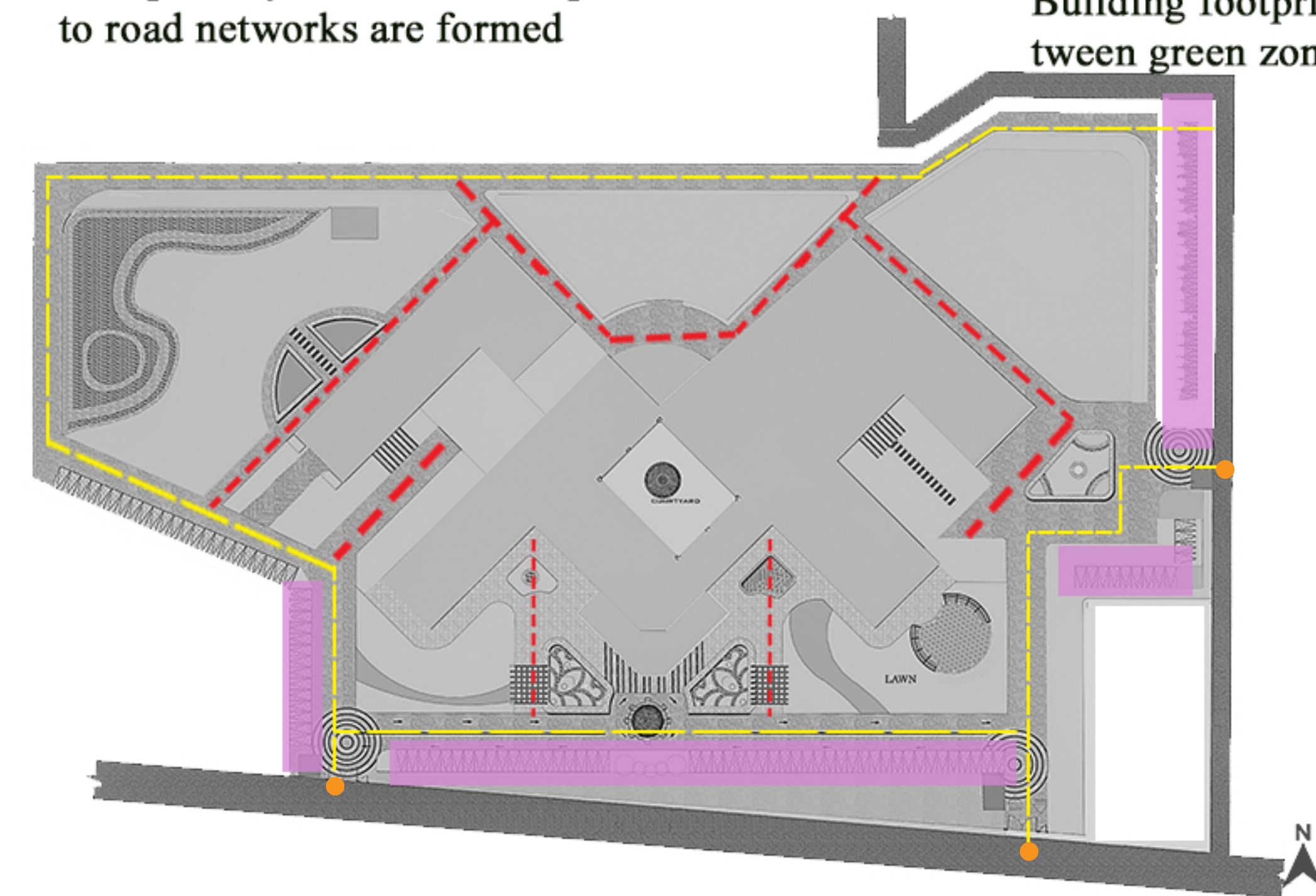
**EQUALITY**  
Society’s responsibility  
towards nature .



Two primary access with respect  
to road networks are formed



Building footprint emerges be-  
tween green zones



CIRCULATION PLAN

Private  
Semi public  
Public

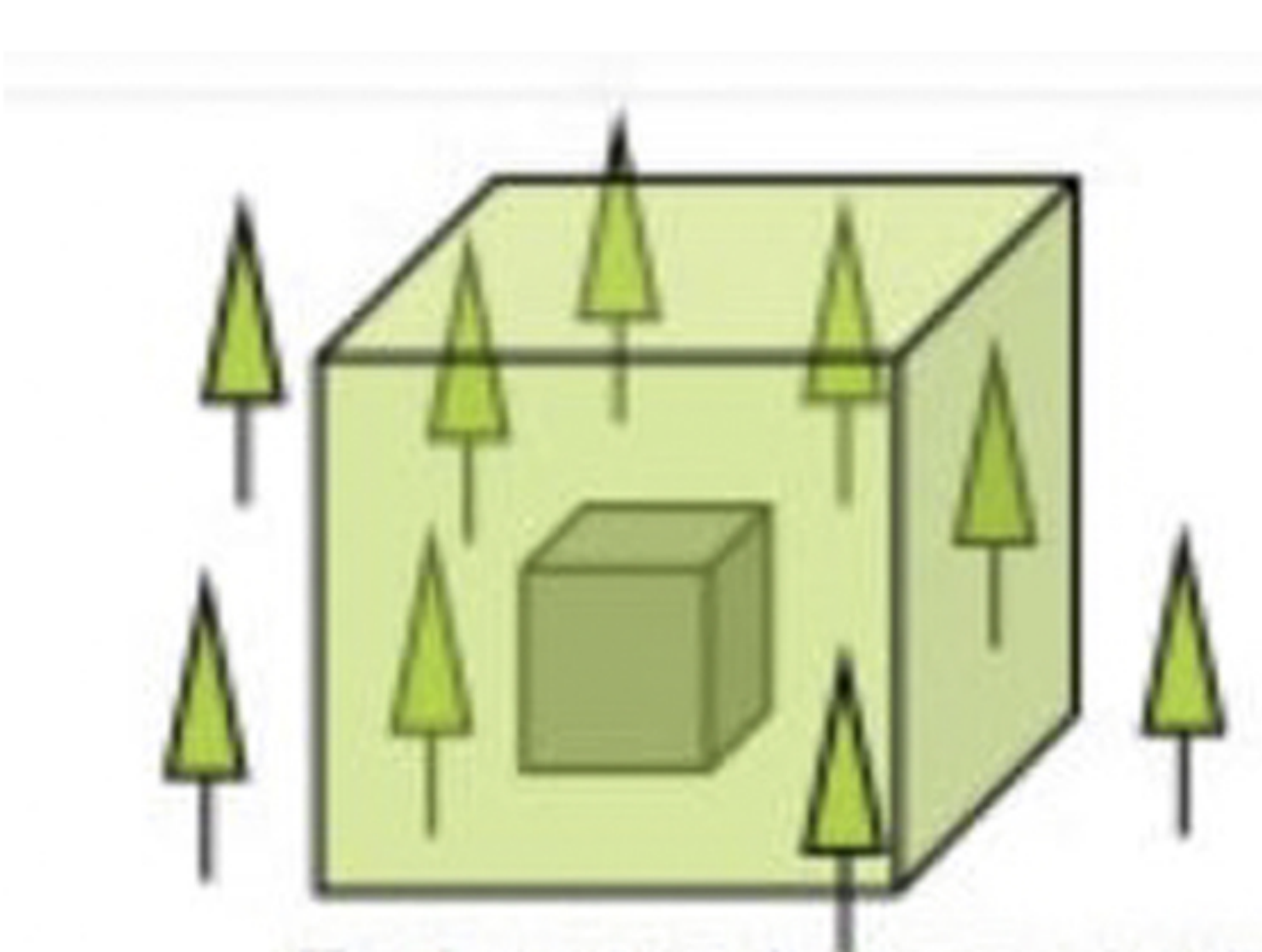
pedestrian movement  
vehicular movement  
Entry/exit  
Parking



