

# *Sustainable Pathways for Renewable Energy Transition*

## **INTERNATIONAL COMPETITION**

### **Zero Energy House Design**

*Interdisciplinary International teams Competition  
of students and young professionals*

*from Architecture and Allied Engineering Disciplines*

## **Prize Distribution Ceremony**

# Objective

To prepare emerging professionals especially the students and young graduates

- to envision and design a climate adaptive,
- resilient,
- inclusive,
- sustainable,
- and innovative house



- that is affordable to own,
- operate and maintain by the standards of middle-income level households in the Global South setting.
- enhance the Quality of Life
- well-being of residents,
- adapt to climate change, and respond to its projected impacts



For a team to enter and win this competition, they were required to:

- Design a house that was intended for four to six occupants spread over a plot of 120 sqm, out of which 80 sqm would be the constructed area (the house).
- Design a house up to a maximum construction cost of US\$220 per sqm (as a general convention for global south). A few regional variations of costs were accepted.



# GENERAL SPECIFICATION OF THE HOUSE

- Total area of plot 120 sqm with allowable constructed area of 80 sqm on ground floor (footprint).
- 3 Bedrooms with closets
- 2 Toilets and Bathrooms
- 1 Kitchen with cabinets
- 1 living area
- G+1 and height should not exceed more than 8m.
- Integrated RE technologies
- Kitchen garden
- Needful energy appliances with their approximate usage details as per local needs and culture.



Winning Prize of £ 500 is awarded to Team 12

Lead by Wajeeha Rehan with team Members  
Zoya Zahid, Muzammil Murshid and Sarmad  
Ahmed



# EOI NET-ZERO HOUSE

TEAM#12 -VINTARCH

## CONCEPT

"MARRIAGE OF CONTEMPORARY AND VERNACULAR ARCHITECTURE"  
A New Twist On Old Favorites

Vernacular architecture is defined as architecture that is familiar and useful to the people of a particular geographic area, and thus valued by them. Combining it with modern techniques using the same old traditional materials to increase its functionality can increase the material's flexibility in a particular culture. Employing traditional materials with modernity is also a critical regionalism strategy. The design approach will be to promote local resources while using them in a contemporary manner.



## SPATIAL ORGANIZATION

THE INTERCONNECTEDNESS OF SPACES FORMS  
THE HEART OF THE DESIGN



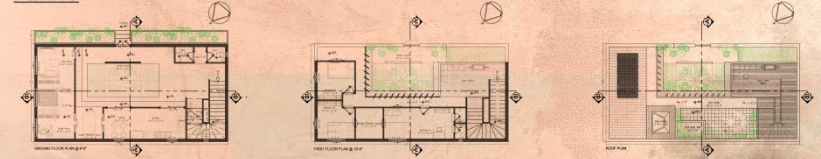
All of the spaces are revolving around the courtyard, giving a sense of connectivity, re-connectivity with the nature, hence enhancing the well-being of the residents. Private, public and semi-private spaces are divided into different masses but arranged in a clustered manner around the open space.

## SITE

LOCATION: Main Intersection at  
Airport Road, New Cantt Bahawal-  
pur, Punjab Pakistan  
PLOT SIZE: 50' X 25'

