

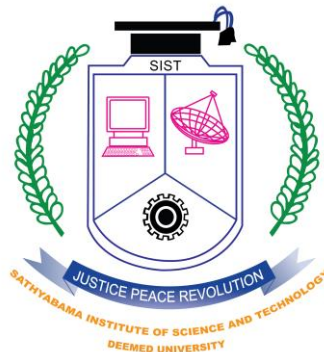
EVALUATING THE SUSTAINABLE PRINCIPLES OF VASTU SHASTRA IN A MODERN CONTEXT WITH RELEVANCE TO RESIDENTIAL TOWNSHIP IN WARM-HUMID CLIMATE

A Thesis

Submitted in partial fulfillment of the requirements for the award of
Master of Architecture degree in Sustainable Architecture

By

A.DEEPTHI KRUSHNIKA (39890006)



**DEPARTMENT OF ARCHITECTURE
SCHOOL OF BUILDING AND ENVIRONMENT**

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

Accredited with Grade "A" by NAAC

JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600 119

MAY 2021



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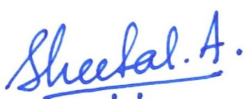


DEPARTMENT OF ARCHITECTURE

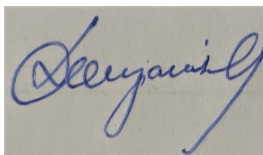
BONAFIDE CERTIFICATE

This is to certify that this Report is the bonafide work of **A.DEEPTHI KRUSHNIKA (39890006)** who carried out the Thesis entitled **"EVALUATING THE SUSTAINABLE PRINCIPLES OF VASTU SHASTRA IN A MODERN CONTEXT WITH RELEVANCE TO RESIDENTIAL TOWNSHIP IN WARM-HUMID CLIMATE"** under our supervision from January 2021 to May 2021.

Internal guide
(Ar. SWETHA)


Internal Panel Member
(Ar. SHEETAL AMRAOTKAR)

External guide
(Ar. BALAMURUGAN)



DR. DEVYANI GANGOPADHYAY
Dean, School of Building and Environment
Department of Architecture

Submitted for Viva voce Examination held on 31-05-2021

Internal Examiner

External Examiner

DECLARATION

I **A.DEEPTHI KRUSHNIKA** hereby declare that the Thesis Report entitled “**EVALUATING THE SUSTAINABLE PRINCIPLES OF VASTU SHASTRA IN A MODERN CONTEXT WITH RELEVENCE TO RESIDENTIAL TOWNSHIP IN WARM-HUMID CLIMATE**” done by me under the guidance of **Ar. SWETHA** (Internal) and **Ar. BALAMURUGAN RAJKUMAR, Principal Architect -Proton Ateliers** (External) at Sathyabama Institute of Science and Technology is submitted in partial fulfillment of the requirements for the award of Master of Architecture degree in Sustainable Architecture.

DATE: 25-05-2021

PLACE: CHENNAI

SIGNATURE OF THE CANDIDATE

ACKNOWLEDGEMENT

I am pleased to acknowledge my sincere thanks to Board of Management of **SATHYABAMA** for their kind encouragement in doing this Thesis project and for completing it successfully. I am grateful to them.

I convey my thanks to **Dr. Devyani Gangopadhyay, Dean and Head of the department, Dept. of Architecture, School of Building and Environment**, for providing me necessary support and details at the right time during the progressive reviews.

My special thanks to **Dr. Suresh Kuppusamy**, our Design chair and **Ar. Balamurugan Rajakumar**, (External guide) and **Ar. Sheetal Amraotkar** (Thesis Coordinator) for their valuable comments and guidance during the project work.

I would like to express my sincere and deep sense of gratitude to my Project Guide **Ar.Swetha** for **her** valuable guidance, suggestions and constant encouragement which paved way for the successful completion of my project work.

I wish to express my thanks to all Teaching and Non-teaching staff members of the Department of Architecture who were helpful in many ways for the completion of this Thesis.