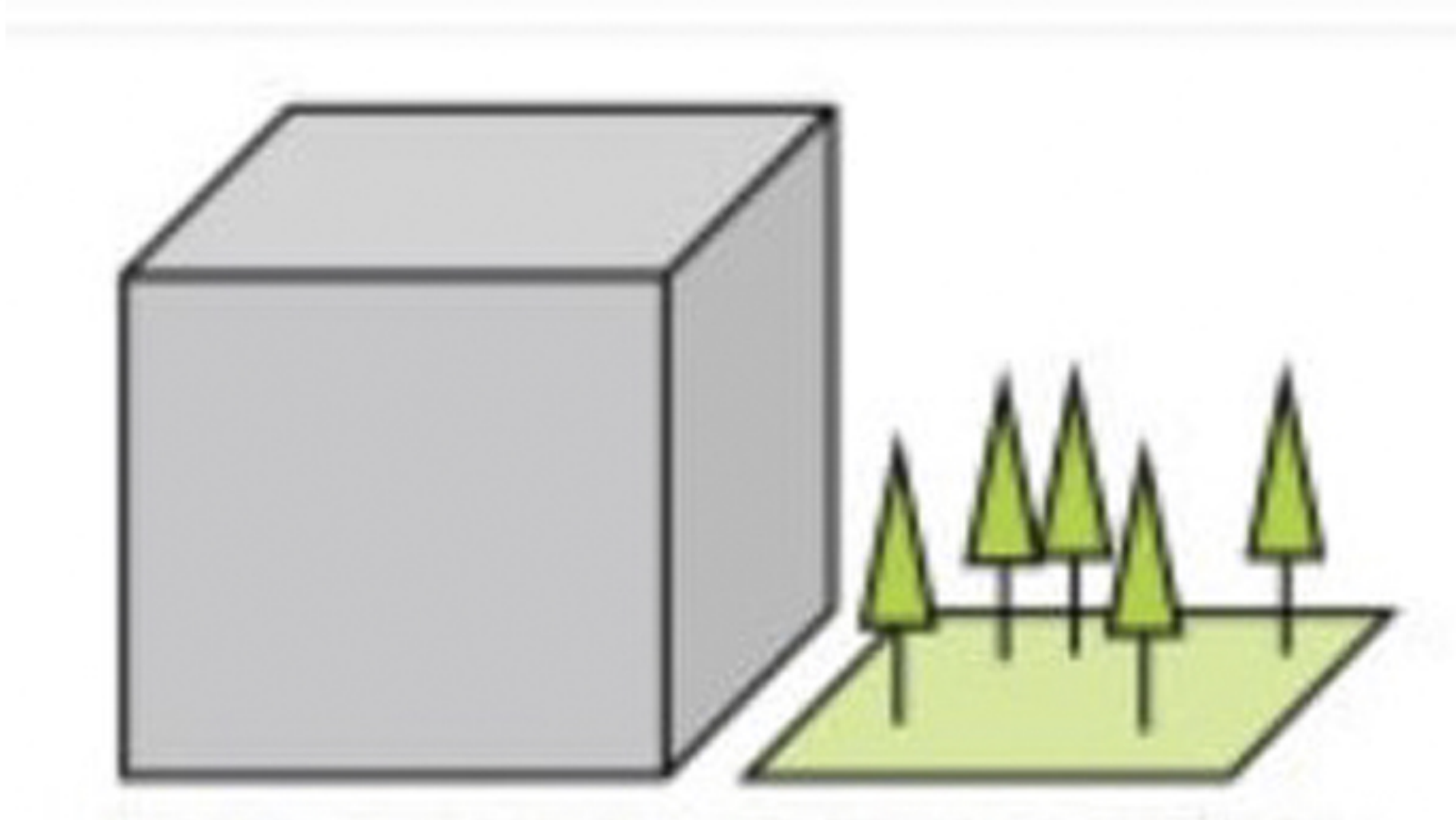
**BUBBLE DIAGRAM**



**FORM EVOLUTION**

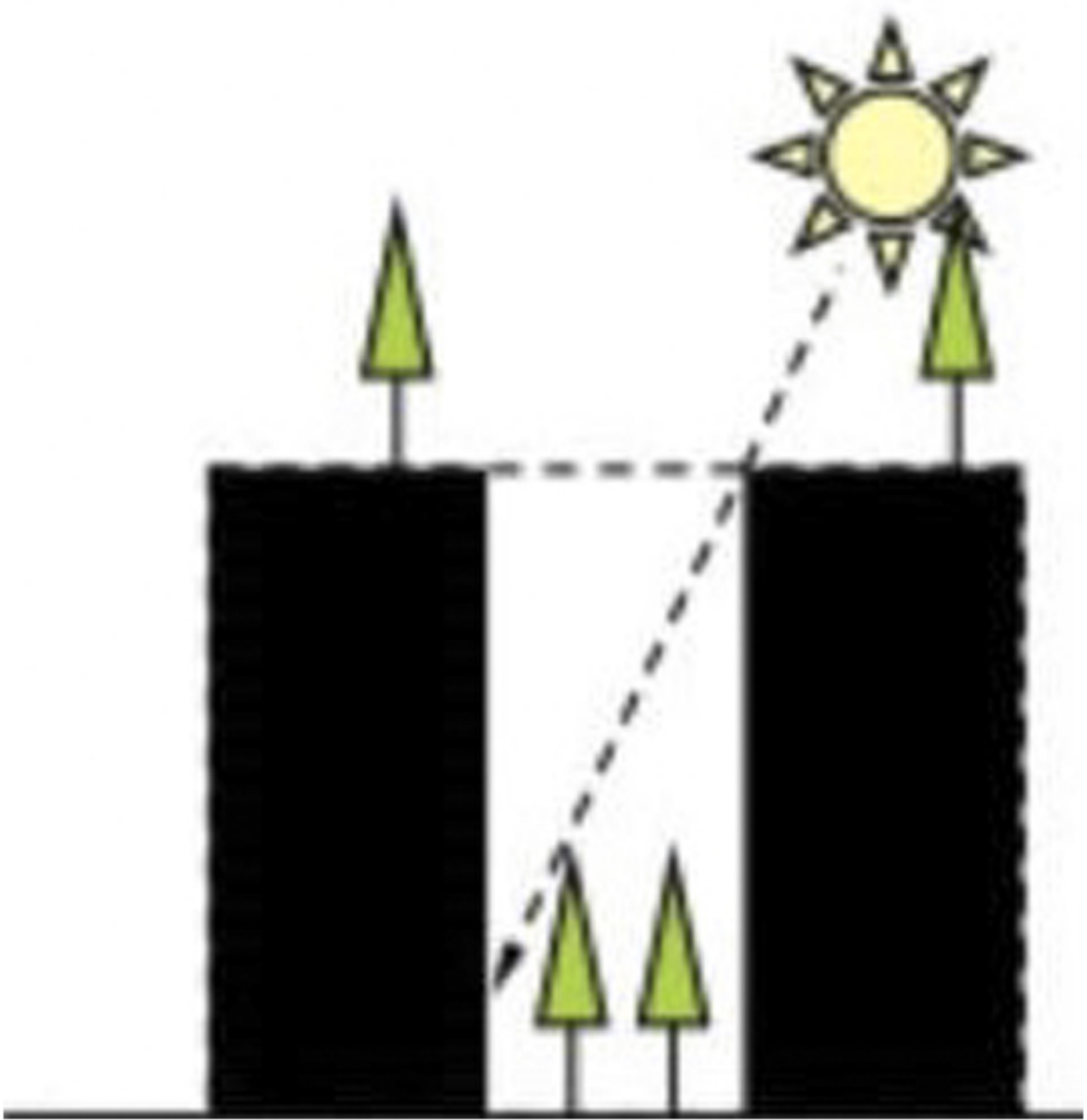
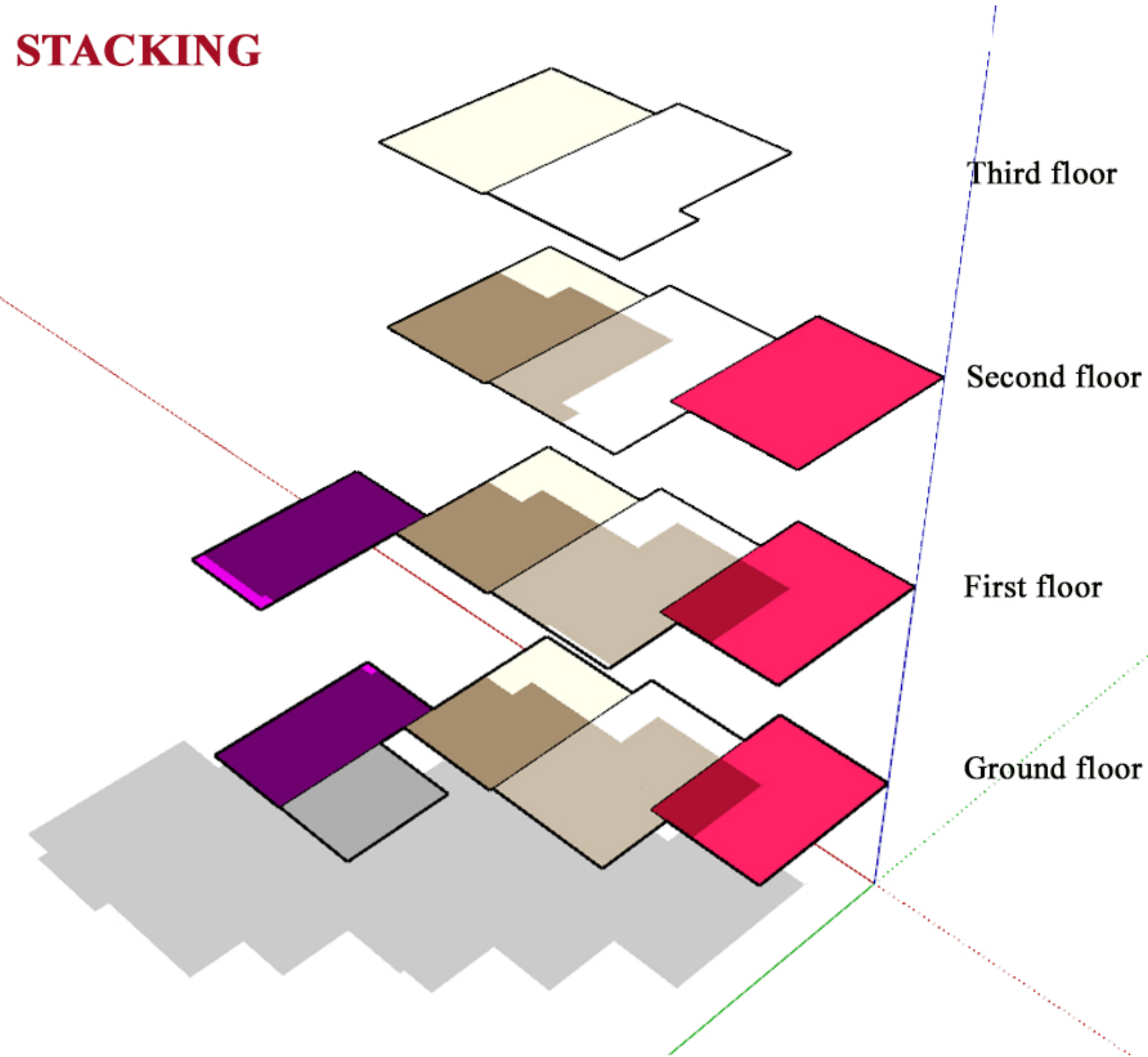


Early period - home is the shelter from wind and rain , the safe gaurd security , sanctuary and human lives in nature

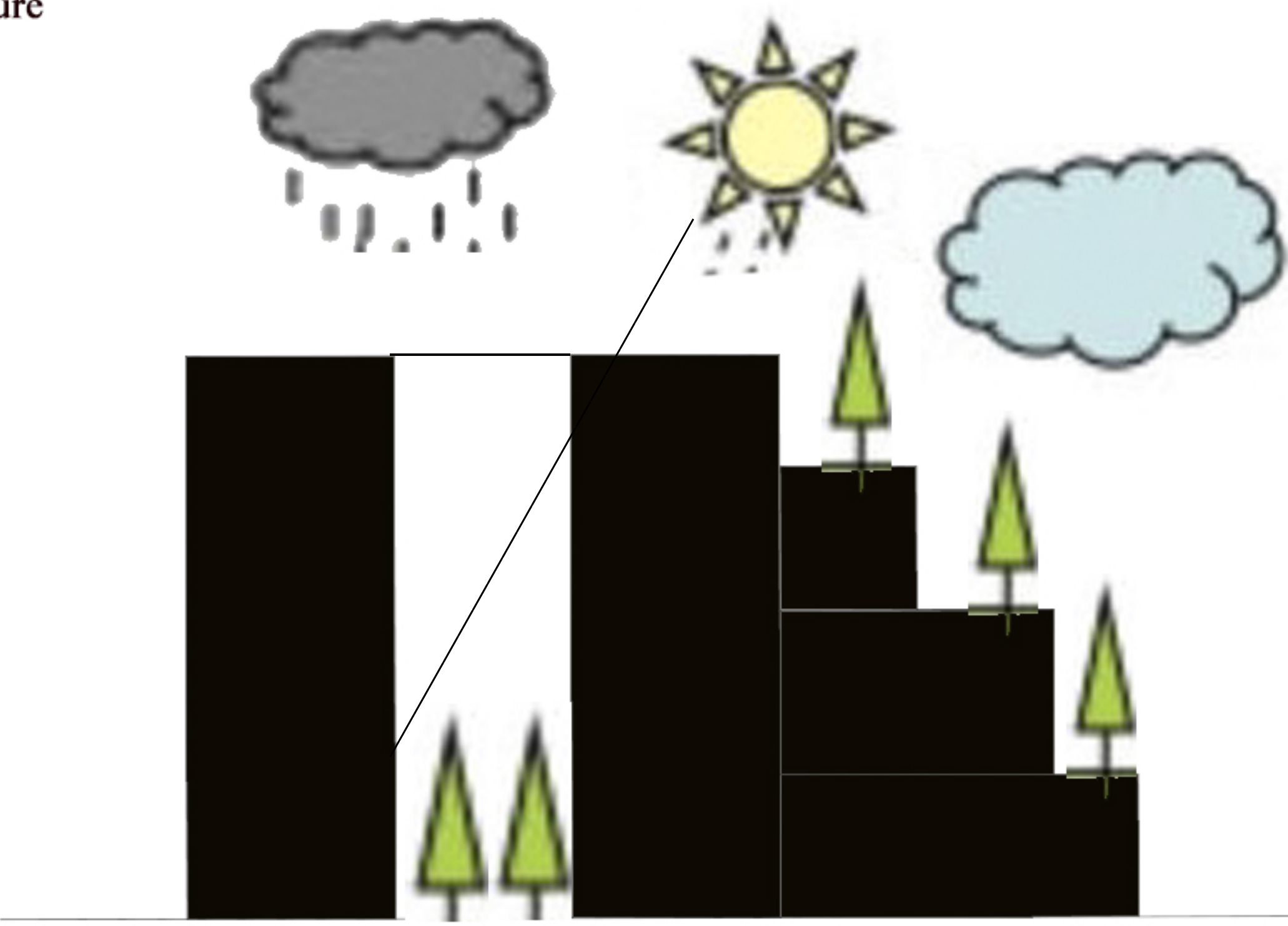


Modern period - rsidences after urbanisation , the human is separated from nature , the front yard and the park is an oppurtunity to get in touch with nature

**STACKING**



The well shaped courtyard is only restricted to ground level , the roof provides the people with the oppurtunity with the direct contact with nature



The courtyard provides a botanical garden like special aspect that draws human and nature together. ( on various level )



## RECYCLED WASTE MATERIAL COURT

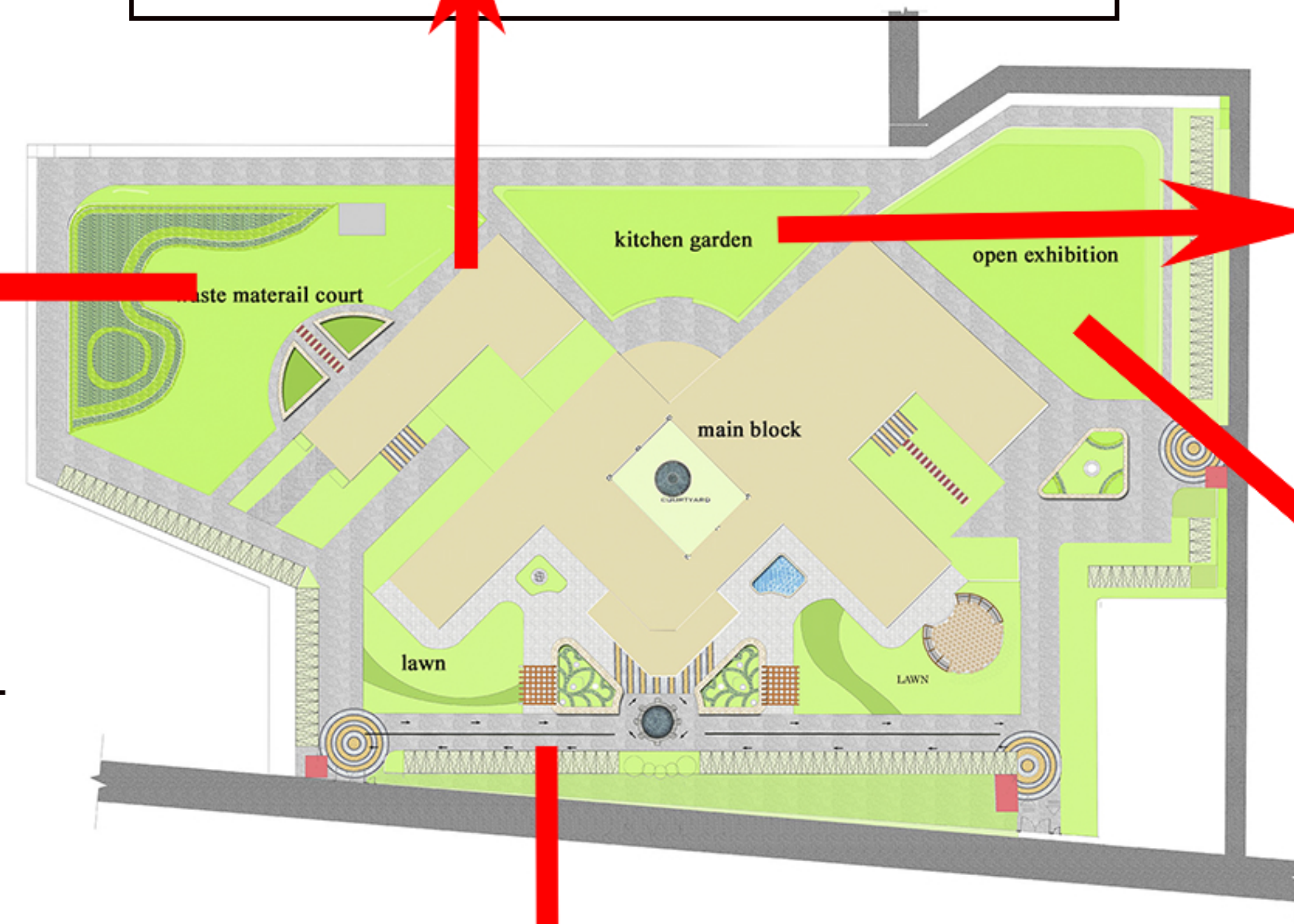


- Waste material sculpture
- curtain wall using dustbins
- can reuse material environmental friendly approach

