Atharva Dhavale

designer . civil engineer . data analyst

PORTFOLIO

Academic | Professional Practice | Competitions & Explorations

2020-2025

Selected Works

atharva dhavale

designer . civil engineer . data_analyst .

Pune, India
atharva.dhavale22@gmail.com
+91 9373294530

education

2024 **Vishwakarma Institute of Information Technology**
Pune, India
Bachelor's of technology in civil engineering (*9.04 cgpa*)

2020 **Shri Gopal Highschool and Junior College**
Pune, India
Secondary Education

2018 **RMD Sinhgad Spring Dale School**
Pune, India
Primary Education

experience

present **BDA Architects**
Junior Engineer_Pune, India
Collaborated on design development, construction drawings and FSI calculations for mixed use and housing projects

2024 **Badhekar Group**
Intern_Pune, India
Worked as Assistant Site Engineer on Residential & commercial Project

2023 **Freelance**
Pune, India
Architectural Renderings of Commercial and Interior Projects

awards

2024 **IIT Bombay National Level Open Hardware-IoT Geospatial**
Winner

2024 **IIT Bombay FOSSEE Geospatial Mapathon 2024 - IV**
Notable participant

2024 **GATE 2024**
Qualified (Score: 360)

2023 **Geotechnical Engineering-1_NPTEL**
Elite Rank

2022 **Structural Analysis-1_NPTEL**
Qualified

2018 **Yogsadhana Yoga Competition**
First Winner

workshops

2024 **Feed architectural lectures series**
Member

2023 **Water treatment plant study**
Pune, India

2023 **Constro 2023 International Expo**
Volunteer

2022 **Sculpture and pottery workshop**
Pune, India

skills

Geo-spatial Data: QGIS, GIS modeller
Coding Languages: Python
Digital Modeling: autoCAD__Revit Primavera_sketchup_Lumion_Rhino3d
Post Processing: (Adobe Creative Suite) photoshop_illustrator_inDesign
Microsoft Office: powerpoint_word_excel
Craft: model making_hand sketching

research

Spatial Analysis of Health and Sanitation in Pune _IIT Bombay
Publishing research and data analysis

Thesis:
Application of Data-Driven Techniques for Water Level and Reservoir Prediction in Panchganga Basin

Intelligent Parking Solutions with IoT and AI
Optimizing Urban Parking Efficiency Through Smart Technology

involvement

Toastmasters Club of Pune
Active member since 2024

Rotaract Club of VIIT
Member

Sahyadri Trekkers Foundation
Member

NSS, VIIT Member

electives

AI/ML for Geodata Analysis
IIRS_ISRO, India

Geotechnical Engineering
Prof D.N.Singh IIT Bombay, India

Structural Analysis
Prof Amit Shaw IIT Bombay, India

Advanced Structural Analysis
VIIT Pune, India

Advanced Foundation Engineering
VIIT Pune, India

Advanced course on Architectural Revit_Autocad_Primavera
The Heights Pune, India

languages

English (*IELTS:7/9*)
Marathi (Mother Tongue)
Hindi (Fluent) | **German** (Beginner)

about

Rooted in civil engineering, my work explores the intersection of technology, design, and the built environment. With a deep curiosity for how spatial data, structural systems, and digital tools can shape more responsive and human-centered spaces, I seek new ways to bridge engineering logic with architectural intuition. I believe that buildings shouldn't just stand; they should speak, adapt, and resonate with the people they serve. From material systems to urban form, my approach is a continuous search for innovation—where technology enhances the way we build, experience, and inhabit spaces.

This portfolio is a reflection of my creative, engineering & architectural journey. Included drawings, sketches, essays and photographs are done by the author unless otherwise stated.

academic

professional

competition & explorations

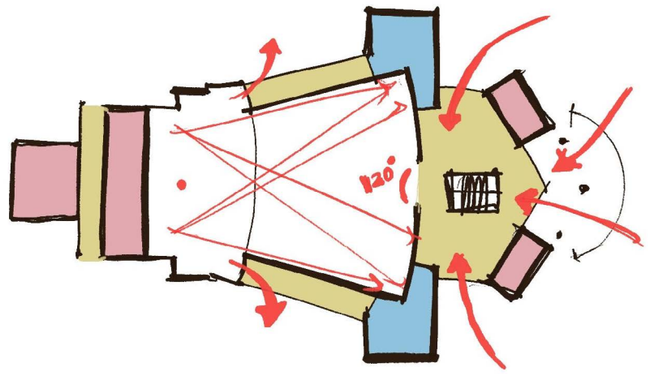
01
Auditorium Design, Pune

Academic | Architectural and structural Design |
Individual work | 2023

The auditorium project is meticulously designed to integrate seamlessly into a military camp setting, drawing inspiration from classic British architecture to complement its surroundings. With a seating capacity of over 350, it features terrace galleries for an enhanced viewing experience. The auditorium is strategically angled at 120 degrees, mirroring the human eye's peripheral vision for optimal sightlines. Structurally, the roof is supported by trusses, ensuring durability and architectural integrity.

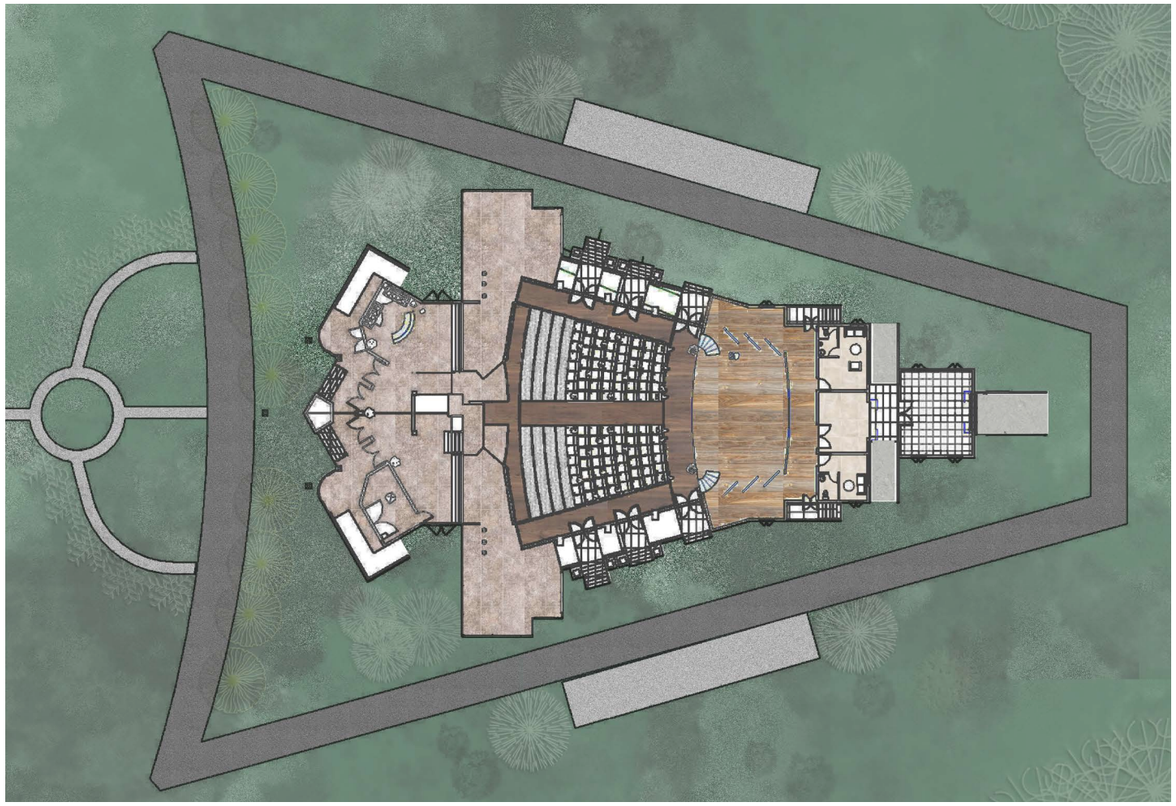
Design Strategies

- Optimal Acoustics
- Adequate ventilation
- Efficient Human Circulation
- 120 ° angle for perfect vision
- Ample Natural Light
- Visual Connection and Acoustics



