A CITY LIKE GHAZIABAD WITH CEASELESSLY GROWING INDUSTRIES AND POPULATION, TENDS TO STRIVE PEOPLE TOWARDS FRESH AIR TO BREATHE AND HEALTHY SURROUNDINGS TO LIVE IN.

THE INCREASING NEED OF GREEN BUILDINGS AND SUSTAINABILITY IS BECOMING THE THIRST OF THESE SURROUNDINGS. DESIGN SOLUTIONS OF BUILDINGS THUS ASK FOR FUNCTIONALITY AND OCCUPANTS' COMFORT, AND WITH INCREASING IMPORTANCE, THE COMFORT OF OUR PLANET EARTH.

WITH THIS WE GET ENVISAGED WITH THE FACT OF NOT JUST SELF, BUT ALSO THE WORLD'S SOLACE.

ACCOUNTING FOR ALL CULPABLE FACTORS, WE ARE HERE TO PRESENT YOU WITH THE DESIGN OF A GST BUILDING WHICH ADHERES TO A MULTITUDE OF GREEN MANAGEMENT STRATEGIES. AN ADAPTABLE SURROUNDINGS WORKING WITH RENEWABILITY, EFFICIENCY AND SECURITY, WHILE TAKING A STEP FORWARD TOWARDS SUSTAINABLE WELL BEING.

VIEW FROM THE MAIN ENTRY GATE

Apprehension

GRIHA TROPHY 2021-2022

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NASA

LOCATION- 28.6795 N 77.4588 E

ALTITUDE- 214 M

LOCATED 50 KILOMETERS FROM DELHI

ACCESSIBILITY

JHANSI RANI MARG

BUS STOP IN 500 M

SUBWAY IN 5.4KM

CLIMATIC ANALYSIS

CLIMATE TYPE- COMPOSITE

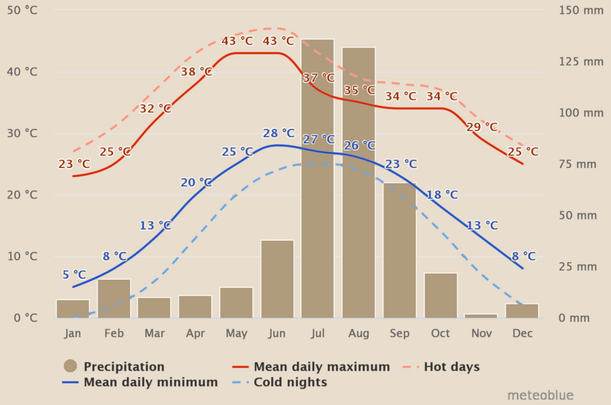
ANNUAL RAINFALL- 764 MM

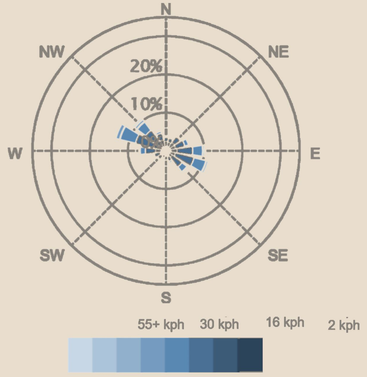
AVERAGE HUMIDITY- 68%

SEISMIC ZONE IV

AIR QUALITY- VERY POOR

GROUND WATER LEVEL- 18.7 M IN 2016, PRE MONSOON LEVEL; DROPPED TO 30.6 IN 2020





AIR QUALITY INDEX HISTORY

DECEMBER 2021- 335

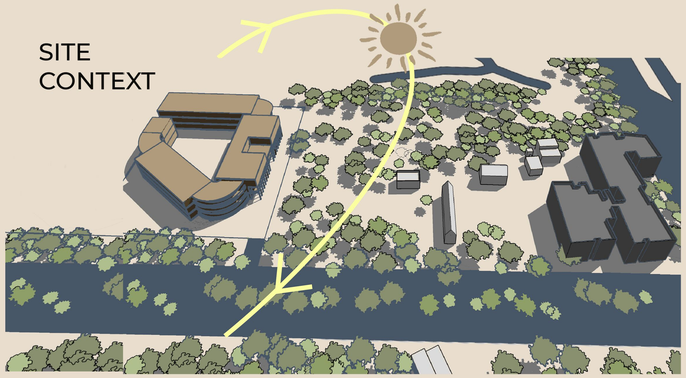
DECEMBER 2020-419

DECEMBER 2019- 412

NATURAL VEGETATION

NEEM	TEAK
JAMUN	GUAVA
MANGO	ASHOK
SHISHAM	CHAMPA
BABOOL	PEEPAL
BANYAN	ARJUN
KADAMB	MAHUA
TAMARIND	AMALTAS

SITE CONTEXT



PROPOSED DESIGN

GOVERNMENT OFFICES

ROADWAYS

NEARBY STRUCTURES

INDO SARACENIC
ARCHITECTURE INFLUENCE

STEEL
CHEMICAL
SUGAR MILLS
ELECTRONICS

MAJOR SEISMIC HISTORY OF GHAZIABAD

1945	1945	1955	1958	1966	1966	1975	1975	1991	1999
6.5 RICHTER	6.4 RICHTER	6.2 RICHTER	6.1 RICHTER	6.7 RICHTER	6.3 RICHTER	6.8 RICHTER	6.0 RICHTER	6.8 RICHTER	6.6 RICHTER
273 KMS AWAY	403 KMS AWAY	316 KMS AWAY	403 KMS AWAY	462 KMS AWAY	462 KMS AWAY	562 KMS AWAY	316 KMS AWAY	378 KMS AWAY	426 KMS AWAY

S

CLOSELY LOCATED TO OTHER GOVERNMENT OFFICES

NO NOISE SOURCES ON 3 SIDES

AMPLE PRE-EXISTING VEGETATION & GREEN BUFFER IN SITE SURROUNDING

LOCATED ADJACENT TO A MAJOR HIGHWAY IN THE CITY CENTER

W

AIR POLLUTION DUE TO NEARBY INDUSTRIAL ZONE

ADJACENT ROAD CAUSES NOISE & AIR POLLUTION

O

THE SITE RECIEVES GOOD SOLAR INSOLATION

ABSENCE OF WIND OR SUN BARRIERS IN CLOSE VICINITY

NEIGHBOURING VACANT LAND FOR FUTURE EXPANSION

T

THE SITE FALLS UNDER SEISMIC ZONE IV

Site Infographic

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WE AIMED TO CREATE A BUILDING THAT IS A RESPECTFUL SUCCESSOR AND A NOTE-WORTHY PREDECESSOR TO A LONG LINE OF INDELIBLE MONUMENTS THAT HAVE HOUSED PRESTIGIOUS GOVERNMENT ESTABLISHMENTS.

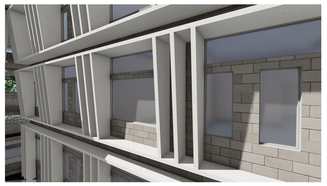
A BUILDING THAT STANDS STRONG THROUGH DECADES OF SEISMIC ACTIVITY AND CHANGING GOVERNANCE WHILE DOING NO HARM TO THE ENVIRONMENT THAT SUSTAINS IT.