## ACCOMODATION



Large, dynamic openings are the lungs, bringing natural light down and moving air up.  
•EATS connected to dormitory for temperature



- Young plants which are propagated in nursery can be sold
- Promotes Gardening
- Utilizing Space
- enhance site aesthetically
- creates a sensitive ecosystem

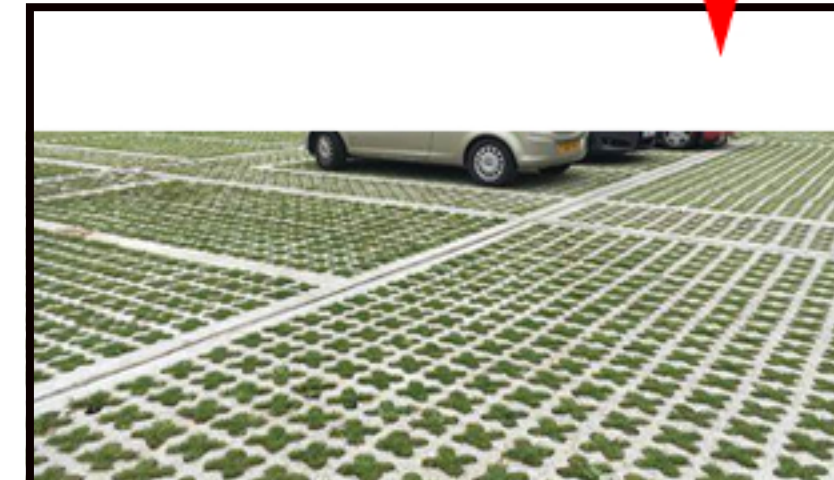


## OPEN EXHIBITION

- environment-friendly and low cost.
- Easy Access. Perhaps the most obvious reason why companies opt for open exhibition stand designs is the ease of access, which makes them more attractive for attendees. .

- to promote their products in a way that is less intrusive to customers.
- Increase productivity
- seek attention

- A water feature enhances the appearance of a landscape, purifies air, reduces noise pollution.
- waste material sculpture attracts attention



•A grass paver system can be a cost-effective way to create parking areas, roadways or driveways that are both attractive and durable.

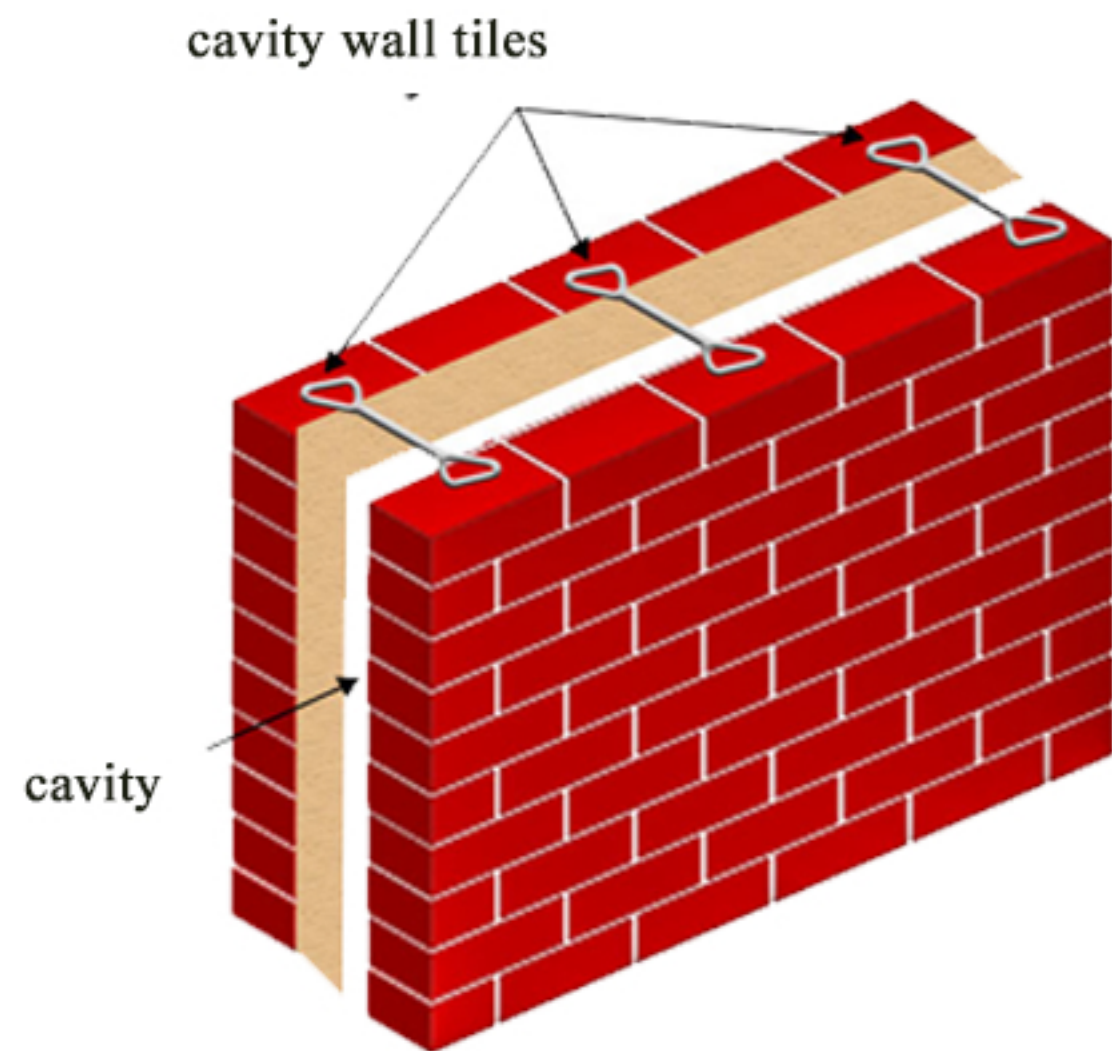




## DESIGN PARAMETERS

### Cavity wall

•A cavity wall consists of two parallel walls with a 5 cm to 8 cm gap or a cavity between them sometimes, this cavity may be filled with insulation material.

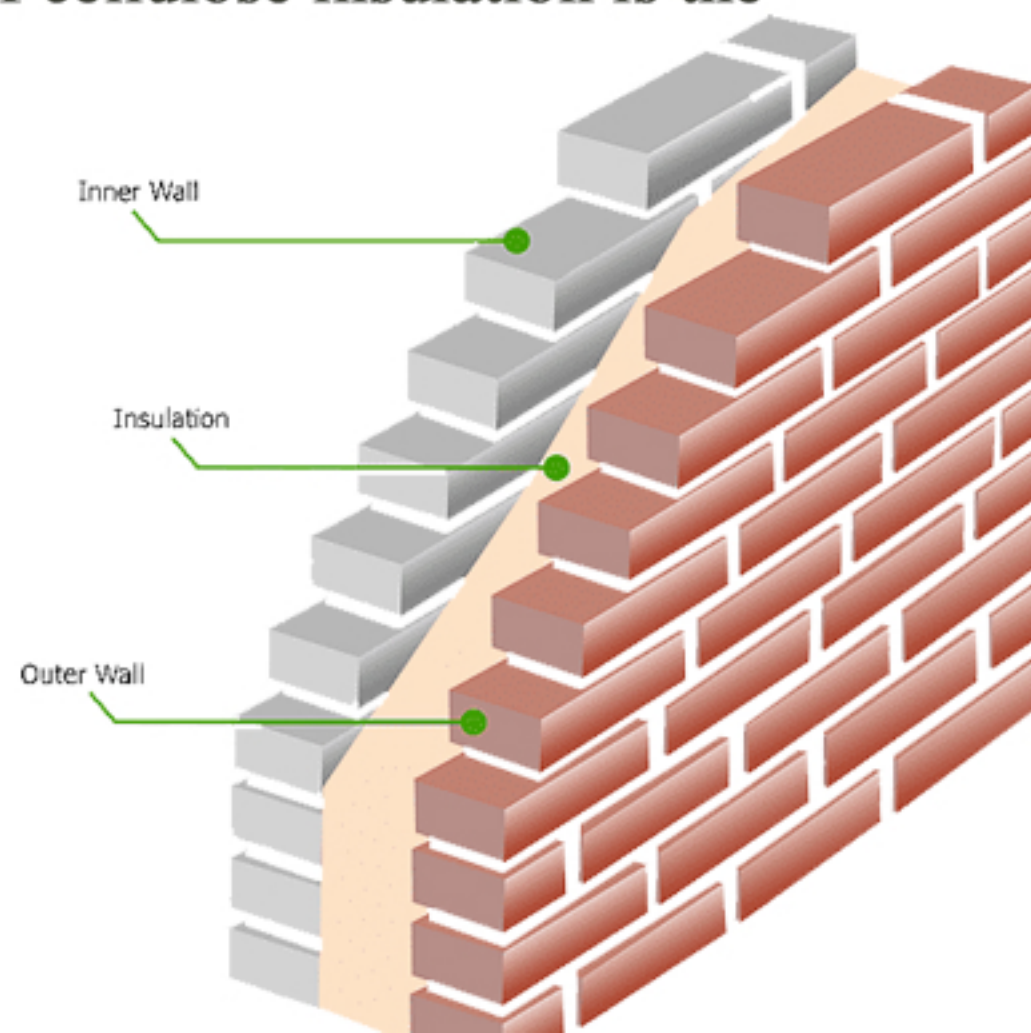


### Cellulose insulation

- it is made from either 75% to 85% ground-up recycled paper or recycled denim.
- It is heavily treated – around 15 percent by volume – with boric acid, borax, or ammonium sulfate
- It can be blown as loose-fill insulation in attic cavities, dense packed into walls and floors, or wet spray for new construction that helps increase heat retention and has the potential to

### Environmental properties

- Recycled content
- Low toxicity and environmental impact of raw materials.
- Embodied energy- The embodied energy of cellulose insulation is the



### Earthen floors

- An earthen floor, or adobe floor, is a floor made of dirt, raw earth, or other unworked ground materials.
- Provision of earthen floors in dormitory to create cool temperature inside the buuiling .



### Benefits

- One of the cheapest flooring methods
- Variety of colors, textures, and materials
- Can be installed over nearly any subflooring
- Integrates well with in-floor radiant heat tubing

### Use of bamboo

- Food kiosk roof can be made using bamboo.
- The structure of a roof can consists of purlins, rafters and trusses.
- Gazebos can be made out of using bamboos



### Jali

- It is created by small perforations in a wall that make the direct sunlight to scatter while it enters the interiors.
- It allows the daylight to get inside without glare.
- Jaali follows the Bernoulli and Venturi laws which state that the speed of air increases when it passes through smaller holes. Therefore, even if the wind is mild outside, Jaali is able to create a profound effect in the indoor areas.
- Jaali is used to promotes light, air, and privacy together, in a smart way.

