GST Council is a governing body to regulate and direct each and every step for the implementation of goods and service tax in the nation. Functions of GST Council:

- Under definable threshold limit, services and goods will be exempted from GST building.
- Details of goods and services that are affiliated to GST will be excluded from GST.

From being the 'Gateway to UP' to having richest archeological history, Ghaziabad is amongst the most planned city of Uttar Pradesh. The city once ruled by Maratha kings, is now ruled by industries. Growth in industrial sector has set a benchmark in upgrading the economic graph of the city.

Maximum temperature reaches 35°C which means summer months being around 32°C lowest temperature being 3°C with winter months having a mean of 8°C.

Moderate amount of rainfall generating a need to design proper water management on site to create a self-sustained water consumption and storage system.

Maximum Altitude Angle: 84.94° (Summer Solstice)
Minimum Altitude Angle: 38.09° (Winter Solstice)
West followed by North is the prominent wind direction having high wind speed hence we receive a lot amount of natural wind.

Above charts are for November-February which shows 20 percent human comfort, after adapting strategies (provide heating and high thermal mass in building) human comfort increases to 100 percent.

Above charts are for March-June which shows 21 percent human comfort, after adapting strategies like radiant cooling and dehumidification, human comfort increases to 90 percent.

Context:

- Site Area: 8959 sq.m
- Latitude: 28° 40' 36.63" N
- Longitude: 77° 27' 20.14" E

Strenght:
- Vacant, levelled land with existing boundary wall.
- Well road connectivity, easy approach.
- Natural barrier is created from vehicular noise by existing trees on site entry.

Weakness:
- Negligible vegetation on site.
- Unhealthy air quality.
- Presence of alluvial soil on site. (Weak soil type)
- No contextual shading on site. Fully exposed to sun.

Opportunities:
- Site area is big enough to foster microclimate.

Threat:
- Fourth highest seismic zone making site vulnerable to earthquakes.

Nearest airport Safdarjung Airport (26.52 km SW)
Nearest bus stand - Kamala Nehrunagar (2.6km)
Nearest railway station (3.1km SE)
• Orienting the built mass along the north-south axis to increase the surface area and provide ample day-light.

• Connecting units are created to generate passive cooling through courtyards and promote cross ventilation.

• Concept of mutual shading and green terrace is developed by staggering the built units.

• Creating an array of punctures on West facade to reduce solar heat gain and implement self shading.

Architecture is masterly, correct and magnificent play of masses brought together in light. Our eyes are made to see forms in light, light and shade reveal these forms.

-Le Corbusier
CONSTRUCTION MANAGEMENT

WASTE MANAGEMENT

Before transferring the waste to the recycling/disposal stations the waste from the entire building is collected from a demarcated collecting space. Dry and wet waste are segregated using multicolored bins.

REDUCE HARD PAVINGS

Hard pavings are confined only to roads and parking areas.

PURIFYING POLLUTED CAR EMISSION

The polluted air is absorbed by the plants fresh air is then released into the atmosphere. Planter boxes are provided along the side of pathways.

COMPOST COLLECTION (during construction)

The solid waste is dumped in a compost pit which, over the time fertilizes the top soil.

SOIL CONSERVATION

Intramural landscaping
Top soil conservation
Green belts surrounding the building and its neighbourhood.

Provision of 3m barricading around the construction area.
Using gunny bags for curing
Wheel washing facility at the vehicular entrance of the site.

XERISCAPING

- This is a process of landscaping with native and drought resistant plants along with the use of mulches that reduces water for irrigation up to 60 percent.
- Mulch keeps plant roots cool, prevents soil from crusting, minimizes evaporation, and reduces weed growth.

INDOOR PLANTS

- Indoor plants are helps in reducing humidity in interior spaces and act as dehumidifiers.

