DOMUS SEKHMET

"THE HOSPITAL IS A HUMAN INVENTION AND AS SUCH CAN BE REINVENTED AT ANY TIME"

- LELAND R. KAISER

ENVISIONING A HOSPITAL REDESIGN PROPOSAL FOR AN OFFICE BUILDING INCLUDING SUSTAINABLE MEASURES, STRATEGIES AND LOW CARBON FOOTPRINT.

BUILDING, CONSTRUCTION AND INFRASTRUCTURE SOLUTIONS ARE CONSIDERED TO ENHANCE ENERGY AND WATER PERFORMANCE.

GRIHA Trophy 2022-23

Registration code:
65GRIHA
-10

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CLIMATE ANALYSIS

28.5013° N, 77.4111° E

CLIMATE TYPOLOGY - **COMPOSITE CLIMATE**

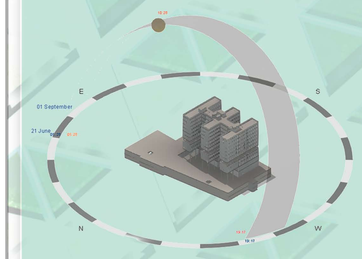
ANNUAL RAINFALL - **65.71 MM**

AIR QUALITY INDEX - **265 AQI · POOR**

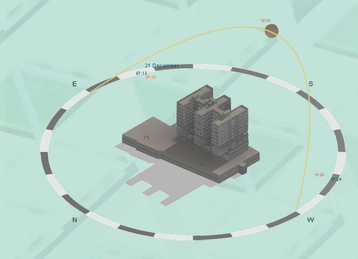
SUITABLE TO HARVEST SOLAR ENERGY DUE TO SUFFICIENT SOLAR RADIATION

NOT SUITABLE TO HARVEST WIND ENERGY DUE TO LOW WIND SPEED

SUN PATH DIAGRAM

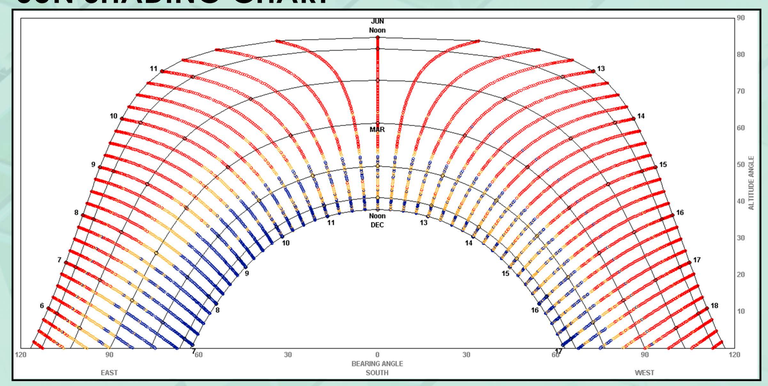


SUMMER SOLSTICE



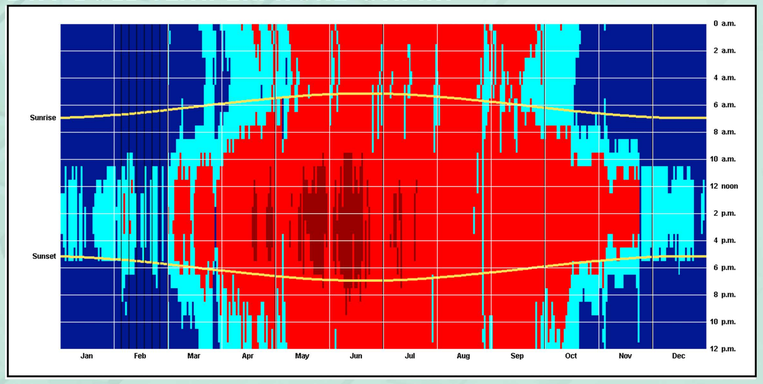
WINTER SOLSTICE

SUN SHADING CHART



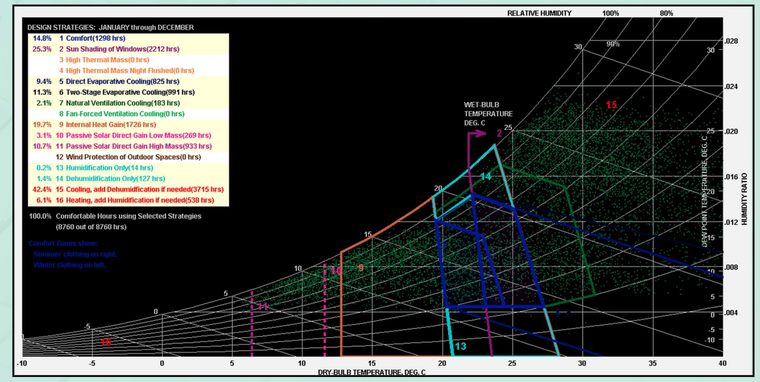
Sun shading is required for all months except from December to February. Windows are effectively shaded between sunrise till noon for these months. Windows are required to be shaded for the rest of the hours.

DRY BULB TEMPERATURE CHART



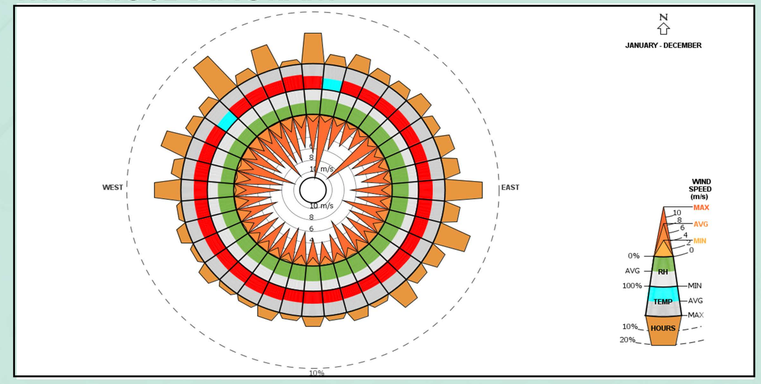
A major part of the working hours are depicted as **uncomfortable** by the dry bulb temperature graph. The months from December to February have the most comfortable temperatures during working hours.

PSYCHOMETRIC CHART



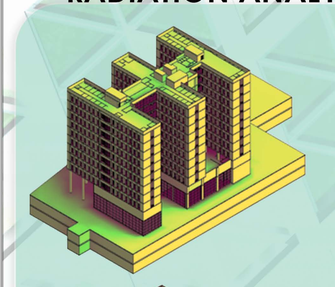
By sun shading and addition of cooling and dehumidification systems, upto **67.7% of comfortable hours can be achieved**. Active and passive design strategies are added to majorly address these requirements in the design.

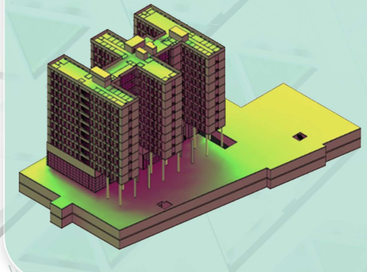
WIND ROSE DIAGRAM

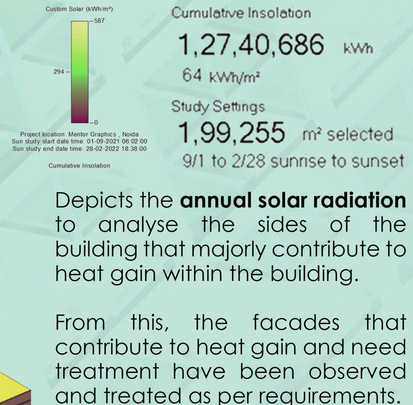


The prevalent wind direction during working hours (from 10 am to 6 pm), annually is from the **North-West direction**. The secondary wind direction is considered to be in the South-East direction.

RADIATION ANALYSIS







Cumulative Insolation

1,27,40,686 kWh

64 kWh/m²

Study Settings

1,99,255 m² selected

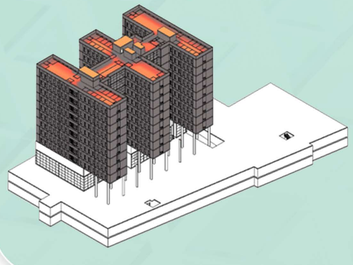
9/1 to 2/28 sunrise to sunset

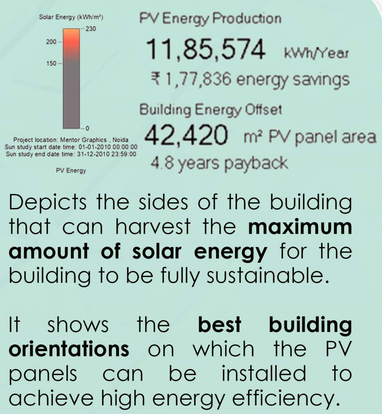
Depicts the **annual solar radiation** to analyse the sides of the building that majorly contribute to heat gain within the building.