### Outdoor comfort

building design to create comfort for outdoor special spaces

FLexibility and adaptability

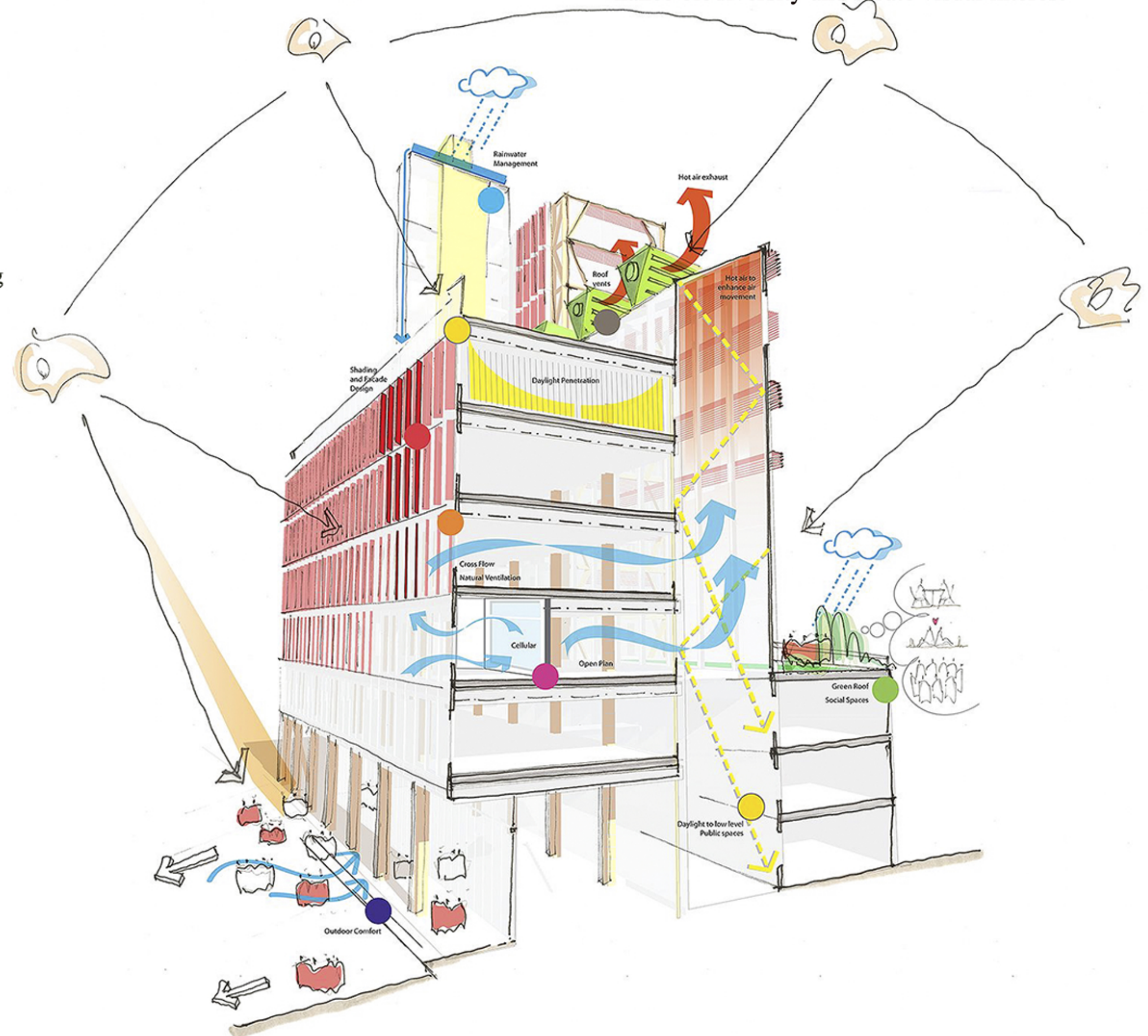
Simplicity in architure +structure in design

Natural ventilation

the environmentally approach for building to design natural ventilated space by narrow floor plates allowing cross flow shading design

The solar radiation received by each facade

Green roof  
green roof provides for elevated social spaces enhance biodiversity and create visual interest





# DESIGN PARAMETERS



**\*USE OF GEOMETRIC FORMS**  
**\*USE OF EARTH COLOURS**  
**AND MATERIAL**  
**\*REPETITIVE SHAPES**



- Forms like square , triangle ,circle and polygon
- geometric forms give a sense of simplicity
- use of earth colours exterior give a sense of block merging with th nature hence giving a pleasing overall effect.
- Simple straight line , low key architecture in context with surrounding , site and climate.



**\*USE OF WATER BODIES.**  
**\*USE OF LANDSCAPE EL-**  
**EMENTS**  
**\*USE OF BATTERY OPER-**  
**ATED VEHICLES**



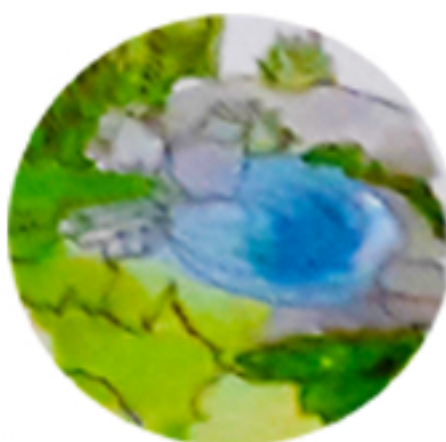
- Maximum use of water bodies to be created artificially in order to enhance the micro climate
- Use of battery operated vehicles and bicycles as mode of transport
- lush green surrounding with use of various landscape elements and principles
- use of vegetation and landscaping to obstruct the direct sunlight
- water feature act as natural cooling bodies that help in lowering the ambient temperature of development



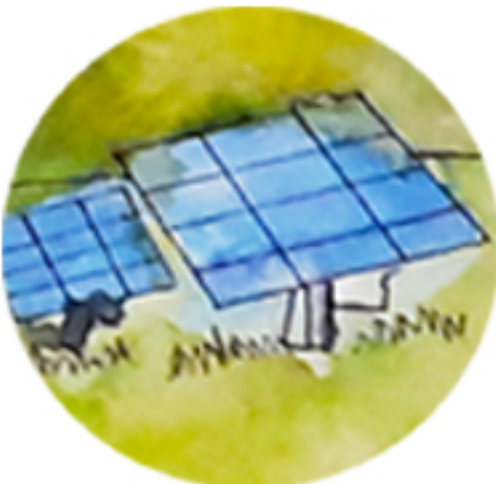
**\*PROVISION OF THE**  
**ARTIFICIAL PONDS**  
**\*USE OF PERMEABLE**  
**PAVER BLOCKS**



- Provision of artificial ponds for collection of rainwater which also controls the micro climate of site
- use of permeable paver blocks in the pathways to absorb water , to increase the ground water table recharge of borewells through special arrangement rainwater collected to reuse the water for irrigation
- rain water harvesting helps to recharge ground water and can be used in various purposes like irrigation .



**CONSERVATION**  
**USE OF THE SOLAR**  
**PANELS**  
**USE OF THE SOLAR**  
**STREET LIGHTS**



- Solar energy to be harvested with the use of solar panels plates on the site
- solar lights to be used inside the site thus cutting down the electricity to a great extent
- use of solar street light along the pathway
- use of solar lights in landscaping
- helps to save electricity throughout the site



**USE OF GLASS FOR**  
**ROOF AND WINDOWS**  
**PROPER LANDSCAPE**  
**TO CHANNELISE AIR**



- Providing large openings , helps in maximum penetration of natural light
- landscaping done in such a way to channelise air scattered planning of blocks will help in proper circulation of air and uninterrupted natural lighting
- use of glass for roof to gain light
- The terrace part is covered by broken sanitary tiles to make inner temperature cool

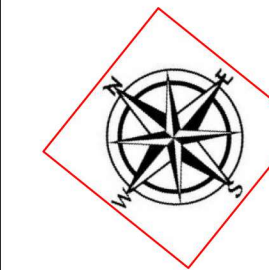


**USE OF FLY ASH**  
**BRICKS**  
**USE OF NON TOXIC**  
**PAINTS**



- No use of hazardous paint and finishing products
- use of flyash brick resulting in significant energy saving
- use of woods and wood finishes to give more natural appearances
- use of cellulose insulation in cavity wall which is made up of recycled paper
- plastic roads
- use of green concrete





E  
C  
O  
  
R  
E  
S  
E  
A  
R  
C  
H  
  
C  
E  
N  
T  
R  
E

AT BAREILLY, UP

THESIS 2021-22

GUIDED BY : PROF. MOHIT KUMAR AGARWAL  
AR. SHALINI DIWAKER

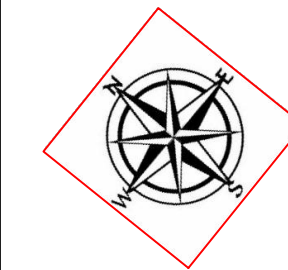
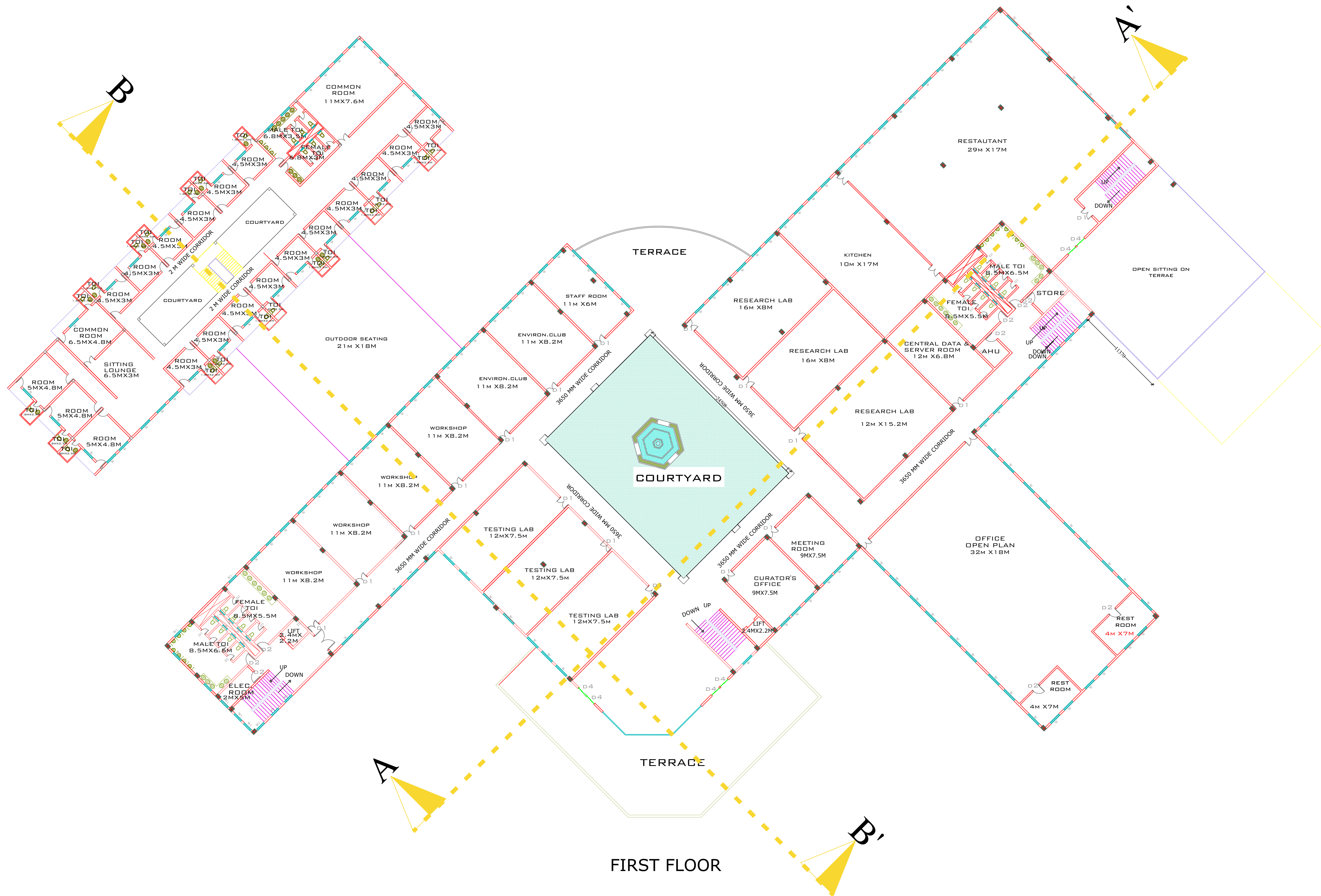
SCALE :

THESIS BY: ZARISH KANWAL

B.ARCH 5TH YR

B.B.D.U





# Eco Research Centre

AT BAREILLY, UP

THESIS 2021-22

GUIDED BY : PROF. MOHIT KUMAR AGARWAL  
AR. SHALINI DIWAKER

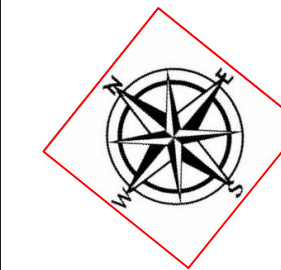
SCALE :