AIM

- To design a residential development by reviving the principles of Vastu Shastra suitable to modern requirements and optimize environmental sustainability using green building norms.

OBJECTIVE

- To analyse the behaviour of building and on site (following Vastu Principles) for Warm-Humid Climate
- Derive a prototype module which follows Vastu principles along with user requirements of current lifestyle
- Inclusion of Vastu principles with reference to green building norms.
- To analyse to environmental & social sustainability by optimizing between Vastu principles & Green building norms.

SCOPE

- Identification of sustainable Vastu principles suitable to modern context and relevance to IGBC Green homes credits.
- Influence of these strategies in Site planning and designing according to Green townships.
- Individual house planning including Vastu principles with respect to orientation and analysing sustainable benefits.
- Energy & water efficiency strategies, Construction materials analysed with respect to Sustainable Vastu principles and it's efficiency in current scenario.

LIMITATIONS

- The IGBC credits achieved would be quantified.
- Other benefits such as Social sustainability would be analysed in a qualitative method.
- The Vastu strategies (principles) would limit to site zoning & levelling, location of vegetation & water bodies ,massing, orientation, proportions, location of openings.

ABSTRACT

In today's world, in order to achieve sustainability in architecture each day there are new findings in various context. There are many sustainable strategies followed for several years at various parts of the world. These have been strategies used in most sustainable way. As it evolved we somewhere lost this approach & lost this factor with relation to developing trends. So, looking back into these sustainable strategies (Vastu Shastra) which could provide solutions to achieve sustainability again, can be accepted , but with consideration of current trends & it's users. Looking into Indian history Vaastu was followed for thousands of years where it's a Science of human relation to his surrounding Environment & elements of Nature which is basic principle of Sustainability. The main aim is in order to revive the sustainable Strategies in Vastu Shasta which can appropriately suit the modern context in current existing conditions.

The Methodology followed in thesis would include 3 phases where the sustainable principles of Vedic architecture would be studied & it's application in different time periods in different climates would be analyzed. The evolution of Vastu principles along with time period would be analyzed with respect to sustainability. This would lead to further research on designing a residence in a different climate where in the Sustainable principles of Vedic & Modern Architecture would be optimized to suit users & the environment.

**RESEARCH QUESTIONS**

- What are the modern user requirements w.r.t Vastu principles which can helps in sustainable development?
- How Vastu principles can be incorporated in green building credits?
- How effective does these strategies help in environmental & social sustainability in the township?
- Will optimization between Vastu & Green building norms suit our modern context in terms of sustainability?
- How well is thermal & mental comfort achieved based on above strategies?

SITE SELECTION (Live Proposal)

- Proposal Details
- Site Location & Surroundings
- Site Chronology
- Vegetation & Water bodies
- Soil type & Site slope
- Micro Climate Analysis (Based on Vastu)
- Water Supply & Drainage

ANALYSIS**REVISED DESIGN PROPOSAL****INITIAL STUDY****ANALYSIS****VASTU SHASTRA STUDY**

- 5 Principles of Vastu**
- Site Selection & Planning
 - Vaastu Purusha Mandala
 - Propionate Measurement of Buildings-
 - Six canons of Vedic Architecture-
 - Aesthetics of Building

Vastu influenced Strategies (Case Study – Traditional & Modern)

- Climatic Considerations
- Shape & Angle of Plot
- Shape of Building & Set backs
- Slope of Land & Abutting Roads
- Height of Building
- Orientation & Laying of Rooms
- Construction & Building Materials
- Position & Sizing of Doors & Windows etc

- (Principles)**
- Scientific Reasoning
 - Effects on environment
 - Well being of Users

- (Case Study)**
- Day lighting
 - Thermal Comfort
 - Ventilation
 - Social sustainability

- (Design Strategies & Simulations)**
- Site Development
 - Zoning (Ventilation & Solar radiation)
 - Vedic Planning Strategies
 - User friendliness
 - Compliance with Vastu (Based on Analysis)