OUR DESIGN EVOLVED FROM THE BASIC VERNACULAR TYPOLOGY OF A COURTYARD EDIFICE INTO A MULTI-BLOCK BRIDGED COMPLEX WITH A COLOSSAL FACADE.

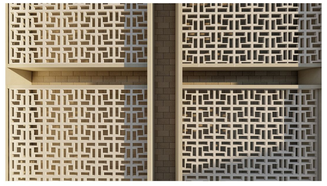
WE SET OUR SIGHTS AT CREATING A FACILITY THAT WAS SECURE FROM THREATS YET WELCOMING TO ITS EMPLOYEES. THE BUILDING TARGETS TO FUEL PRODUCTIVITY AND PROVIDE AN ATMOSPHERE OF RESPONSIBILITY AS WELL AS A SENSE OF COMFORT AND BELONGING.

INSPIRED BY EXPERION DEVELOPERS, OUR TEAM INTENDED TO CREATE A FOUNDATION THAT IS PENSIVE IN GIVING OPEN ACCESSIBLE SPACES WHICH FOCUS ON INTERACTIONS BETWEEN NATURAL AND BUILT ENVIRONMENT. OUR APPROACH WAS TOWARDS BUILDING A FOLIAGE OF INSEPERABLE BONDS OF HEALTHY RELATIONSHIPS THROUGH POSITIVE LIVING.

Outlook



Fins



Jaali

Colonnade

Arcade

DESIGN GOALS

SEISMIC STABILITY

IMPORTANT FOR THE LONGETIVITY OF THE EDIFICE.

SENSORY INDULGEMENT

THE DESIGN AIMS AT PROVIDING CHANGING STIMULI TO PREVENT MONOTONY.

USER WELLNESS

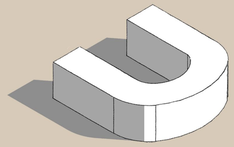
THE FACILITY ATTEMPTS AT A NEW-AGE GREEN GOVERNMENT OFFICE.

BIOPHILIA

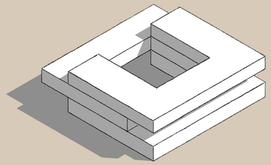
DRAWING FROM AFFINITY OF HUMAN BEINGS WITH NATURE.

PRIVACY & SECURITY

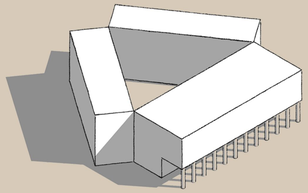
FOCUS ON CGST APPROPRIATE SECURITY TO BE LAID AT EVERY STAGE.



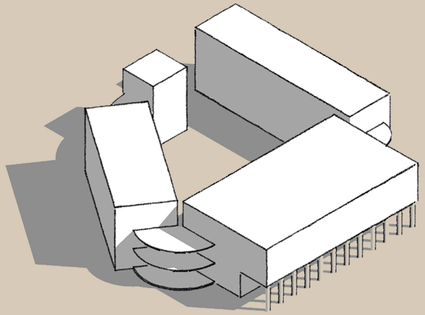
USE OF THE CONVENTIONAL COURTYARD TYPOLOGY IN LIGHT OF THE COMPOSITE CLIMATE.



STAGGERATION BETWEEN FLOORS TO ALLOW FOR SELF-SHADING.



CONVERSION TO RECTANGULAR BLOCKS & ADDITION OF STRUCTURAL FRAMEWORK FOR SEISMIC STABILITY.



ADDITION OF BRIDGES FOR CONNECTIVITY BETWEEN BLOCKS. THESE BRIDGES HAVE THEIR INDIVIDUAL FRAMEWORK. ALL BLOCKS ARE CONNECTED BY EXPANSION JOINTS.

Aspirations and Evolution

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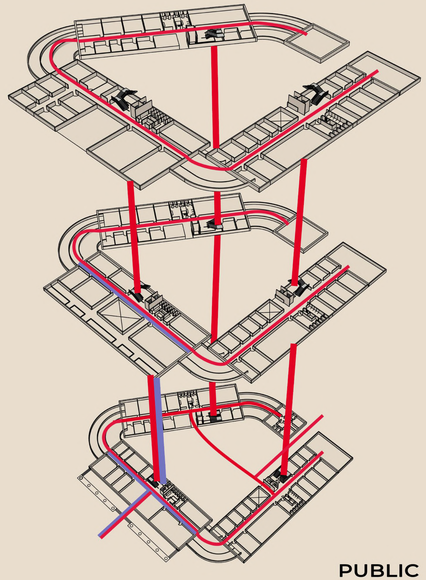
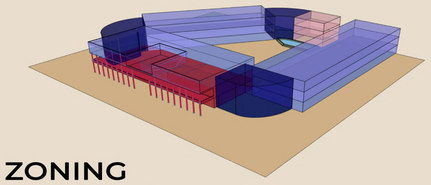


PUBLIC

EMPLOYEES

PASSENGER MOVEMENT



ZONING OF SPACES

BRIDGES

GENERAL SPACES

DIVISIONS

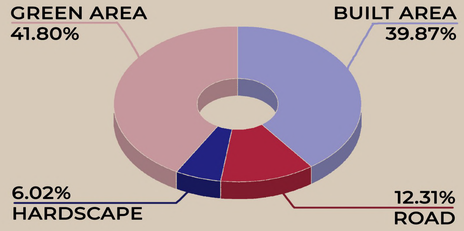
SUITES & CONFERENCE

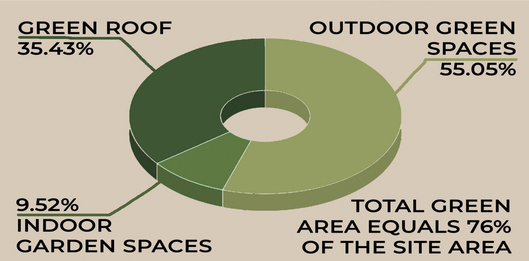
SITE PLAN

1. MAIN ENTRY GATE
2. GUARD ROOM
3. ACCESSIBLE PARKING
4. RAINWATER HARVESTING PIT
5. SERVICE ENTRY GATE
6. RAINWATER GARDEN
7. NORTH BRIDGE
8. SOUTH EAST BRIDGE
9. SOUTH WEST BRIDGE
10. BASEMENT
11. GENERAL BLOCK
12. DIVISION BLOCKS
13. TRANSFORMER
14. DG SET
15. WATERBODY

AREA STATEMENT FOR CGST BUILDING

TYPE OF AREA	AREA IN SQ M
TOTAL SITE AREA	8959.1
BUILT-UP AREA	3358.721
CARPET AREA	8888.217
MUMTY AREA	214
TOTAL BASEMENT AREA	4111.163
ROAD AREA	1103
OUTDOOR GREEN AREA	6155.155
INDOOR GREEN AREA	648
TOTAL GREEN AREA	6803.155
WATER BODY AREA	116





Site Plan and Movement

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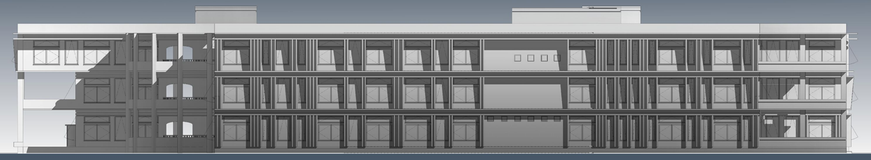
NORTH ELEVATION