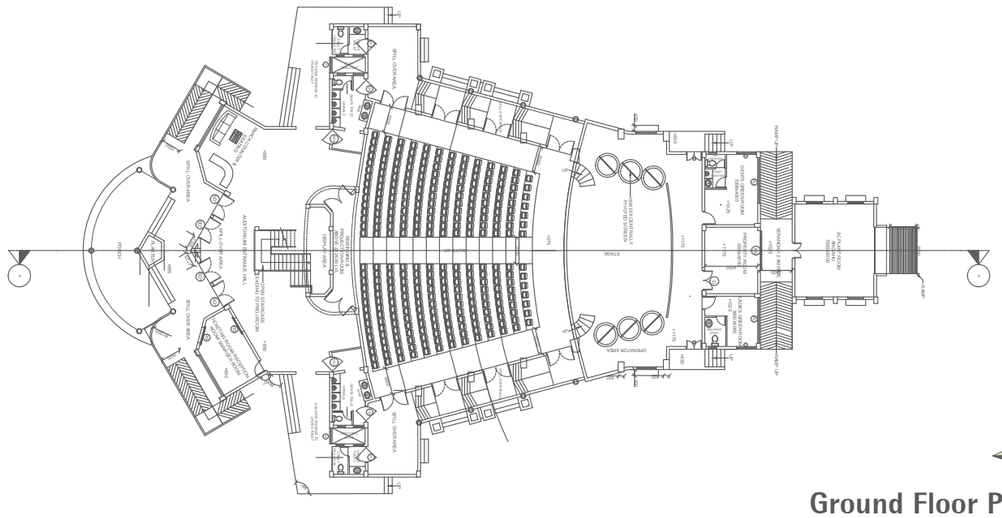
Zoning Plan

Concept Section



Site Plan

Entrance View



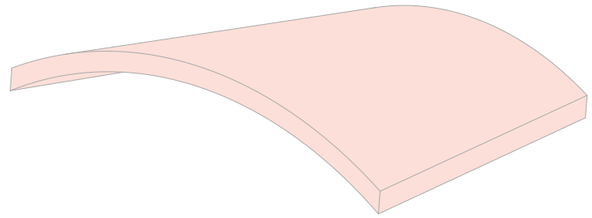
Ground Floor Plan

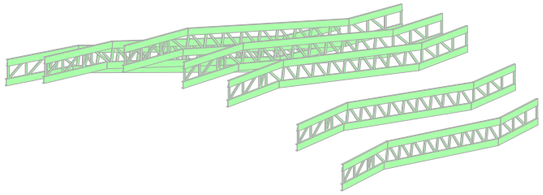
Curved Roof

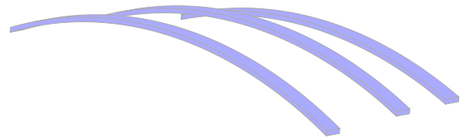
Steel Trusses

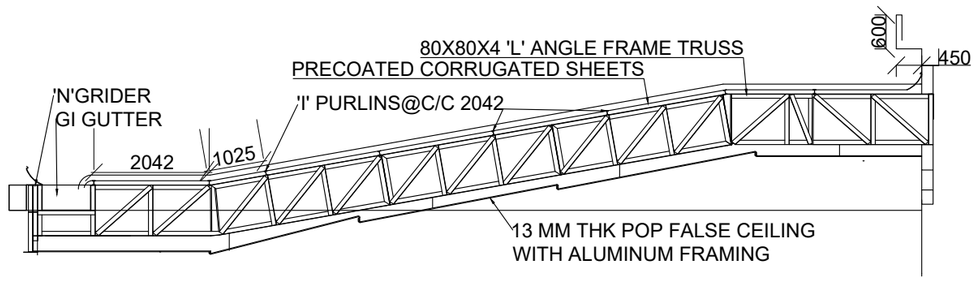
Curved Purlins

Isolated roof axonometric view

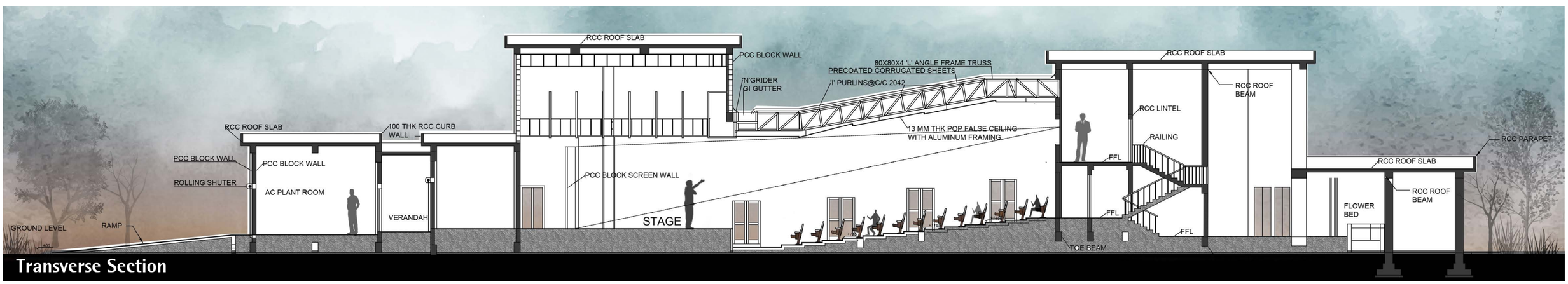




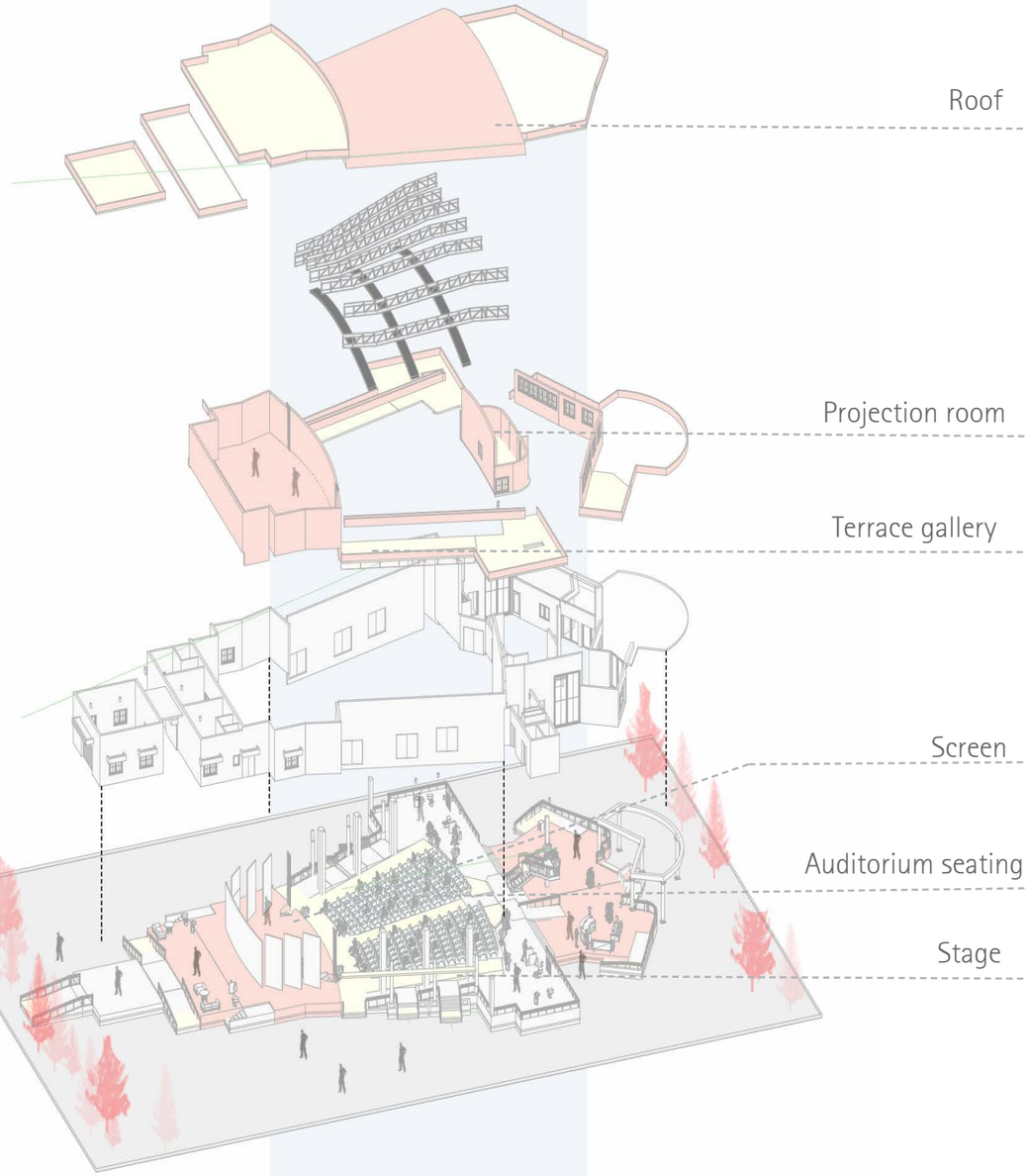




Truss Section Details



Transverse Section



Axonometric view

Auditorium Interior seatings view

Reception desk Interior view

02

Pune City Hospital, India

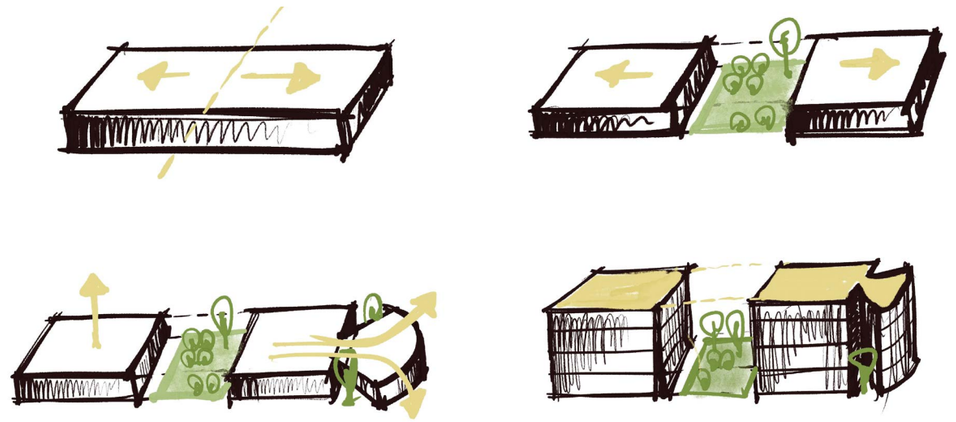
Academic | Architectural Design | Individual work | 2024

The Pune City Hospital Design integrates functionality, sustainability, and healing architecture through an organic massing strategy that enhances natural light, ventilation, and spatial fluidity. The split volumes create open courtyards, fostering a therapeutic environment that prioritizes patient well-being.

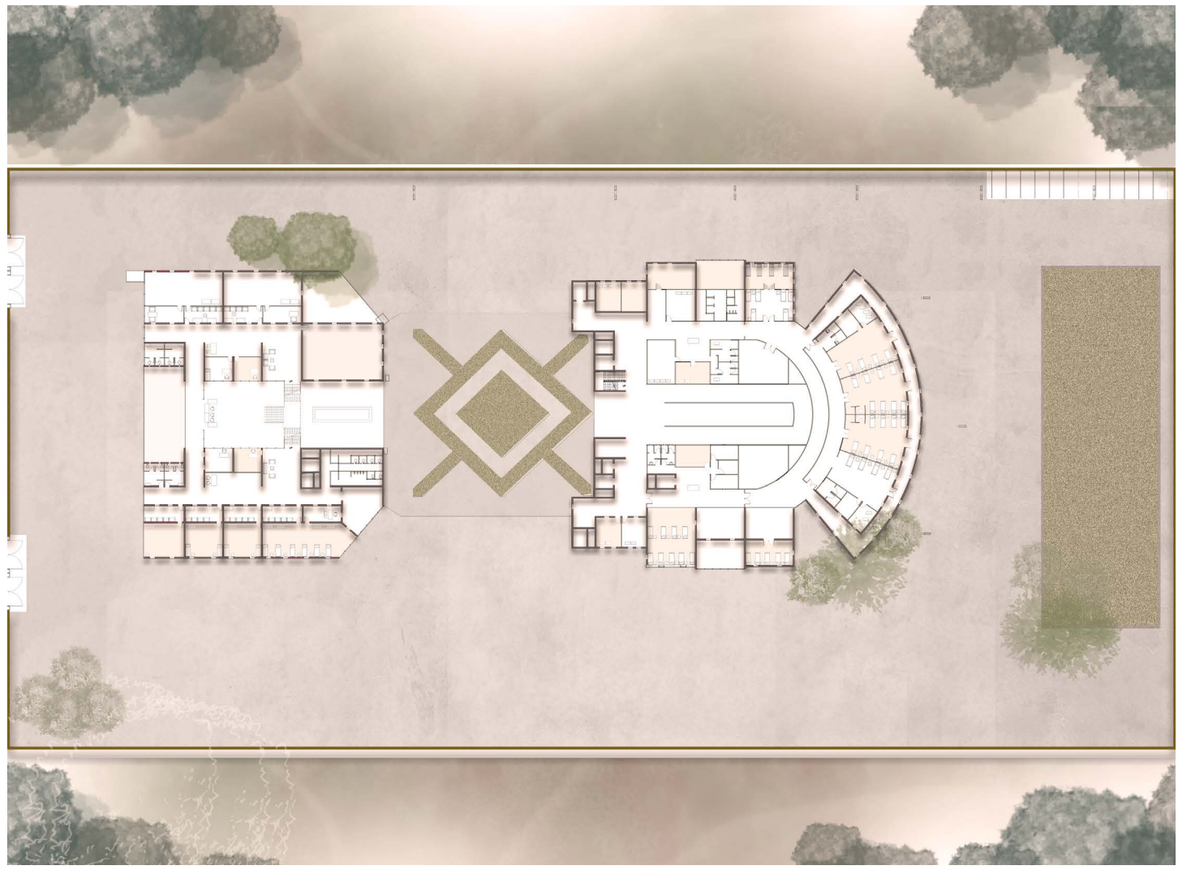
A balance of circular and rectilinear forms enhances connectivity, while locally sourced materials ensure thermal comfort and contextual harmony. Passive cooling strategies and energy-efficient design transform the hospital into a holistic, human-centric space, redefining healthcare infrastructure.

Form Development

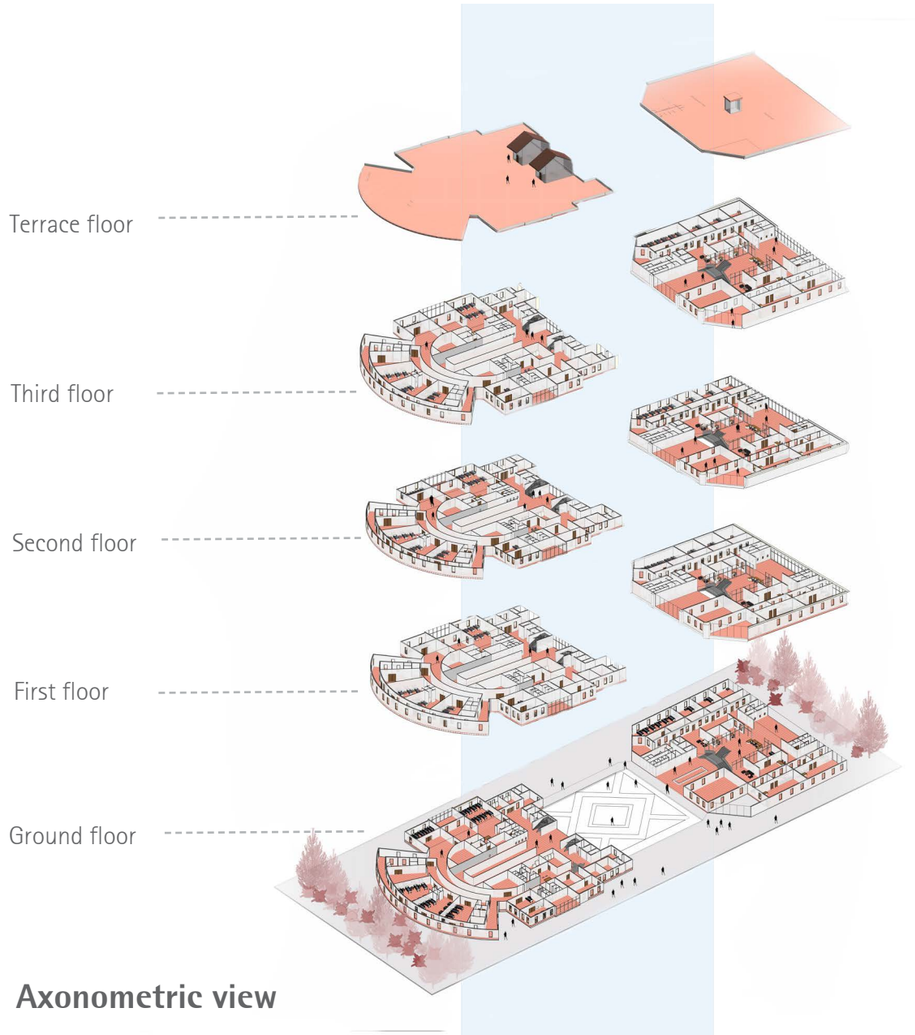
Splitting the mass
inviting open space in between
Organic mass distribution as a response to
the context



Ground Floor Plan

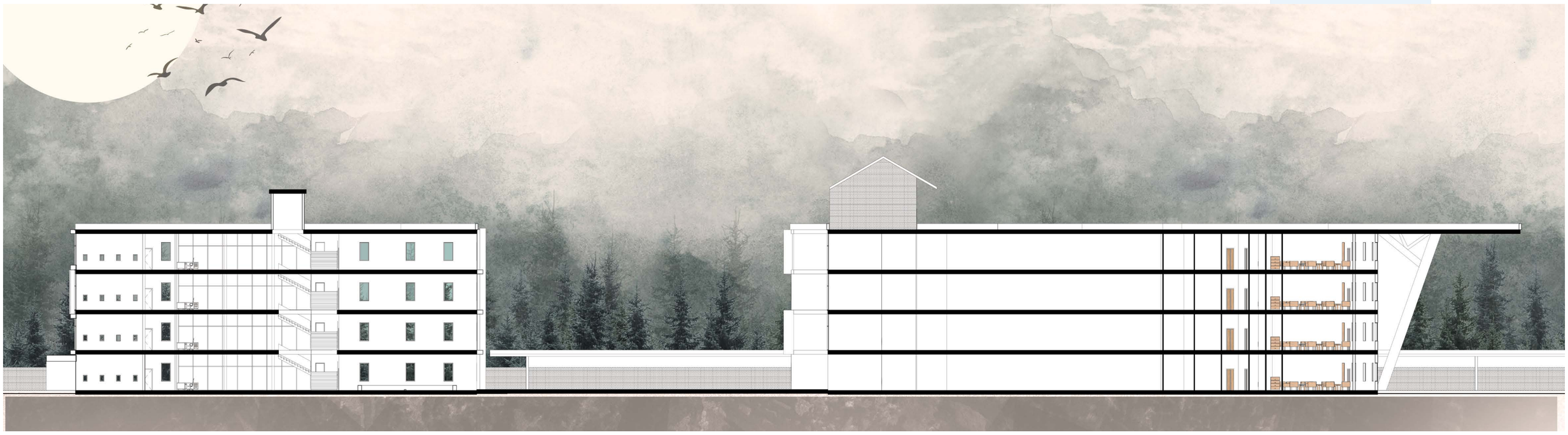


View of the circular complex



Axonometric view

Transverse Section



03

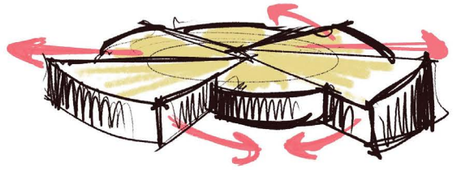
Circular Villa, North India

Academic | Architectural Design | Individual work | 2023

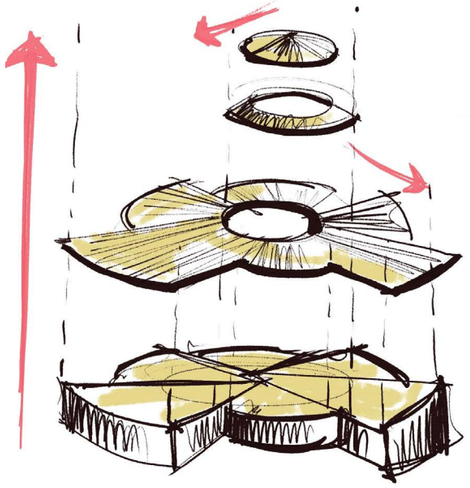
The Circular Villa Project embraces a sustainable design approach, seamlessly blending with its surroundings. Its circular layout enhances spatial flow and harmony, while naturally sourced wood ensures eco-friendliness. Thoughtfully designed roofs with a central skylight provide optimal natural lighting, illuminating every corner. Integrated niches bring in greenery, creating a villa that merges effortlessly with nature. The form seamlessly blends into the rich natural context.