THESIS BY: ZARISH KANWAL

B.ARCH 5TH YR

B.B.D.U





# ECO RESEARCH CENTRE

AT BAREILLY, UP

THESIS 2021-22

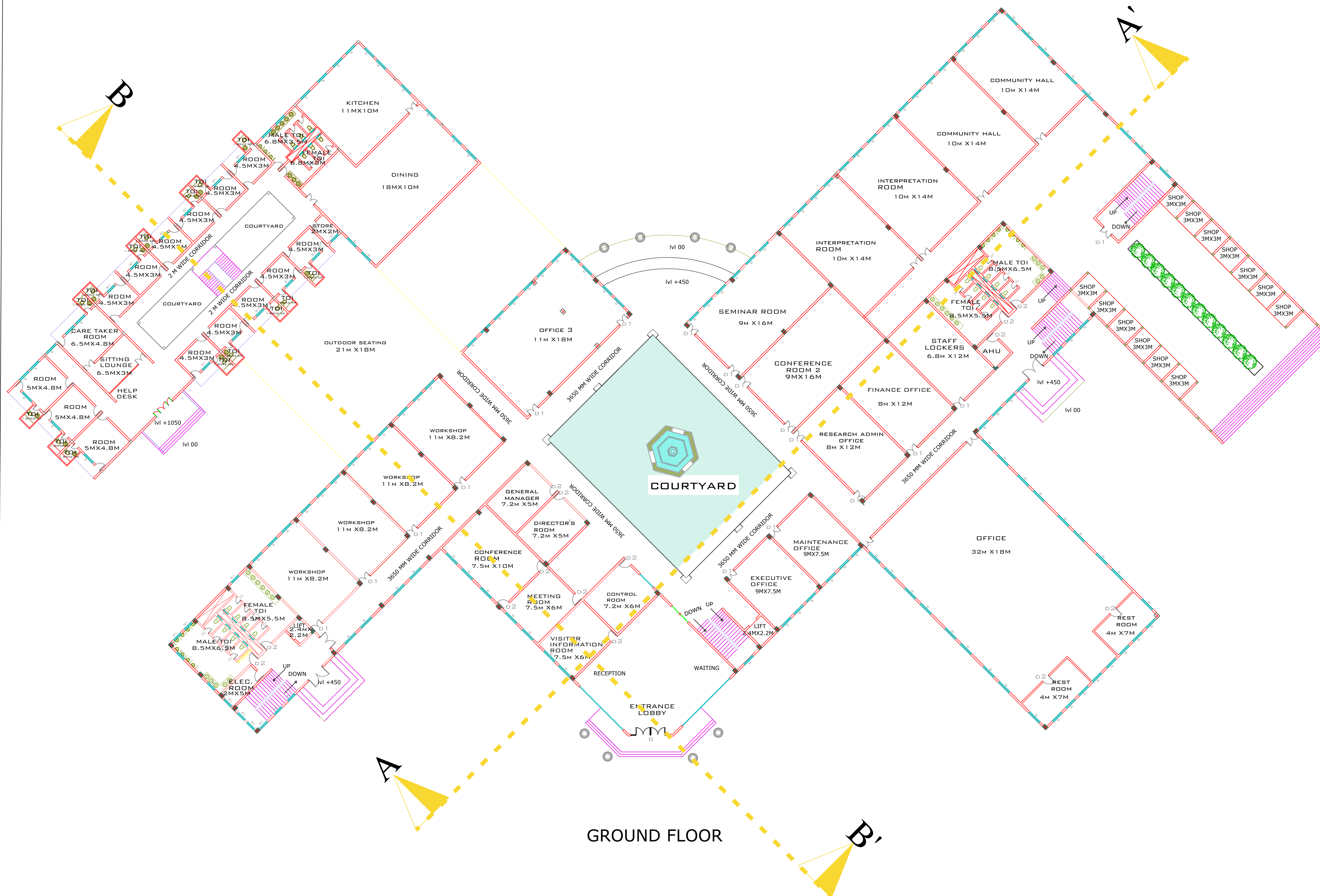
GUIDED BY : PROF. MOHIT KUMAR AGARWAL  
AR. SHALINI DIWAKER

SCALE :

THESIS BY: ZARISH KANWAL

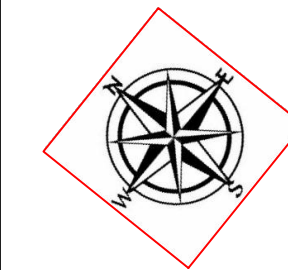
B.ARCH 5TH YR

B.B.D.U



GROUND FLOOR





# ECO RESEARCH CENTRE

AT BAREILLY, UP

THESIS 2021-22

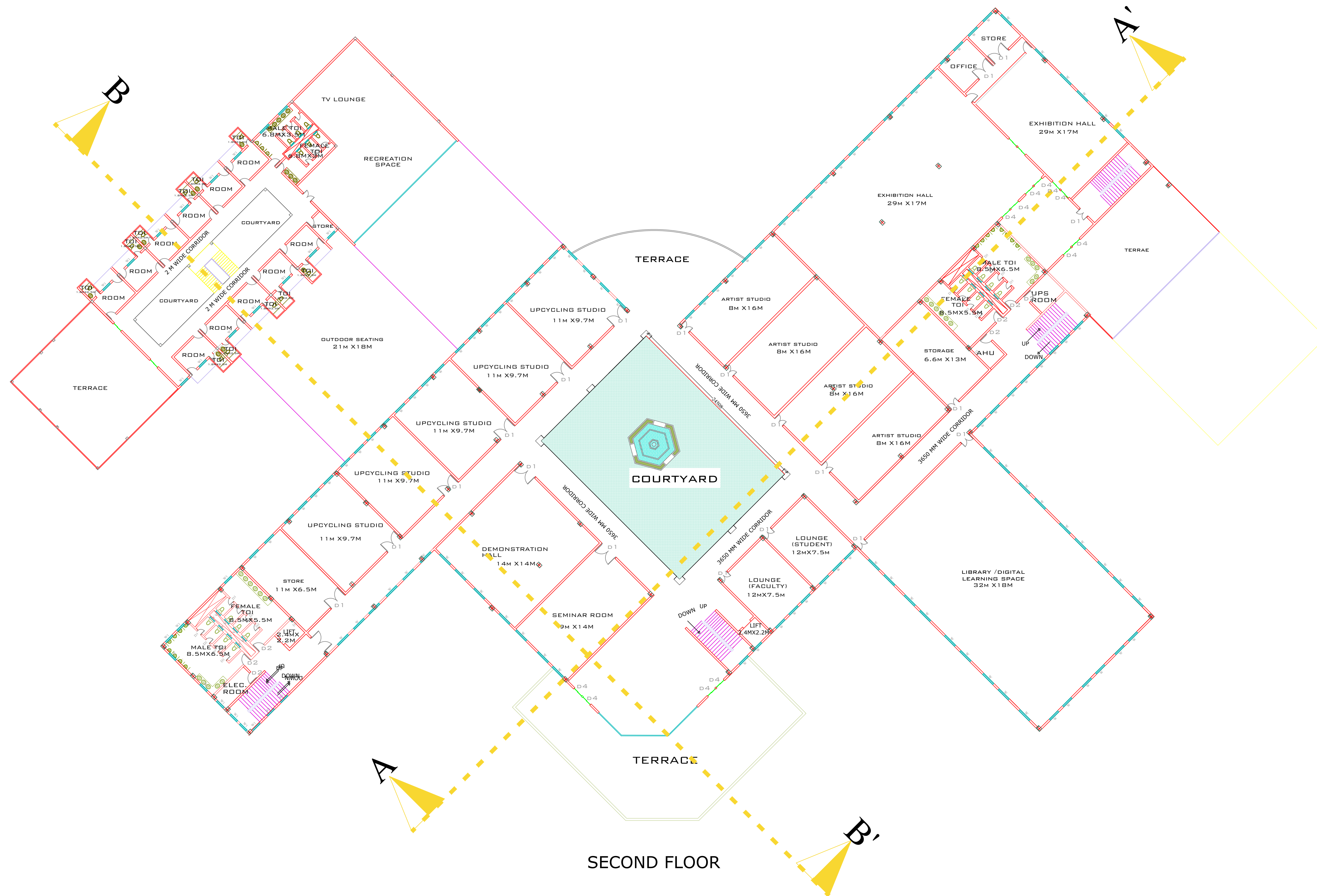
GUIDED BY : PROF. MOHIT KUMAR AGARWAL  
AR. SHALINI DIWAKER

SCALE :

THESIS BY: ZARISH KANWAL

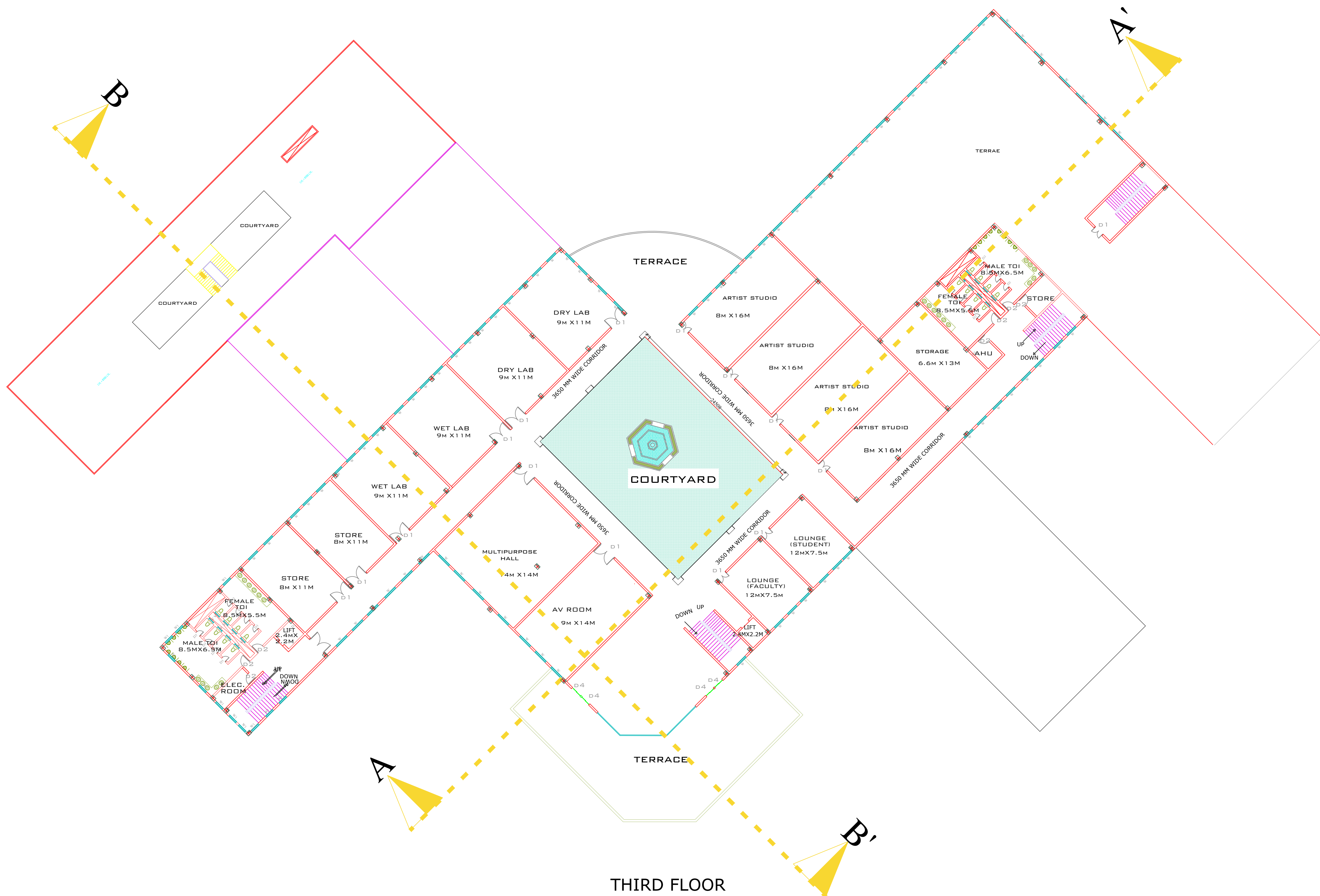
B.ARCH 5TH YR

B.B.D.U

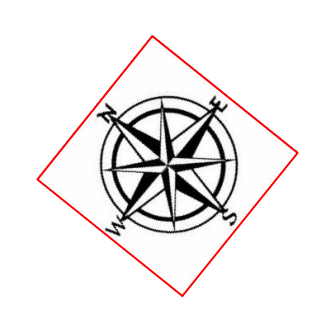


SECOND FLOOR





THIRD FLOOR



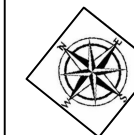
E  
C  
O  
  
R  
E  
S  
E  
A  
R  
C  
H  
  
C  
E  
N  
T  
R  
E

AT BAREILLY, UP

THESIS 2021-22

GUIDED BY : PROF. MOHIT KUMAR AGARWAL  
AR. SHALINI DIWAKER

|                          |
|--------------------------|
| SCALE :                  |
| THESIS BY: ZARISH KANWAL |
| B.ARCH 5TH YR            |
| B.B.D.U                  |