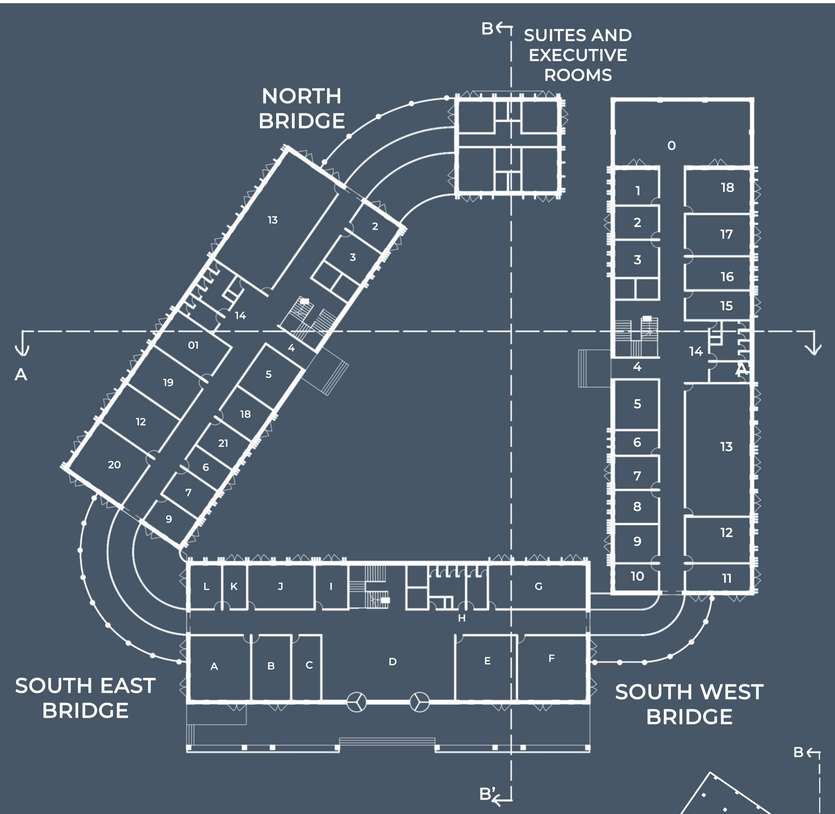
SOUTH ELEVATION



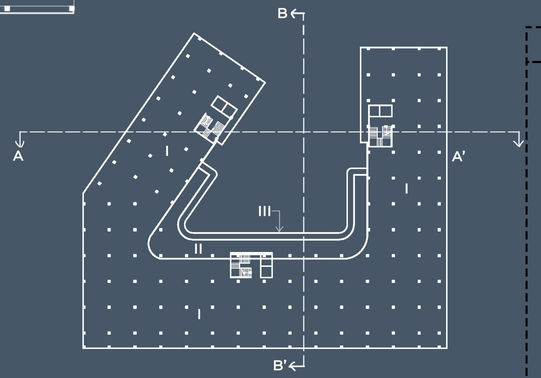
EAST ELEVATION

WEST ELEVATION

TOTAL BUILDING HEIGHT- 12.3 M | FLOOR HEIGHT- 3.6 M | PLINTH HEIGHT- 0.6 M



GROUND FLOOR PLAN IN 1:500



BASEMENT PLAN IN 1:800

DIVISION FLOOR LEGEND

ROOMS	AREAS IN M²
0. FUTURE EXPANSION	142
1. EAS ROOM	40
2. INSPECTOR ROOM	27
3. SUPERINTENDENT ROOM	25
4. ENTRANCE	15
5. A.H.U	33
6. PANTRY	18
7. AUDIT ROOM	28
8. ANTI-EVASION ROOM	22
9. WAITING ROOM	25
10. STORE ROOM	28
11. RECORD ROOM	28
12. LEGAL REVIEW & ADJUDICATION	44
13. DIVISION ROOM	128
14. TOILET BLOCK	60
15. ARMORY	28
16. MINI CONFERENCE	32
17. CHIEF COMMISSIONER ROOM	40
18. DEPUTY COMMISSIONER ROOM	44
19. BAR ROOM	56
20. CONFEERENCE ROOM	22

GENERAL FLOOR LEGEND

ROOMS	AREAS IN M²
A. SERVER ROOM	57
B. RECEIPT DISPATCH	31
C. FIRE CONTROL	32
D. ENTRANCE LOBBY	125
E. TAXPAYER'S SERVICE CENTRE	66
F. APPEAL OFFICE	60
G. CRECHE	66
H. TOILET BLOCK	39
I. GUARD ROOM	21
J. CHANGING ROOM	44
K. MEDICAL	16
L. WIRE CONTROL	22

BASEMENT FLOOR LEGEND

I. PARKING SPACES	3631 M²
II. OPEN EXCAVATION	319 M²
III. GREEN AREA	114 M²

Plans and Elevations

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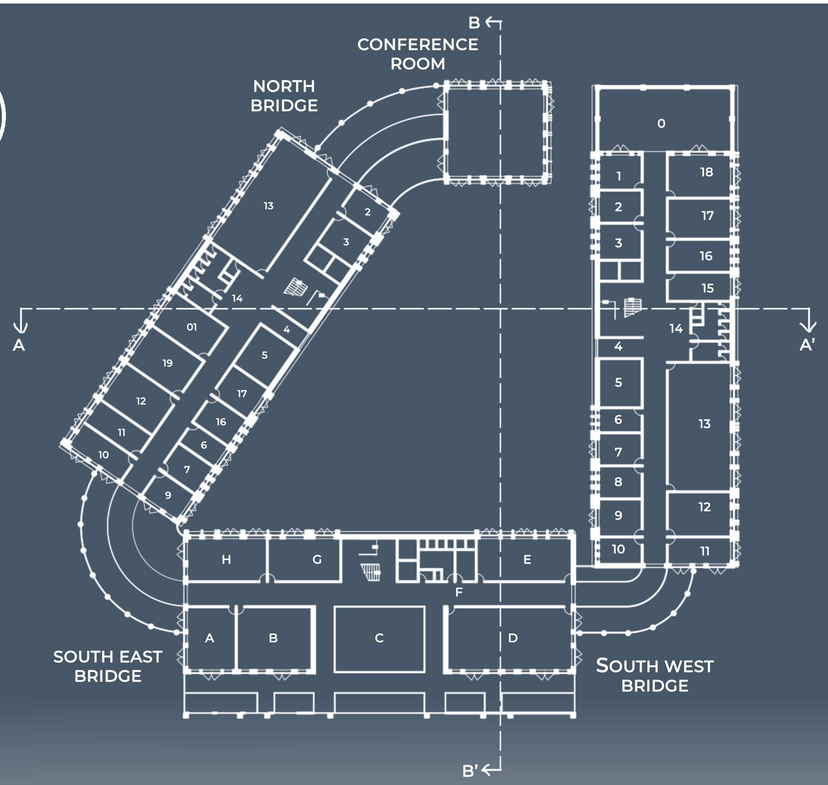
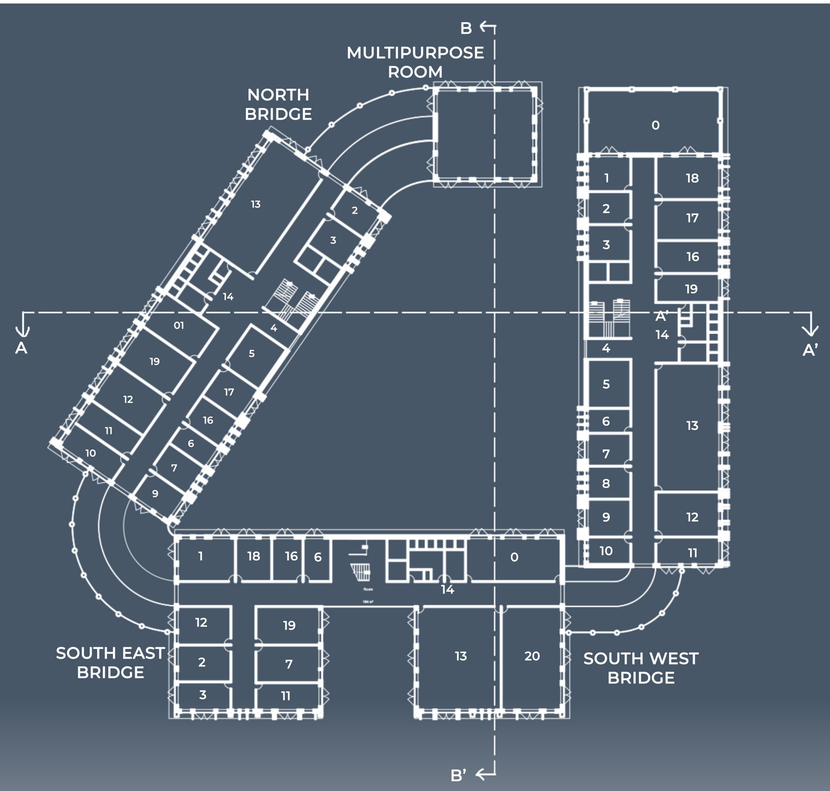


