G - D E C K
BUILDING

Location
The site is located at Kamala Nehru Nagar, Ghaziabad, Uttar Pradesh. Ghaziabad is a part of National Capital Region in Uttar Pradesh. It has a population of about 2.8M (2020 census). It’s the second fastest growing city in the world.

Geographical context
Ghaziabad is located on the western edge of Uttar Pradesh between the Ganges and Yamuna river, the two main rivers of the country, and between 770 to 780 eastern longitude and 280 to 290 northern latitudes.
CONCEPT

The design utilizes data on the region's weather patterns and accounts for factors like seasonality, intensity of the sun, wind, rainfall and humidity.

RESOURCES AVAILABILITY

Bagasse is the dry pulpy fibrous material that remains after crushing sugarcane or sorghum stalks to extract their juice from the steel factories around Ghazabad, we get slag which can be used as a substitute for cement.

It increase strength, reduce permeability, improve resistance to chemical attack and inhibit rebar corrosion.
**TERRACOTTA**

The potter forms the clay into the desired shape.

Terracotta tube is geometrically optimised for increased surface area.

Effect on warm air upon passing through the wet tube.

Honeycomb configuration.

Water is circulated through the pump. Terracotta is porous and stores water.

Air that passes through this system cools down several degrees.

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**MODULE GENESIS**

**SOLAR LIGHT PIPE**

Solar light pipe is a technology for daylight transportation and energy efficiency. It has a Sunlight capturing system (Light collector), light transfer pipe and double glazed light diffuser. The light gets emitted through the water and terracotta tubes into the building space for a length of 12m and gives an aesthetically pleasing view.

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**WIND CATCHER**

The wind catcher is used to disperse the heat accumulating indoor amidst the prevailing hot sunny days. It consists of a hollow square tower constructed with the building fabric, with top side openings and internal partitioning to allow catching the wind from any direction, creating an air stream in the tower's shaft leading to the occupied building space to be ventilated. Here the wind catcher has an open and closable technology so that it can be closed during winter.

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**TERRACOTTA TOWER**

The tower is designed in a circular shape so that the air from wind catcher is spread evenly in all directions. Also, the air from outside enters the building space after crossing two layers of terracotta which provides extra cooling and more decreased temperature.

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**CIRCULAR PIPE**

Water: The water passes through a channel into the water pipe. It has small holes under it to allow the water to drip on the terracotta tubes.

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**GEOTHERMAL HEAT PUMP**

The geothermal heat pump is a highly efficient renewable energy technology used for space heating and cooling, as well as water heating. Here, we are using it during winter to heat up the air inside the room. A ground source heat pump absorbs heat from the ground – by circulating water through piping in the ground – and transfers the heat into the building by circulating hot water through radiators, or underfloor piping circuits.

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**SECTION OF THE MODULE**

GRIHA TROPHY 2021-22
AREA STATEMENT

Ground floor - 2393 m.sq.
Administration - 750 m.sq.
Officials rooms - 5x30 m.sq.
Staff rooms - 3x27 m.sq.
2x50 m.sq.
Conference room - 105 m.sq.
Documents room - 42 m.sq.
Library - 160 m.sq.
Cafeteria - 180 m.sq.
Dinning - 324 m.sq.
Toilets - 5x42 m.sq.
2x84 m.sq.
Car parking - 950 m.sq.
Visitors parking - 550 m.sq.
Sit out - 70 m.sq.
Landscape and road - 5946 m.sq
Ground coverage - 33.6%
FAR - 1.50

1 - Lounge
2 - Main entry
3 - Reception and Administration
4 - Outdoor dining area
5 - Officials room
6 - Secretary room
7 - Officials room 2
8 - Lounge
9 - Cafeteria
10 - Joint secretary
11 - Door to roof garden
12 - Library
13 - Atrium
14 - Toilet
15 - Minister of state room
16 - Conference room
17 - Document room
18 - Entry from parking
19 - Officials room 3
20 - OSD room
21 - Deputy secretary room
22 - Restrooms
23 - Office Parking and Refreshing rooms

GRIHA 2021-22
NATIVE VEGETATION IN LANDSCAPE
- Albizia lebbeck
- Sis tree
- Cycas revoluta
- Sage palm

OUTDOOR PLANTS THAT REQUIRE LESS WATER
- Albizia saman
- Rain tree
- Dalbergia sissoo
- North Indian rosewood
- Lagerstroemia
- Banaba tree
- Butea monosperma
- Sacred tree
- Bauhinia monandra
- Orchid tree

INDOOR PLANTS
- Money plant
- Dracaena
- Trifasciata
- Snake plant
- Areca palm

CHINNI KHANNAS
Chini khanas are vernacular elements where cascade falls against a lift arched niches behind them to give an exotic look during night time.