**Outdoor Plants**
- Ashoka tree: Ornamental tree and better acoustic effect
- Dracaena Tricolor: Aesthetic and decorative

**Indoor Plants**
- Monstera: Indoor plants
- Snake Plant: Indoor plants
- English Ivy: Indoor plants
- Spider Plant: Indoor plants

**Cynodon Dactylon**
These are yellow flower plants used in lawns and as indoor plants.

**Javanica Dracena**
These are tricolour plants used in lawns and as indoor plants.

**Plumeria Alba**
These are aesthetically appealing plants used in lawns.

**Duranta**
These are ornamental flowering plants used in lawns and as indoor plants.

**Provision of 3m barricading around the construction area.**

**Wheel washing facility at the vehicular entrance of the site.**

**GRIHA TROPHY 2021-22**
Registration code: 64GRI-27
**UNIVERSAL ACCESSIBILITY**
Creating a functional building which is accessible to all user groups and provide conventional facilities for disabled.

- Toilets for disabled people
- Ramps for impediments
- Tactile pavings for visually impaired
- Parking for disabled people

**MICROCLIMATE**
- Creating courtyard in vicinity adds up to the green aspects and builds a harmonious ecosystem entrance of the site.

**GREEN SPACE BESIDES TOILETS**
Fresh air prevents germs growth and foul smell is reduce.

**VERTICAL WIND TURBINE**
Each blade get hits by the wind at different angle. it uses airfoil design to generate energy to make the turbine rotate.

**AREA STATEMENT**
- Proposed ground coverage area: 2233.14sqm
- Proposed ground coverage: ~ 33.33
- Proposed builtup area: 7037.20 sqm
- Total area of terraces: 60sqm
- Ground floor height: 4m
- First floor height: 3.5m
- Second floor height: 3.5m
- Total height: 11.6m
**ENERGY OPTIMIZATION**

**KINETIC PAVEMENTS**
- A special energy harvesting tiles, made from 95 percent recycled tyres. That flexes 5mm when stepped on converts 1 footstep to 3 joules of energy which would light up an LED Wayfinding sign of 30sec.

**WASTE WATER MANAGEMENT**
- The use of low flow fixtures help in optimizing the building water demand.
- Low flow fixtures used
  - W/C- Double flush ( reduces water usage upto 66% )
  - Faucet- Aerated faucets ( reduces water usage upto 38% )

**WATER OPTIMIZATION**
- The use of low flow fixtures help in optimizing the building water demand.
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**WATER OPTIMIZATION**
- Low flow fixtures used
  - W/C- Double flush ( reduces water usage upto 66% )
  - Faucet- Aerated faucets ( reduces water usage upto 38% )

**RAINWATER HARVESTING**
- Screening created at the top of the building for accumulation and storage of rainwater for reuse on site rather than allowing it to run off and convey them for filtration. Uses include water for irrigation, gardens, office use with proper treatment, the harvested water can also be used for drinking if properly treated and for kitchen purposes. It can also be used for purposes such as groundwater recharge.

**MOISTURE NANO IRRIGATION**
- Substantial amount of moisture is released during sub-surface irrigation system, which uses nano technology to reduce plant stress while constantly providing water and reducing its consumption by 75%.

**ROOT ZONE TREATMENT SYSTEM**
- It is an engineered method of purifying wastewater as it passes through artificially constructed wetland area.
- Root zone technology is a low cost method to treat wastewater.
- The Root zone treatment is a natural maintenance free system where the wastewater is purified by the roots of wetland plants.
- Roots of indigenous plants including canna, indica, helicornium and plantain act as filters in removing the organics in water while retaining salts.

**PHOTOVOLTAIC CELLS**
- Building integrated Photovoltaic cells are used on the roof pargolas with automated sensors control mechanism a one axis hydraulic control system to get the desirable tilt angle. The produced energy is utilized for electric vehicle charging system to make the building future ready.

**RADIANT COOLING**
- Parking integrated photovoltaic cells used on the roof pargolas with automated sensors control mechanism a one axis hydraulic control system to get the desirable tilt angle. The produced energy is utilized for electric vehicle charging system to make the building future ready.

**GREEN AREA**
- The green roof helps to mitigate the urban heat island effect and helps to control Strom water runoff and retention improves and reduces energy consumption. Increases energy efficiency by 30%.
### Building Materials

#### Grass-Crete
- The surface water drainage system can be eliminated
- Infiltration of storm water
- High load bearing capacity
- Increases green space
- Reduces heat land effect
- Uses recycled materials.