FIRST FLOOR PLAN IN 1:500



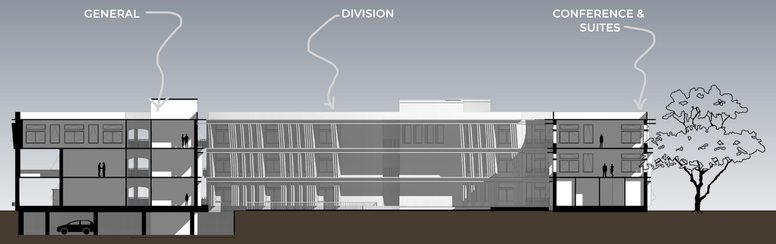
SECOND FLOOR PLAN IN 1:500

DIVISION FLOOR LEGEND

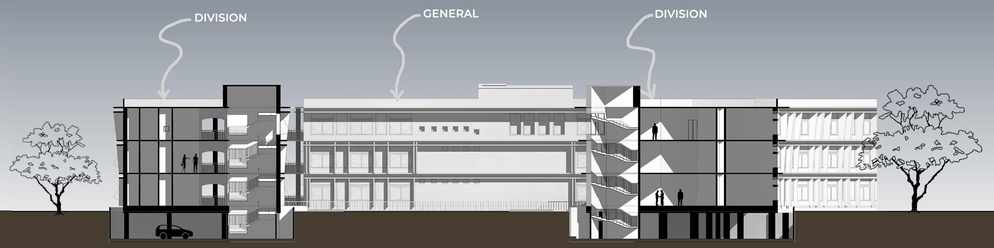
ROOMS	AREAS IN M²
0. FUTURE EXPANSION	63
1. EAS ROOM	40
2. INSPECTOR ROOM	27
3. SUPERINTENDENT ROOM	25
4. ENTRANCE	15
5. A.H.U	33
6. PANTRY	18
7. AUDIT ROOM	28
8. VIGILANCE	22
9. WAITING ROOM	25
10. STORE ROOM	28
11. RECORD ROOM	28
12. LEGAL REVIEW & ADJUDICATION	44
13. DIVISION ROOM	128
14. TOILET BLOCK	60
15. INTERROGATION	28
16. MINI CONFERENCE	32
17. CHIEF COMMISSIONER ROOM	40
18. DEPUTY COMMISSIONER ROOM	44
19. ADDITIONAL ROOM	22
20. EMPLOYEES' LOUNGE	90

GENERAL FLOOR LEGEND

ROOMS	AREAS IN M²
A. PAY AND ACCOUNTS OFFICE	50
B. STAFF ASSOCIATION	76
C. ATRIUM	94
D. CANTEEN & DINING	127
E. EMPLOYEE'S LOUNGE	65
F. TOILET BLOCK	39
G. ACCOUNTS	47
H. ELECTRICAL TRANSMISSION	55



SECTION B-B'



SECTION A-A'

Plans and Sections

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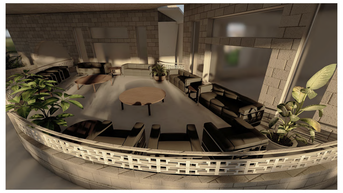
VIEW OF THE COURTYARD FROM RIGHT DIVISION



Open Lounge

OPEN LOUNGES LOCATED ON ALL THE BRIDGES, INTERTWINE THE EXTERIORS WITH THE INTERIOR LEISURE SPACES, FOR EMPLOYEE WELFARE

Atrium

AN ATRIUM OVER THE ENTRANCE LOBBY CREATES VARIATION IN VOLUME, LIGHT & AIR, AND A FEELING OF GRANDEUR.

Water Curtain

THE NORTH BRIDGE FEATURES A WATER CURTAIN THAT ACTS AS A COOLANT & A PURIFIER FOR INCOMING WIND INTO THE COURTYARD.

Basement

EXCAVATION OF THE BASEMENT BEYOND BUILDING SURFACE OPENS IT UP TO THE NATURAL ELEMENTS, WITH A VIEW OF THE COURTYARD,

Views and Sights

GRIHA TROPHY 2021-2022

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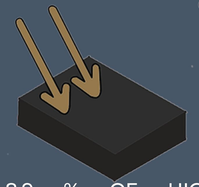
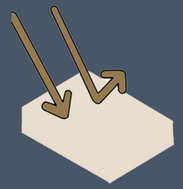
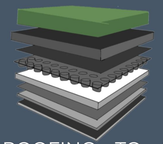


8.9 % OF HIGH ALBEDO COVER

69% OF GREEN COVER ONSITE

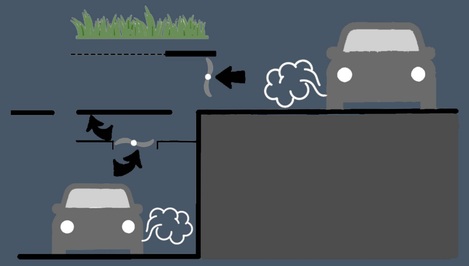


22% OF LOW ALBEDO SURFACES



GREEN ROOFING TO MINIMIZE HEAT ISLAND EFFECT ALLOWS FOR COMFORTABLE OCCUPANCY & TO INCREASE GREEN COVER.

GYPSUM BOARDS HAVE BEEN USED IN INTERIOR FINISHES



TO CONTROL AIR QUALITY ABSORBING PLANTERS ALONG SITE ROADS FEATURE AN EXHAUST FOR EMISSIONS.