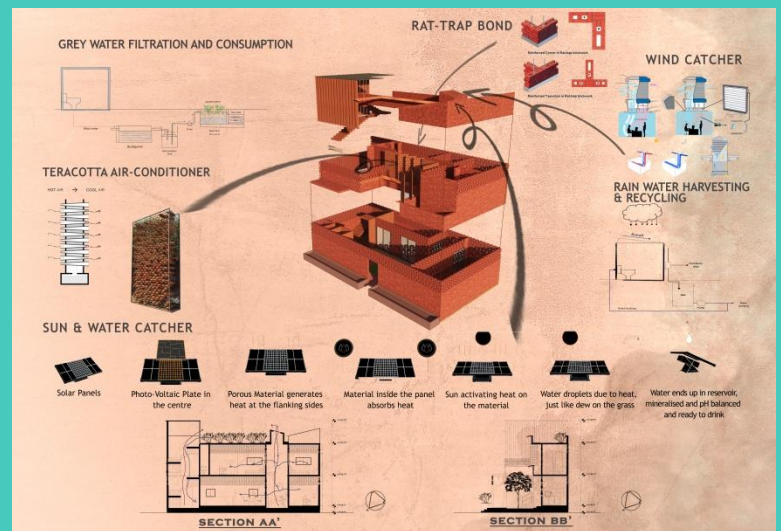
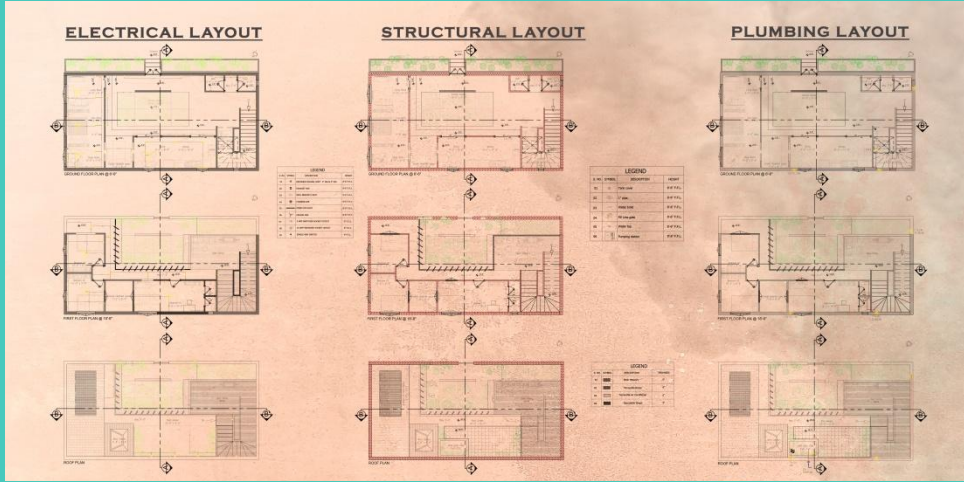


## PLANS



SCALE: 1'0"-3/32





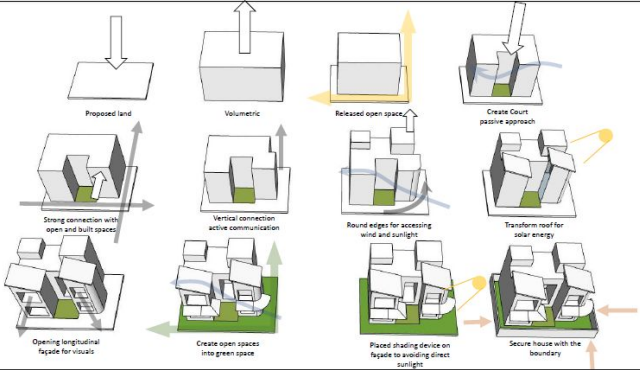


Runner Up Prize of £ 300 is awarded to  
Team 23

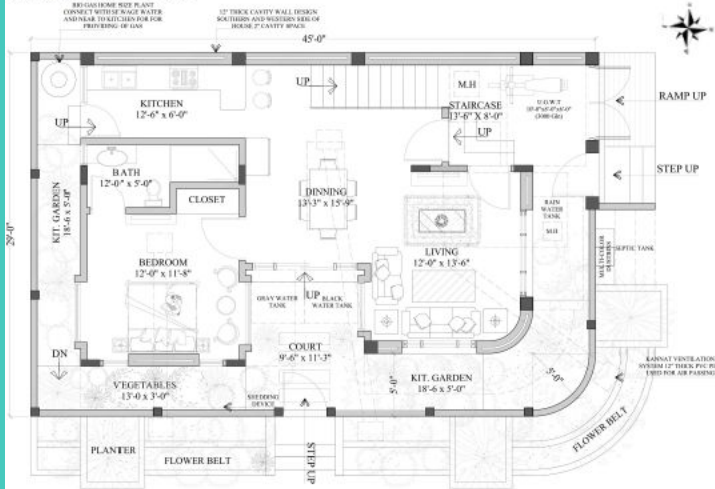
Lead by Mudassir Khalid with team  
member Mir Balaj Bashir