From this, the facades that contribute to heat gain and need treatment have been observed and treated as per requirements.

Active and passive design strategies have been adopted suitable to **reduce the observed radiation values**.

SOLAR PV ANALYSIS





PV Energy Production

11,85,574 kWh/Year

₹ 1,77,836 energy savings

Building Energy Offset

42,420 m² PV panel area

4.8 years payback

Depicts the sides of the building that can harvest the **maximum amount of solar energy** for the building to be fully sustainable.

It shows the **best building orientations** on which the PV panels can be installed to achieve high energy efficiency.

The panels will be installed only on these facades to **cut down on cost and maximize efficiency**.

CONCEPTUALIZATION

The main intent that was to be achieved through this proposal was to design a **building that 'breathes,'** just like any other living organism.

The approach for this was mainly through the understanding of the climatic advantages and disadvantages, along with the consideration of user comfort.

Prioritization was given towards the understanding of the daily functioning of a hospital - its thermal and energy levels and their impact on occupant functioning and comfort levels.

Designed to **'envision' and be resilient for the future** - this project is designed to be adaptable to various unpredictable situations that our generation has faced along with the key element that our future generations require - **sustainability**.

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Faces extreme temperature (Summer Max.45 degree C, Winter Min. 4 Degree C)

C & D Block making industry

PUF installed sandwich panel industry

Poor air quality

Power plamts and Steel industries being a reason for pollution

More black carbon content in air due to burning of solid waste

Flood and Earthquake prone zone

Less GREEN areas around the site. Surrounded by buildings

Big mass of C&D waste is generated around site

Electricity is produced from Rice husk

Low water table

Metro interrupts water supply

Mg

Mg

Ca

Poor water quality - hard water

Mg

Mg

Ca

Mg

Ca

Ca

Ca

Site is near highways - high traffic noise in morning and evening

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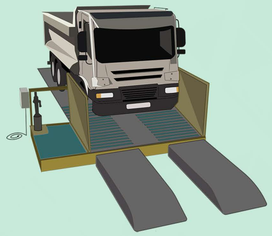
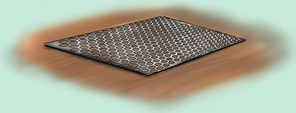
CONSTRUCTION MANAGEMENT STRATEGIES

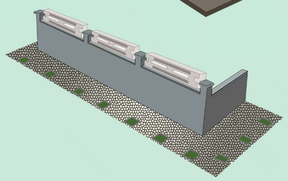


Wheel washing facilities are provided at all entrances and exits of the site to ensure that soil pollutants remain within the site boundary.



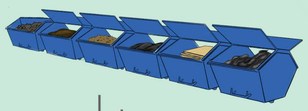
Topsoil preservation is done by introducing porous mats to ensure that the soil remains undisturbed by vehicular and human activity.

All vehicles that **carry waste out of the site are covered** to prevent further pollution outside of the site boundaries.



Barricades upto 3 meters high are provided during the construction phase to prevent air and soil pollution outside the site boundary.

Water sprinklers are used over construction material in order to minimze the airborne dust pollution that occurs during construction. The use of **non-potable, recycled water** ensures sustainability and reduction of water wastage.



Introduction of **waste segregation bins** during the construction phase will ensure proper wet waste disposal and recycling of building material and dry waste.

Use of **gunny bags for curing** concrete reduces water demand while assuring efficiency of the curing process.

All vehicular movement on site is **restricted to 10 kmph** to ensure that surrounding soil and construction debris remains undisturbed and prevents undesired dust. This will reduce both air and soil pollution on site.

Foam Dust Supressants are used on unpaved pathways to reduce the dust from the construction site that pollutes the surrounding air. It ensures **lower water consumption** in comparison to the use of water sprinklers.

Using **non- potable, recycled grey water for concrete mixing** reduces wastage of potable water. Also, addiition of **water-reducing admixtures** in the concrete mixture for construction of additional columns, beams and slabs will reduce water consumption.