AIR CURTAINS ON ALL ENTRY POINTS

SEED COVERINGS

BAMBOO CHIPS

BIO BASED ASPHALT SEALANT

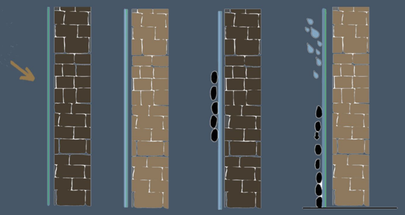
REDUCED DEPENDENCE ON PETROLEUM BY REPLACING THE FOSSIL CONSTITUENT OF ASPHALT WITH A PLANT CONSTITUENT, LIGNIN.

RHINO BRICKS (PLASTIC BRICK) FOR MASONRY ENTAILS--

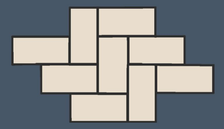
- EXTREMELY LOW WATER CONSUMED IN PRODUCTION
- NEGLIGIBLE WATER IS REQUIRED FOR CURING
- 75% OF FOUNDRY DUST CONSTITUENT IS RECYCLABLE AFTER DEMOLITION

2.5 TIMES STRONGER & 25% LIGHTER THAN REGULAR BRICKS , MAKING THEM SUITABLE FOR SEISMIC STABILITY

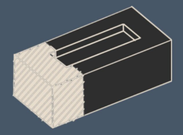
EXTERIOR WALLS HAVE BEEN FINISHED WITH LIMESTONE CLADDING



TITANIUM DIOXIDE PAINT OVER EXTERIOR SURFACES CONVERTS SURROUNDING POLLUTANTS INTO SOLUBLE SALTS THAT ARE WASHED AWAY BY RAINWATER



CONCRETE PAVING ON THE SITE HAS BLOCKS MADE WITH 20% C & D WASTE.



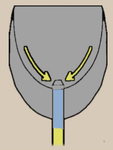
PLASTIC BRICKS USED FOR CONSTRUCTION ARE MADE WITH 25% PLASTIC & 75% FOUNDRY DUST

WATER DEMAND MANAGEMENT

IN FLUSH TANK BASINS , WHEN THE SINK IS USED FOR HAND WASHING, GRAVITY BRINGS THE WATER INTO THE TOILET TANK FOR THE NEXT USE.

FLUSH TANKS FITTED WITH DUAL FLUSH MECHANISM. THIS SAVES UPTO 75% WATER DEMAND.

REFLUSHING TOILETS USE PERFORATED PIPE AND CLEANSING MECHANISM TO REUSE BLACK WATER TO A SMALL EXTENT.

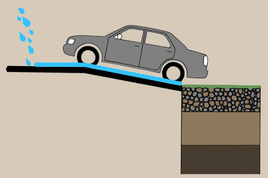


WATERLESS URINALS USE DENSITY VARIATIONS IN WATER AND OIL TO AVOID FLUSHING.THEY ARE ODORLESS AND MAINTAINANCE FREE

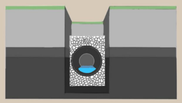
LOW FLOW FIXTURES USE AERATORS THAT C UT BACK ON WATER DEMAND BY 75-80%

RAINWATER MANAGEMENT

TENSILE ROOFS OVER PATHWAYS COLLECT RAINWATER THROUGH GUTTERS TO BE STORED IN A RESERVOIR.



IMPERMEABLE SITE SURFACES HAVE BEEN SLOPED TOWARDS RAINWATER GARDENS TO PRVEVENT UNDIRECTED RUNOFF



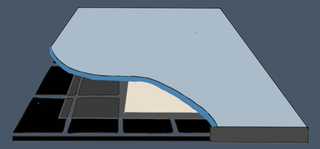
PEBBLE DRAINS FILTER THE SEDIMENTS, ORGANIC MATTER AND OIL RESIDUE FROM THE RUNOFF. RUNOFF RATE IS REDUCED AND IT ALSO ACTS AS RUNOFF STORAGE

ONSITE RAINWATER GARDENS AT REGULAR INTERVALS PREVENT RUNOFF AND SERVE AS A GOOD SYSTEM FOR GROUNDWATER RECHARGE;A STRATERGY EXTREMELY IMPORTANT FOR THIS SITE.

Design Strategies

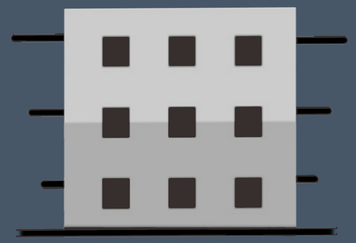
RENEWABLE ENERGY SYSTEMS

SOLAR PANELS ARE AN ATTEMPT AT SELF RELIANCE & REDUCE DEPENDENCE ON CONVENTIONAL ENERGY SYSTEMS.

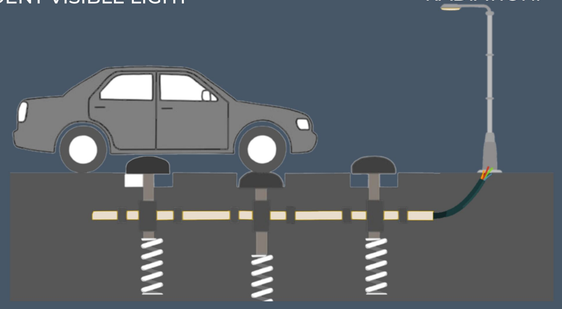


PHOTOVOLTAIC GLASS ON SOUTH-FACING CLERESTORY AND OVER THE ATRIUM CUTOUT WINDOWS MAKES GOOD USE OF INCIDENT RADIATION

ALL STAIRCASE TOWERS HAVE SKYLIGHTS WITH PHOTOVOLTAIC GLASS THAT ONLY ALLOWS INCIDENT VISIBLE LIGHT

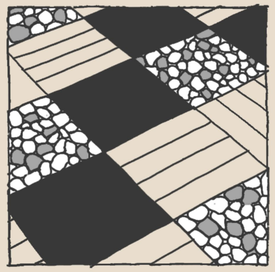


HORIZONTAL FINS ASCEND IN PROTRUSION AS THE FLOOR LEVEL INCREASES TO SUIT VARYING INCIDENT RADIATION.