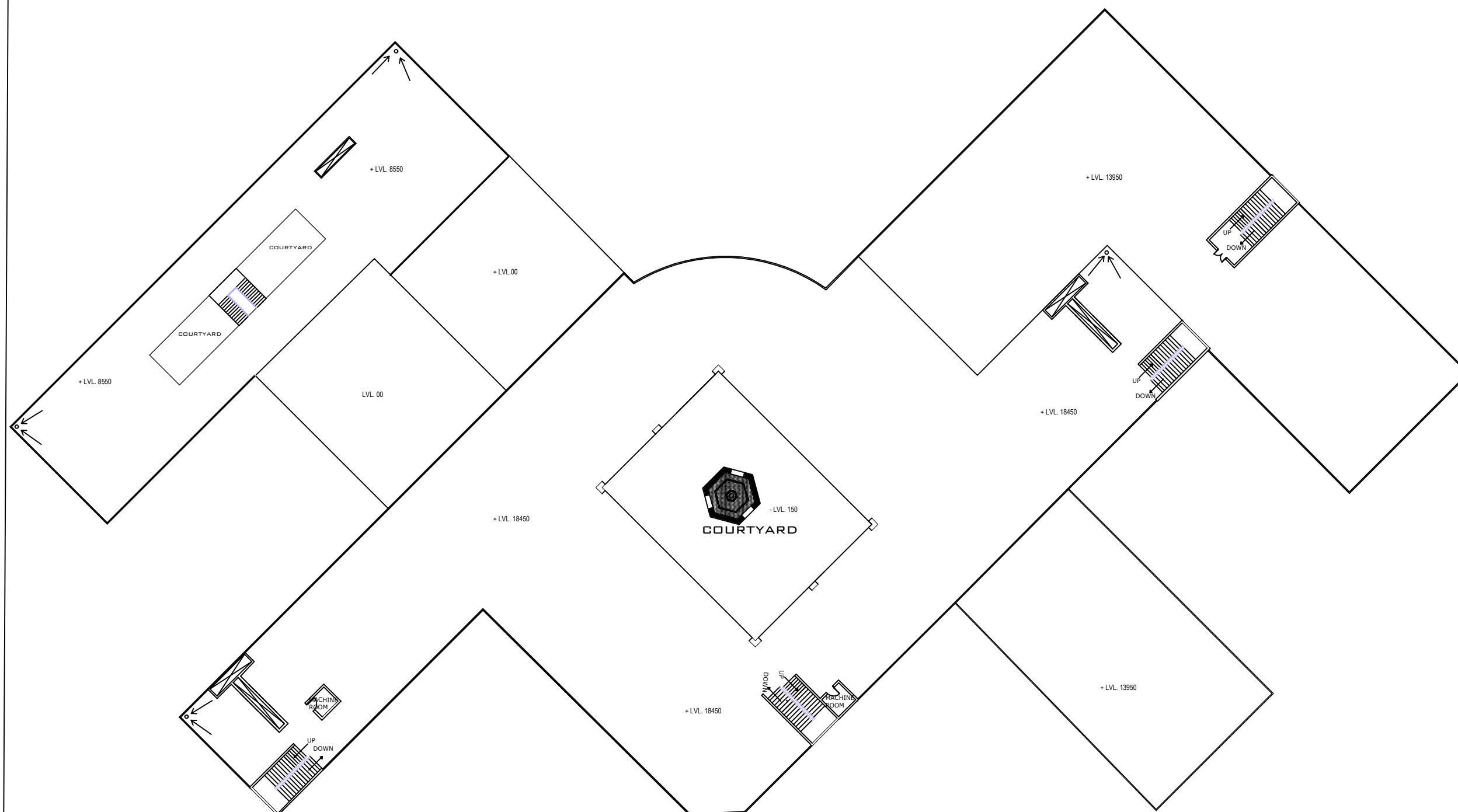
# ECO RESEARCH CENTRE

AT BAREILLY, UP

THESIS 2021-22

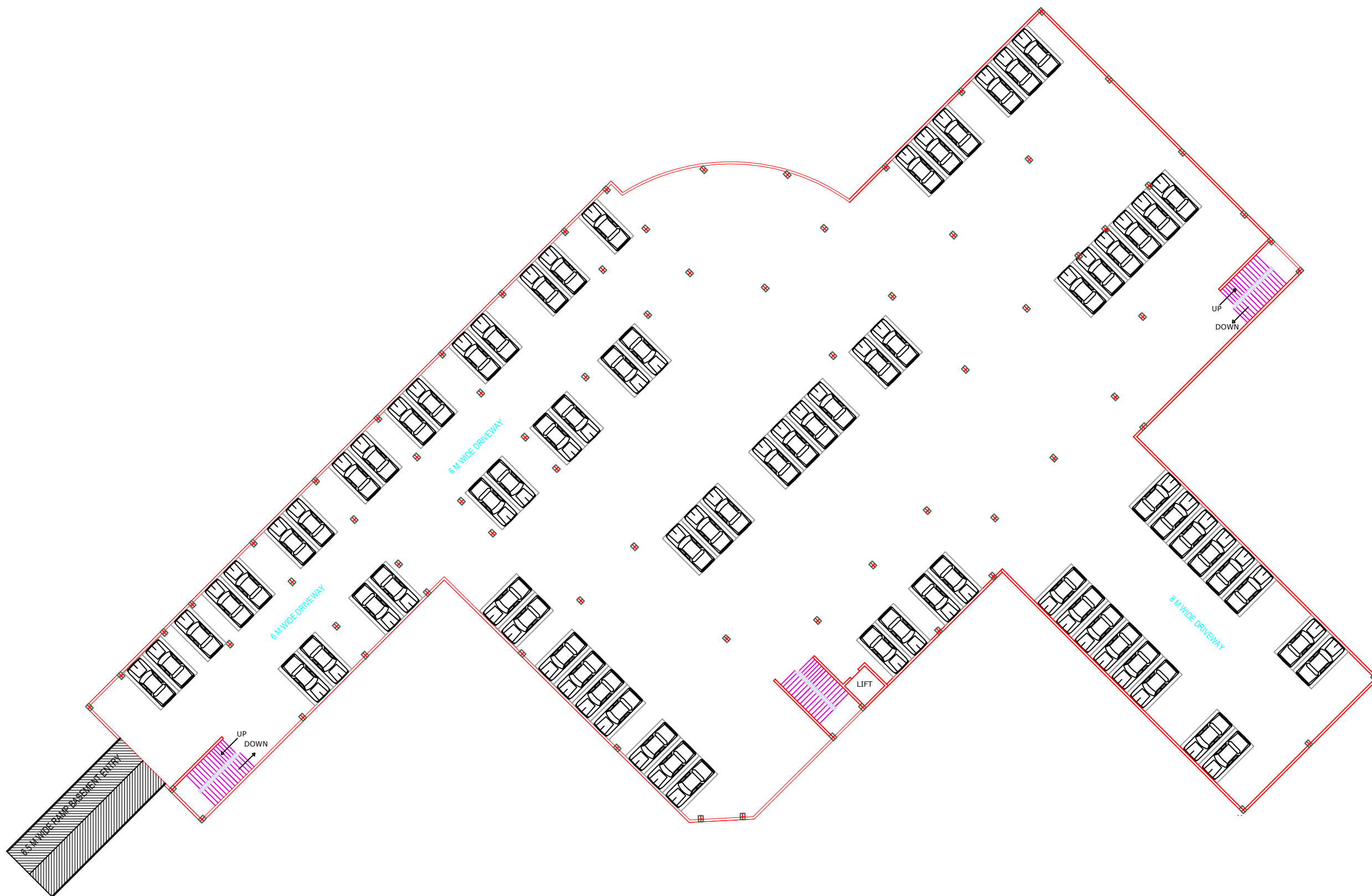
GUIDED BY : PROF. MOHIT KUMAR AGARWAL  
AR. SHALINI DIWAKER

|                          |
|--------------------------|
| SCALE :                  |
| THESIS BY: ZARISH KANWAL |
| B.ARCH 5TH YR            |
| B.B.D.U                  |

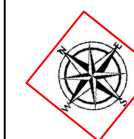


TERRACE PLAN





BASEMENT PLAN



# ECO RESEARCH CENTRE

AT BAREILLY, UP

THESIS 2021-22

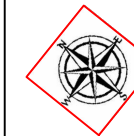
GUIDED BY : PROF. MOHIT KUMAR AGARWAL  
AR. SHALINI DIWAKER

SCALE :

THESIS BY: ZARISH KANWAL

B.ARCH 5TH YR

B.B.D.U



ECO  
RESEARCH  
CENTRE

AT BAREILLY, UP

THESIS 2021-22

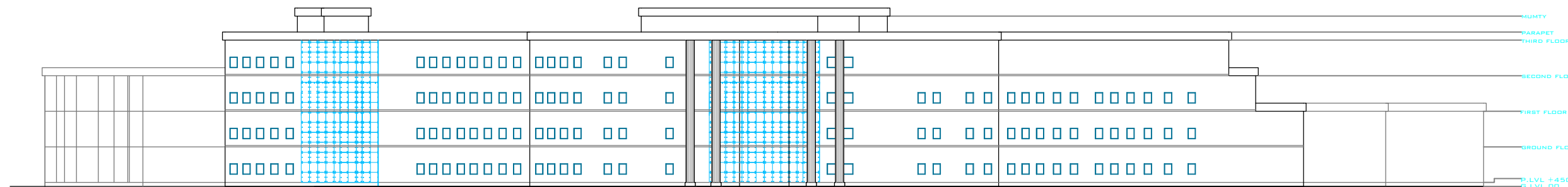
GUIDED BY : PROF. MOHIT KUMAR AGARWAL  
AR. SHALINI DIWAKER

SCALE :