BOUGAINVILLEA


MORNING GLORY


PASSION FLOWER


GOLDEN MONEY PLANT


SPIDER PLANT


PEACE LILY


LEMONGRASS


SNAKE PLANT


PHILO-DENDRON


ALOE VERA


MINT


TULSI

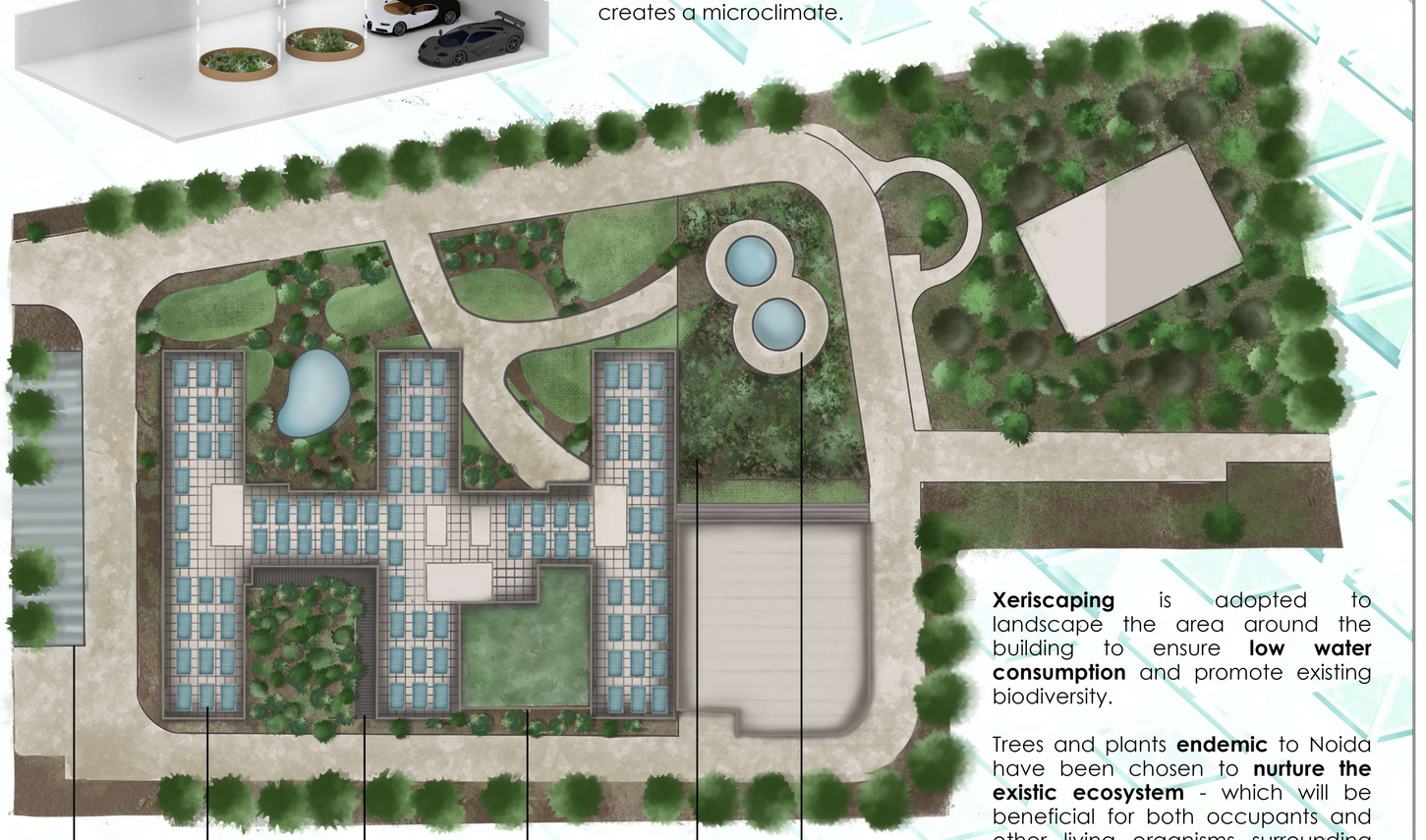

SAGE


CUMIN

SITE PLAN AND LANDSCAPING

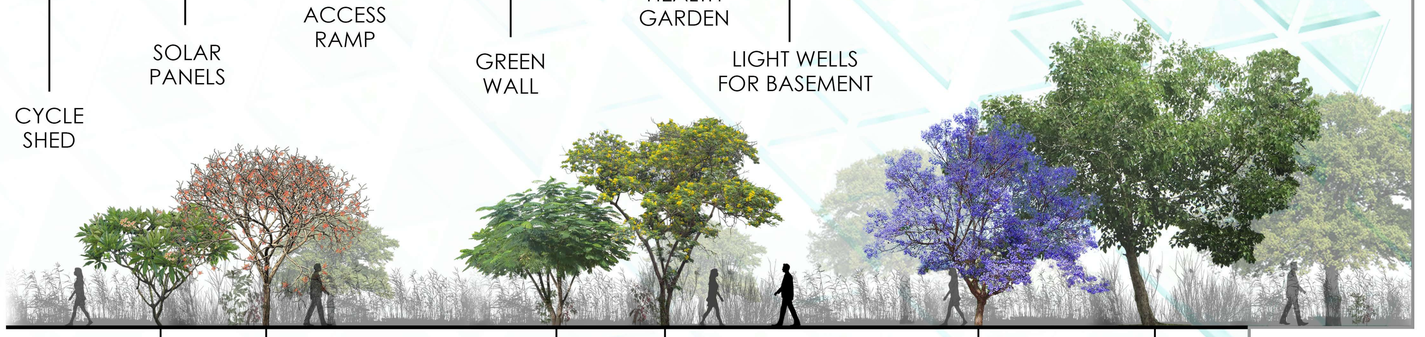
Light wells are provided on the landscaping areas for light to reach the green spaces present in the basement in order for them to thrive.

These light wells are converted into **lily ponds** on the ground level which also **reduces the UHI Effect** and creates a microclimate.



Xeriscaping is adopted to landscape the area around the building to ensure **low water consumption** and promote existing biodiversity.

Trees and plants **endemic** to Noida have been chosen to **nurture the existic ecosystem** - which will be beneficial for both occupants and other living organisms surrounding the site.



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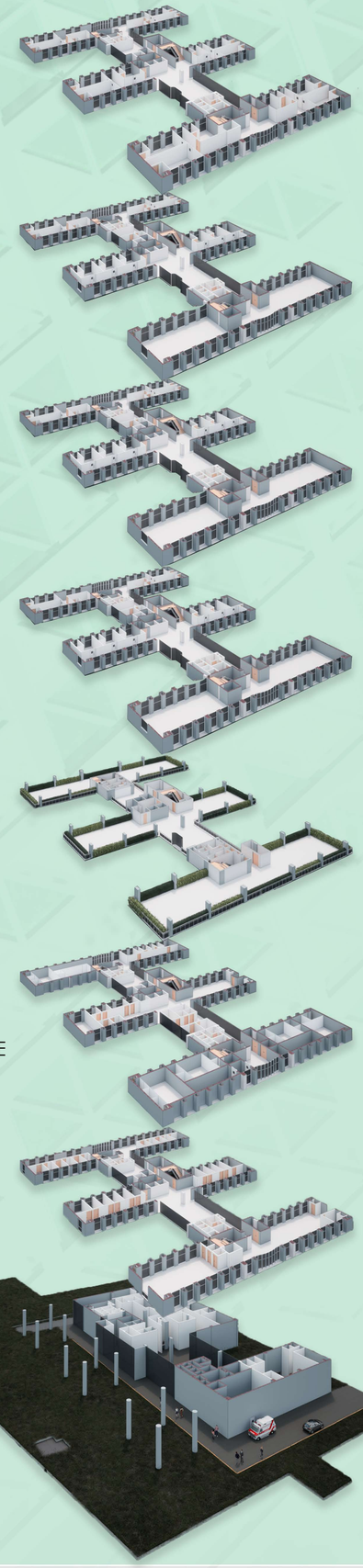
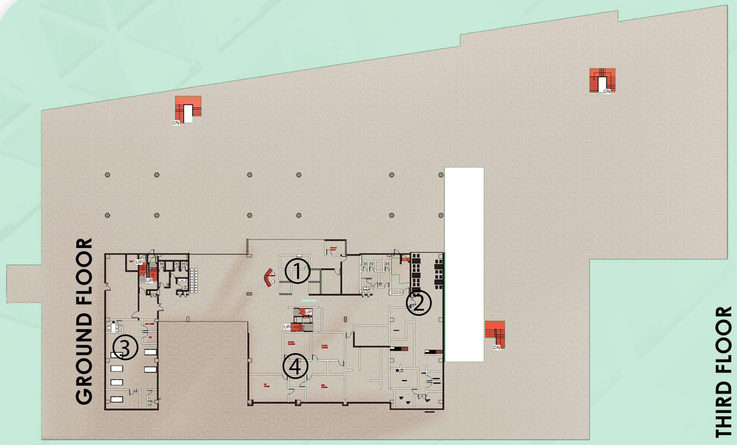
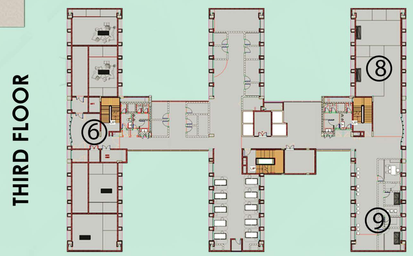




1 ADMIN AREA
RECEPTION
RECORD ROOM
OFFICE AREA
190m.sq.

4 DIAGNOSIS
CT SCAN
MRI
X-RAY
US
293m.sq.

2 CAFE
CAFE
KITCHEN
470m.sq.



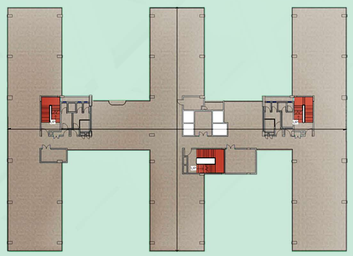
6 OT UNIT
OT
DIRTY UTILITY
SCRUB
GOWN CHANGE
POST OP AND PRE OP
STERILE STORE
TROLLEY PREPERATION
OT OFFICE
OT COUNSEL
CHANGING (D)
CHANGING (N)
CONFERENCE
LIBRARY
425m.sq.

9 LAB UNIT
BLOOD COLLECTION
LAB INCHARGE ROOM
PATHOLOGY
MICROBIOLOGY
180m.sq.

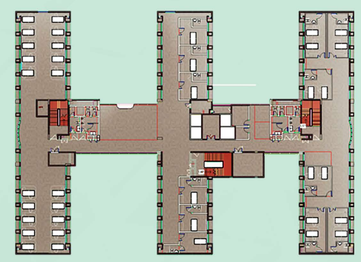
8 LOUNGE
DOCTORS LOUNGE
NURSES LOUNGE
180m.sq.

4 ICU UNIT
ICU
ISOLATED UNIT
DIRTY UTILITY
CLEAN UTILITY
TOILET
425m.sq.

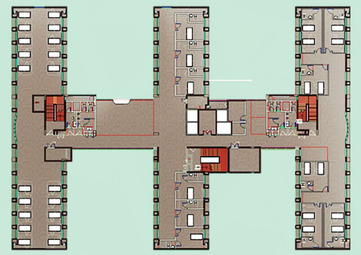
5 CONSULTATION
CONSULTATION UNIT
NURSE STATION
RECEPTION
AHU
850m.sq.