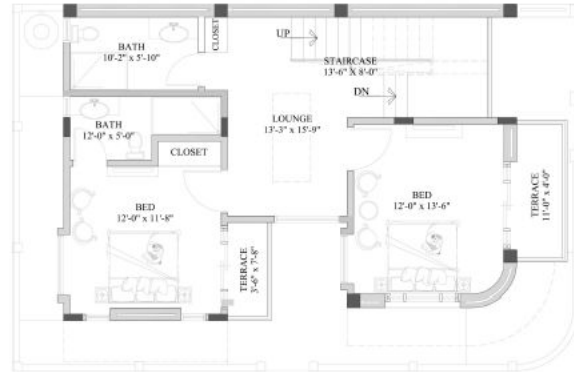
**SITE PLAN**



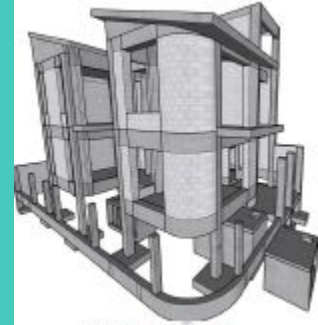
**FINAL FLOOR PLANS**



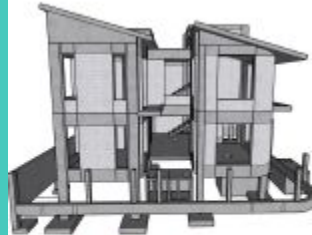
**GROUND FLOOR PLAN**



**FIRST FLOOR**

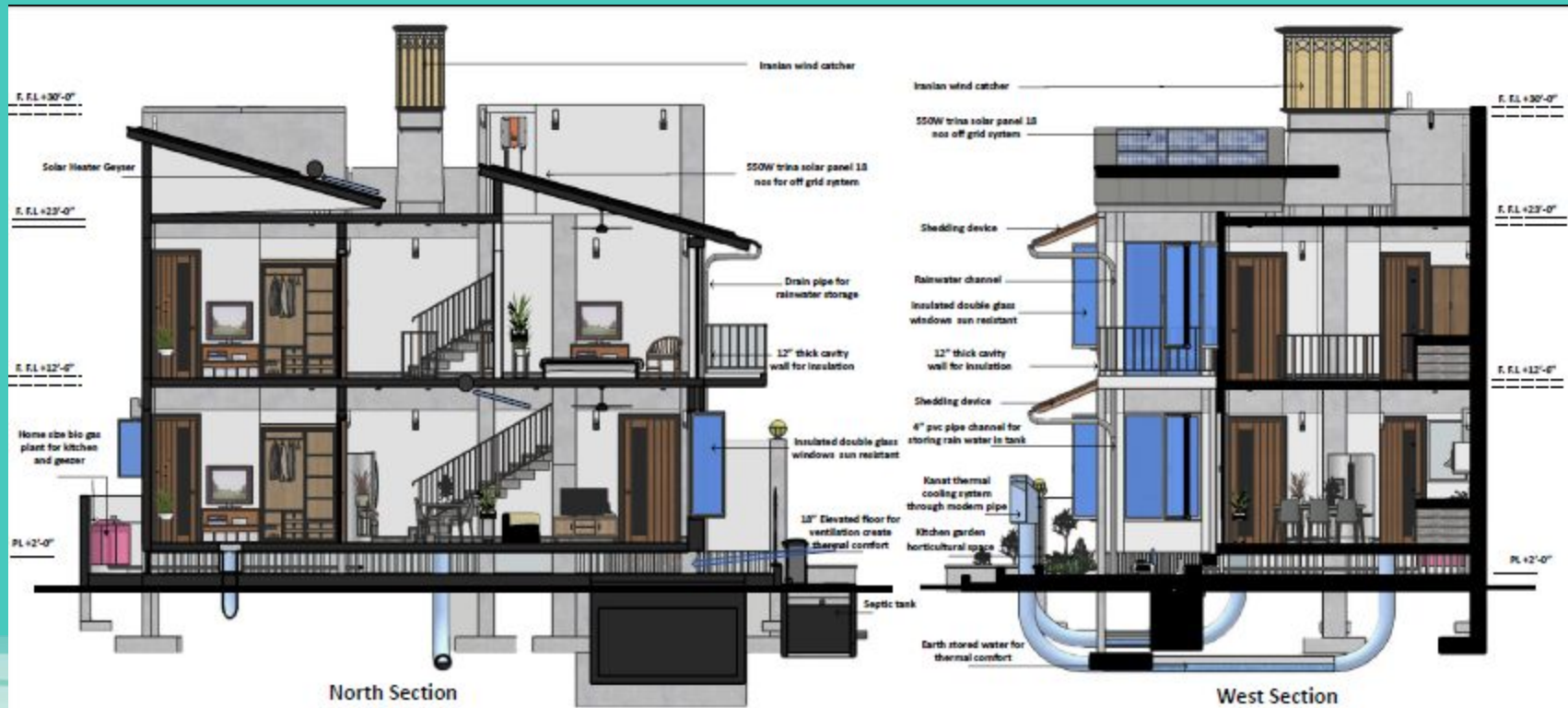


Shallow Foundation,  
Concrete Block Masonry



RCC Frame Structure

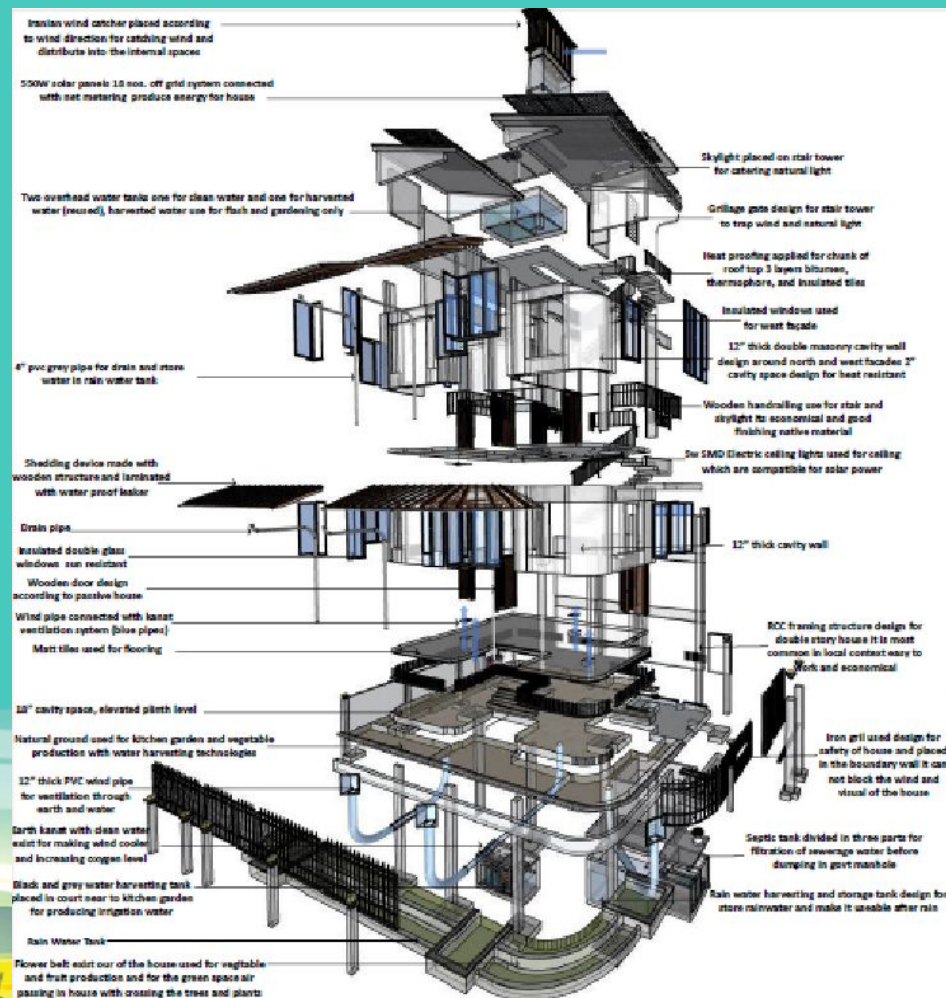




North Section

West Section





AXONOMETRIC EXPLODED DIAGRAM



ROOF TOP VIEW



FACADE



INTERIOR VIEWS



EXTERIOR VIEWS VIEWS

## Two Honorable Mentions who again showed an exemplary effort

1. Team 08 lead by Saadiah with team members Rushaan Nabi Khan, Eshatirrazia, Azhan Ahmed and Anas Ahmed.
2. Team 22 lead by Alyina Rizwan Hashmi with team members Muhammad Khizar Hassan, Gul e Noor Khalid, Syeda Narmeen Zehra, Abdur Rahman and Faiz Ahmed