Form Development

Circular form interacting with context

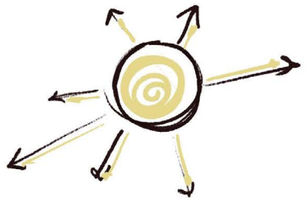


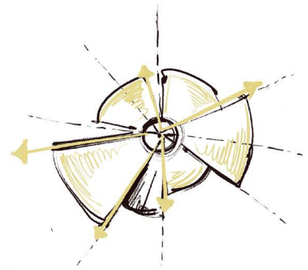
Venturi effect



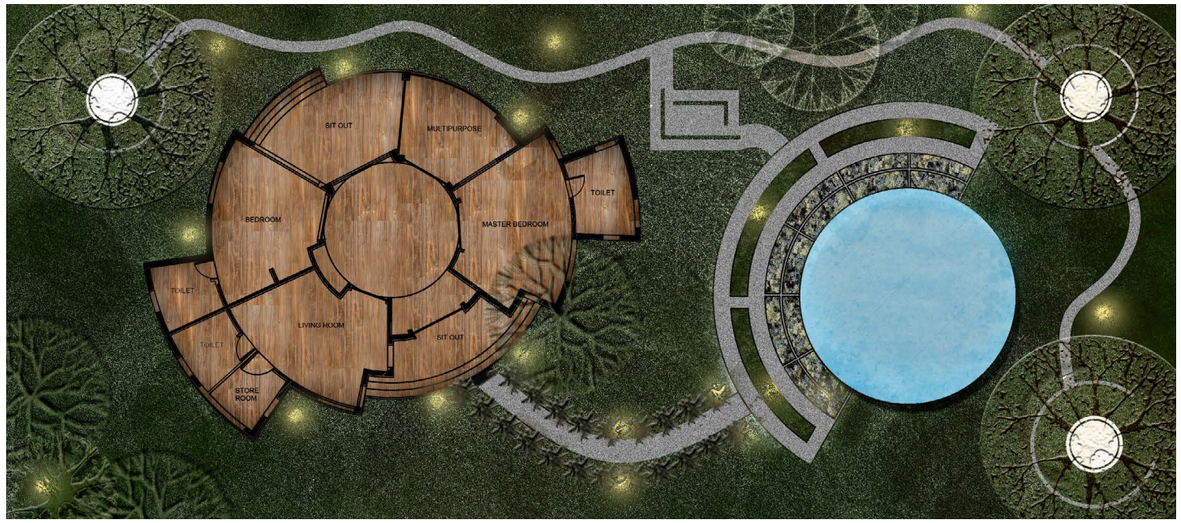
Play of forms on the radical axis

Creating nitches to bring in the greenery



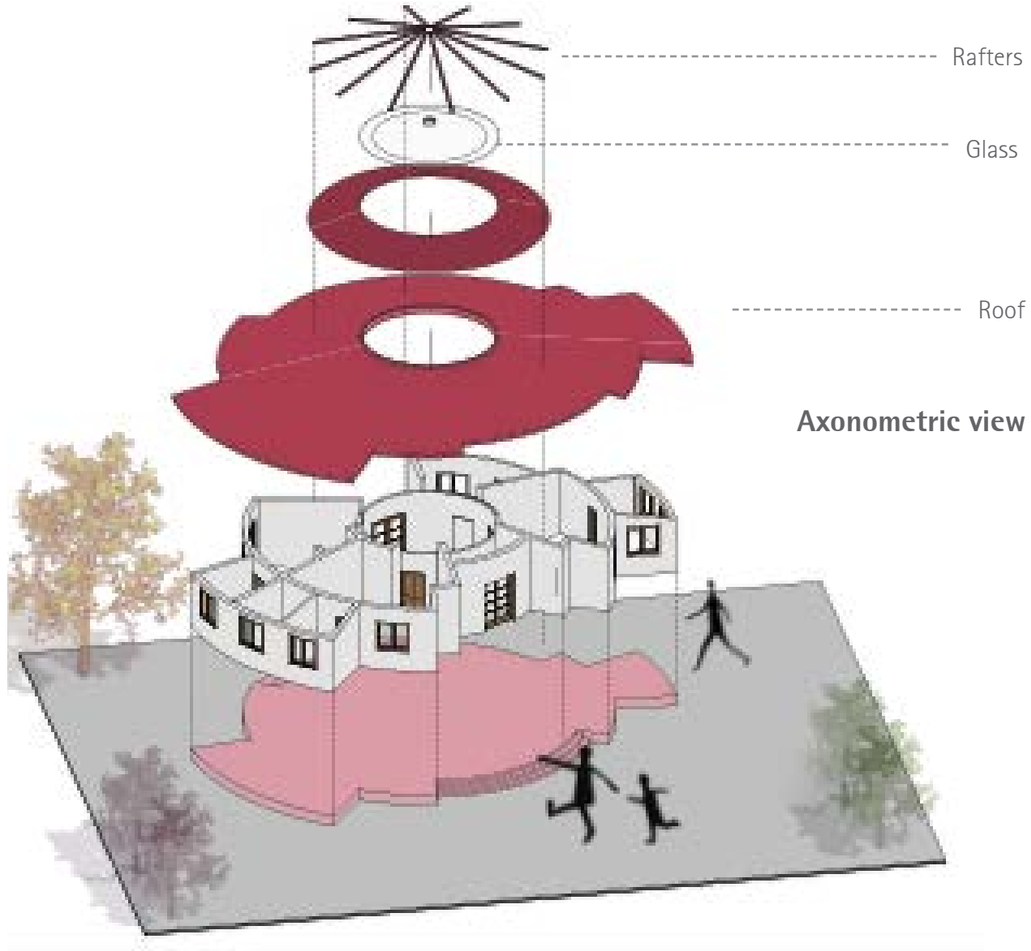


Ground Floor Plan



Entrance View

A warm and inviting entrance blends seamlessly with the snowy landscape, highlighting the use of local materials and passive design strategies for thermal comfort.

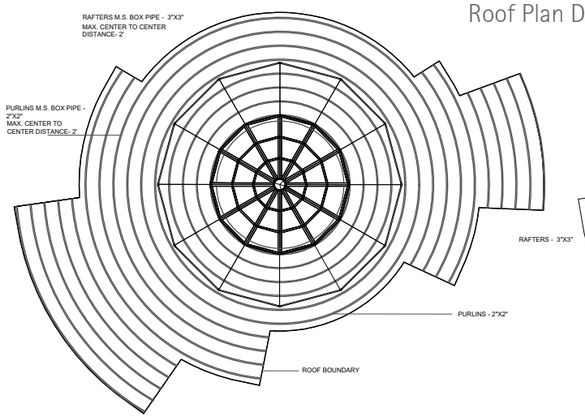


Axonometric view

Site view with context

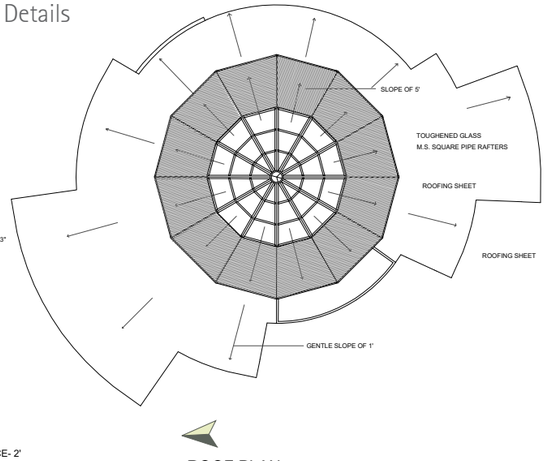
Section AA

Roof Plan Details



ROOF PLAN

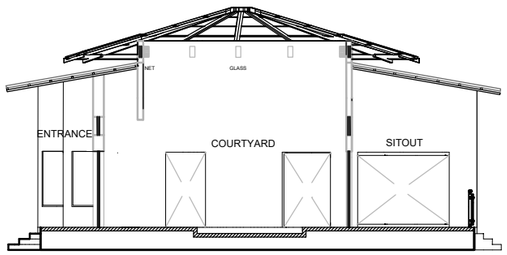
PURLINS CENTER TO CENTER DISTANCE- 2'
RAFTER'S MAX. CENTER TO CENTER DISTANCE- 2'



ROOF PLAN

TOUGHENED GLASS

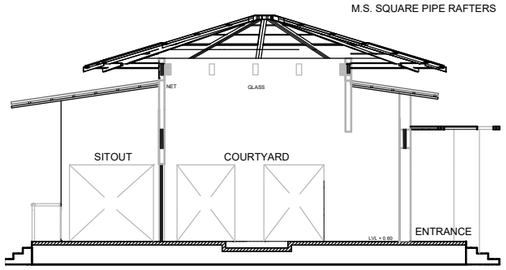
M.S. SQUARE PIPE RAFTERS



SECTION CC'

TOUGHENED GLASS

M.S. SQUARE PIPE RAFTERS



SECTION DD'

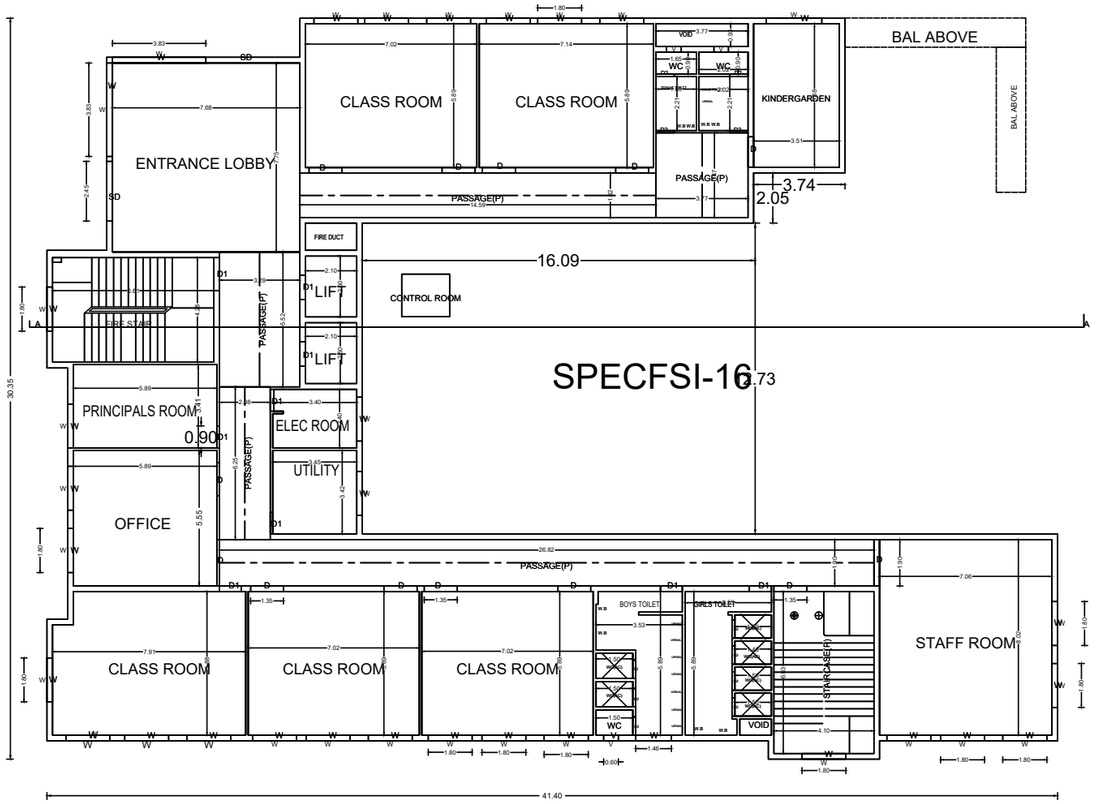
Entrance View

04

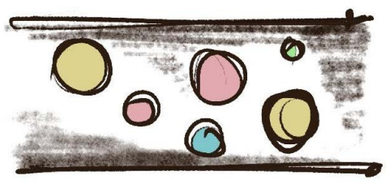
Primary School, India

Academic | Architectural Design | Individual work | 2023

The G+1 primary school design fosters a nourishing and playful environment, incorporating flexible spaces, a vibrant facade, and engaging interiors. Thoughtfully designed fun and attractive interiors keep children engaged, while a strong visual connection throughout the space enhances interaction and stimulation for a dynamic learning experience. Different aspects of design like the colour pyscology and form influences in spatial design were studied.



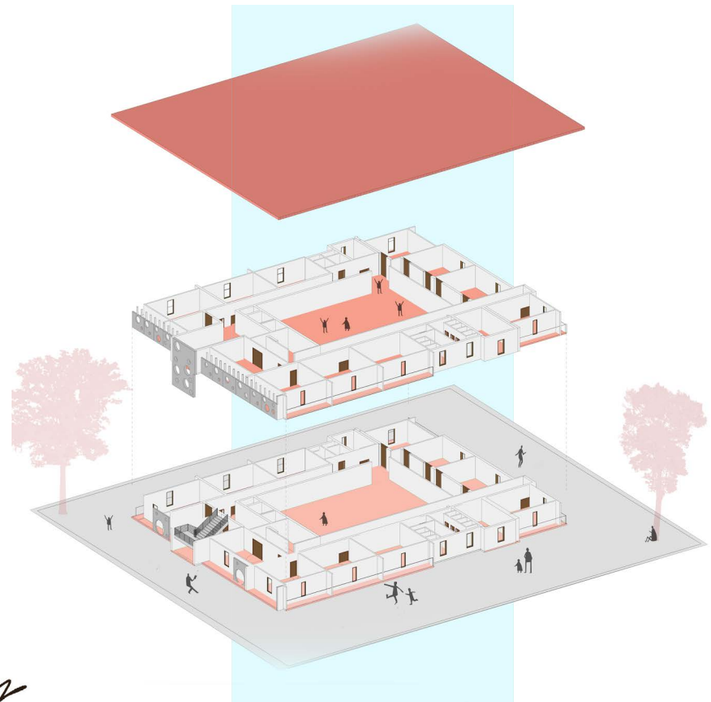
Ground Floor Plan



Design Strategies

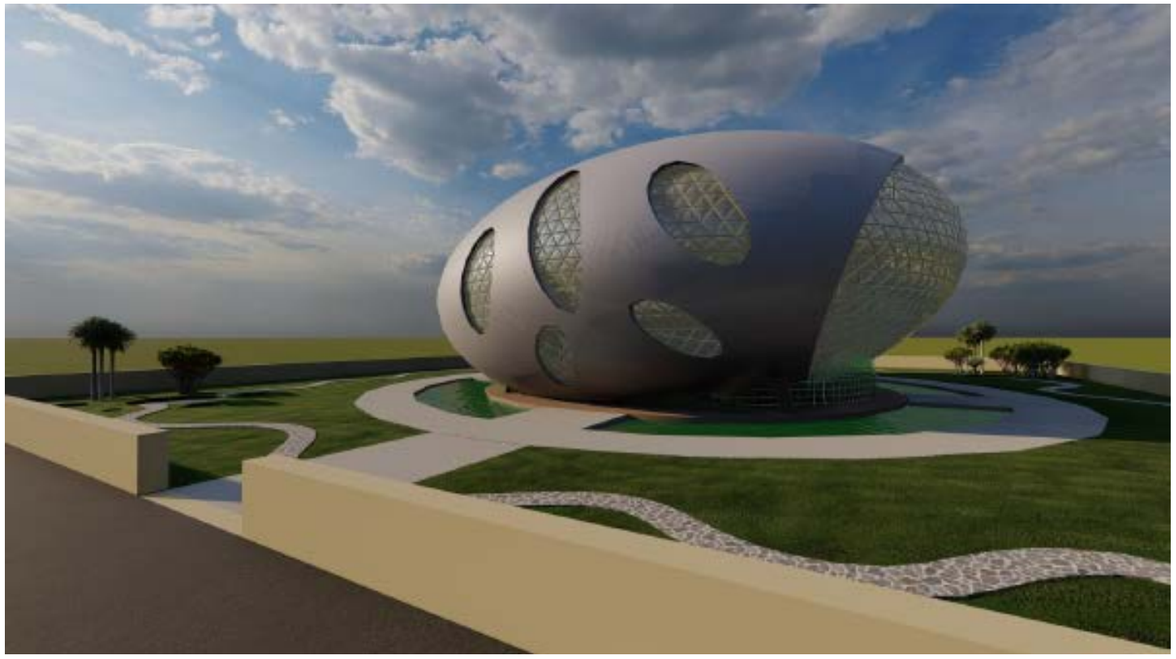
- Flexible spaces
- Visual Connections
- Playful forms
- Colour Pyscology