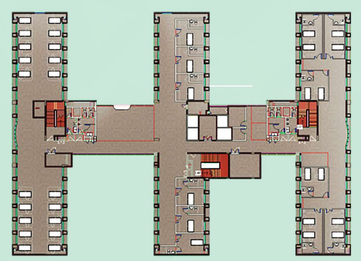
HERBAL GARDEN



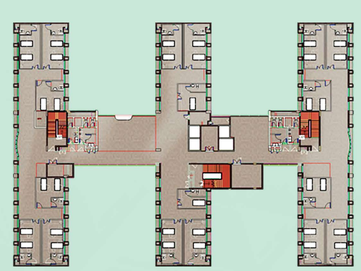
WARD
COMMON WARD
SINGLE BEDROOM
TWIN BEDROOM



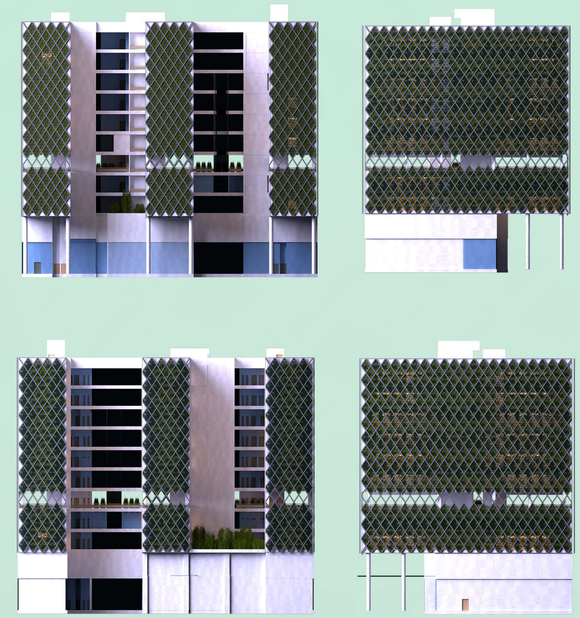
WARD
COMMON WARD
SINGLE BEDROOM
TWIN BEDROOM

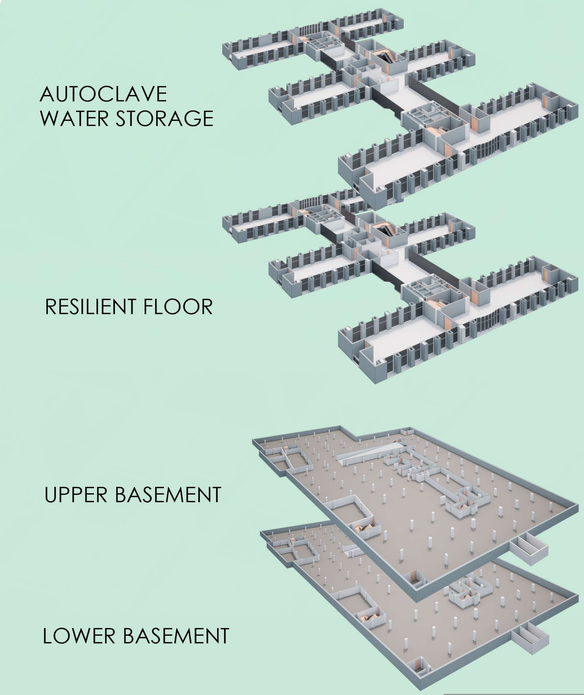


WARD
COMMON WARD
SINGLE BEDROOM
TWIN BEDROOM



ELEVATIONS





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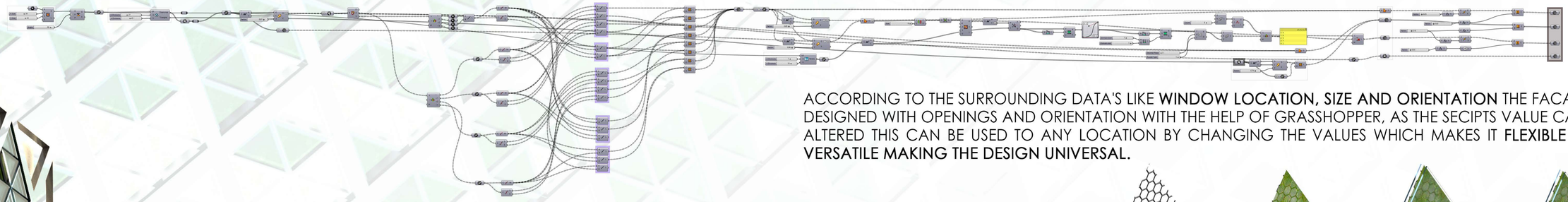
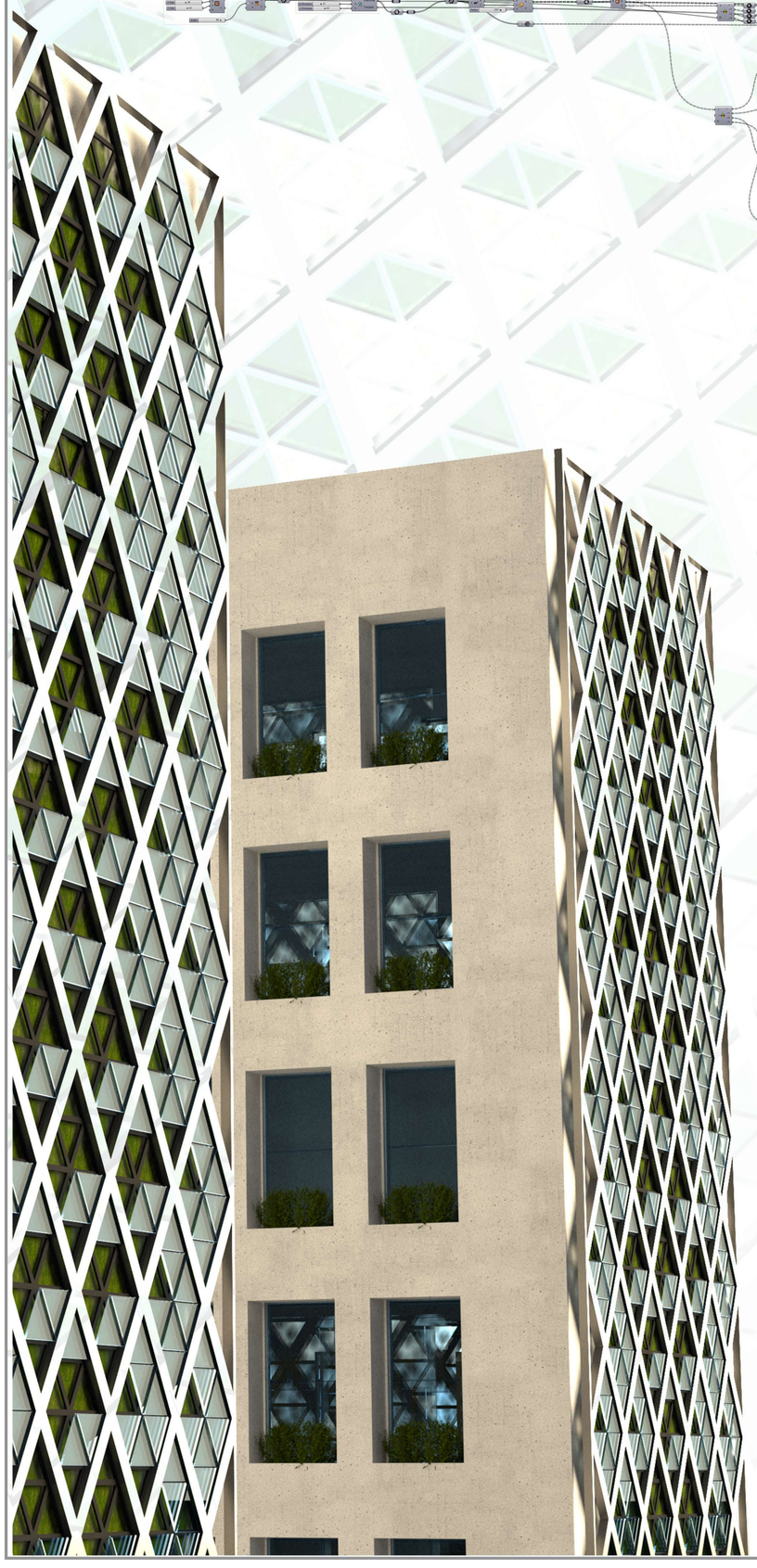
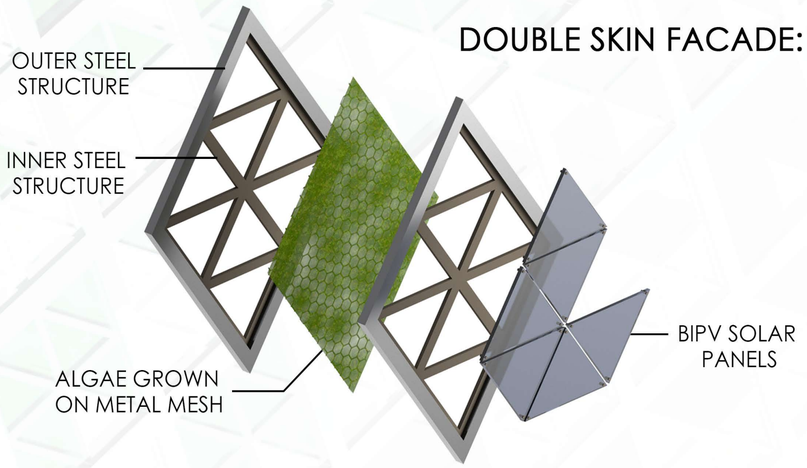
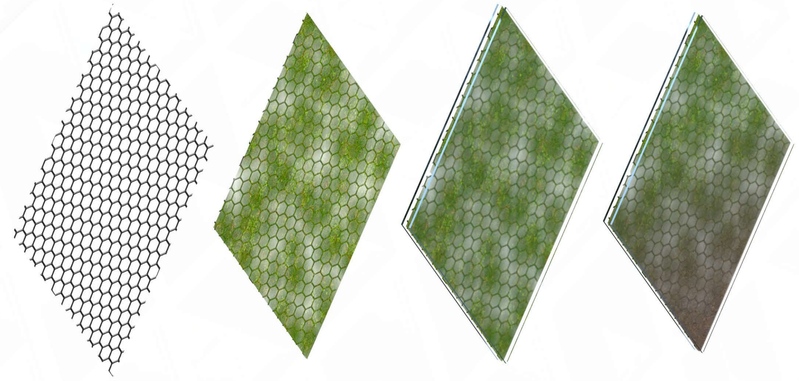