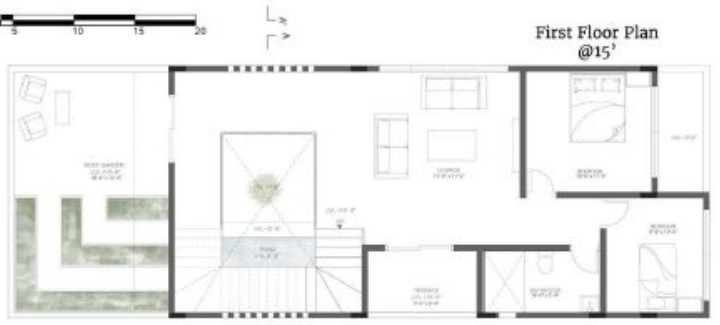
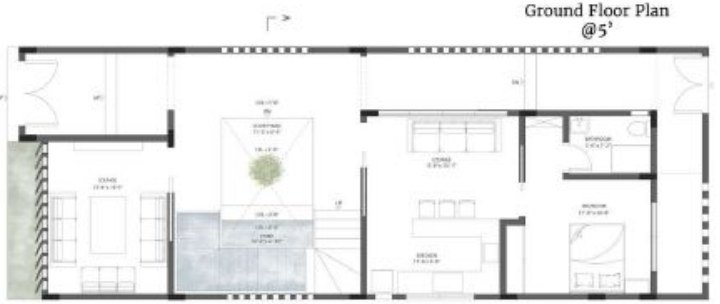
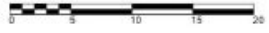


**Site**  
Ghori Vasin, Shikarpur  
Pakistan



"The site is located near farmlands in Shikarpur, a city in the Sindh province of Pakistan. The city was once the seat of culture, trade, and civilization in the region. Some of its history is fortunately preserved in the form of architectural heritage, among which, havelis remain one of the main architectural typologies of the city. Owned by the wealthy and the nobles at one point in time, they are now just a remnant of what they once were.

The temperatures go upwards of 40 degrees celsius during the summers and the winters are rarely too cold.



The kitchen garden is on the south side to set back the building as well as give the plants plenty of sunlight to grow. This garden also acts as a terrace for the family to use during the evenings as a gathering space.



Since the site is in between existing farmlands, it is surrounded by natural forests which keep the surrounding temperature lower than the overall temperature.





## Methods of Ventilation



The U-shaped windows mirror the U-shaped stairs and act as wind catchers for the first floor. They catch wind and sunlight from the opening above and can be manually operated increase of rain or during the colder season.



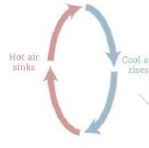
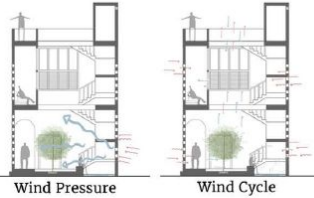
The central courtyard is a common open space for sitting. There is a pond that has both functional and aesthetic purposes, a tree that also helps cool the incoming air. This courtyard also allows for the drawing room.