- (Simulations & Analysis)**
- Orientation
 - Proportions & Massing
 - Day lighting
 - Indoor Ventilation
 - Material Study & Thermal behaviour
 - Aesthetics

GUIDELINES & NORMS

- UDPGI Guidelines
- IGBC Green Homes & Township
- Tamil Nadu Combined Development and Building Rules, 2019

- Optimization between Vastu and IGBC
- Relevance of credits earned by Vastu as sustainable design strategies

INFERENCE

- (Calculations)**
- Credits earned by following Vastu
 - Credits earned by influence of Vastu strategies
 - Credits earned by following modern green building regulations

DESIGN DEVELOPMENT**DESIGN ANALYSIS****IGBC COMPLIANCE****METHODOLOGY**

SUSTAINABLE PRINCIPLES OF VASTU

After looking at relation of Vastu & modern principles, an additional importance in vastu guidelines are that it includes location of various elements of Nature which connects humans to environment creating energy flow inside the building for well-being.

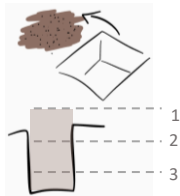
5 FUNDAMENTAL PRINCIPLES

- **Site Selection & Planning** - Site Orientation refers to the location or position of the Site with respect to the cardinal direction. The Site's orientation is identified by the direction that the front of the Site faces i.e. the side facing the road.
- **Vaastu Purusha Mandala - Doctrine of Orientation** - Vastu Purusha Mandala, is a metaphysical square plan that illustrates how the Vastu Purusha was pinned down by Brahma and 44 Gods – face down, with his head to the North-East and his feet towards the South-West
- **Proportionate Measurement of Buildings**- The Vastu principle '**Maana-Proportions**' prescribes the perfect ratio of height-to-breadth of a building, to make it look proportionate.
- **Six canons of Vedic Architecture**- This will ensure a proportionate, aesthetic and beautiful building with the right measurements. The Vastu principle '**Aayadi – dimensions**' prescribes six formulae to work out the right dimensions (length, breadth and height) of a building.
- **Aesthetics of Building** - This will ensure a proportionate, aesthetic and beautiful building with the right measurements. One of the Vastu principles known as '**Chanda – aesthetics/form**', describes the different forms or elevations of a building.

SITE SELECTION

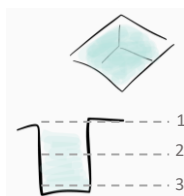
Initial tests include

Compression test



- 1 – GOOD SITE
2 – AVERAGE SITE
3 – BAD SITE

Water absorption test



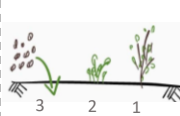
- 1 – GOOD SITE
2 – AVERAGE SITE
3 – BAD SITE

Oxygen level on Site



An unbaked earthen lamp with four wicks in Ghee or clarified butter. The flame of the wick indicates the suitability of the land. The soil is unsuitable if the wicks in the lamp do not light up.

Soil fertility test



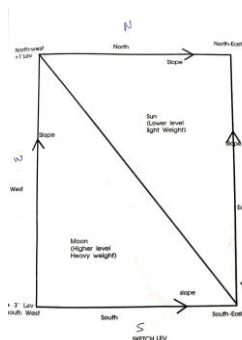
- 1 – GOOD SITE
Sprout grown in 4 days
2 – AVERAGE SITE
Sprout grown in 7 days
3 – BAD SITE
Sprout not grown

Compression test - This is the test to determine the soil's natural moisture, density and aeration. If the hole is not fully filled up, it means the soil is dense and clayey and hence will retain water which is not good for a building foundation. Eg, Wetlands

Water absorption test - The water is absorbed readily, then the soil is too loose (sandy) and not firm enough for supporting the foundation. If there are cracks, it indicates clayey soil, which will retain water and hence, can cause dampness to the foundation. Sites with sandy or clayey soils will necessitate extra strong foundations with proper water proofing, which in turn will be more expensive.