ACCORDING TO THE SURROUNDING DATA'S LIKE **WINDOW LOCATION, SIZE AND ORIENTATION** THE FACADE IS DESIGNED WITH OPENINGS AND ORIENTATION WITH THE HELP OF GRASSHOPPER, AS THE SECIPTS VALUE CAN BE ALTERED THIS CAN BE USED TO ANY LOCATION BY CHANGING THE VALUES WHICH MAKES IT **FLEXIBLE AND VERSATILE MAKING THE DESIGN UNIVERSAL.**



DOUBLE SKIN FACADE:





METAL MESH

ALGAE ARE GROWN IN MESH

GLASS PANELS ARE ADDED ON BOTH SIDES TO COLLECT THE RESIDUE

RESIDUE IS COLLECTED

PANELS IN THE EXTERIOR FACADE THAT COINCIDE WITH THE WINDOW FRAME ARE PROVIDED WITH **LARGER OPENINGS FOR BETTER VENTILATION** COMPARED TO THE PANELS ADJOINING THE WALL.

MODULE 1 MODULE 2 MODULE 3 MODULE 4

MODULE 5 MODULE 6 MODULE 7 MODULE 8

ALGAE ARE GROWN IN BETWEEN THE STEEL STRUCTURE TO HELP IN **PURIFYING THE AIR THAT FLOWS** INTO THE BUILDING BY ABSORBING THE CO_2 GAS MOLECULES.

WATER IS PASSED THROUGH THE FACADE PANELS WHICH TRANSPORT THE WATER FROM THE OUTER TO THE INNER STEEL STRUCTURE, THE WATER RECEIVED IS SPRINKLED ONTO THE ALGAE-GROWN METAL MESH RESULTING REFURBISHMENT.

THROUGH A PERIOD OF TIME WHEN **0.7 KG OF ALGAE ABSORBS UP TO 1.3KG OF CO_2** IT REACHES ITS RESTRAINT AND DRIES UP.

BIO REACTOR:

THE DRIED PARTICLES OF ALGAE FALLING INTO THE GLASS PANELS ARE COLLECTED AND THAT IS **TREATED THROUGH THE BIOREACTOR AND THIS AS A RESULT GENERATES ELECTRICITY.**

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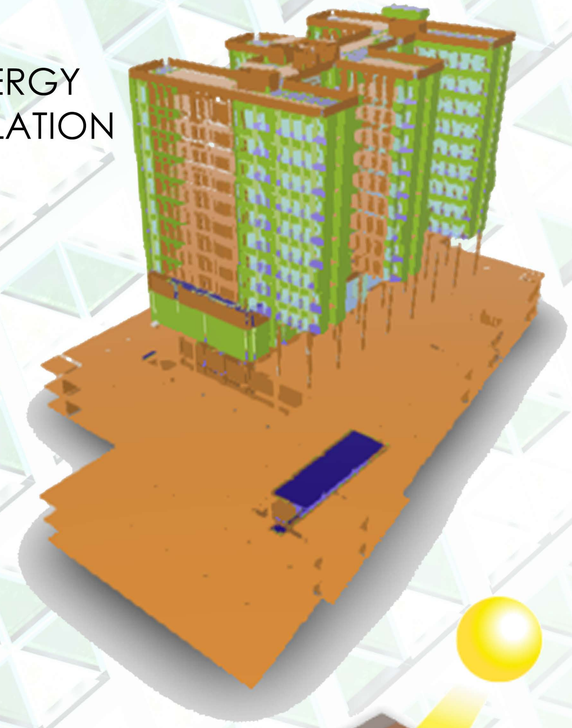
ENERGY SIMULATION



WINDOW WALL RATIO

SOUTH - **14%**
NORTH - **15%**
WEST - **15%**
EAST - **15%**

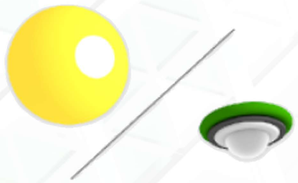
PLUG LOAD

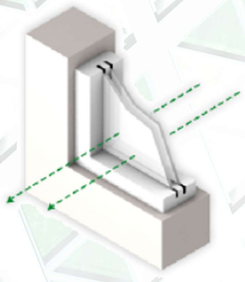
10.76 W/sqm

WINDOW SHADE

2/3 WIN HEIGHT

DAYLIGHTING AND OCCUPANCY CONTROLS



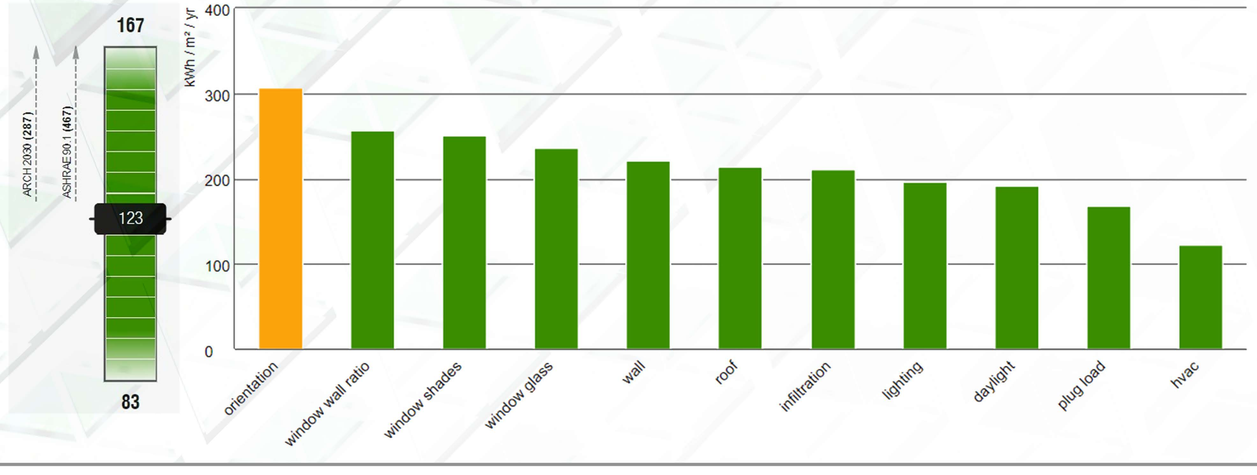


WINDOW GLASS CURRENT SETTING:

Trp LoE

INFILTRATION

ACH - 0.4

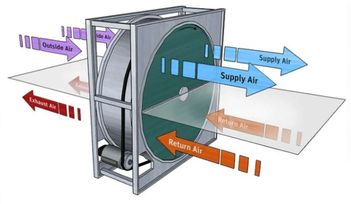


DEDICATED OUTDOOR AIR SYSTEM

A **dedicated outdoor air system** is an HVAC unit that is installed outdoors and often used with other HVAC equipment. These units bring fresh outside air into interior spaces **independently from heating or cooling systems**.

It supplies **cooled and dehumidified outside air** to a building in the summer and warm outside air during the winter.