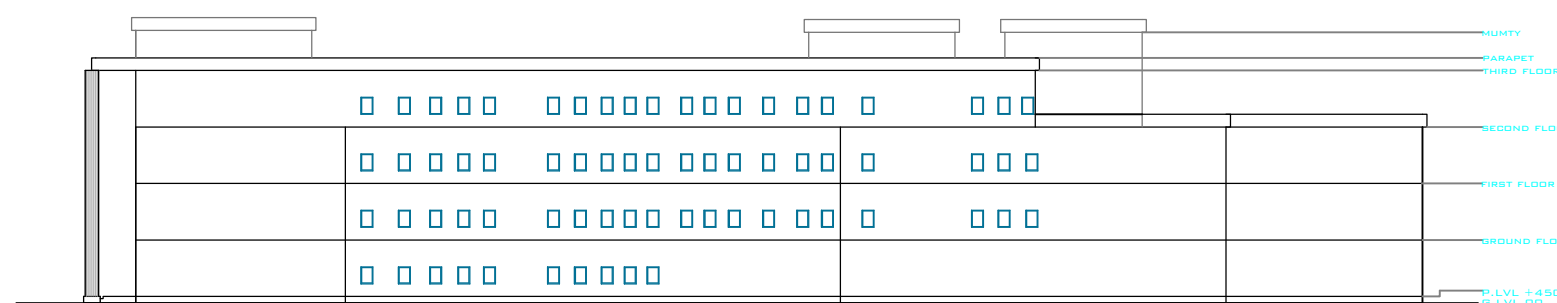
THESIS BY: ZARISH KANWAL

B.ARCH 5TH YR

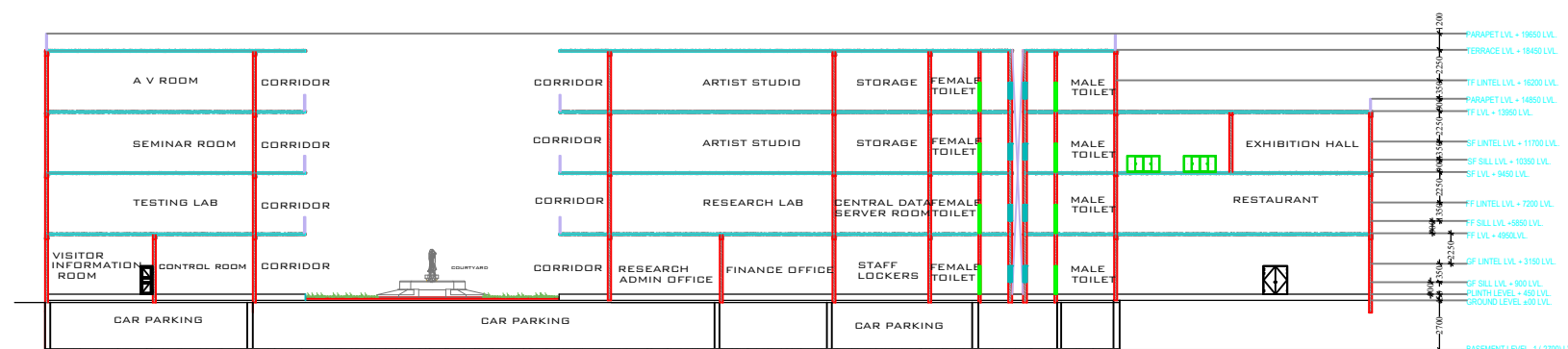
B.B.D.U



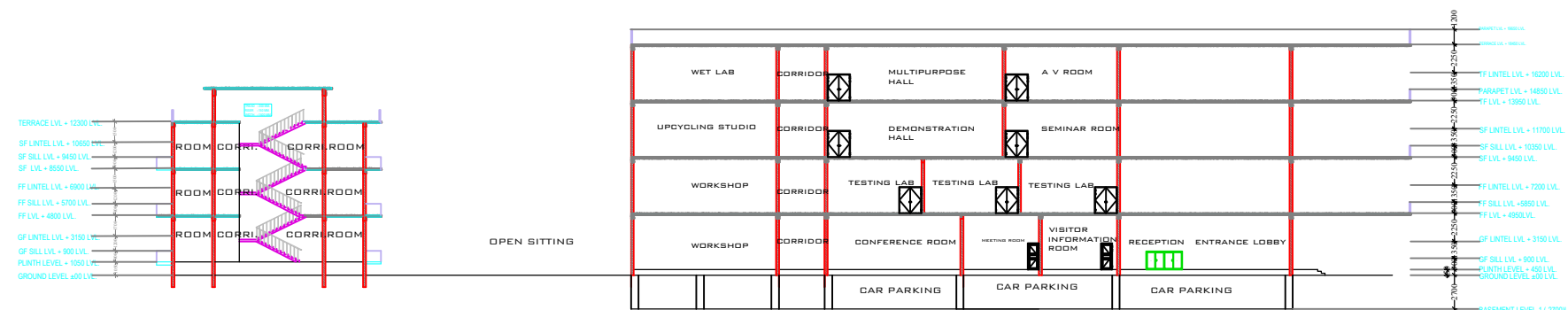
FRONT ELEVATION



SIDE ELEVATION

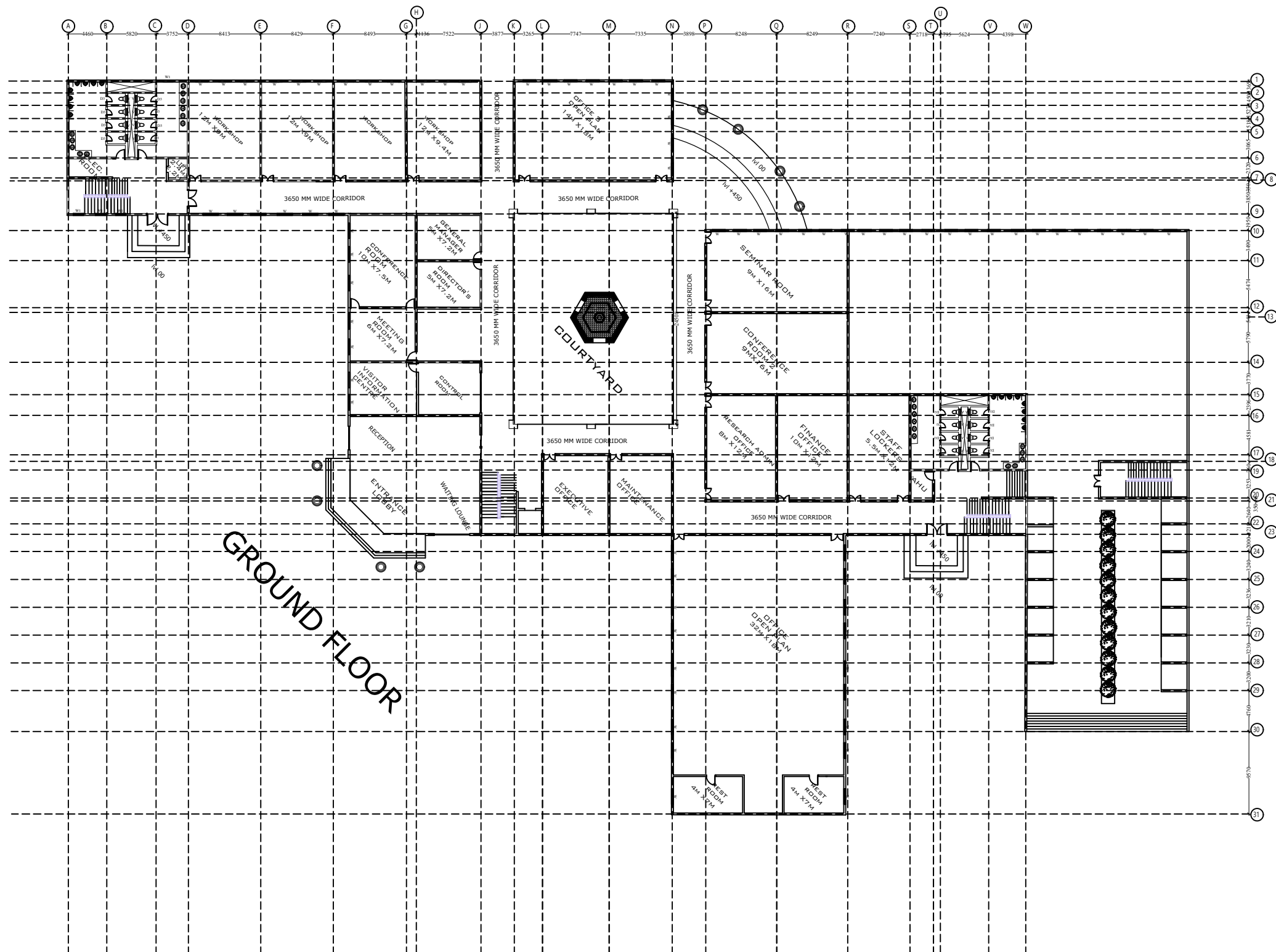


SECTION A-A'

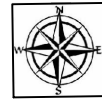


SECTION B-B'





WALL CENTER LINE PLAN  
(GROUND FLOOR)



# ECO RESEARCH CENTRE

AT BAREILLY, UP

THESIS 2021-22

GUIDED BY : PROF. MOHIT KUMAR AGARWAL  
AR. SHALINI DIWAKER

SCALE :

THESIS BY: ZARISH KANWAL

B.ARCH 5TH YR

B.B.D.U



# ECO RESEARCH CENTRE

AT BAREILLY, UP

THESIS 2021-22

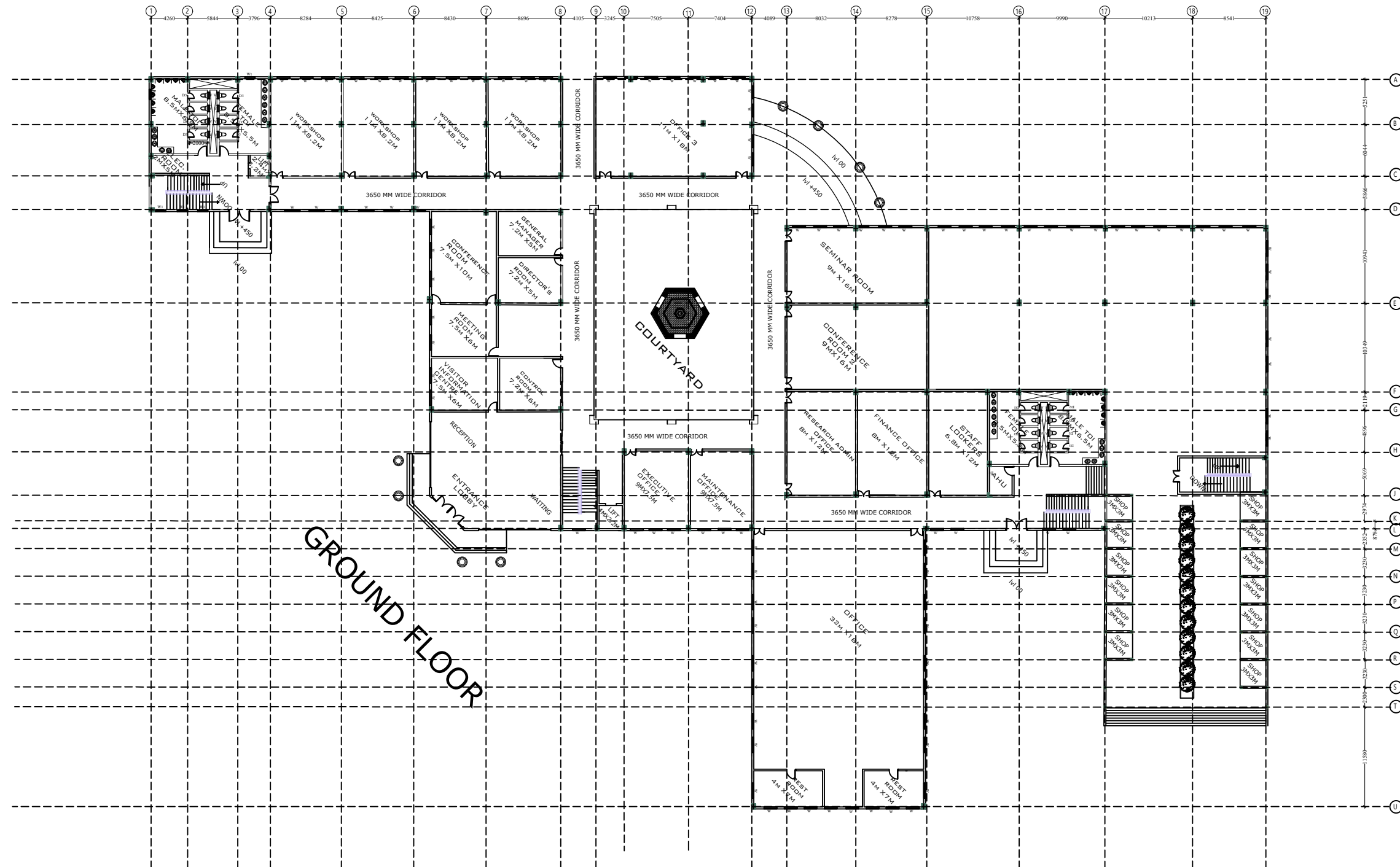
GUIDED BY : PROF. MOHIT KUMAR AGARWAL  
AR. SHALINI DIWAKER

SCALE :

THESIS BY: ZARISH KANWAL

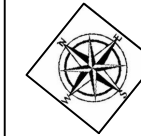
B.ARCH 5TH YR

B.B.D.U



COLOUMN CENTER LINE PLAN  
(GROUND FLOOR)





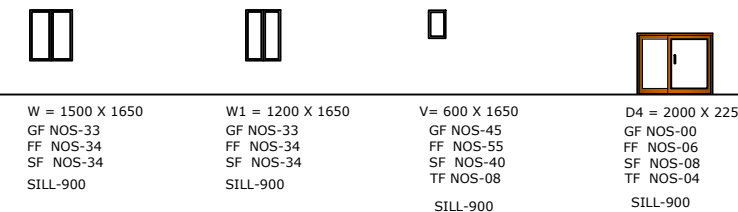
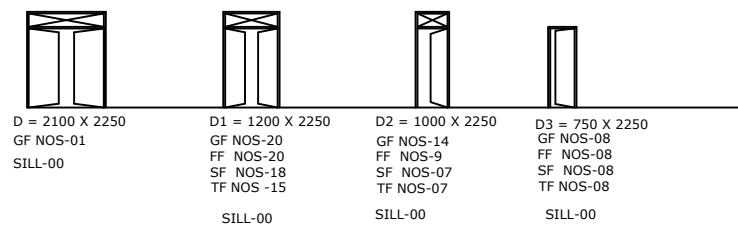
# ECO RESEARCH CENTRE

AT BAREILLY, UP

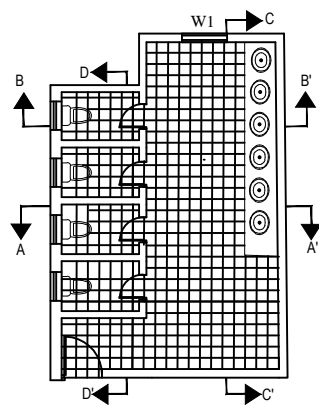
THESIS 2021-22

GUIDED BY : PROF. MOHIT KUMAR AGARWAL  
AR. SHALINI DIWAKER

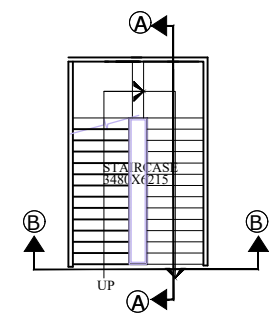
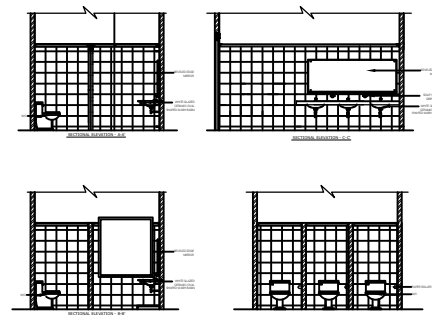
|                          |
|--------------------------|
| SCALE :                  |
| THESIS BY: ZARISH KANWAL |
| B.ARCH 5TH YR            |
| B.B.D.U                  |