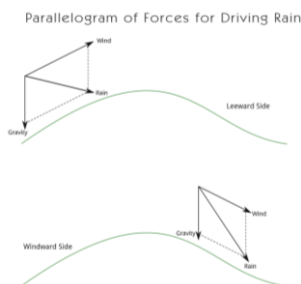
SUSTAINABLE PRINCIPLES OF VASTU

VASTU PRINCIPLES – SITE SELECTION & PLANNING



Location & Environment

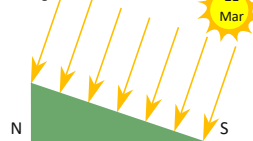
- Slope – SW-NE – This is very important as it is an integrated approach.
- Trees with branchy roots on site must be avoided or structure built away
- Surrounding hills – Site to South & west of hills must be avoided



Vastu recommends avoiding of North & East for Building due to seasonal SW Monsoon which could affect especially in hilly areas.

SLOPE OF SITE & COSINE LAW OF RADIATION

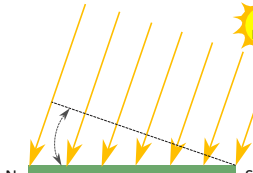
Angle of incidence = 0°



Land slopes 1:3 (19°) towards South
Location: Bombay at 19° North
Angle of Incidence = 0°

Cosine of 0° = 1
Therefore Solar Intensity = 100%
Reduction in Solar Intensity = 0%

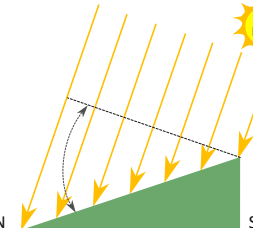
Angle of incidence = 19°



Land is flat
Location: Bombay at 19° North
Angle of Incidence = 19°

Cosine of 19° = 0.945
Therefore Solar Intensity = 94.5%
Reduction in Solar Intensity = 5.5%

Angle of incidence = 38°



Land slopes 1:3 (19°) towards North
Location: Bombay at 19° North
Angle of Incidence = 38°

Cosine of 38° = 0.788
Therefore Solar Intensity = 78.8%
Reduction in Solar Intensity = 21.2%



SUSTAINABLE PRINCIPLES OF VASTU SHASTRA

PROPORTIONATE MEASUREMENT OF BUILDINGS

The following ratios of Height to Breadth are the best for buildings and each ratio indicates a certain aspect of beauty and proportion. It is best to follow one of these ratios, according to requirement.

1.Ratio of 1: When the Height is equal to the Breadth, the structure is considered to be aesthetically proportionate.

2.Ratio of 1.25: When the Height is 1.25 times the Breadth, the structure is considered to have good stability.

3.Ratio of 1.5: When the Height is 1.5 times the Breadth, the structure is considered to have a pleasant appearance.

4.Ratio of 1.75: When the Height is 1.75 times the Breadth, the structure is good in every way and will appear to be both strong and beautiful.

5.Ratio of 2: When the Height is twice the Breadth, the structure will appear gorgeous

TABLE III (Manasara XI.6-40) The dimensions are in Hasta.

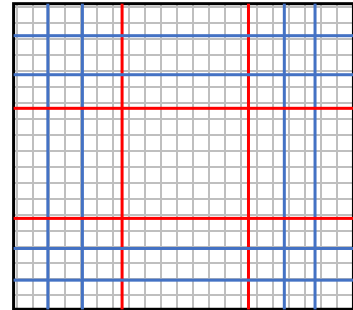
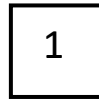
One Storeyed Building										
Small Type					Intermediate Type					
	a	b	c	d	e	a	b	c	d	e
Width	2	4	6	8	10	4	6	8	10	12
Length	3	5	7	9	11	5	7	9	11	13
Height	2(Width) or equal to Width									

Two Storeyed Building					Intermediate Type					
Small Type	a	b	c	d	e	a	b	c	d	e
Width	5	7	9	11	13	6	8	10	12	14
Length	6	8	10	12	14	7	9	11	13	15
Height	2(Width) or equal to Width					1+3/4(Width)				