GRIHA TROPHY 2021-22
Mosaic has a rich history that dates thousands of years, and is one of the original sustainable products to create low resource, low maintenance, high visual impact mosaic imagery and durability.

The Miyawaki forests grow in two to three years and are self-sustaining. This helps to reduce the temperatures heat islands like Ghaziabad, reduce air and noise pollution, attract local birds and insects, and create carbon sinks.

Framed slabs are the portion of concrete replaced by low cost, light weight filler material like mangalore tile, clay pots etc to maintain the temperature lower than the outdoor area.

ROOF POND SYSTEM

As Ghaziabad has extremely hot summer and cold winter, we need to adapt both the climate. The roof pond is a system that passively incorporates water elements to passively cool and heat the building.

Winter heating cycle
The uncovered roof draws heat during day time to collect solar heat in the water bags. The covered roof then radiates the heat from the water bag to the interior of the house during night time.

Summer cooling cycle
The uncovered roof expose the water bag to the sky. The water bag radiates absorbed heat into the air during night time. The uncovered roof keeps heat out and the indoor space cool during day time.

KEYHOLE GARDEN

Keyhole gardens allow gardeners to add uncooked vegetable scraps, greywater, and manure into a composting basket that sits in the centre of the bed converted into manure and nutrients.

WIND TREE

Wind energy tree uses tiny blades housed in the aero leaves to generate power from wind energy. This is used for the lamp post of the premises.

GEOTHERMAL HEAT PUMP

Geothermal heat pumps are used for space heating and cooling, as well as water heating.

TOP SOIL PRESERVATION

Laying pebbles over soil makes sure that the soil doesn’t get eroded by rain or damaged from over-exposure to sunlight. When vehicles enter into the building, the pollutants or any other contaminants gets filtered through the pebbles and the soil fertility is retained. Gardening pebbles also last longer than grass and they are easier to manage.

WHEEL CHAIR LIFT

A stair lift is a sufficiently wide mechanical stairs, where a rail is mounted to the treads of the stair with a chair attached to it. Handicapped people gets onto the chair and is lifted up or down the stairs by the chair which moves along the rail.

SMOOG EATING CONCRETE

A photocatalytic additive, dioxide in the presence of sunlight gets activated and reacts with the pollutants to neutralize them into harmless salts.
**SOLAR PANELS**

Viroofop panels supply electricity to buildings, so they need to buy less electricity from the grid thereby saving on energy costs.

**LED LIGHTING**

LED lights are up to 80% more efficient than traditional lighting such as fluorescent and incandescent lights and are used for interiors.

**GREEN WALLS**

The interior and exterior living green walls act as insulation during the summer and winter to maintain the cooler and hotter temperatures respectively.

**BIOGAS PLANT**

Biogas is a renewable fuel produced by the breakdown of organic matter such as food scraps and animal waste which is converted into electricity and is used as vehicle fuel.

**BUILDING ENERGY MANAGEMENT SYSTEM**

A Building Energy Management System (BeMS) monitors and controls energy powered services, such as air-conditioning, heating and ventilation, to ensure the building is operating at maximum levels of efficiency, whilst removing wasted energy usage and, in turn, associated costs.

**PERMEABLE PAVEMENT**

Permeable pavement is provided to allows water infiltration through surfaces, rain and snow may then recharge the groundwater table, and air may pass through to nourish the roots of grass and trees.

**SOLAR PANELS WITH GREEN ROOF**

Solar panels incorporate solar energy into green roofs and creates synergies. The performance of photovoltaic modules depends on the temperature of the modules and the surrounding ambient air temperature. The rule of thumb is: “the warmer the module, the lesser the performance”. However, if combined with a green roof, solar modules will perform better. Through the cooling effect caused by evaporation at plant level, the ambient air temperature is cooler and photovoltaic cells improve their performance.