Axonometric view



Library Space Interior

Classroom Interior View



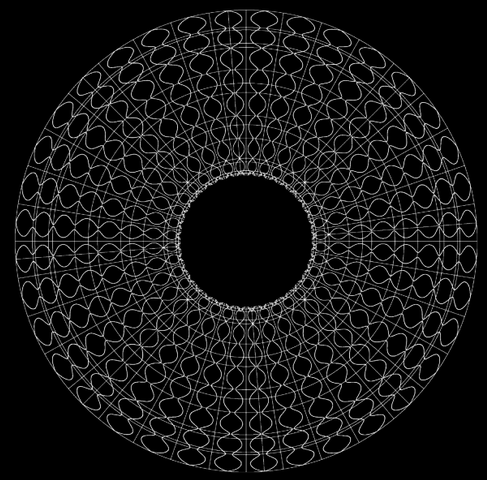
05

Form Explorations

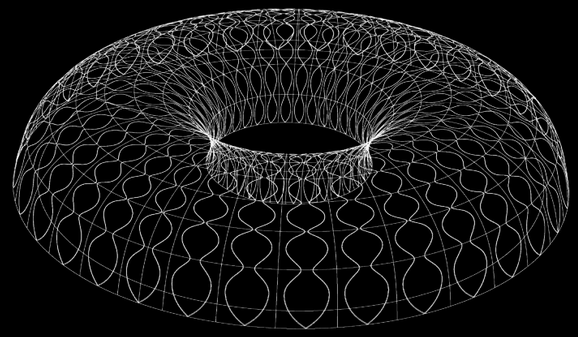
Academic | Structural Design | Individual work | 2023

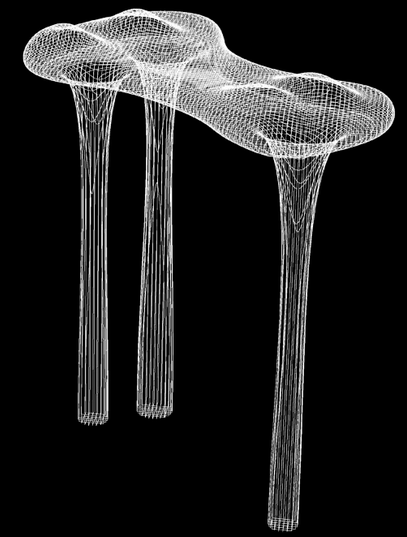
Drawing inspiration from natural forms, this project explores the design of organic structures that seamlessly integrate into urban environments through software Rhino. These structures serve both functional and aesthetic purposes, providing varous functions like shaded open spaces while enhancing the visual appeal of the surroundings. By mimicking nature's efficiency and elegance, the design ensures a harmonious blend of sustainability, practicality, and architectural innovation. Te main aim pof this exercise was to explore organic forms through technology.

(Indian Banyan — Ficus benghalensis)

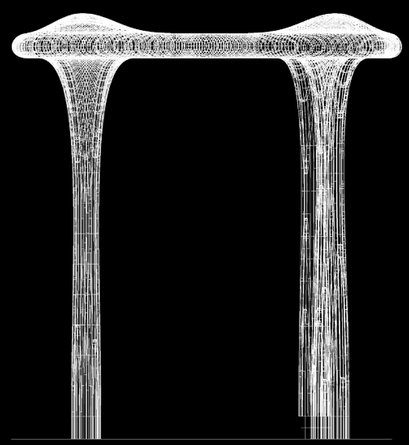


Top view

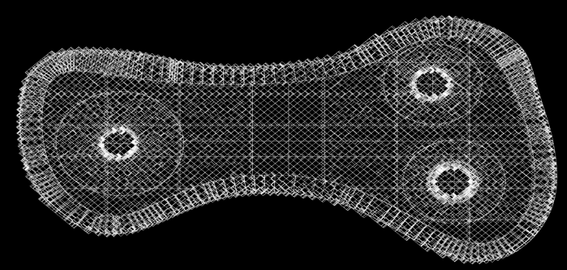




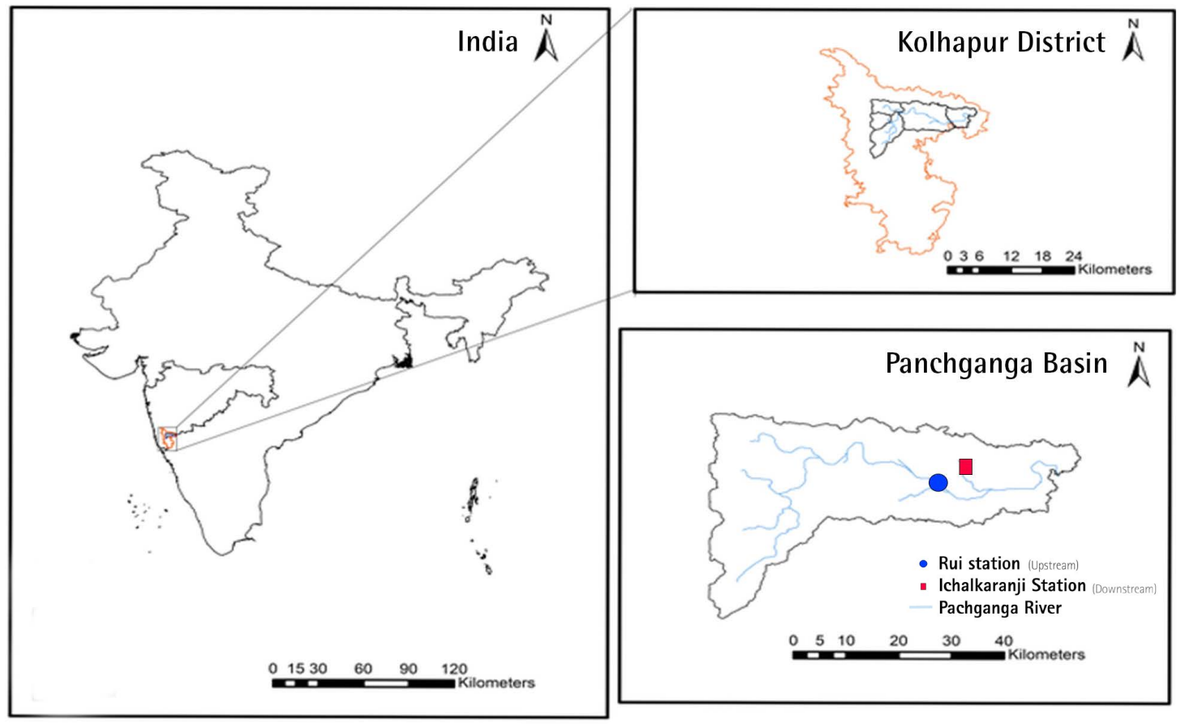
(Baobab tree: Adansonia digital)



Elevation



Top view



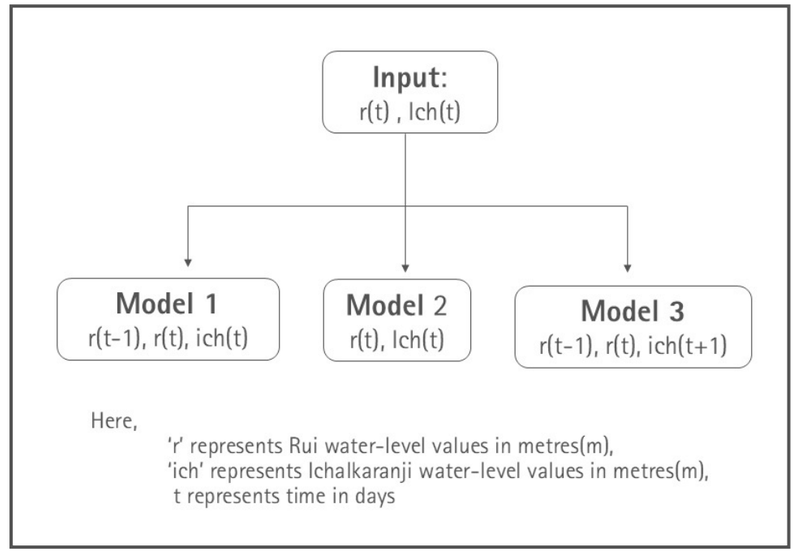
The study area for the project encompassed Rui (upstream station) and Ichalkaranji (downstream station), both situated within the Panchganga Basin in Kolhapur, India.

06

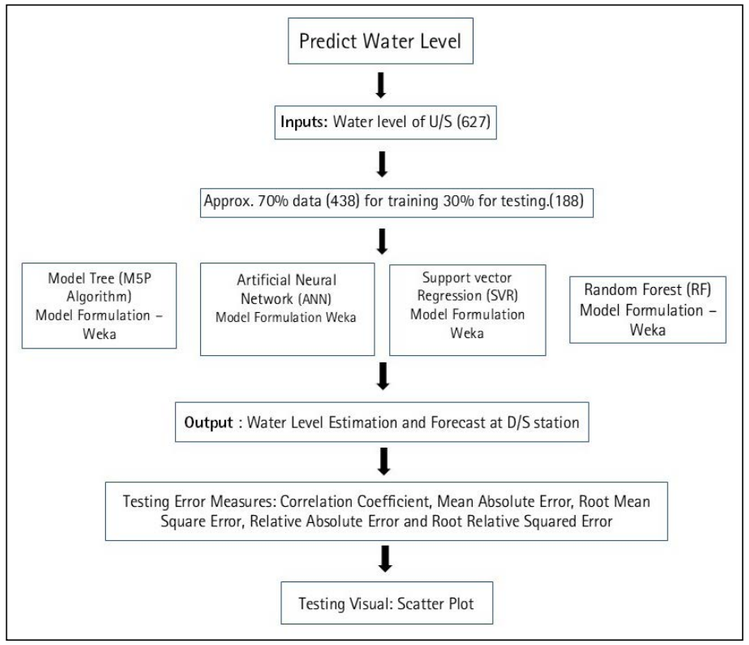
Application of Data-Driven Techniques for Water Level and Reservoir Prediction in Panchganga Basin

Thesis: Research & Application | Team Work | 2024

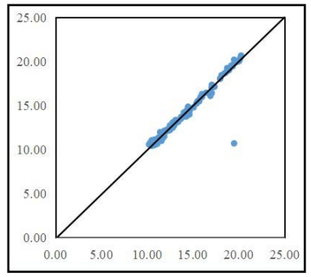
The Panchganga Basin in Kolhapur faces hydrological challenges due to erratic rainfall, unregulated water use, and climate extremes, leading to floods in monsoons and water shortages in dry periods. Accurate water level and reservoir flow prediction is crucial for efficient water allocation, flood control, and drought preparedness. This thesis, Application of Data-Driven Techniques for Water Level and Reservoir Prediction in Panchganga Basin, employs Model Tree (MT), Support Vector Regression (SVR), Random Forest (RF), and Artificial Neural Networks (ANN) using WEKA to analyze historical water data. Using data from Kolhapur Municipal Corporation (Rui & Ichalkaranji observation points), the study enhances forecasting accuracy, supporting sustainable water management and disaster preparedness.



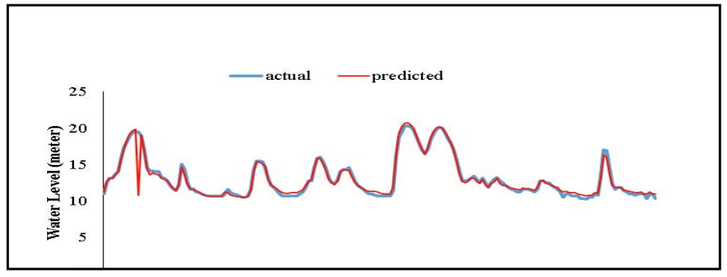
Three models using Rui and Ichalkaranji station data were considered. Model 1 uses Rui's past and present levels along with Ichalkaranji's current level. Model 2 relies only on simultaneous Rui and Ichalkaranji levels. Model 3 includes Rui's past and present levels to predict Ichalkaranji's future level. This comparison helps assess the impact of past and future data on forecasting accuracy.



Project Methodology



Scatter plot



The graph illustrates the comparison between actual and predicted water levels over time, with the blue line representing actual measurements and the red line depicting model predictions.

Result and Analysis:

Random Forest (RF) and Model Tree (MT) emerged as the most effective models for water level prediction in Rui and Ichalkaranji. RF achieved the highest accuracy with a correlation coefficient of 0.9951 and the lowest mean absolute error (0.2102), making it the most reliable. Overall, RF and MT proved most suitable, enhancing forecasting accuracy for improved water management in the Panchganga Basin.

Comparison of extreme water level forecasts for selected dates, analyzing peak and minimum levels across different time periods.