ENERGY RECOVERY WHEEL



An **energy recovery wheel** consists of a circular matrix of heat-absorbing material, which slowly rotates within the supply and exhaust air streams of an air system.

The wheel transfers energy between two air streams it gains or loses heat to the opposite air stream.

As the wheel rotates into the incoming airstream, energy is released by the wheel to heat and humidify the incoming airstream closer to indoor conditions, reducing unit workload and energy consumed by the heating system.

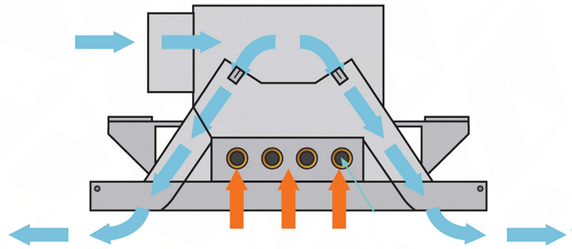
During summer, heat and humidity are captured from the fresh outdoor air.

ACTIVE-PASSIVE CHILLED BEAM SYSTEM

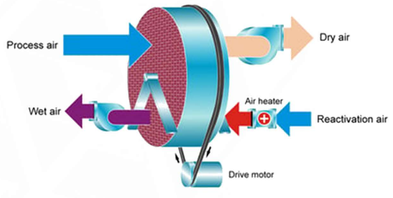
A **passive chilled beam** is an air-conditioning system that relies on the heat transfer efficiency of water and the fluid dynamics for the process of natural convection.

Being one of the **most energy efficient systems**, it does not have nor require any moving parts. It also adds to **acoustic comfort** due to the absence of a fan noise.

An active-passive beam system effectively provides cooling to a space **without adding to usage of fan energy** – all while promoting a high level of occupant comfort and energy efficiency.



DESSICANT DEHUMIDIFIER WHEEL



A **desiccant wheel** is a common type of sorption dehumidifier using a solid desiccant. The desiccant material is coated and placed on the supporting rotor structure.

The desiccant wheel is called a passive desiccant wheel as it functions when there is no air heater. It functions as an active desiccant wheel when provided with an air heater .

The wheel is installed with thermal insulation and air-proof material, so no mass and energy exchange takes place with the surroundings.

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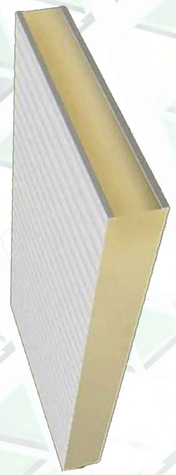
RENEWABLE ENERGY

Solar panels incorporate solar energy into green roofs and create synergies. The temperature of the modules and surrounding ambient temperature are the main factors in which the performance of the photovoltaic modules depend on. Therefore, **when combined with a green roof, solar panels will showcase better performance**. This is because the cooling effect caused by evaporation at plant level improves the ambient air temperature and makes it cooler which **enhances the performanc**e.

LOW ODP AND GWP MATERIALS



PUF panels, being **good heat insulators**, protect the inner environment from the heat and sunlight, thus keeping the structure cool. This **saves the costs incurred in indoor cooling**. PUF panels can also retain the heat inside the structure to keep it warm and comfortable inside. They also provide **acoustical shielding effect** and weather resistance.

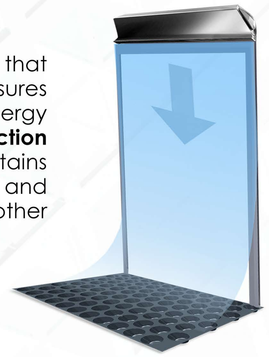
This material is available locally - at a distance of **12 kilometers from the building site**.

Refrigerants used for cooling systems in the building are **CFC and HCFC free** (compounds that are responsible for depletion of the ozone layer).

Fire extinguishers placed in the building consist of **halon-free compunds** which are responsible for ozone depletion and other health concerns.

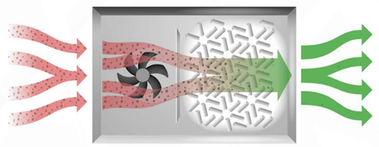
INDOOR AIR QUALITY

Air curtains at entrances of spaces that have temperature differences ensures **thermal control** and reduction of energy consumption. **Porous mats with suction technology** placed under the air curtains creates a system that **traps dust** and unwanted particles from entering other rooms.



Continuous monitoring of indoor air quality levels through installation of sensors in different parts of the building to ensure health and well-being of occupants.

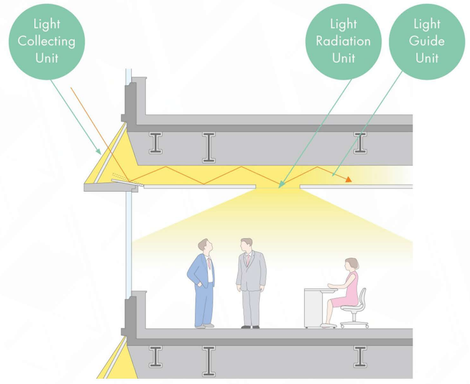
Air sanitization systems are a crucial requirement in hospitals for the maintenance of a clean air environment for occupants. Energy efficient air sanitization systems are installed throughout the building.



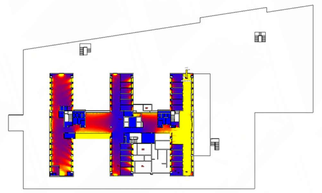
Introduction of **indoor plants that purify the air and reduce pollutants** in the air create a refreshing environment for the occupants. These plants also ensure that **oxygen levels are replenished** within the building.

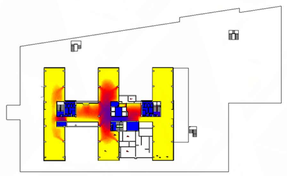
These **water-based natural paints (No-VOCs)** give off almost no smell. They are made from natural raw ingredients such as water, bees wax, plant oils and resins, plant dyes and essential oils and natural elements such as clay, chalk and talcum.

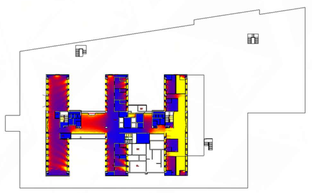
LIGHTING

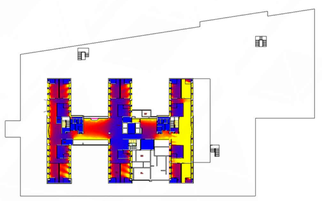


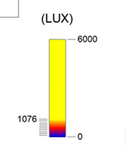
Mirror ducts capture *zenith daylight* (which is brighter than lateral daylight) through external collectors. The light is channeled into horizontal reflective ducts within the false ceiling. Daylight harvested from mirror ducts is usually **glare-free** and the technology involves **no mechanical parts and requires no power**, enabling a considerable energy consumption











Artifical lighting for the building is designed to meet the **recommended lighting level** for specified tasks for different spaces. This is done by uniform distribution of light and providing **visual comfort** by avoiding glare and placing lights in favorable positions throughout a space.

Most of the artificial light requirements are fulfilled with **dimmable LEDs, and lamps that provide a high colour rendering index value** to ensure better visual quality.

Occupancy sensors ensure efficient use of provided artificial light. It controls the dimmable lights according to occupancy and daylighting in a space.

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WATER DEMAND REDUCTION

Flow rates for the water fixtures in the hospital are maintained as per the required building norms. These are **lower than the given GRIHA base case** and play an important role in reducing water consumption in the building.

Demand for municipal water has been reduced by **re-using the treated grey water waste** within the building for non-potable applications such as flushing.

High efficiency fixtures are used to reduce water consumption by **20-30%**. Dual flush water closets, low-water consumption urinals, pressure reducing devices, and water conserving shower heads are introduced for the same.