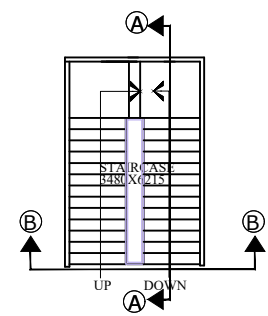
DOOR WINDOW SCHEDULE



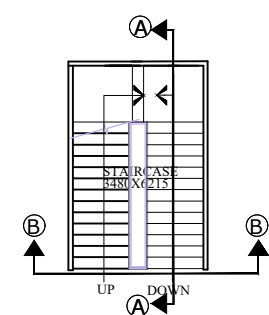
FEMALE TOILET DETAIL



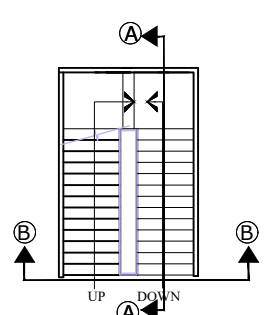
GROUND FLOOR PLAN



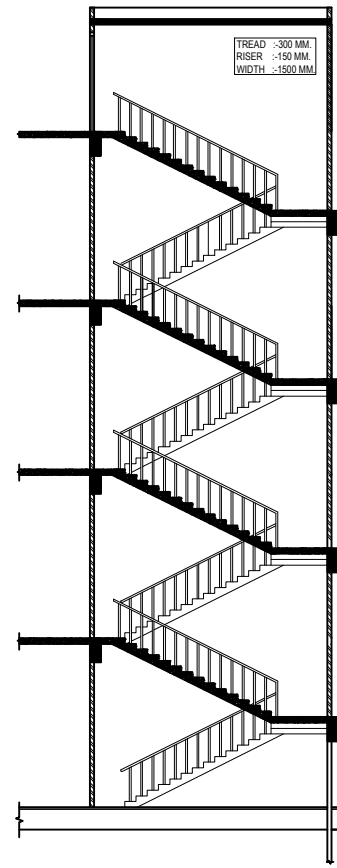
FIRST FLOOR PLAN



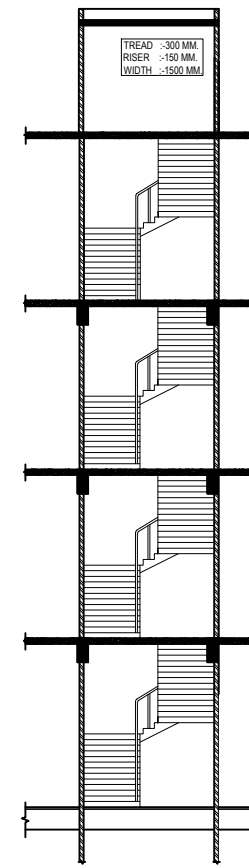
FIRST FLOOR PLAN



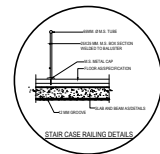
THIRD FLOOR PLAN



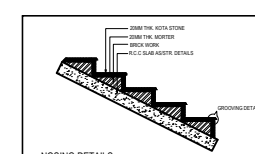
SECTION A-A'



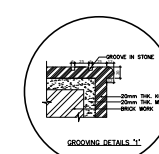
SECTION B-B'



STAIR CASE RAILING DETAILS



NOSING DETAILS



STAIR CASE RAILING DETAILS

STAIRCASE DETAIL

ECO CENTRE

AT BAREILLY, UP

THESIS 2021-22

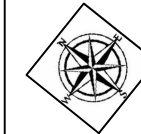
GUIDED BY : PROF. MOHIT KUMAR AGARWAL  
AR. SHALINI DIWAKER

|                          |
|--------------------------|
| SCALE :                  |
| THESIS BY: ZARISH KANWAL |
| B.ARCH 5TH YR            |
| B.B.D.U                  |



SITE PLAN





# ECO RESEARCH CENTRE

AT BAREILLY, UP

THESIS 2021-22

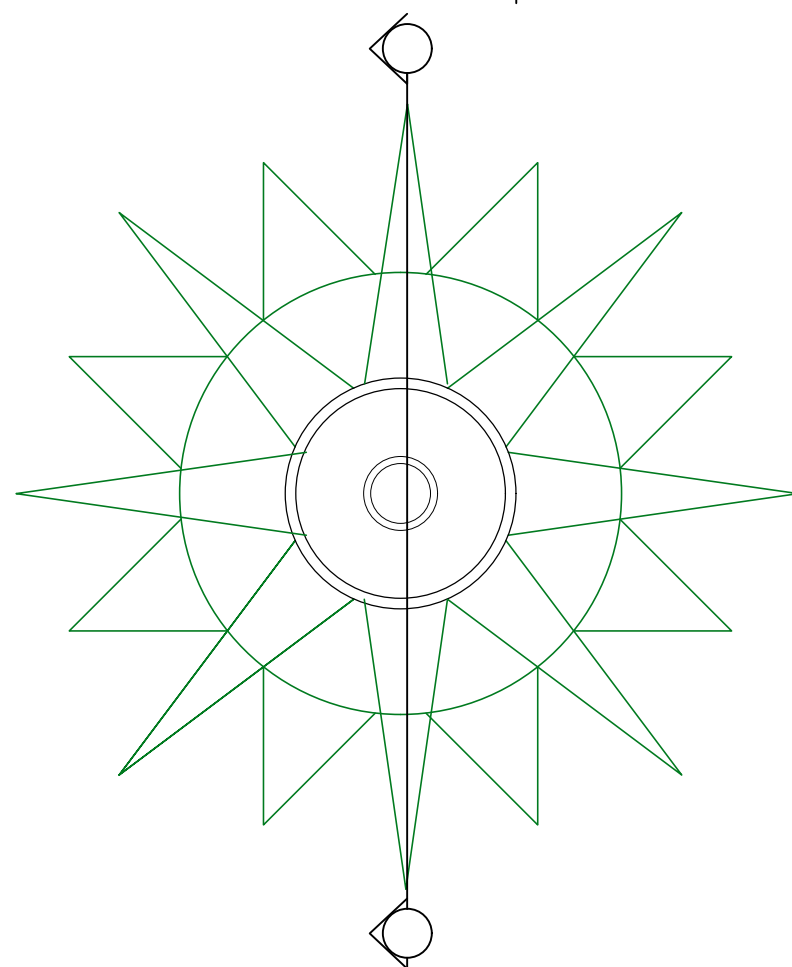
GUIDED BY : PROF. MOHIT KUMAR AGARWAL  
AR. SHALINI DIWAKER

SCALE :

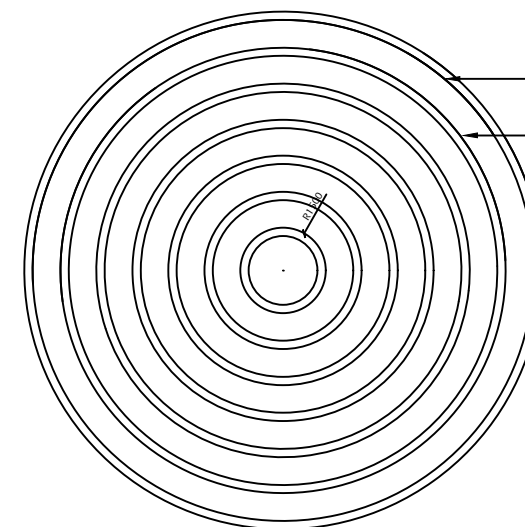
THESIS BY: ZARISH KANWAL

B.ARCH 5TH YR

B.B.D.U

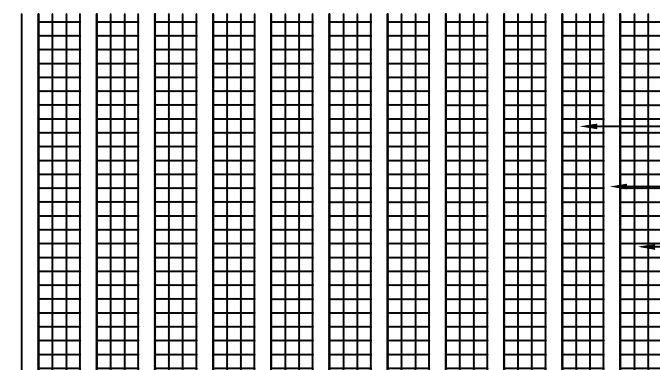


FOUNTAIN PLAN



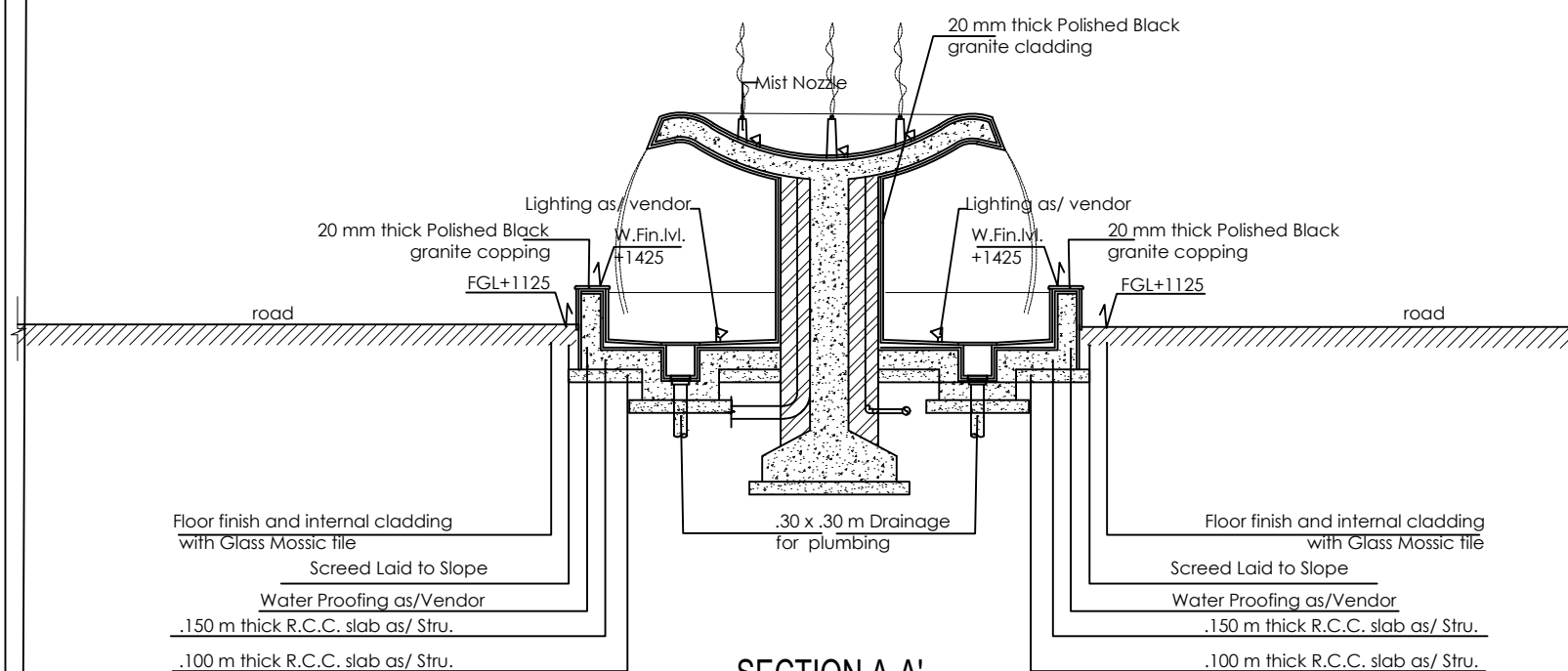
100 X100 MM GREY GRANITE  
COBBLE STONE  
100 X100 MM BEIGE GRANITE  
COBBLE STONE

PATHWAY DETAIL

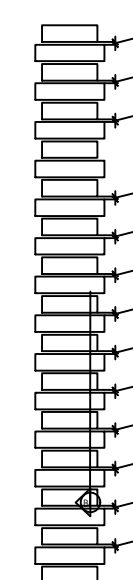


300 X300 MM STEEL GREY GRANITE  
FLAMED FINISH AS/APPROVED SAMPLE  
150 X150 MM BLACK GRANITE  
POLISHED FINISH AS/APPROVED SAMPLE  
300 X300 MM RUSTIC YELLOW GRANITE  
FLAMED FINISH AS/APPROVED SAMPLE

PATHWAY DETAIL



SECTION A-A'



PATHWAY DETAIL