Three Storeyed Building											
Small Type						Intermediate Type					
	a	b	c	d	e	a	b	c	d	e	
Width	8	10	12	14	16	9	11	13	15	17	
Length	9	11	13	15	17	10	12	14	16	18	
Height	2(Width) or equal to width					1+3/4(Width)					

TABLE XV Proportions of Dandaka type of houses according to Manasara and Mayamata

Dandaka	Breadth : Length (Manasara XXV)	Breadth : Length (Mayamata XXVI)
Type 1	1:1	3:4
Type 2	1:2	4:6
Type 3	2:3	3:6
Type 4	2:4	3:6
Type 5	3:4	6:12
Type 6	4:6	
Type 7	5:7	
Type 8	6:8	



CONSTRUCTION – During the constructing stage, not many measuring scales were used, but were based on human scales of measurement (Arm length, Finger etc to suit human scale for use & also reduces unnecessary measuring scale & mistakes)

FORM & SHAPE – These are the best shapes to use for construction.

Advantages of using these forms are

Material Efficiency – This shape reduces exposure to exterior environment which reduces material requirement on exterior face for protection.

Structural Stability – Even distribution of load due to its shape. Harmony in planning by using formula in multiples of 6, 9, 11, 13 etc.



SUSTAINABLE PRINCIPLES OF VASTU SHASTRA

Vaastu Purusha Mandala – Doctrine of Orientation

Direction	Approximate Time	Representative functions ¹⁴
North-east	3-6 a.m.	Room for meditation
Between NE and E		Multipurpose room
East	6-9 a.m.	Bathroom
Between E and SE		Room for churning curds
South-east	9-12 a.m.	Kitchen
Between SE and S		Storage of clarified butter
South	12-3 p.m.	Bedroom
Between S and SW		Toilet
South-west	3-6 p.m.	Armoury
Between SW and W		Study
West	6-9 p.m.	Dining hall
Between W and NW		Room for mourning
North-west	9-12 p.m.	Granary
Between NW and N		Conjugal room
North	12-3 a.m.	Treasury
Between N and NE		Medicine room

LIVING AREA– Arrangement for seating can be made in the south and West side so as to allow the morning sunlight better not to extract the windows with furniture.

BEDROOM – Head in the East & South sleeping in with the head in the in the East is suggested to increase knowledge & for sleeping keeping the head in the south direction is correct sleeping with one head in the south brings feeling and good sleep.

KITCHEN –The sun's rays first reaches East corner of the earth and then the ultraviolet rays in it kills the germs collected in the kitchen overnight keep the food from contamination and avoid small insects to grow inside the kitchen hence kitchen is located south-east corner of the house.

BATHROOM

The bathroom in the West help to block the Western Sun the Western Sun radiation to other parts of the house keeping them comparatively cool.

DINING ROOM – Eating facing south will cause restlessness since the body will be affected by repelling forces.

TREES– Trees in the south and West but should be avoided in north and East.

SIX CANONS OF VEDIC ARCHITECTURE

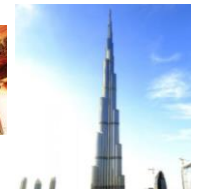
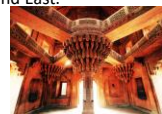
If the 4 faces of the buildings were oriented towards the cardinal directions, they could withstand the impact of these energies and also benefit from them. Most religious buildings, palaces, cities, villages and roads of ancient India and many other parts of the face the cardinal directions. Eg, the Giza of Egypt are oriented to the North. So if it was not possible to orient a building to the cardinal directions, it was important that the dimensions of the building should be such that it can withstand the forces of nature. This is where the Yoni (Breadth) calculation was useful.