The upstairs living room is for family use and has a connected balcony as well as giving access to the terrace. The windows can be used to view the courtyard below and also work as a structural part of the building to support the stairs.

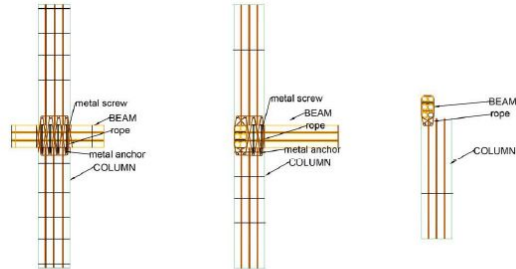
Using basic convection methods, we deduced where the wind will be coming from. Once that was done, openings were created to allow wind to enter and exit from. The courtyard pond cools the incoming wind and the opening towards the sky above the courtyard allows lighter, hot air to escape. This allows the interior to remain cool during harsh sindh summers.

The manually operated window on the first floor act as wind catchers to ventilate the first floor and also act as light tunnel.



## Joints

The longer face of the beam is connected to the bamboo column using a screw. Both the members are attached using a metal anchor. After everything is screwed in place it is tied using metal wires and rope.



A wood peg and steel wires are used to connect the shorter face of the beam to the column. Anchor joint techniques are used wherever the need rises to connect a beam to a beam. Once again, a peg and wire tie technique is used to make the joint stronger.

## Materials



Mud Coated with Lime plaster and banded with hay

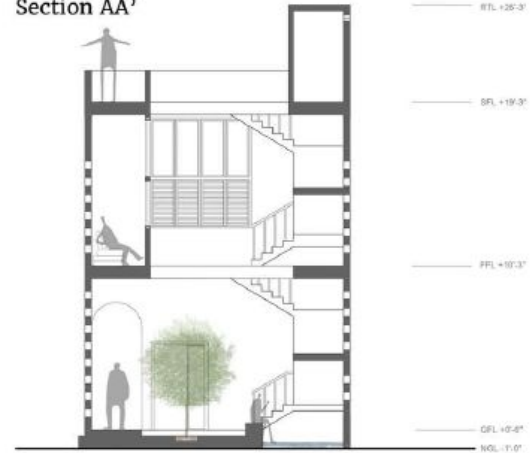


Bamboo lattice slabs and Bamboo structural members



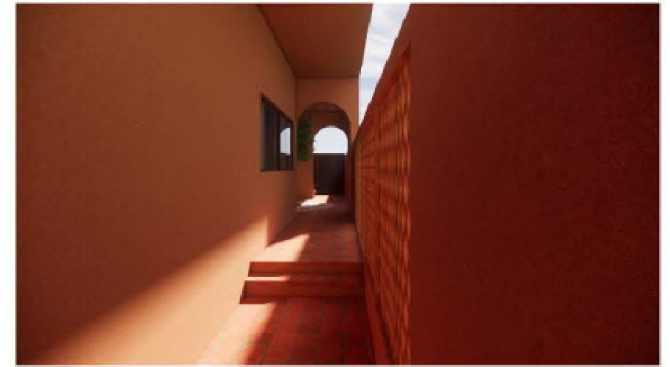
Wood for doors, windows and stairs as well as railings

## Section AA'



The central courtyard is more than just an aesthetic addition to the house. Taking inspiration from the traditional havelis seen in sindh, we have incorporated this courtyard to help promote ventilation and make the house adaptable to a global pandemic.

Section BB'

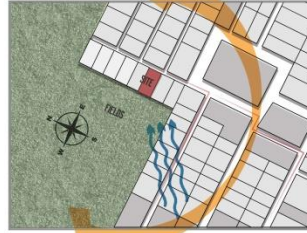


## WHY THIS SITE?

Our Site is located in **Sheikupura**, Punjab. The site is enriched with fertile lands, traditional Punjab vernacular elements which we seek to embrace in our design.

Scorching suns of summer remains here upto 8 months, heavy rainfalls throughout the year, gave the opportunity to use natural energies/resources to the maximum.