Date	Rui (obs)	Ich(obs)	Ich predicated by data driven Techniques			
			MLP	MT	SVR	RF
2/7/2016	13.18	12.34	11.53	11.825	11.972	12.204
14-07-2016	22.02	20.73	20.629	20.712	20.836	20.558
3/9/2016	9.09	10.77	9.261	10.391	8.52	10.353
1/7/2019	15.70	14.33	13.78	14.521	14.306	14.297
7/8/2019	24.08	22.86	21.757	22.62	22.816	22.803
10/9/2019	20.96	19.58	19.93	19.736	19.827	19.538
11/9/2019	11.79	19.51	13.03	18.163	11.76	15.671
3/10/2020	12.29	10.97	11.265	11.206	11.345	10.982

Table 01: Values for Model

Date	Rui (obs)	Ich(obs)	Ich predicated by data driven Techniques			
			MLP	MT	SVR	RF
2/7/2016	13.18	12.34	12.17	12.23	12.21	12.34
14-07-2016	22.02	20.73	20.94	20.85	20.91	20.65
3/9/2016	9.09	10.77	8.18	8.42	8.19	9.96
1/7/2019	15.70	14.33	14.76	14.79	14.69	14.5
7/8/2019	24.08	22.86	22.73	22.83	22.94	23.16
10/9/2019	20.96	19.58	19.92	19.83	19.86	19.69
11/9/2019	11.79	19.51	10.73	10.70	10.84	10.67
3/10/2020	12.29	10.97	11.25	11.14	11.34	10.94

Table 02: Values for Model

Date	Rui (obs)	Ich(obs)	Ich predicated by data driven Techniques			
			MLP	MT	SVR	RF
2/7/2016	13.18	12.34	9.985	9.782	9.579	11.238
14-07-2016	22.02	20.73	20.616	20.232	20.339	20.439
3/9/2016	9.09	10.77	11.144	11.104	11.152	10.692
1/7/2019	15.70	14.33	10.823	10.695	10.744	10.651
7/8/2019	24.08	22.86	22.2	21.799	21.9	22.406
10/9/2019	20.96	19.58	19.897	19.487	19.563	19.228
11/9/2019	11.79	19.51	20.103	19.642	19.698	19.329
3/10/2020	12.29	10.97	11.127	11.151	11.129	10.929

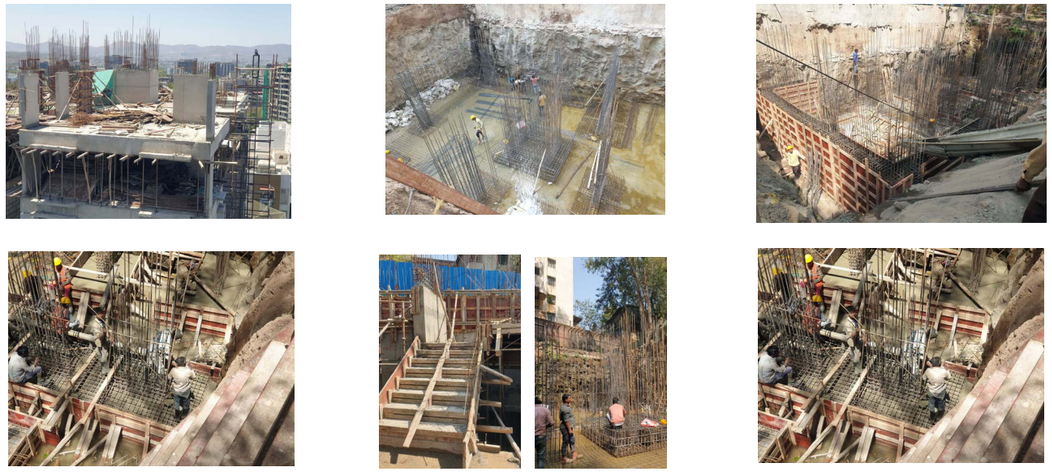
Table 03: Values for Model

07

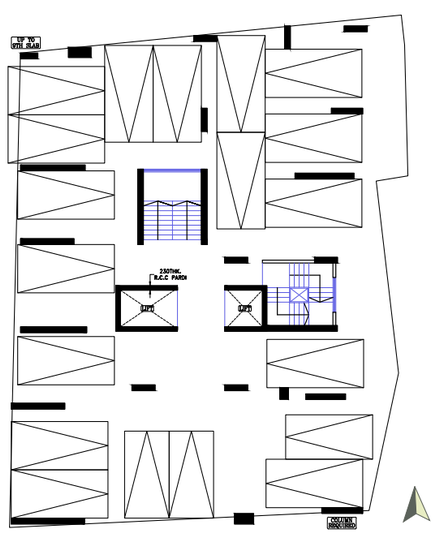
Ram Krupa, Pune

Internship | Badhekar Group | Management & Supervising | 2024

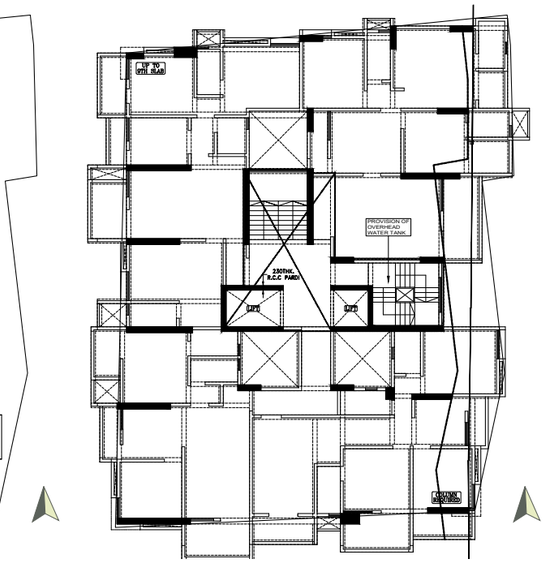
Ram Krupa project is a 14-story residential building situated in the prime locality of Kothrud, Pune, featuring a column footing foundation, two lifts, and a step-in column design after the 7th floor for enhanced structural efficiency. A major challenge was ensuring seamless load distribution while maintaining structural integrity during the step-in column transition. With four flats per floor, the project emphasized space optimization and service coordination for efficient planning. Precision in reinforcement detailing, concreting, and material management was essential to meet safety and design standards. Additionally, high-rise construction challenges, such as vertical material transportation and formwork sequencing, were carefully handled to ensure smooth project execution.



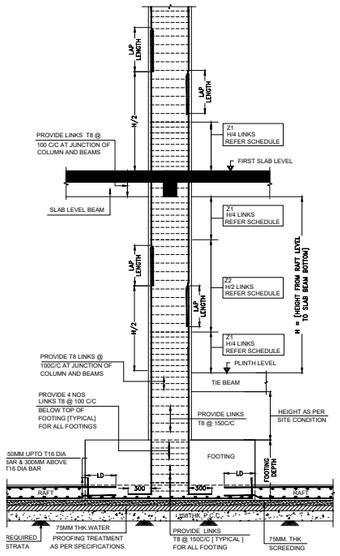
Work in progress site images



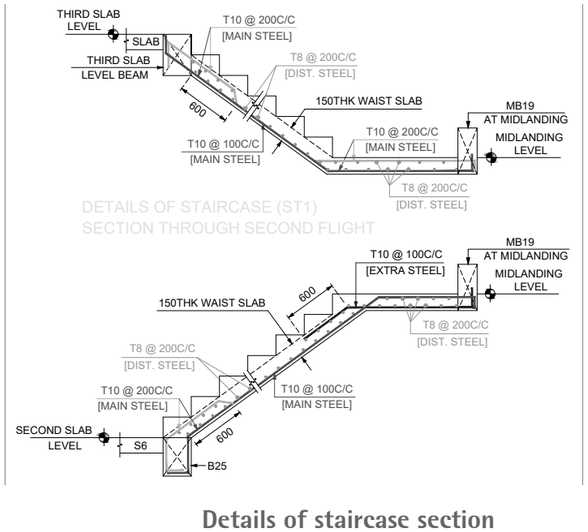
Parking floor



Typical floor



Typical section of column



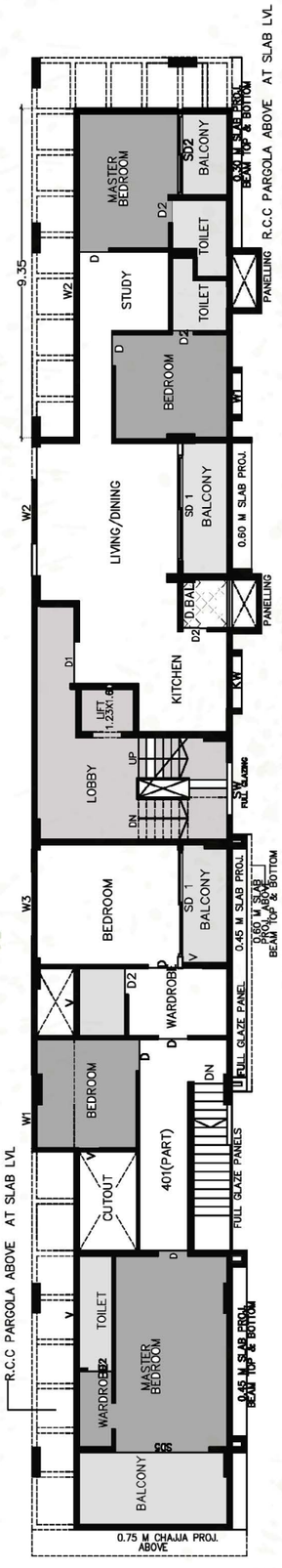
Details of staircase section

08

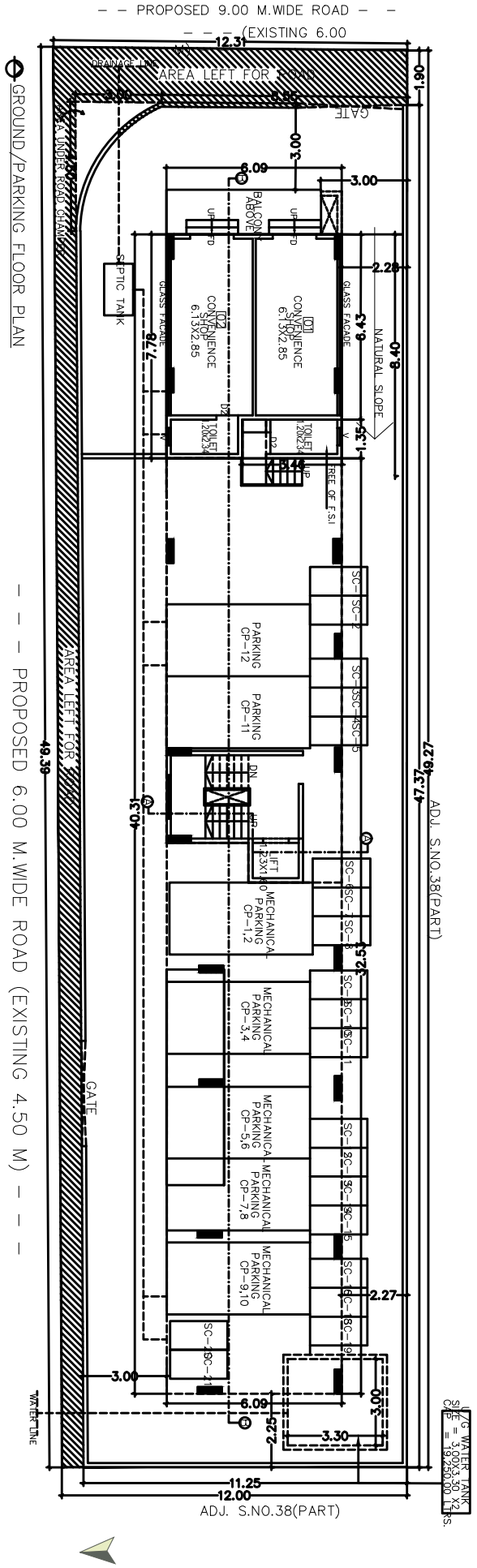
Suryawanshi Heights, Pune

Professional Work | BDA Architect | 2024

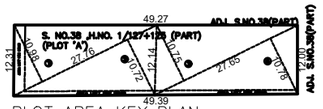
Suryawanshi Heights project is a 5-story mixed-use building in Baner, an emerging luxury hub, featuring commercial shops, professional offices, and residential units. Initially planned as a commercial complex, the design was adapted to professional office spaces due to road width restrictions (less than 12m). The layout includes four professional offices, with two on each of the first two floors, while the upper levels house a duplex apartment across two floors, with one flat per floor, ensuring an efficient blend of commercial and residential use.



Typical floor plan



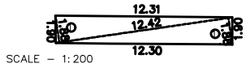
LOCATION PLAN
SCALE – N.T.S



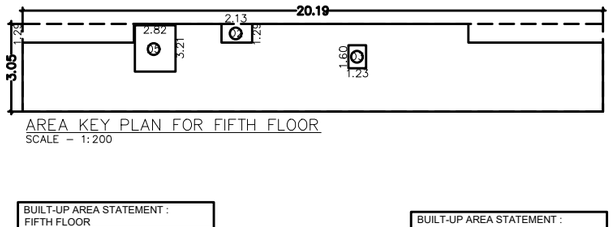
PLOT AREA KEY PLAN
SCALE – 1:500

PLOT AREA CALCULATION BY △ METHOD	
△ 1) 1/2 X 27.76 X 10.98 =	X152.40 SQM.
△ 2) 1/2 X 27.76 X 10.729=	X 148.91 SQM.
△ 3) 1/2 X 27.65 X 10.75 =	X148.618 SQM.
△ 4) 1/2 X 27.65 X 10.784=	X 149.09 SQM.
TOTAL PLOT AREA AS PER DEMARCATION	598.018 SQM.
TOTAL PLOT AREA AS PER 7/12	= 594.00 SQM.
MINIMUM CONSIDERED	= 594.00 SQM.

SCALE – 1:200



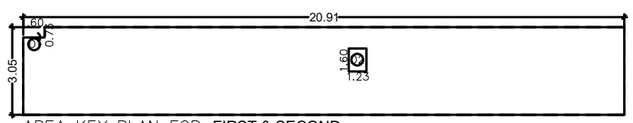
SCALE – 1:200



AREA KEY PLAN FOR FIFTH FLOOR
SCALE – 1:200

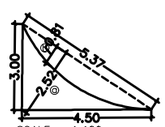
BUILT-UP AREA STATEMENT : FIFTH FLOOR		
AREA OF BLOCK = 40.37 X 6.09 = 245.85 SQ.M		
STANDARD DEDUCTIONS :-		
D1. 7.73 X 1.29	=	9.97 SQ.M
D2. 2.23 X 1.29	=	2.87 SQ.M
D3. 1.23 X 1.60	=	1.96 SQ.M
D4. 9.35 X 1.29	=	12.06 SQ.M
D5. 2.82 X 3.21	=	9.05 SQ.M
TOTAL DEDUCTIONS	=	35.91 SQ.M
GROSS AREA : 245.85 - 35.91	=	209.94 SQ.M

BUILT-UP AREA STATEMENT : FIRST & SECOND FLOOR		
AREA OF BLOCK = 41.81 X 6.09 = 254.62 SQ.M		
STANDARD DEDUCTIONS :-		
D1. 1.60 X 0.73	=	1.16 SQ.M
D2. 1.23 X 1.60	=	1.96 SQ.M
TOTAL DEDUCTIONS	=	3.12 SQ.M
GROSS AREA : 254.62 - 3.12	=	251.50 SQ.M

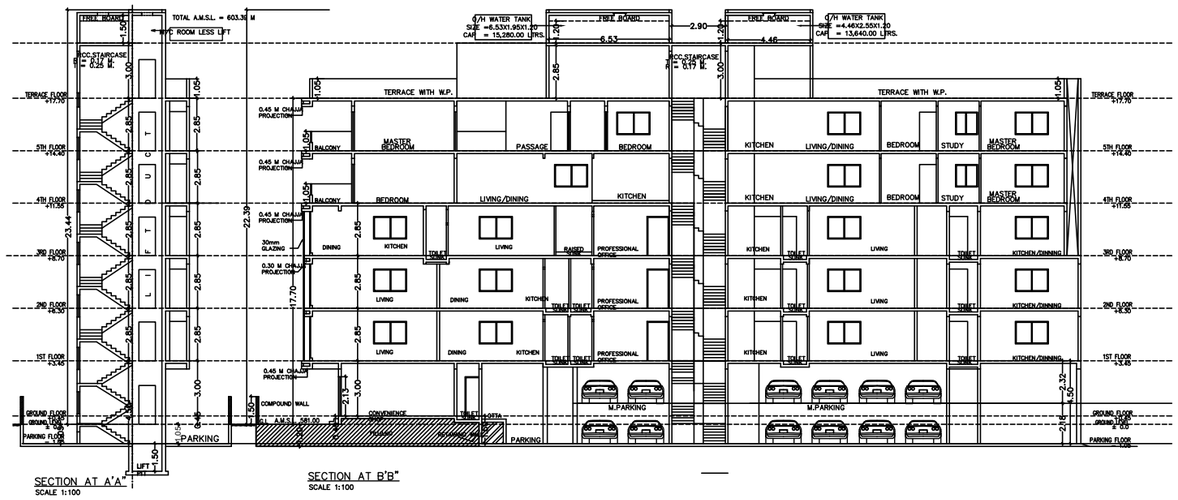


AREA KEY PLAN FOR FIRST & SECOND FLOOR SCALE – 1:200

AREA CALCULATION OF CHAMPER	
△ a) 1/2 X 5.37 X 2.52 =	6.76 sqm
TOTAL AREA	=6.76 sqm.
DEDUCTION	
△ b) 2/3 X 5.37 X 2.80 =	6.28 sqm
TOTAL AREA	(6.28 sqm.)