#### Ash-Crete
- 40% of cement is replaced with flyash to produce ashcrete
- Recycled material
- Greater strength
- Reduces thermal cracking

#### FSC Certified Timber
The forest stewardship council (FSC) is an international non-profit multi stake holder organisation FSC certified wood come from sustainably managed forests its main aim, to lower the environmental impact maintenance of high conservation value forests – to maintain or enhance the attributes which defines such forest.

#### Reflective Tiles
Reflective tiles are used on the top of roof to reflect heat radiation and to collect rainwater from roof top.

#### ACC Blocks
ACC Blocks reduces only surface wetting and no curing is needed before use, this reducing water consumption during construction.

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#### Non VOC Paints
Non VOC paints are water based solvent and not oil based paints with oil based solvent release volatile organic compounds (VOCs) which are harmful for our environment and carcinogenic. Therefore, Low VOC paints are environment friendly.

<table>
<thead>
<tr>
<th>Material</th>
<th>Embodied Energy (MJ/kg)</th>
<th>Usage</th>
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</thead>
<tbody>
<tr>
<td>Concrete (RCC)</td>
<td>0.298</td>
<td>WALL</td>
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<tr>
<td>AAC block</td>
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<td>Concrete Flooring</td>
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<tr>
<td>Terracotta</td>
<td>18</td>
<td>FAÇADE</td>
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<tr>
<td>Double glazed window</td>
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<td>WALL</td>
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<tr>
<td>Grass crete</td>
<td>0.298</td>
<td>LANDSCAPE</td>
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<tr>
<td>Pond tiles</td>
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<td>POND</td>
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<tr>
<td>Steel Bars</td>
<td>56</td>
<td>COLUMN</td>
</tr>
<tr>
<td>Radiant system</td>
<td>19</td>
<td>ROOF</td>
</tr>
</tbody>
</table>

---

#### Construction and Demolition Materials
- Reuse of stones timber piping railings on site.
- Rubble, broken concrete pieces are used for building activities such as levelling and undercoat of lanes.
- Fine materials such as sand and dust are used as covering materials.
- Larger unused are used for filling up low layering areas.
- Reused materials like plastic, glass and concrete are used for flooring.

#### Double Glazed Glass
Low-E coating on interior surface reflects room heat back to the interior U factor = 0.20
Solar heat gain constant = 0.26
Visible light transmittance = 0.63
Often referred to as spectrally selective low-E glass due to their ability to reduce Solar heat gain while retaining high visible transmittance.
Low-solar-gain low-E glass is typically made with sputtered low-E coatings consisting of two layers of silver.

#### Light Shelf
A light shelf is a passive architectural device used to reflect natural daylight into a building into a building. Bouncing sunlight off a horizontal surface distribute it more evenly and deeply within a space, whereas direct sunlight can cause glare near an opening, whilst leaving dark areas further in.

#### Perforated Screen
Jalis are used to prevent glare and heat gain while ensuring adequate day lighting and views. It acts as a perforated screen which is used for bringing natural light and also ventilation.
**END USE**

- **Site and Source Energy**
  - Total Energy: 5235.78 kWh
  - Energy Per Total Building Area: 1712.14 kWh/1000 ft²

- **Energy Use**
  - Electricity use: 402,356 kWh
  - District Cooling: 1,021,653 kWh
  - District Heating: 35,378 kWh
  - Interior Equipment: 227,419 kWh
  - Interior Lighting: 174,936 kWh
  - Heating: 35,378 kWh
  - Lighting: 174,936 kWh

**ENERGY USE**

- **Energy Use Per Total Conditioned Floor Area**
  - Lighting: 205.60 kWh
  - HVAC: 0.00 kWh
  - Other: 267.88 kWh
  - Total: 473.42 kWh

**ELECTRICITY USE**

- **Window/Wall Ratio**
  - North (105 to 210 deg): 1039.65 ft², 1129.37 ft², 822.94 ft²
  - East (45 to 105 deg): 789.47 ft², 1129.37 ft², 822.94 ft²
  - South (105 to 215 deg): 789.47 ft², 1129.37 ft², 822.94 ft²
  - West (225 to 315 deg): 789.47 ft², 1129.37 ft², 822.94 ft²

**SOLAR GAIN ANALYSIS**

- **Total Energy Use**
  - Gross Roof Area [ft²]: 1402.47
  - Skylight Area [ft²]: 0.30
  - Skylight/Total Roof Ratio [%]: 0.00