The Site is 26' x 50' rectangular plot, with front and rear facade free while sandwiched from the sides [ 1' gap for the ventilation purpose]. Rear end meets the fields area with astonishing landscape.



## S.W.O.T

**Strength:** Natural and calm environment.

**Weakness:** High heat.

**Opportunities:** climate to be used for energy conserving techniques.

**Threats:** Privacy & security.



FRONT ELEVATION

# NET-ZERO HOUSE DESIGN

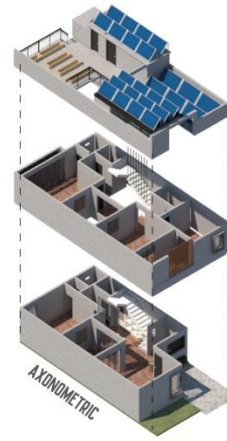
## CONCEPT

In order to achieve net-zero house design, Our first approach was to implement passive design strategies in our house, maximizing the use of natural energies as much as we could.

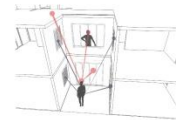
Considering Solar paths and wind directions, structure is oriented to resist direct heat, while capturing natural light and wind.

As to the context of our site - Punjab, the fusion of both traditional and contemporary design approaches have been used. While the privacy has been kept on supreme, designing an invert planned house, in which inhabitants can enjoy views outside but no one penetrates the inner privacy of house without permission.

Energy preserving techniques like Solar panels and rain water harvesting system is introduced in the design.

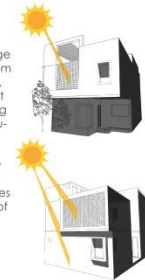


The courtyard provides not only Natural light and ventilation, but also visual connection throughout the house. Its placed centrally and it has view from all the spaces inside the house.



One of the major challenge was to resist heat gains from the front and rear facade, which faces East and West respectively, while ensuring cross ventilations and natural light.

To tackle this, we used **Brick Jalis** which not only resists direct heat and ensures air flow, but also serves as a Vernacular element of our design.



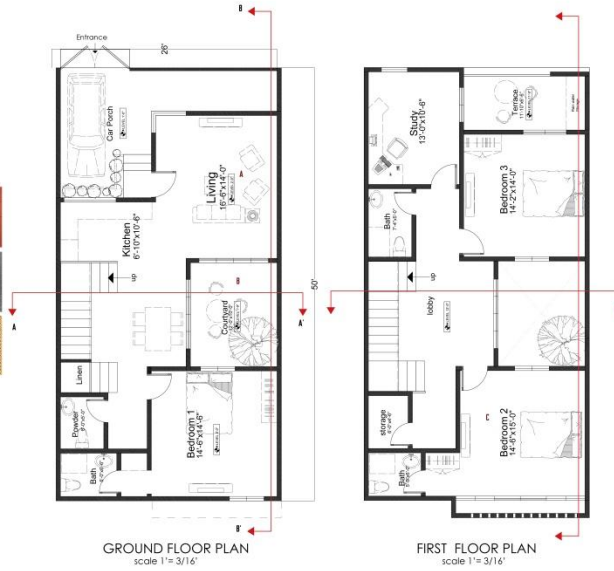
REAR ELEVATION

## MATERIALS

Terracotta majority used for flooring. Primarily chosen due to its eco friendly characteristics & aesthetics.

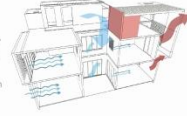
Glass is used as a contemporary element in design.

Rattan furniture is used to preserve vernacular element in our design.



1

The courtyard maintains the air flow within the house. To ensure privacy for the rear end bedrooms without compromising the passive cooling techniques, the courtyard has been placed ideally.



2

As the site is prone to heavy rainfalls rain water harvesting was the major go for netzero. In our design the water is collected from the roof in a storage tank. This water can cut the water bills upto 30% of the house.



3

Direct heat gains are kept minimum in the house, less vulnerable surfaces are given, a tree has been used as a shading device for courtyard, white roof prevents the heat to penetrate within the interior.



## VIEWS