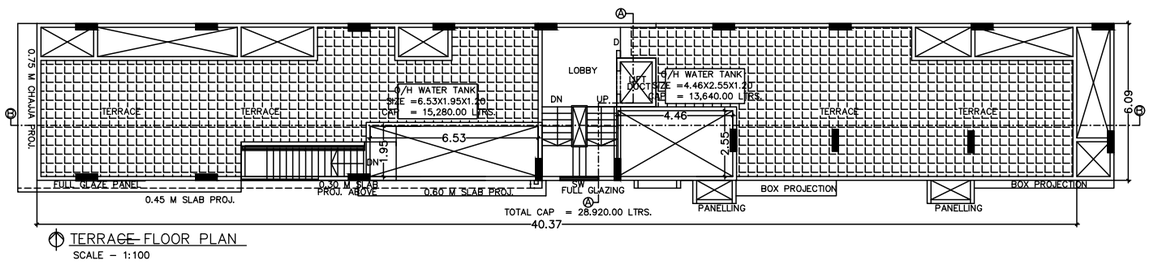


SCALE – 1:100



Transverse section

Longitudinal section



TERRACE FLOOR PLAN
SCALE – 1:100

Longitudinal elevation

Sanction Drawings and FSI calculations

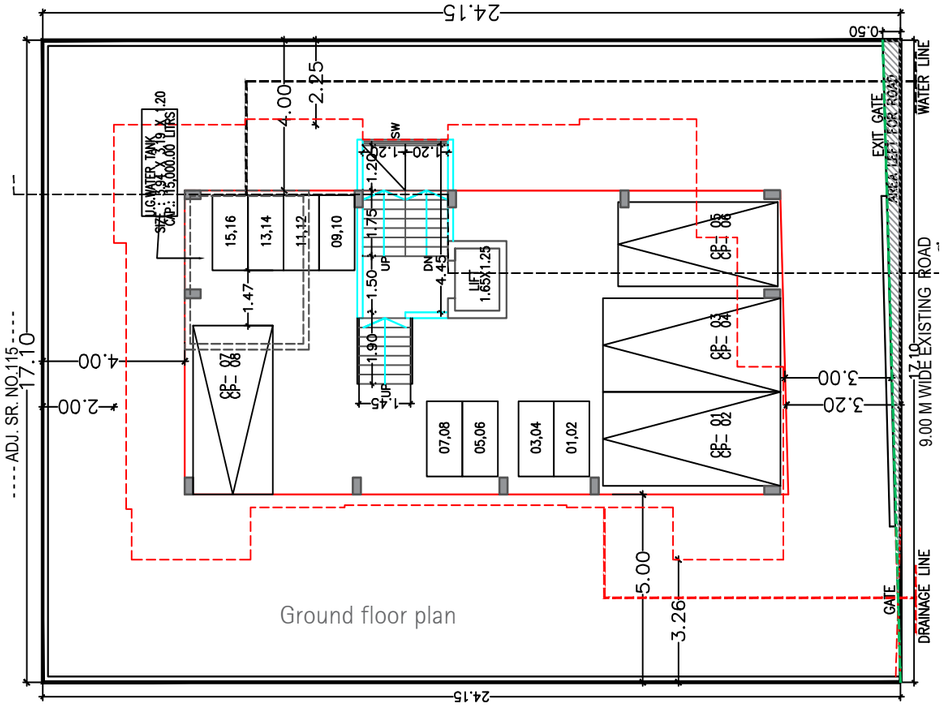
09

Shitole Park, Pune

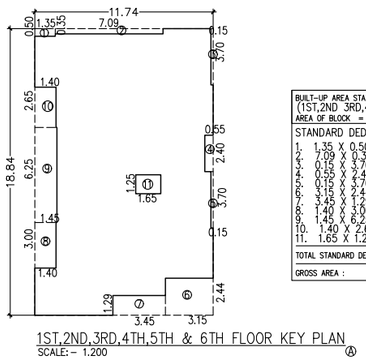
Professional Work | BDA Architect | 2024

Shitole Park project, located in core of Pune is a 7-story residential building featuring eight luxurious 3 BHK flats and mechanical parking to maximize space utilization. Strategically located along a 9m road in the city center, the project overcomes compact site constraints by optimizing vertical space. Constructed with an FSI of 1.6, it incorporates TDR and premium paid FSI for efficient land use. The project involved meticulous calculations for FSI, construction costs, and salable areas, ensuring both feasibility and profitability while maintaining a high-end living experience.

Typical floor plan



Ground floor plan



1ST,2ND,3RD,4TH,5TH & 6TH FLOOR KEY PLAN
SCALE: – 1.200

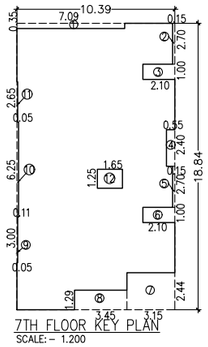
BUILT-UP AREA STATEMENT : TYPICAL FLOOR PLAN
(1ST,2ND 3RD,4TH,5TH & 6TH FLOOR)
AREA OF BLOCK = 11.74 X 18.84 = 221.18 SQ.M

STANDARD DEDUCTIONS :–

1.	1.35 X 0.50	=	0.68 SQ.M
2.	7.09 X 0.35	=	2.48 SQ.M
3.	0.15 X 3.70	=	0.56 SQ.M
4.	0.55 X 2.40	=	1.32 SQ.M
5.	0.15 X 3.70	=	0.56 SQ.M
6.	3.15 X 2.44	=	7.69 SQ.M
7.	3.45 X 1.29	=	4.45 SQ.M
8.	1.40 X 3.00	=	4.20 SQ.M
9.	1.45 X 6.25	=	9.06 SQ.M
10.	1.40 X 2.65	=	3.71 SQ.M
11.	1.65 X 1.25	=	2.06 SQ.M

TOTAL STANDARD DEDUCTIONS = 36.77 SQ.M

GROSS AREA : 221.18 – 36.46 =184.41 SQ.M



7TH FLOOR KEY PLAN
SCALE: – 1.200

BUILT-UP AREA STATEMENT : SEVENTH FLOOR
AREA OF BLOCK = 10.39 X 18.84 = 195.75 SQ.M

STANDARD DEDUCTIONS :–

1.	7.09 X 0.35	=	2.48 SQ.M
2.	0.15 X 2.70	=	0.41 SQ.M
3.	2.10 X 1.00	=	2.10 SQ.M
4.	0.55 X 2.40	=	1.32 SQ.M
5.	0.15 X 2.70	=	0.41 SQ.M
6.	2.10 X 1.00	=	2.10 SQ.M
7.	3.15 X 2.44	=	7.69 SQ.M
8.	3.45 X 1.29	=	4.45 SQ.M
9.	0.05 X 3.00	=	0.15 SQ.M
10.	0.11 X 6.25	=	0.69 SQ.M
11.	0.05 X 2.65	=	0.13 SQ.M
12.	1.65 X 1.25	=	2.06 SQ.M

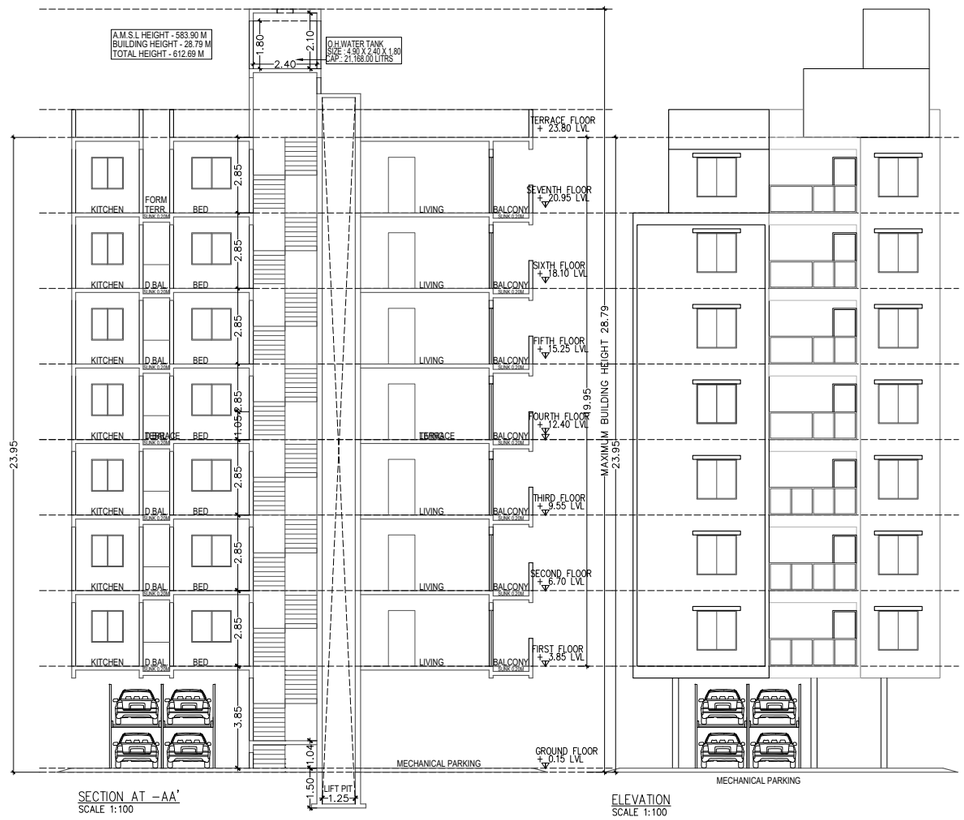
TOTAL STANDARD DEDUCTIONS = 23.99 SQ.M

GROSS AREA : 195.75 – 23.99 =171.76 SQ.M

TERRACE FLOOR PLAN
SCALE 1:100

U.G.WATER TANK
SIZE :-4.90 X 2.40 X 1.80
CAP.: 21,168.00 LITRS

	F.S.I AREA STATEMENT		Area in sqmt.
1	Area of plot (Minimum area of a, b, c to be considered)		
	(a) As per ownership document (7/12, CTS extract)		400.00
	(b) as per measurement sheet		413.07
	(c) as per site		—
2	AREA LEFT FOR 9.00M.WIDE ROAD		4.27
3	BALANCE PLOT AREA (1A – 2)		400.00
4	Built up area with reference to Basic F.S.I. as per front road width (400.00 X 1.10)		440.00
5	Addition of FSI on payment of premium		—
	(a)Maximum permissible premium FSI – based on road width / TOD Zone.		—
	(b) Proposed FSI on payment of premium (0.50 X 400.00)		200.00
6	In–situ FSI / TDR loading		—
	(a) TDR area (0.40 X 400.00)		160.00
	(d) Total in–situ / TDR loading proposed		—
7	Additional FSI area under Chapter No. 7		—
8	ADDITION AREA LEFT FOR 9.00M.WIDE ROAD		—
9	Total entitlement of FSI in the proposal		800.00
	(a) Ancillary Area FSI upto 60% or 80%with payment of charges(60% OF 800.00)	480.00	478.22
	(b) Total entitlement (9 + 9a)		1278.22
10	Total Built–up Area in proposal.(excluding area at Sr.No.17 b)		—
	(a) Existing Built–up Area		—
	(b) Proposed Built–up Area (as per 'P–line')		1278.22
	(c) Total (a+b)		—
11	F.S.I. Consumed (15/13) (should not be more than serial No.14 above.)		—
12	Area for Inclusive Housing, if any		—