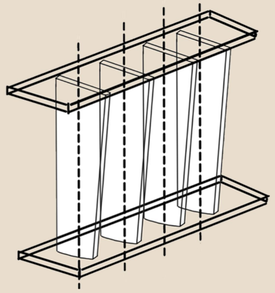


PIEZOELECTRIC SYSTEMS HAVE BEEN USED ON THE SPEED BREAKERS ON VEHICULAR RAMPS TO UTILIZE BREAK IMPACT OF VEHICLES. THIS POWER CAN BE USED FOR THE STREET LIGHTING

BRAILLE SCRIPT ON ALL RAILINGS TO ALLOW FOR COMFORTABLE NAVIGATION OF DIFFERENTLY ABLED USERS



VARIATIONS IN FLOORING TEXTURES ASSIST DIFFERENTLY ABLED USERS IN NAVIGATING THROUGH THE SITE

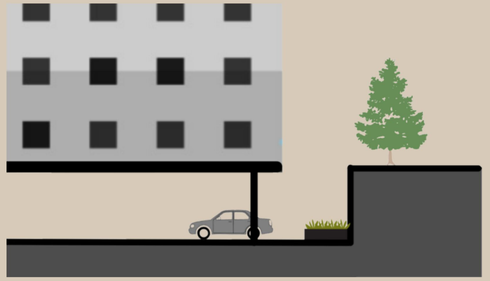


MOVABLE GFRP FINS ON SOUTH AND SOUTHWEST FACING FACADES TO ALLOW AUTONOMY OVER SUNLIGHT ADMISSION IN WINTERS & SUMMERS

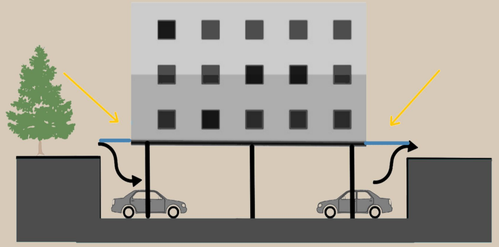
ORGANIC WASTE MANAGEMENT

ON SITE COMPOSTING FOR ORGANIC MATTER ENRICHES SOIL AND REDUCES THE NEED FOR CHEMICAL FERTILIZERS

MAJORITY OF ONSITE SOLID WASTE COMPRISES OF REFUSE AND LEFTOVERS FROM THE CANTEEN & PANTRIES, ALONGWITH LANDSCAPING WASTE PRODUCED IN INDOOR & OUTDOOR GARDENS



AN EXCAVATED BASEMENT SPACE RUNS BESIDE THE CENTRAL COURTYARD. THIS SPACE IS A CONNECTOR OF BASEMENT WITH NATURE



AIR VENTILATORS AND GLASS SKYLIGHTS HAVE BEEN INCORPORATED INTO THE DESIGN TO ALLOW DAYLIGHT AND FRESH AIR INTO THE BASEMENTS

LANDSCAPING BY ALTERNATE PLACEMENT OF PLANTS WITH VARYING ROOT DEPTH ENSURES OPTIMUM NOURISHMENT FOR EVERY PLANT. HENCE, FULL GROWTH IS ACHIEVED

Design Strategies

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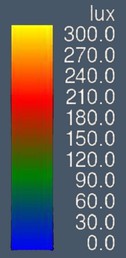
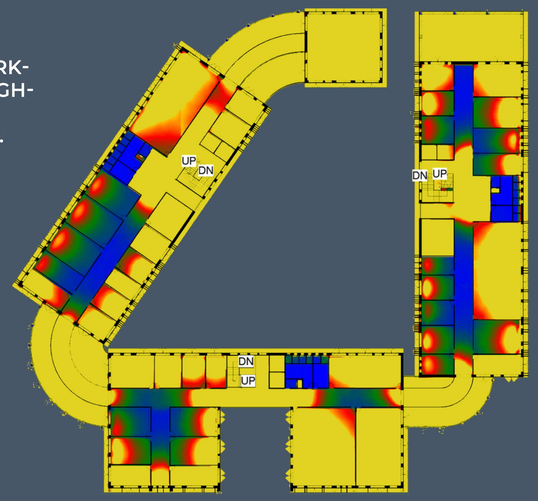
DAYLIGHT ILLUMINANCE

OPTIMUM ILLUMINANCE FOR OFFICE WORKING SPACES HAS BEEN ACHIEVED THROUGHOUT THE DAYTIME. THIS ENSURES VISUAL COMFORT FOR ADEQUATE PRODUCTIVITY.

THE USEFUL DAYLIGHT IILLUMINANCE WITHOUT ARTIFICIAL LIGHTING RANGES FROM 120 LUX TO >300 LUX





DAYLIGHT ILLUMINANCE SIMULATIONS WERE PERFORMED ON AUTODESK REVIT.

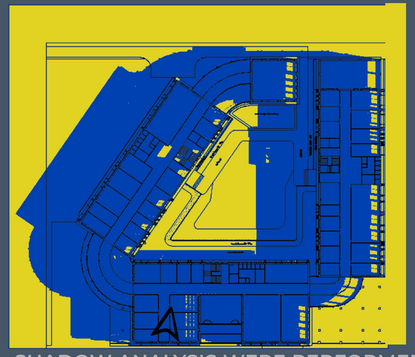
SHADOW ANALYSIS

MORE THAN HALF OF THE COURTYARD REMAINS SHADED THROUGHT THE DAY.

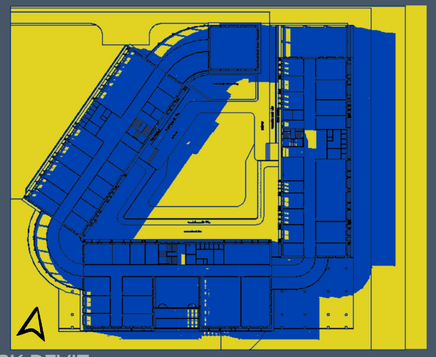
SHADOW

SUNLIGHT

13 MAY 2021 09 :15 A.M.

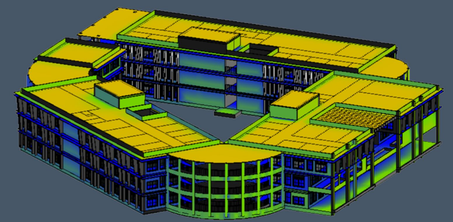


13 MAY 2021 04:15 P.M.

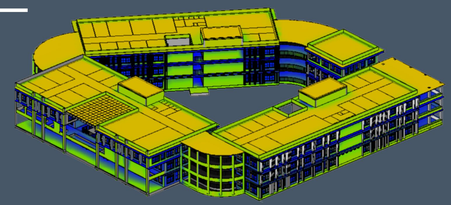


SHADOW ANALYSIS WERE PERFORMED ON AUTODESK REVIT.

SOLAR ANALYSIS



SOUTHWEST VIEW

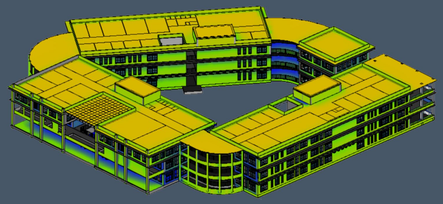


SOUTHEAST VIEW

SOLAR ANALYSIS WITH FACADE TREATMENT
CUMULATIVE INSOLATION- 511 kWH/M²

AS A RESULT OF FACADE TREATMENT AND CLIMATE-AWARE ORIENTATION, WE SEE A 19.65% DECREASE IN CUMULATIVE INSOLATION RECIEVED BY THE BUILDING.

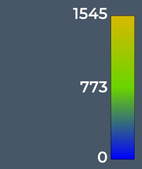
AS A CONSEQUENCE OF THIS, INDOOR TEMPERATURES OF THE BUILDING ARE REDUCED.