**DAYLIGHT ANALYSIS**

- **Second Floor**
  - North: 1039.65 ft²
  - East: 789.47 ft²
  - South: 789.47 ft²
  - West: 789.47 ft²

- **First Floor**
  - North: 1039.65 ft²
  - East: 789.47 ft²
  - South: 789.47 ft²
  - West: 789.47 ft²

- **Ground Floor**
  - North: 1039.65 ft²
  - East: 789.47 ft²
  - South: 789.47 ft²
  - West: 789.47 ft²

**COURTYARD SITTING**

- **REST ROOM**

**GRIHA TROPHY 2021-22**
CALCULATION AND QUANTITIES

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<tr>
<th>MATERIAL</th>
<th>COST</th>
<th>PIECE</th>
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<th>RETURN</th>
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<td>DOUBLE GLAZED WINDOW WITH UPVC FRAME</td>
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<td>CONCRETE PLINTH</td>
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<td>ROOF REFLECTIVE TILE</td>
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<td>PINEWOOD</td>
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<td>BRICKS</td>
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<td>STONE SILL</td>
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<td>LIGHT FIXTURE</td>
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<td>BASIN</td>
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<td>FLY ASH</td>
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<td>WIND TURBINE</td>
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<td>RAINWATER HARVESTING</td>
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<td>250000</td>
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<td>IRRIGATION SYSTEM</td>
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</table>

TOTAL COST = 152,000,000 (150000000)

SOLAR PANELS
Without subsidiary = 1.5
Solar panel cost = 12000
Transportation = 50
Replaced in 6 years = 15
Installation = 10
Total = 26
Solar panel dimension = 2m
Output = 250 W/H
Average sunlight = 10 Hrs
Considering = 8 Hrs
Units produced per day = 1 W/H
Which is equal to 2 units
Commercial cost of 2 units = 25000
Electricity is 15% = 39000 Rs
Cost of Electricity saved per Year = 49500
3.76 Years required to recover invested amount

VERTICAL WIND TURBINE
Wind Turbine Cost = 410000 Rs
Transportation Cost = 10
Replaced in 6 years = 15
Installation cost = 10
Total cost = 553500 Rs
Windmill height = 2m
Bidge height = 50m
Output = 30000 W/H
Working Time = 24hrs
Unit Produce/Day = 300 x 24 x 7.3 kW
Commercial cost of 7.3 kW = 2628 kW
Yearly produce = 2628 kW
Price recover in 1 year = 144500 Rs
Total cost recovered in 3.8 years

GRIHA EVALUATION POINTS

Sustainable Site Planning
Criterion 2: Low-Impact Design Strategies
Criterion 3: Design to Mitigate UHIE

Construction Management
Criterion 4: Air and Soil Pollution Control
Criterion 5: Topsoil Preservation
Criterion 6: Construction Management Practices

Energy Optimization
Criterion 7: Energy Optimization
Criterion 8: Renewable Energy Utilization
Criterion 9: Low COP and GWP Materials

Occupant Comfort
Criterion 10: Visual Comfort
Criterion 11: Thermal and Acoustic Comfort
Criterion 12: Indoor Air Quality

Water Management
Criterion 13: Water Demand Reduction
Criterion 14: Wastewater Treatment
Criterion 15: Rainwater Management
Criterion 16: Water Quality and Self-sufficiency

Solid Waste Management
Criterion 17: Waste Management Post Occupancy
Criterion 18: Organic Waste Treatment On-Site

Sustainable Building Materials
Criterion 19: Utilization of Alternative Materials in Building
Criterion 20: Reduction in GWP through Life Cycle Assessment
Criterion 21: Alternative Materials for External Site Development

Life Cycle Costing
Criterion 22: Life Cycle Cost Analysis

Socio-Economic Strategies
Criterion 23: Safety and Sanitation for Construction Workers
Criterion 24: Universal Accessibility
Criterion 25: Dedicated Facilities for Service Staff
Criterion 26: Positive Social Impact

Performance Metering and Monitoring
Criterion 27: Commissioning for Final Rating
Criterion 28: Smart Metering and Monitoring
Criterion 29: Operation and Maintenance Protocol

Innovation
GRIHA TROPHY 2021-22

Registration code: 64GRI-27