**CATEGORYIZED DUSTBINS**

To minimize soil pollution, the wastes such as paper, plastics, metals, glasses, organics, petroleum products and industrial effluents etc should be recycled and reused by categorized dustbins.

**WATER TREATMENT**

Grey water and black water are separately treated through dual plumbing system and used for suitable activities such as flushing, irrigation etc.

**SAFETY AND SECURITY**

Construction workers are provided with proper safety measures like helmets, goggles, etc. for their safety in site. Post construction building has installed CCTV cameras for the safety of office going people. Smoke detectors and fire alarm are set.
MATERIALS THAT WOULD BRING CHANGE

ECO Surfaces - Recycled rubber floor

Its low life cycle cost and ease of maintenance have made ECO surfaces products a alternative to VCT and carpeting. It has recycled content. ECO surfaces flooring is made from post industrial waste and organic fillers. The result is an environmentally responsible commercial flooring that passes the strictest tests for indoor air quality, low VOC emissions and is recyclable.

ZERO - Brick masonry without jointing

The new facing brick allows the use of traditional masonry to achieve a homogenous brick facade with almost no jointing. In addition to the clean aesthetic look, ZERO is also cost effective, given that jointing is no longer needed. Due to the lack of jointing, the facade will age more slowly. Also less mortar is required.

Antimicrobial panels

It can be used in toilets and other crowded areas during this pandemic time to provide an efficient and long lasting protection against bacteria, mildew and acid.

Handloomed fabrics

This handloomed fabrics comprised of natural fibres from wide variety of bamboo and grasses. This creates a two dimensional fabric of polished finish and geometric refinement. This can be used for acoustics or window screen.

Protective textile finish

The natural non stick and cleaning process also known as the self cleaning effect helps repel water and stains, stay clean for longer need less care and have a longer service life.

SUSTAINABLE SITE PLANNING

- Criteria 1: Site Selection
- Criteria 2: Preservation & Protection of Landscape during Construction
- Criteria 3: Soil Conservation (Post Construction)
- Criteria 4: Design to include existing site features
- Criteria 5: Reduce hard paving on site
- Criteria 7: Optimize on site circulation efficiency

WATER MANAGEMENT

- Criteria 10: Reduce landscape water requirements
- Criteria 11: Reduce building water use
- Criteria 12: Efficient water use during construction
- Criteria 20: Waste water treatment
- Criteria 21: Water recycle and reuse

ENERGY OPTIMIZATION

- Criteria 6: Enhance outdoor lighting system efficiency
- Criteria 13: Optimize building design to reduce conventional energy demand
- Criteria 14: Optimize energy performance of building within specified comfort limits
- Criteria 18: Renewable energy utilization
- Criteria 19: Renewable energy based hot water system

SUSTAINABLE BUILDING MATERIALS

- Criteria 15: Utilization of fly-ash or equivalent industrial/agricultural waste as recommended by BIS in building structures
- Criteria 16: Reduce embodied energy of instruction by adopting material efficient technologies and low-energy materials
- Criteria 17: Use low energy materials for interiors
- Criteria 22: Reduction of waste during construction
- Criteria 23: Efficient waste segregation
- Criteria 24: Storage and disposal of waste
- Criteria 25: Resource recovery from waste
- Criteria 26: Use Low VOC paints and adhesives
- Criteria 27: Minimise ozone depleting substance
- Criteria 28: Ensure water quality
- Criteria 29: Ensure acceptable noise levels
- Criteria 30: Tobacco and smoke control
- Criteria 31: Universal accessibility
- Criteria 32: Energy audit and validation
- Criteria 33: O & M protocol for operation and maintenance of the various systems in the building
- Criteria 34: Innovation
### Detailed LCC Calculation

**Configuration Details**

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**Building Dimensions**

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**W. NDOW Deduct.**

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**Sixty Two Lakhs Twenty Eight Thousand Two Hundred Ninety Five**

**Electrical Description**

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**Total Energy Consumed**

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**Energy Reduction**

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<td>Hydro Power</td>
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**Conclusion**

- The GST building of Ghaziabad is designed by using GRIHA V-Rated system satisfying most of the criterias.
- The total energy consumption of our building is reduced by 80%.
- Sustainable vernacular elements are also used to help decrease the energy consumption.
- We have played in levels and the building is being orientated with respect to the site's climate analysis.