SOUTHEAST VIEW

SOLAR ANALYSIS WITHOUT FACADE TREATMENT
CUMULATIVE INSOLATION- 636 kWH/M²

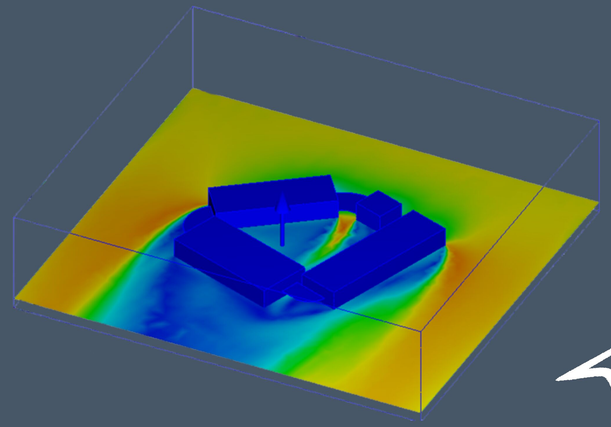
CUSTOM SOLAR (kWH/M²)



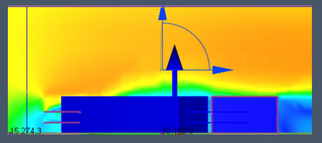
PROJECT LOCATION- GHAZIABAD
SUN STUDY SPAN
01-01-2010 TO 31-12-2010
CUMULATIVE INSOLATION

SOLAR ANALYSIS SIMULATIONS WERE PERFORMED ON AUTODESK REVIT.

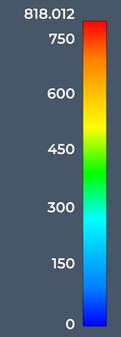
WIND ANALYSIS



DUE TO THE PREVAILING WIND DIRECTION, WE SEE THE WIND ENTERING THE COURTYARD THROUGH THE NORTH BRIDGE AND BEING DIRECTED TOWARDS THE REST OF THE BUILDING



VELOCITY MAGNITUDE- cm/s



WIND ANALYSIS SIMULATIONS WERE PERFORMED ON AUTODESK CFD.

Building Simulations

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LIFE CYCLE ASSESSMENT

1. GOAL: THE GOAL OF THE STUDY THAT IS DESCRIBED IN THIS ANALYSIS IS TO DETERMINE THE MAIN ENVIRONMENTAL IMPACT OF THE BUILDING, WITH A FOCUS ON THE BUILDING'S CONSTRUCTION AND TECHNICAL INSTALLATIONS.

2. SCOPE: THE ANALYSIS ACCOUNTS FOR THE FULL CRADLE TO GRAVE LIFE CYCLE OF THE DESIGN OPTIONS STUDIED ACROSS ALL LIFE CYCLE STAGES, INCLUDING MATERIAL MANUFACTURING, MAINTENANCE AND REPLACEMENT, AND EVENTUAL END OF LIFE.

2A. FUNCTIONAL UNIT: A BUILDING IS A MULTI-FUNCTIONAL ITEM AND MANY OF ITS FUNCTIONS ARE IN REGULATED BUILDING CODES. TO MINIMISE ENVIRONMENTAL IMPACT WHILE CONSTRUCTING THE BUILDING, BUILDING CODES ARE COMPLIED TO. THE TIME FRAME OF 60 YEARS WAS CHOSEN.

2B. SYSTEM BOUNDARY: THE ANALYSIS ACCOUNTS FOR THE FULL CRADLE TO GRAVE LIFE CYCLE OF THE DESIGN OPTIONS STUDIED ACROSS ALL LIFE CYCLE STAGES, INCLUDING MATERIAL MANUFACTURING, MAINTENANCE AND REPLACEMENT, AND EVENTUAL END OF LIFE.
THE MODULES THAT WERE INCLUDED IN THE STUDY WERE A1–A4, B2-B5, C2–C4AND D, WHICH ARE DESCRIBED IN LCI.

2C. EXCLUDED LIFE CYCLE STAGES: THE LIFE CYCLE STAGES A5, B1, B6, B7 AND C1 WAS EXCLUDED.

3. LIFE CYCLE INVENTORY ANALYSIS [LCI]: THE ANALYSIS HAS BEEN CONDUCTED WITH TALLY SOFTWARE. TALLY METHODOLOGY IS CONSISTENT WITH LCA STANDARDS ISO 14040-14044, ISO 21930:2017, ISO 21931:2010, EN 15804:2012, AND EN 15978:2011.

3A. DATA SOURCE: LCA MODELING WAS CONDUCTED IN GABI 8.5 USING GABI 2018 DATABASES AND IN ACCORDANCE WITH GABI DATABASES AND MODELING PRINCIPLES.

3B. DATA QUALITY AND UNCERTAINTY: . THE GABI LCI DATABASES HAVE BEEN USED IN LCA MODELS WORLDWIDE IN BOTH INDUSTRIAL AND SCIENTIFIC APPLICATIONS. THESE LCI DATABASES HAVE ADDITIONALLY BEEN USED BOTH AS INTERNAL AND CRITICALLY REVIEWED AND PUBLISHED STUDIES. UNCERTAINTY INTRODUCED BY THE USE OF PROXY DATA IS REDUCED BY USING TECHNOLOGICALLY, GEOGRAPHICALLY, AND/OR TEMPORALLY SIMILAR DATA.

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 SO_2EQ
- EUTROPHICATION POTENTIAL (EP) KG NEQ
- GLOBAL WARMING POTENTIAL (GWP) KG CO_2EQ
- OZONE DEPLETION POTENTIAL (ODP) KG CFC-11EQ
- SMOG FORMATION POTENTIAL (SFP) KG O_3EQ
- PRIMARY ENERGY (MJ)
- RENEWABLE ENERGY (MJ)

PRODUCT - A1. EXTRACTION, A2.TRANSPORT (TO FACTORY), A3. MANUFACTURING
CONSTRUCTION - A4. TRANSPORT (TO 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

Life Cycle Data

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LIFE CYCLE ASSESSMENT

4. LIFE CYCLE IMPACT ASSESSMENT (TABLE A)

ENVIRONMENTAL IMPACT TOTALS	PRODUCT	CONSTRUCTION	USE	END OF LIFE	MODULE D
GLOBAL WARMING (KG CO_2EQ)	13,09,392	16,006	89,190	19,105	-4,27,160
ACIDIFICATION (KG SO_2EQ)	5,809	74.17	629.3	87.43	-2,780
EUTROPHICATION (KG NEQ)	150.9	6.039	27.16	4.434	-44.7
SMOG FORMATION (KG O_3EQ)	56,837	2,451	7,499	1,739	-21,350
OZONE DEPLETION (KG CFC-11EQ)	-3.307E-005	5.482E-010	2.922E-006	3.479E-009	3.040E-005
PRIMARY ENERGY (MJ)	1.798E+007	2,32,762	13,32,353	3,24,004	-65,18,944
NON-RENEWABLE ENERGY (MJ)	1.356E+007	2,27,192	11,72,864	3,02,961	-40,31,499
RENEWABLE ENERGY (MJ)	44,21,822	5,629	1,59,148	21,403	-24,87,491

5. LIFE CYCLE INTERPRETATION

5a. THE PRODUCTION OF BUILDING PRODUCTS; (A1–A3) LIFE CYCLE PHASES WITH THE DOMINANT IMPACTS.
5b. BUILDING OPERATION; (B2 - B5) SMALL YET SIGNIFICANT IMPACT
5c. TRANSPORTATION AND END OF LIFE; (A4, C2 - C4) HAVE NEGLIGIBLE ENVIRONMENTAL IMPACT
5d. MODULE D; (D) HAS RESULTED IN REDUCTION OF -