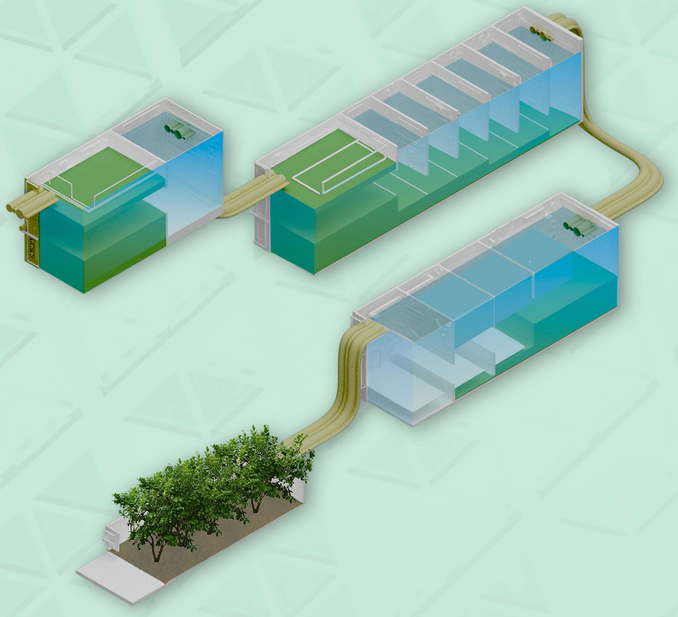
LOW-FLOW FIXTURES

1 LPF

4.5 LPM

4/2 LPF

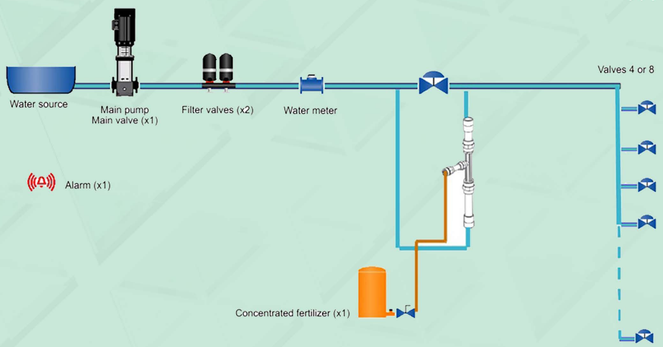
4 LPM



WASTEWATER TREATMENT

The grey water and black water disposed from the building are collected in **separate networks**, are sent for treatment and made fit for non-potable uses in the building. This water is **re-used for landscaping and flushing**.

Overall **water discharge of the building is zero**, since all the waste waster generated is treated and re-used for non-potable applications - that includes landscaping, HVAC systems and flushing.



MOISTURE-NANO TECHNOLOGY IRRIGATION SYSTEM

The piping and connections used in moisture nano technology irrigation systems are similar to those used in drip irrigation however, there is one key distinction: these sensors enable **detection of moisture levels and water the soil accordingly**. When compared to other approaches, this procedure can cut the amount of water used by **75%.**

SOLID WASTE MANAGEMENT

WASTE SEGREGATION BINS

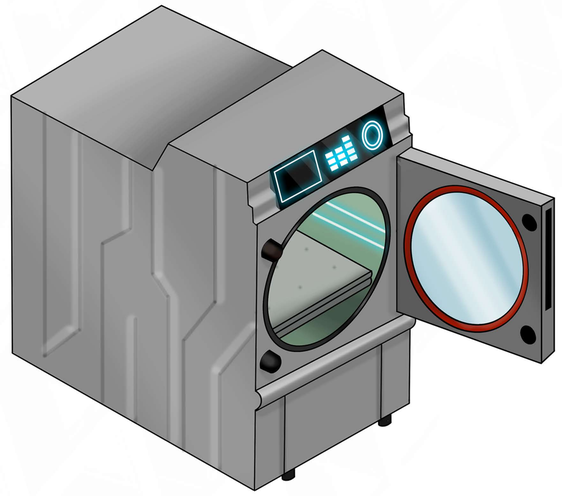
Provision of separate **multi-colored garbage bins** for different types of solid waste ensures segregation of toxic and non-toxic recyclable materials.

In a healthcare facility, it is key importance to separate the bio-medical, hazardous, electronic, dry and wet waste produced to ensure **proper disposal of each waste typology**.

AUTOCLAVE SYSTEM

Bio-medical waste must undergo proper treatment before their disposal to prevent further pollution in the environment.

For this purpose, the **AUTOCLAVE SYSTEM** - a **steam-based waste treatment system** is introducted in the building to ensure the same.



ORGANIC WASTE TREATMENT

Conversion of **organic waste** into other usable resources compost, CNG or manure is done on-site by introducting composting bins and an **organic waste composter**. This compost is then re-used as **manure for the landscaping and vegetation** present on-site.

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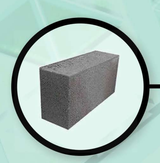
LCC - LIFE CYCLE COSTING



C&D BLOCKS

Non-Hazardous solid waste resulting from construction and demolition activities are processed and trans-formed
into blocks of the desired size.

PERMEABLE PAVER

Pavers that are environment-friendly for Exterior floorings and allow rain-water to run down underground while laying comprises a layer of solid concrete pavers separated by joints filled with small stones. It's not likely to shift over time with factors

SLAG

Steel plants around Noida yield slag that can be used as a substitute for cement

It increases strength, reduces permeabil-ity, improves resistance to chemical attack and inhibits corrosion of rebar.

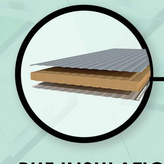
MODULAR WARD FOR FUTURE EX-PANSIONS

MICRO ALGAE

Microalgae are one of the most effec-tive sources of renewable energy pro-duction. It can grow at high rates and capable of producing oil along the year. Microalgae biomass was first suggested as a feedstock for biofuel production and received early atten-tion for commercial application.

ANTI MICROBIAL PANELS

These panels are efficient and pro-vide long-lasting protection against bacteria therefore they can be used in spaces that require strict sanitary requirements .



PUF INSTALLATION

Panels made of polyurethane usually sandwiched between two metal sheets helps to retain the heat inside the structure along with providing good acoustical properties resulting in saving energy costs while increasing the performance of a structure.

	material cost			
	floors	wall area(Sqm)	cost per Sqm	total
C&D BLOCKS	ground	400	400	160000
	1 st	350	400	140000
	2 nd	300	400	120000
	3 rd	450	400	180000
	4 th	55	400	22000
	5 th	265	400	106000
	6 th	265	400	106000
	7 th	265	400	106000
	8 th	180	400	72000
	9 th	120	400	48000
	10 th	120	400	48000
				1108000

	floors	wall area(Sqm)	cost per Sqm	total
PUF SANDWICH PANELS	ground	100	650	65000
	1 st	0	650	0
	2 nd	450	650	292500
	3 rd	300	650	195000
	4 th	0	650	0
	5 th	600	650	390000
	6 th	600	650	390000
	7 th	600	650	390000
	8 th	450	650	292500
	9 th	50	650	32500
	10 th	50	650	32500
				2080000

Annual operative cost of VRF	Difference	Payback Period
2856645	2533469	2.68 years

FACADE

Sides	Area (Sqm)	Cost per Sqm	total
West	700	250	175000
east	700	250	175000
north	150	250	37500
south	150	250	37500

SOLAR PANAL

Without subsidiary	= 15200
Solar panel cost	= 12000
Transportation	= 10
Replaced in 6 years	= 15
Installation	= 1
Total	= 656
Total cost	=14432000
Solar panel dimension	= 2m
Output	= 276832 kwh
Payback	= 4.9 years

Radiant Cooling

Total Radiant cooles area (sqm)	Capital Cost (Rs.)	Annua Operation Cost (Rs.)
4328.25	13008750	323176

LCA

3c. ENVIRONMENTAL IMPACT CATEGORIES:

Potential impacts are reported in kilograms of equivalent relative contribution (EQ) of an emission commonly associated with that form of environmental impact.