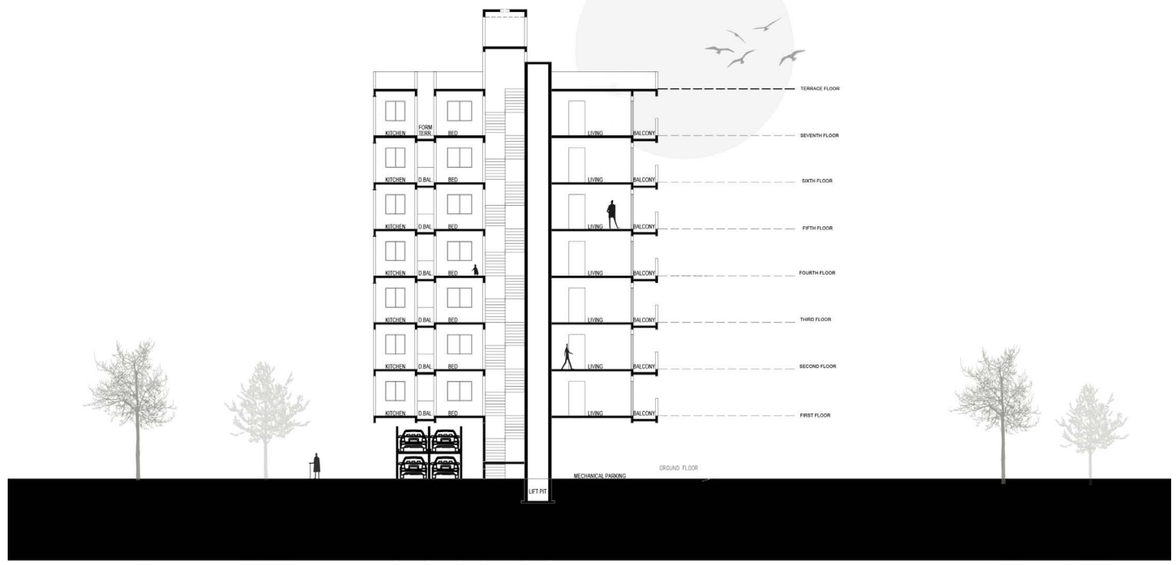


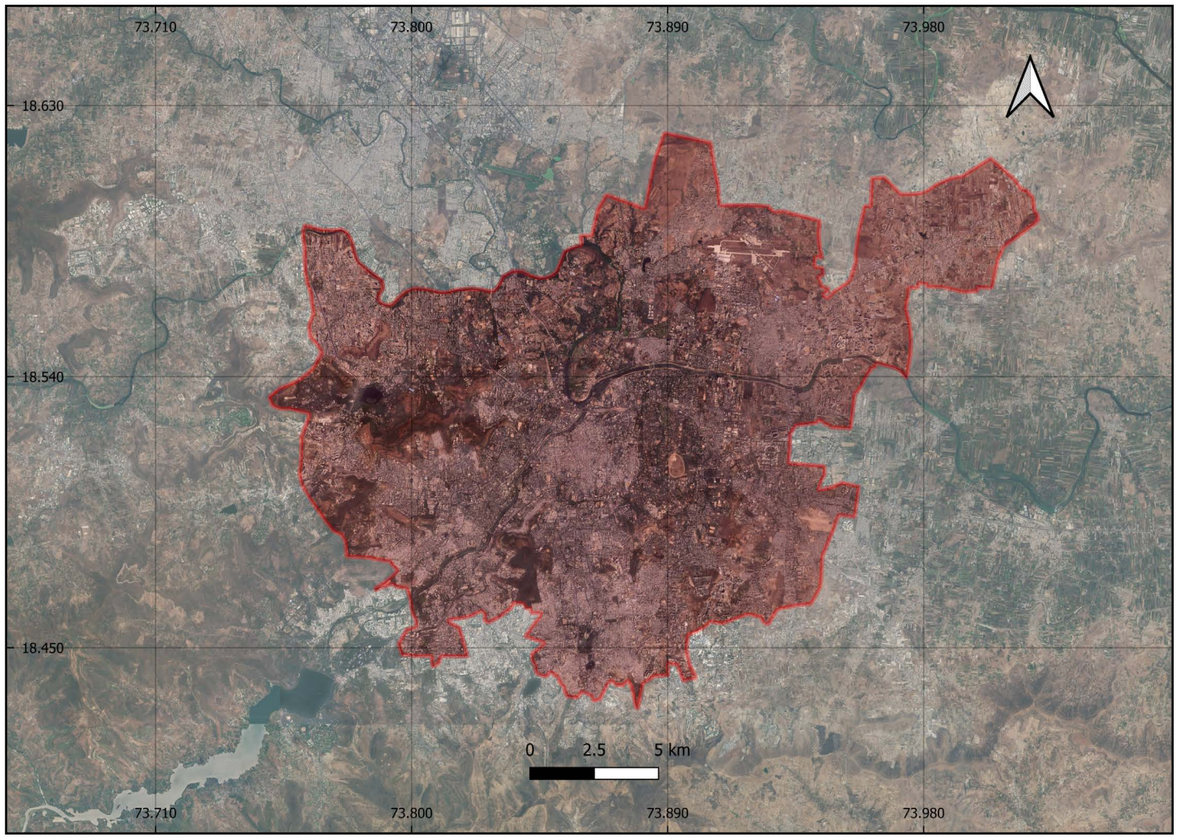
SECTION AT –AA'
SCALE 1:100

ELEVATION
SCALE 1:100

Longitudinal Section

Transverse Section





10

Spatial Analysis of Health and Sanitation in Pune District

Competition | Research & Application | 2024

Notable Participant at IIT Bombay FOSSEE Geospatial Mapathon 2024 (Edition IV)

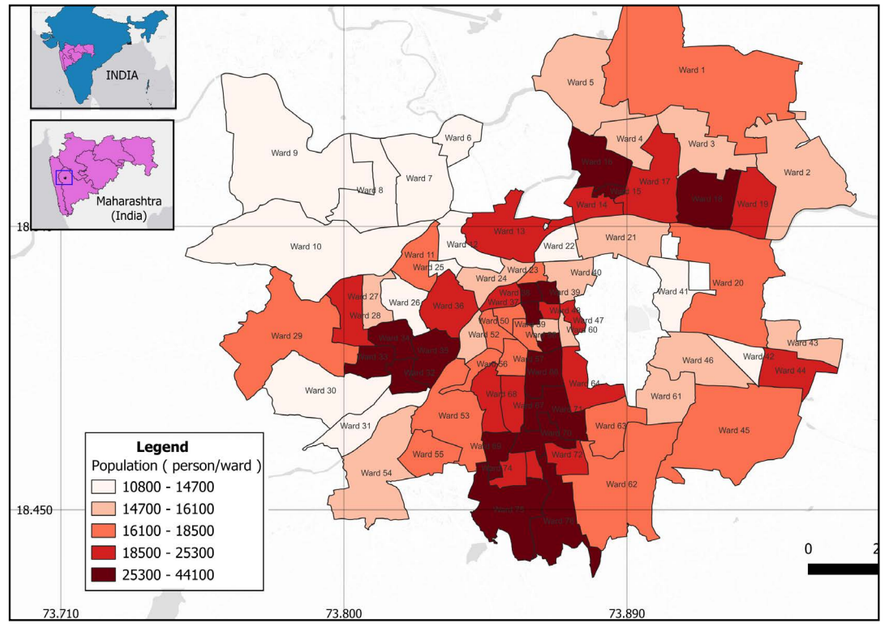
Pune has experienced rapid urbanization over the past decade, leading to significant transformations in its landscape and infrastructure. As the city expands, the relationship between urban development, green cover, and public sanitation becomes increasingly crucial. This study examines changes in urbanization and vegetation using geospatial analysis while also assessing the distribution of public sanitation facilities. Understanding these patterns is essential for sustainable urban planning, ensuring a balance between development, environmental preservation, and public health.

Health and Sanitation:
Urban Development and Green Cover in Pune Map (2012-2024)

Adequate public sanitation is vital for urban health, hygiene, and quality of life. As cities grow, equitable toilet distribution is essential to maintain sanitation standards and prevent health risks. Strategic planning enhances livability, supports marginalized communities, and promotes sustainability. Analyzing population distribution vs. toilet availability enables informed policymaking for better sanitation access and inclusive urban development.

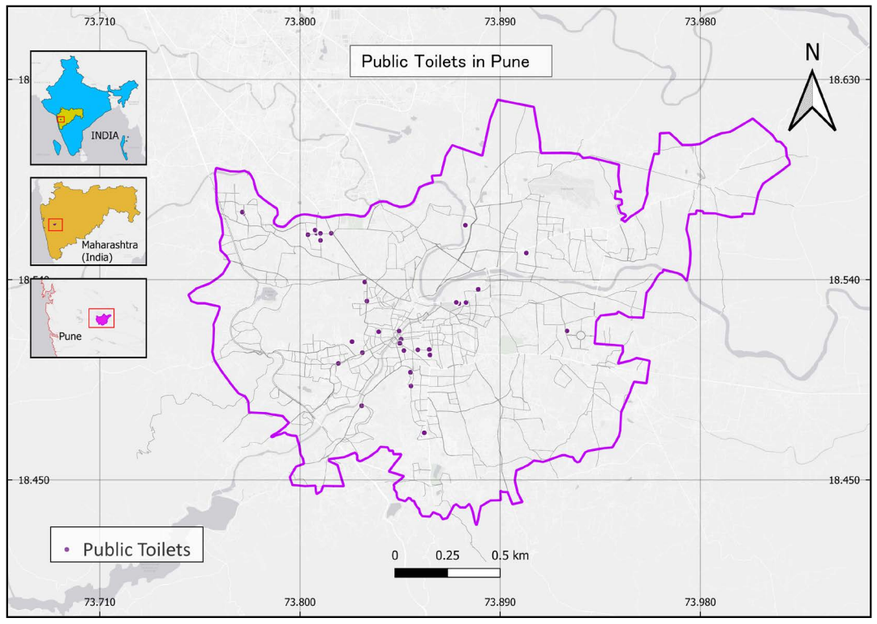
Ward-wise population distribution in Pune,

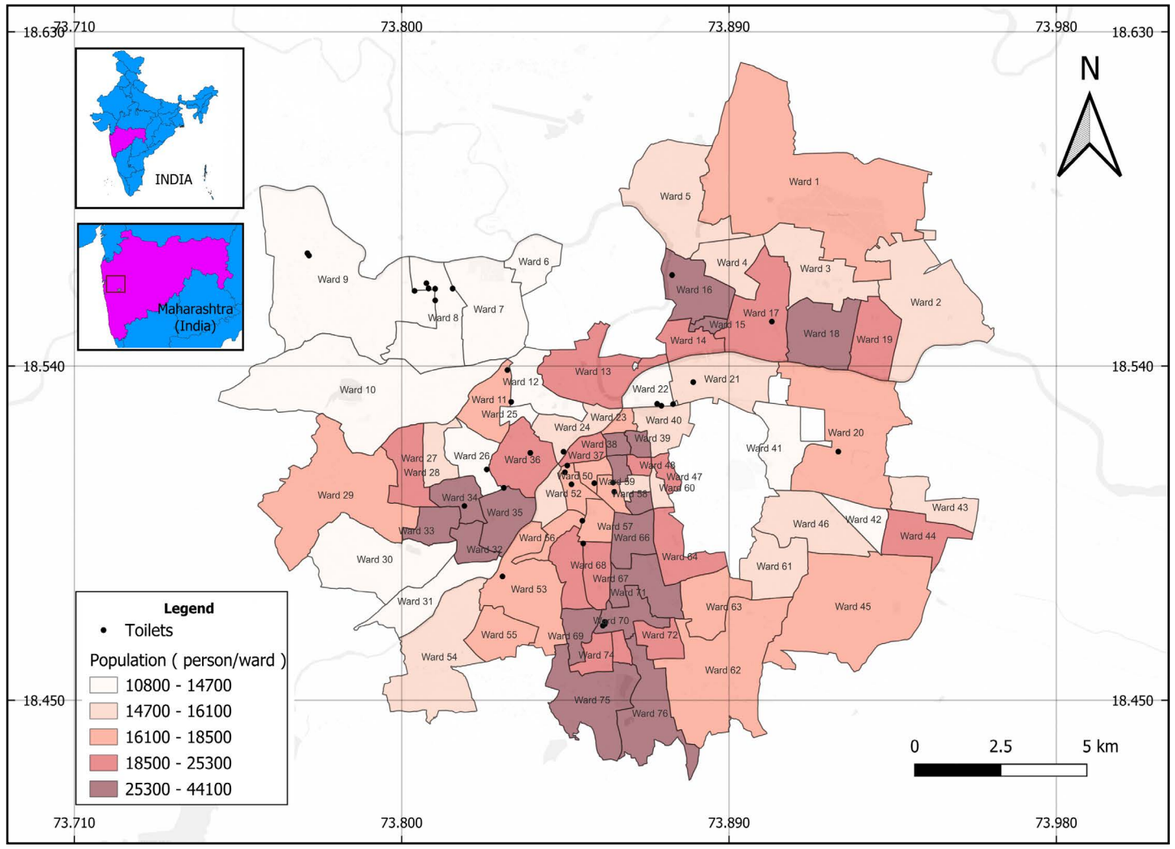
with color coding to represent varying population densities, ranging from light shades for lower densities to dark shades for higher densities.



Geographical distribution of public toilets within the city limits of Pune,

as indicated by purple dots against a backdrop of the city's outline and street network.





Ward-wise population distribution in Pune
along with the spatial distribution of public toilets, represented as black dots.

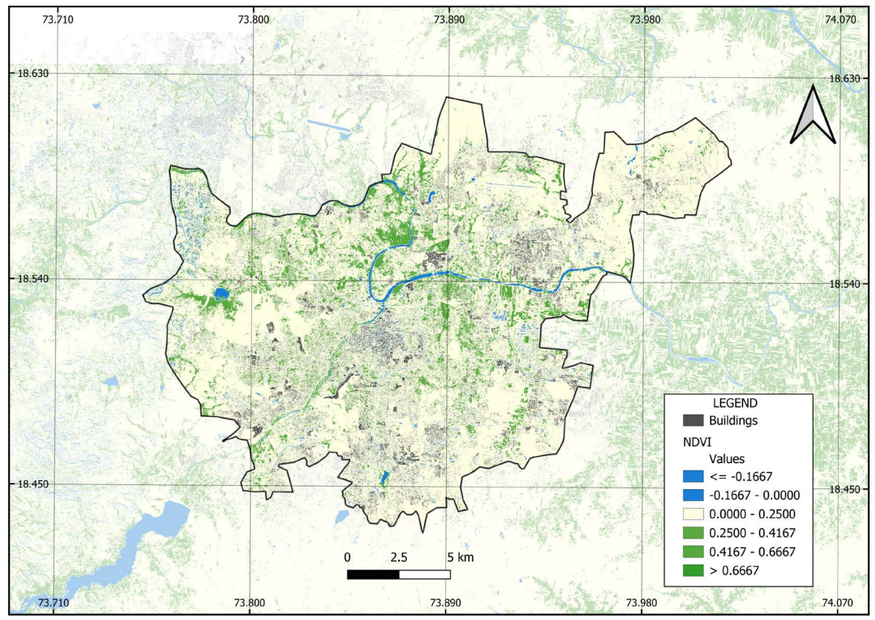
Result and Analysis:

The map highlights a mismatch between population distribution and public toilet availability in Pune. Central areas have higher population densities, with most public toilets concentrated in the central and southern parts. Many high-density wards lack adequate facilities, while peripheral wards, especially in the north and east, appear underserved. This underscores the urgent need for strategic placement of new public toilets to meet guidelines and enhance sanitation.

Green Cover Analysis:

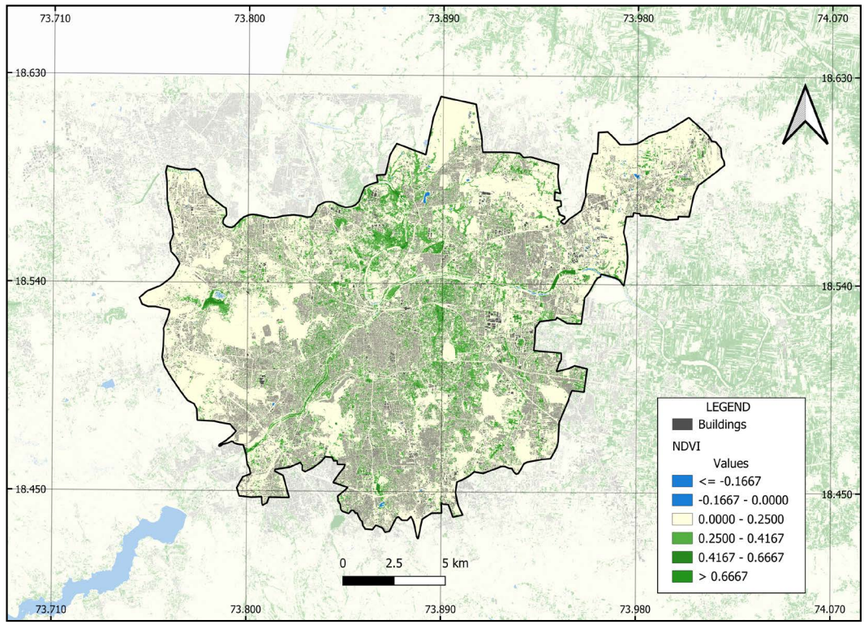
Urban Development and Green Cover in Pune Map (2012-2024)

This map analysis leverages satellite imagery and GIS tools to quantify changes in green cover and urban growth. NDVI, calculated using the red and near-infrared (NIR) bands, was applied to detect vegetation health across Pune, while urban development was assessed through detailed building footprint data from Google. The methodology integrates data from 2012 and 2024 to reveal spatial and temporal trends



Distribution of buildings and green cover in Pune for 2012

Using NDVI values, highlighting urbanization and vegetation density.