GWP BY 30 %
AP BY 42%
EP BY 24 %
SFP BY 31%
LOWER HEATING VALUE BY 26%

Net value (impacts + credits)

Product [A1-A3]
- 03 - Concrete
- 04 - Masonry
- 05 - Metals
- 06 - Wood/Plastics/Composites
- 07 - Thermal and Moisture Protection
- 08 - Openings and Glazing

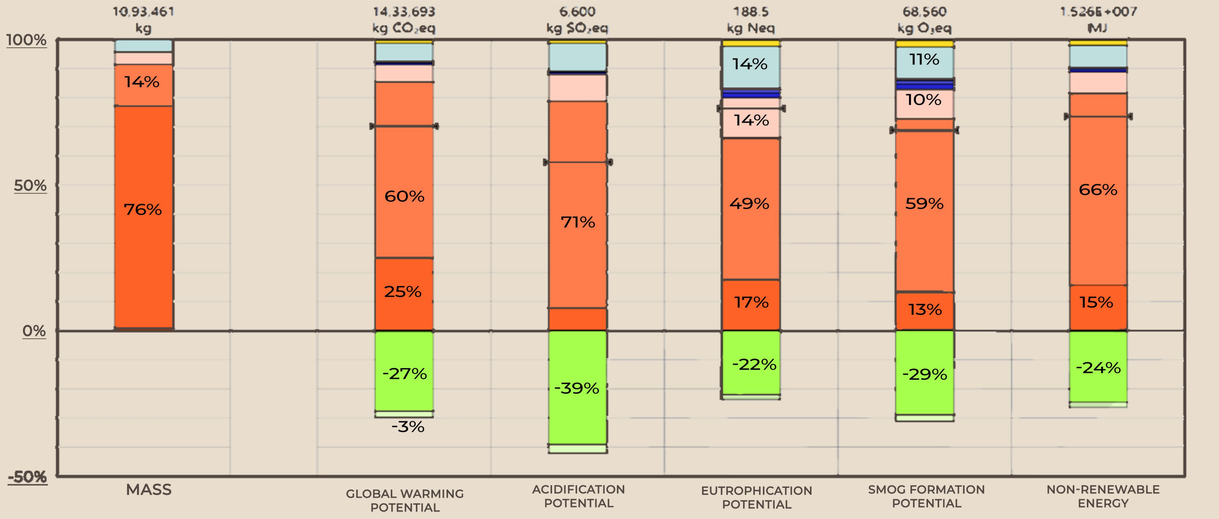
Maintenance and Replacement [B2-B5]
- 03 - Concrete
- 04 - Masonry
- 05 - Metals
- 06 - Wood/Plastics/Composites
- 07 - Thermal and Moisture Protection
- 08 - Openings and Glazing

Transportation [A4]
- 03 - Concrete
- 04 - Masonry
- 05 - Metals
- 06 - Wood/Plastics/Composites
- 07 - Thermal and Moisture Protection
- 08 - Openings and Glazing

End of Life [C2-C4]
- 03 - Concrete
- 04 - Masonry
- 05 - Metals
- 06 - Wood/Plastics/Composites
- 07 - Thermal and Moisture Protection
- 08 - Openings and Glazing

Module D [D]
- 03 - Concrete
- 04 - Masonry
- 05 - Metals
- 06 - Wood/Plastics/Composites
- 07 - Thermal and Moisture Protection
- 08 - Openings and Glazing

Results per Life Cycle Stage, itemized by Division



Life Cycle Data

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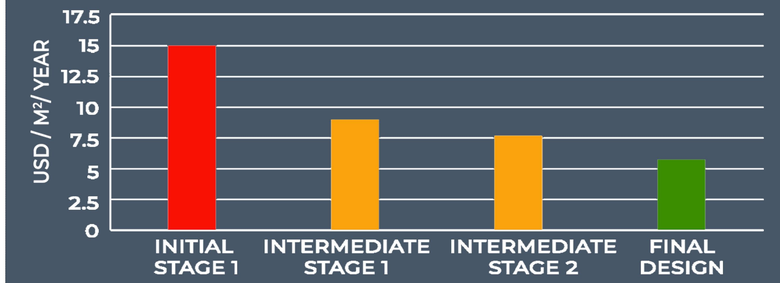
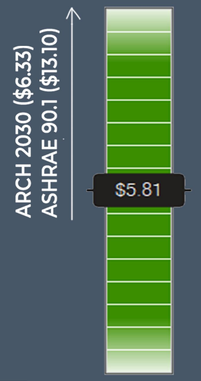
ENERGY OPTIMIZATION





BENCHMARK COMPARISON

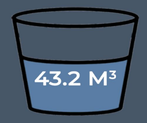
USD / M²/ YEAR

ENERGY OPTIMIZATION MODEL CREATED ON AUTODESK REVIT INGISHTS

LIFE CYCLE COST ANALYSIS

WATER DEMAND HAS BEEN REDUCED BY **30.87%** WITH A PAYBACK PERIOD OF **4.88 YEARS**

ORIGINAL COST OF WATER PER MONTH	REDUCED COST OF WATER PER MONTH
13335 Rs	4116 Rs



75% REDUCTION

USING AUTO IRRIGATION SYSTEM FOR LANDSCAPING

TOTAL ENERGY PRODUCED ONSITE IS 8,21,945 kWh

WATER DEMAND REDUCTION

USAGE	ORIGINAL DEMAND (IN LITRES)	REDUCED DEMAND (IN LITRES)
WC	1420	0
URINAL	950	0
WASH BASIN	1720	344
CANTEEN	4500	2250
PANTRY	300	150
TOTAL	8890	2744

WASTEWATER TREATMENT

QUANTITY OF TREATED WASTEWATER PER DAY	2.286 KILO LITRE
COST OF WASTEWATER TREATMENT PLANT	2,00,000 Rs
COST OF TREATED WASTEWATER PER YEAR	40,992 Rs
NO. OF YEARS REQUIRED TO REPAY THE COST	4 YEARS 7 MONTHS

RENEWABLE ENERGY SYSTEMS

RENEWABLE ENERGY SYSTEM	SURFACE AREA M²	ELECTRICAL ENERGY PRODUCED kWh/ YR	PER YR SAVINGS IN Rs
PV GLASS	333	80,217	12,033
SOLAR PANELS	3216	7,41,677	1,11,252
KINETIC RAMP	144	51.2082	768
TOTAL	3693	8,21,945.21	1,24,053

RAINWATER MANAGEMENT

ANNUAL RAINFALL	764 MILLIMETERS
TOTAL SITE AREA	8959.1 SQUARE METERS
HARVESTING POTENTIAL	6844.75 CUBIC METERS
HARVESTED WATER	2889.77 CUBIC METERS
GROUNDWATER RECHARGE	3954.98 CUBIC METERS

Life Cycle Data

SUSTAINABLE SITE PLANNING
- ☑ CRITERION 1: GREEN INFRASTRUCTURE
- ☑ 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 ODP 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

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 28: COMMISSIONING FOR FINAL RATING
- ☑ CRITERION 28: SMART METERING AND MONITORING
- ☑ CRITERION 29: OPERATION AND MAINTENANCE PROTOCOL

INNOVATION
- ☑ CRITERION 30: INNOVATION

VIEW FROM THE RIGHT DIVISION'S ENTRANCE TO THE COURTYARD

Fin.

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