- **acidification potential (AP) kg SO2EQ**
- **eutrophication potential (EP) kg NEQ**
- **global warming potential (GWP) kg CO2EQ**
- **ozone depletion potential (ODP) kg CFC-11EQ**
- **smog formation potential (SFP) kg O2EQ**
- **primary energy (m)**
- **renewable energy (m)**

PRODUCT – A1. extraction,
A2. transport (to factory),
A3. manufacturing

CONSTRUCTION - a4. transport (to the site)

USE - b2. maintenance, b3. repair, b4. replacement, b5. refurbishment

END OF LIFE - c2. transport (to disposal), c3. waste processing, c4. disposal

MODULE D - d. benefits and loads; 1. reuse 2. recycling 3. energy recovery

03 - Concrete
04 - Masonry
05 - Metals
06 - Wood/Plastic/Composites
07 - Thermal and Moisture Protection
08 - Openings and Glazing

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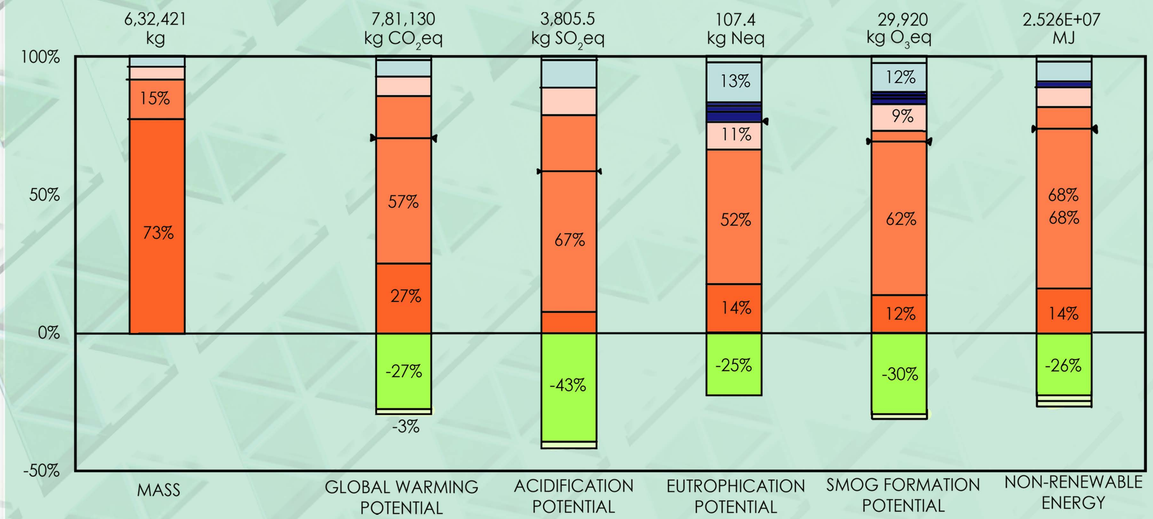


LIFE CYCLE INTERPRETATION

a. the production of building products; (al-a3) life cycle phases with the dominant impacts.

b. building operation; (b2 - b5) small yet significant impact transportation and end of life; (a4, c2 - c4) have negligible environmental impact

MODULE D; (d) has resulted in a reduction of -

GWP by 30 %

AP by 42% EP by 24 % SFP by 31%

LOWER HEATING VALUE BY 26%

WATER CALCULATION

		CONSUMPTION						WATER SOURCES			
Month	Days in month	Domestic use(L)	Cooling use %	Cooling use (L)	Irrigation Use %	Irrigation Use (L)	Total consumption	Municipal Water(L)	Rainwater+ 50% Storm water	Greywater(L)	Blackwater(L)	Total Stored
Jul	31	1627500	0%	0	5%	4650	1632150		1062551	748650	878850	179051
Aug	31	1627500	50%	12,788	5%	4650	1644938		957791	748650	878850	61503
Sep	30	1575000	50%	12,375	50%	45000	1632375		598603	724500	850500	-309272
Oct	31	1627500	50%	12,788	30%	27900	1668188		448770	748650	878850	-470768
Nov	30	1575000	0%	0	90%	81000	1656000		283570	724500	850500	-647930
Dec	31	1627500	0%	0	90%	83700	1711200		149866	748650	878850	-812684
Jan	31	1627500	0%	0	90%	83700	1711200		447882	748650	878850	-514668
Feb	28	1470000	0%	0	90%	75600	1545600		1646521	676200	793800	777121
Mar	31	1627500	80%	7,673	90%	83700	1718873		848605	748650	878850	-121618
Apr	30	1575000	90%	22,275	90%	81000	1678275		598662	724500	850500	-355113
May	31	1627500	100%	25,575	90%	83700	1736775		748628	748650	878850	-239497
Jun	30	1575000	90%	22,275	90%	81000	1678275		3546184	724500	850500	2592409
Total							20013849		11337633	8814750	10347750	138534

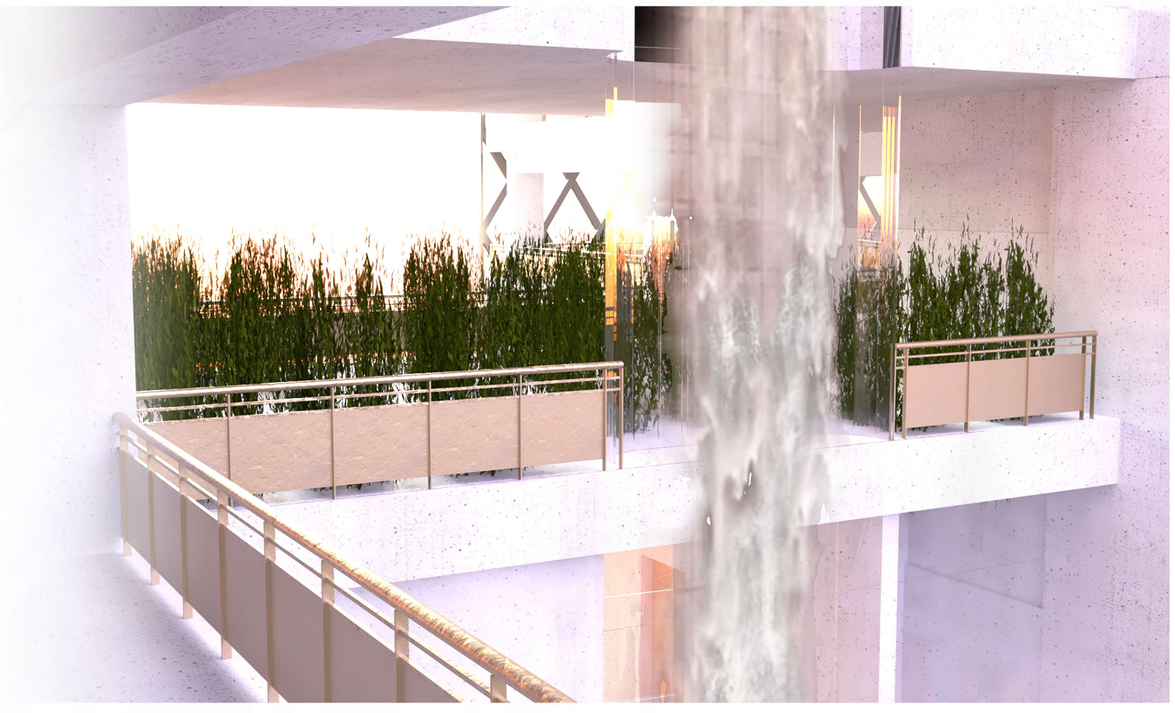
Cooling use	
L/Tr	5.5
Tr per Day(peak)	150
Max LPD	825

Domestic use	
Use LPD/Head	350
Number of people	150
Total LPD	52,500

Irrigation Use	
L/m^2	1
Area m^2	3000
Max LPD	3000

End use	Percent in use	Use in LPD	Greywater in LPD	Blackwater in LPD
Washing	30%	15750	15750	
Cleaning	15%	7875	7875	
Others	2%	1050	525	525
Drinking	20%	10500		10500
Cooling	3%	1575		1575
Toilet flushing	30%	15750		15750
Total		52500	24150	28350

1	Green Infrastructure	✓
2	Low Impact Design Strategies	✓
3	Design to Mitigate UHIE	✓
4	Air and Soil Pollution Control	✓
5	Topsoil Preservation	✓
6	Construction Management Practices	✓
7	Energy Optimization	✓
8	Renewable Energy Utilization	✓
9	Low ODP and GWP Materials	✓
10	Visual Comfort	✓
11	Thermal and Acoustic Comfort	✓
12	Maintaining Good IAQ	✓
13	Water Demand Reduction	✓
14	Wastewater Treatment	✓
15	Rainwater Management	✓
16	Water Quality and Self-Sufficiency	✓
17	Waste Management– Post Occupancy	✓
18	Organic Waste Treatment On-Site	✓
19	Utilization of Alternative Materials in Building	✓
20	Reduction in GWP through Life Cycle Assessment	✓
21	Alternative Materials for External Site Development	✓
22	Life Cycle Cost Analysis	✓
23	Safety and Sanitation for Construction Workers	✓
24	Universal Accessibility	✓
25	Dedicated Facilities for Service Staff	✓
26	Positive Social Impact	✓
27	Commissioning for Final Rating	✓
28	Smart Metering and Monitoring	✓
29	Operation and Maintenance Protocol	✓
30	Innovation	✓



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