Distribution of buildings and green cover in Pune for 2024

Using NDVI values, highlighting urbanization and vegetation density.

11

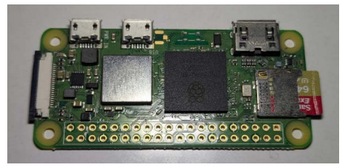
Intelligent Parking Solutions with IoT and AI

Competition | Research & Proposal | Team Work | 2024

Winner at National Level OpenHardware-IoT Geospatial, IIT Bombay Hackathon 2024 (Edition I)

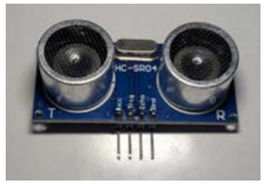
The Intelligent Parking Solution using IoT and AI is a cutting-edge project designed to tackle urban parking inefficiencies by integrating real-time vehicle detection, GPS tracking, AI-powered license plate recognition, and cloud-based data management. Developed for the National Level OpenHardware-IoT Geospatial Hackathon 2024, this system employs ultrasonic sensors to detect parking occupancy, GPS modules for precise location mapping, and Bluetooth communication for seamless data transfer to a Raspberry Pi Zero 2 W, which acts as the system's processing hub. A camera module captures vehicle images, and Optical Character Recognition (OCR) extracts license plate details for tracking and security. All data is processed via a Flask-based cloud server, ensuring real-time updates and analytics, which are then accessible through a Streamlit web application that allows users to find and navigate to available parking spots effortlessly. The project not only enhances parking efficiency and reduces traffic congestion but also lays the groundwork for scalable smart city applications, integrating automation, data analytics, and AI-driven decision-making into everyday urban mobility.

Arduino UNO



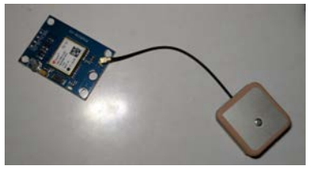
Raspberry Pi Zero 2W

Camera Module

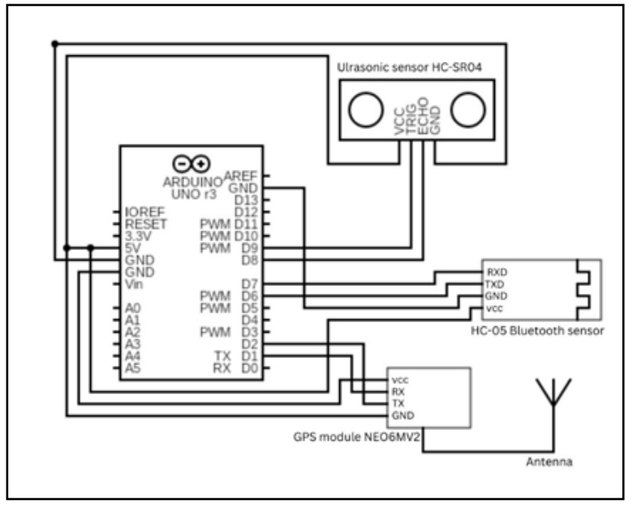


HC-SR04 ultrasonic sensor

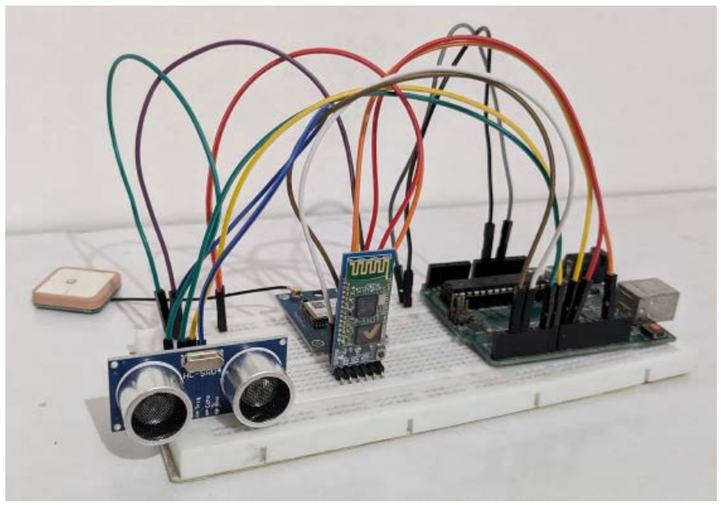
Bluetooth Sensor (HC-05)



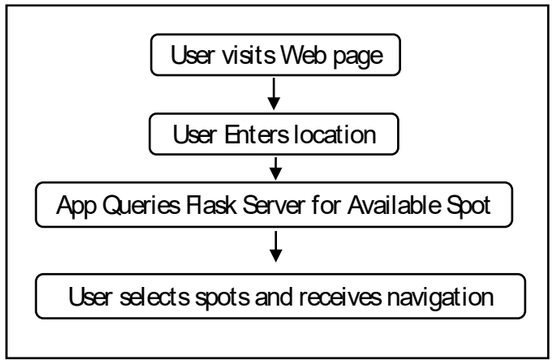
GPS Sensor (NEO6MU2):



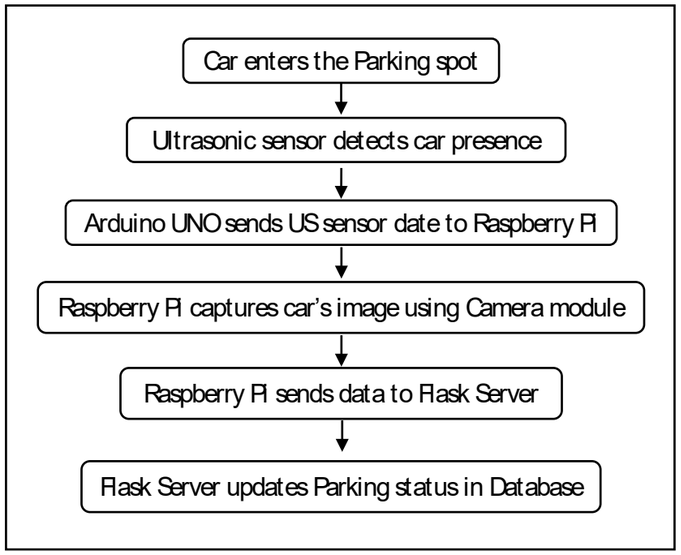
Circuit Diagram



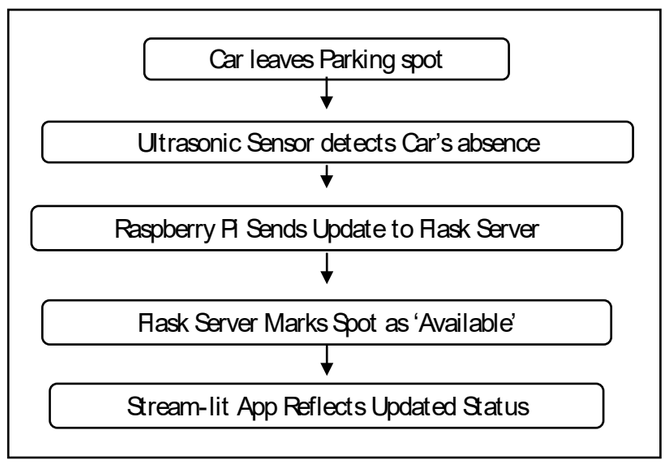
Working Circuit Model



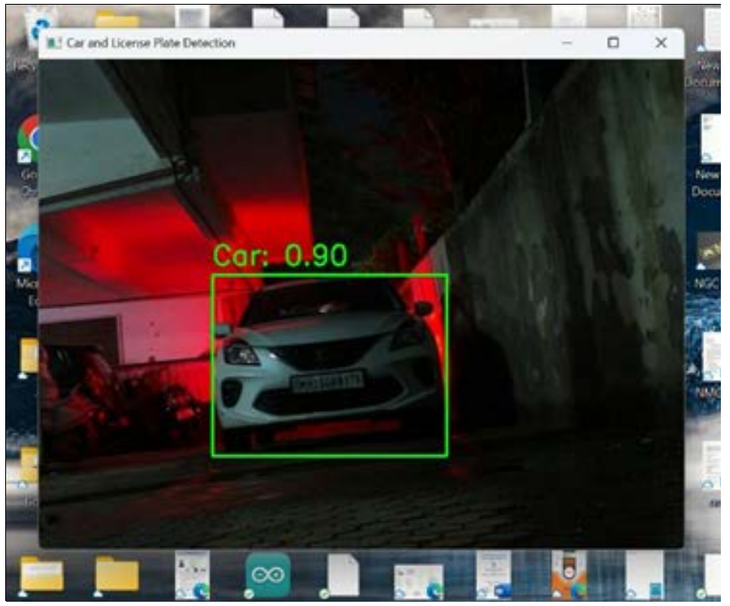
User Workflow



Car Entering the Parking spot workflow



Car leaving the spot workflow

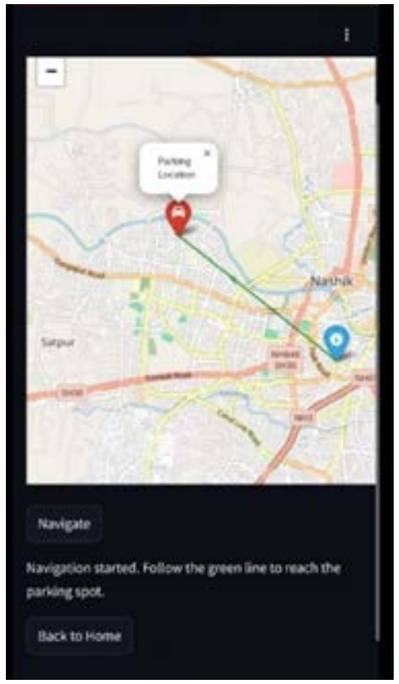


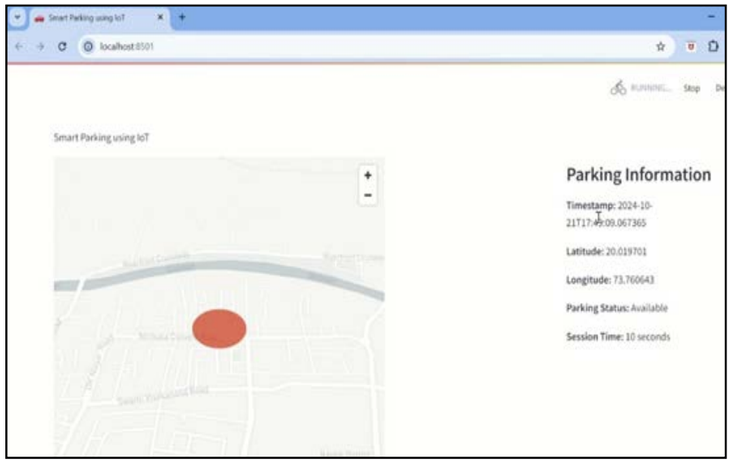
A snapshot of user interface

The algorithm successfully identifies the car and extracts the license plate information captured by the Raspberry Pi Camera Module 3, ensuring accurate vehicle recognition and number plate detection.

A snapshot of user interface

The web interface efficiently locates the nearest available parking spot and provides the user with precise, real-time directions to the selected location, ensuring a smooth navigation experience.





A snapshot of system dashboard

The dashboard offers a real-time overview of the parking system, displaying locations, precise coordinates, and the availability status of each spot. It also tracks session times for parked vehicles, enabling efficient management. With a user-friendly interface, it ensures clear data presentation for seamless monitoring and decision-making.

12

Aeromodelling Project

Competition | Design & Model Making | 2024

Shortlisted at National Aeromodeling Competition 2024, IIT Bombay

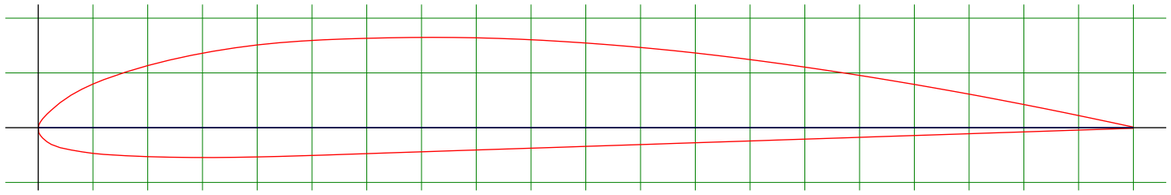
The project is a custom-designed triplane built for the National Aeromodelling Competition at Techfest, IIT Bombay. With a 1-meter wingspan and a lightweight structure under 1 kg, the aircraft is optimized for superior lift and stability. It features two A2212 10T 1400KV brushless motors with 10-inch propellers, ensuring agile flight and an estimated lift capacity of 50 N. The triplane design was chosen for its increased lift, maneuverability, slow-flight capability, and structural durability. The prototype, made from lightweight foam, follows the final model's dimensions, focusing on aerodynamics, balance, and scalability for competitive performance.

A2212 IOT 1400KV Brushless Motor

FlySky FS-i6 2.4G 6CH PPM RC Transmitter With FS-iA6B Receiver

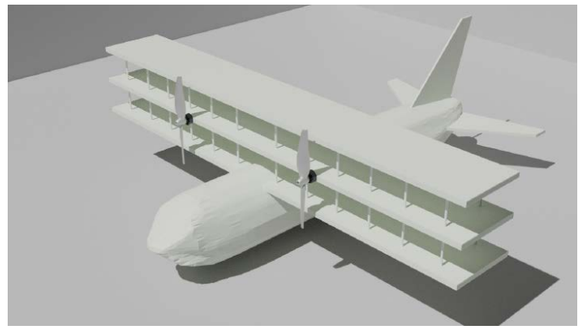
Mircro Servo 9g - SG90

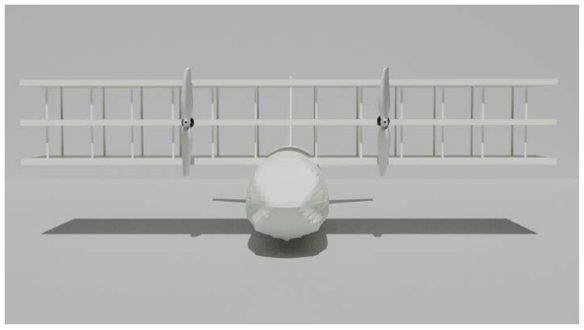
11.1V 2200mAh 40/80C 3S LiPoBattery Lithium EQlymer



Name = CLARK Y AIRFOIL
Chord = 200mm Radius = 0mm Thickness = 90% Origin = 0% Pitch = 0°

Aerofoil section





Digital Model & Design

Working model:1

Working model:2

thank you!

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