- 1.Yoni** is the remainder of Breadth x 3 divided by 8
- 2.Vyaaya** is the remainder of Breadth x 9 divided by 10
- 3.Aaya** is the remainder of Length x 8 divided by 12
- 4.Raksha** is the remainder of Length x 8 divided by 27
- 5.Vara** is the remainder of Height x 9 divided by 7
- 6.Tithi** is the remainder of Height x 9 divided by 30

AESTHETICS OF BUILDING

There are six chandas in Vaastu Shastra. They have been explained below along with suitable architectural examples.

- 1.Meru Chanda,**
- 2.Khanda Meru Chanda,**
- 3.Pataaka Chanda,**
- 4.Sushi Chanda,**
- 5.Uddista Chanda,**
- 6.Nasta Chanda**

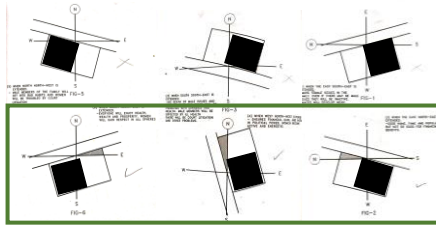


SUSTAINABLE PRINCIPLES OF VASTU

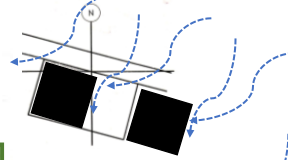
These are some of the strategies in Vastu Shastra which has its scientific reasoning to be studied such as,

- Climatic Considerations
- Shape & Angle of Plot
- Shape of Building & Set backs
- Slope of Land & Abutting Roads
- Height of Building
- Orientation & Laying of Rooms
- Materials
- Position & Sizing of Doors & Windows etc
- Vegetation – Species & Locations

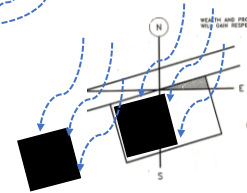
SHAPE & ANGLE OF PLOT



WHY NOT?



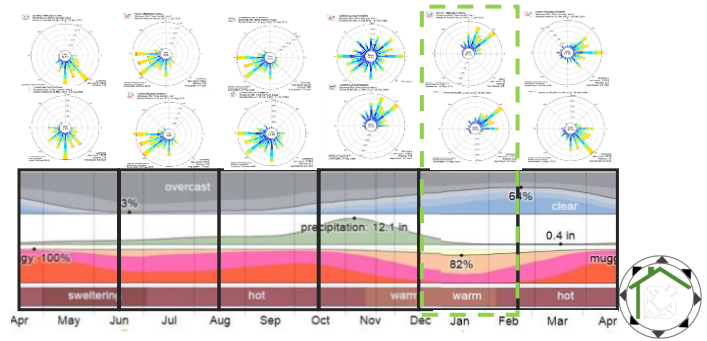
WHY??



CLIMATE ANALYSIS – FORCES OF NATURE

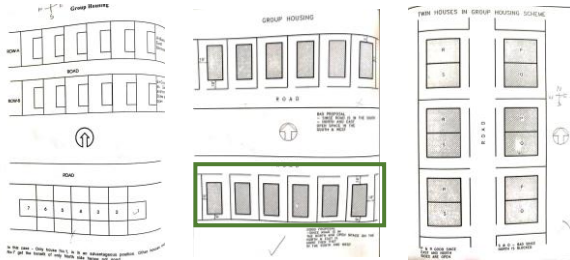
The climate in Vastu is according to Indian calendar (Hindu), where 6 climates are classified in a year which gives a defined climate for couple of months with defined climatic data.

"Traditional" Months	"Standard" months	Season
Chaitra	March – April	Grishma or Summer
Vaisakha	April – May	
Jyeshtha	May – June	
Ashadha	June – July	Varsha or Rainy
Shravana	July – August	
Bhadrapada	August – September	Sharada or Autumn
Adhina	September – October	
Kartika	October – November	Hemanta or Dewy
Margashira	November – December	
Pausa	December – January	Shishir or Winter
Magha	January – February	
Phalguna	February – March	Vasanta or Spring
Chaitra	March – April	

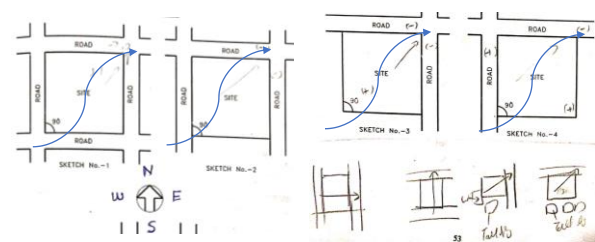


SUSTAINABLE PRINCIPLES OF VASTU

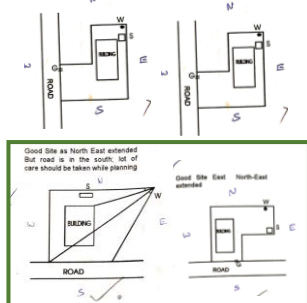
SHAPE OF BUILDING & SET BACKS



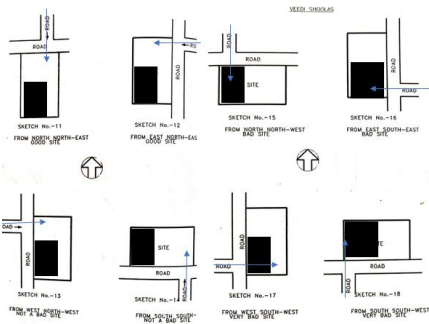
ADJOINING ROADS & SLOPE



SHAPE OF PLOT



PERPENDICULAR ROADS TO SITE



In case the perpendicular streets directly open up to houses, then a buffer space (preferable in NE) must be provided or any treatment façade or protection from external environment must be provided.

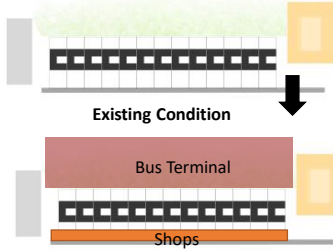
SUSTAINABLE PRINCIPLES OF VASTU

CASE STUDY - INTRO

AGRAHARAM, CHENNAI



Planned/Proposed



PROJECT : AGRAHARAM
LOCATION : AYANAVARAM, CHENNAI
DEVELOPERS :
 NOT KNOWN CONSTRUCTIONS
SITE AREA : 1.4 Acres
No. of Plots : 13

PUNYAKSHETRAM



Planned/Proposed

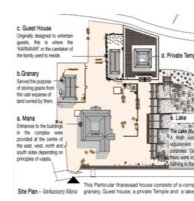


PROJECT : PUNYAKSHETRAM
LOCATION : KUMBAKONAM
DEVELOPERS : VISALAM CONSTRUCTIONS
SITE AREA : 11.79 Acres
No. of Plots : 244

MANA HOUSE, KERALA



Planned/Proposed



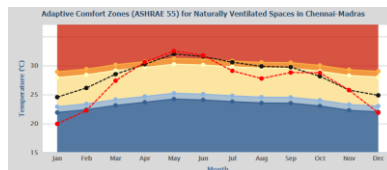
PROJECT : VARIKASSERY MANA
LOCATION : Vaniyankulam, KERALA
DEVELOPERS :
 NOT KNOWN CONSTRUCTIONS
SITE AREA : 4.3 acres
No. of Plots : Complex



CLIMATE COMPARISON – CHENNAI & TRIVANDRUM

CHENNAI

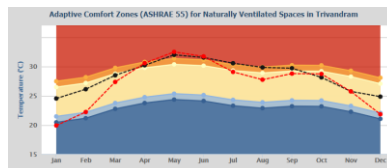
Primary city :	Chennai-Madras											
Climate Zone :	Warm Humid Zone											
Latitude("N) :	13.00	Longitude("E) :	80.17	Altitude(m) :	16							
Dry-bulb temperature (in °C)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Maximum	33	35	36	37	40	39	37	37	36	35	31	31
Mean	24	26	28	30	32	31	30	29	29	28	26	25
Minimum	15	19	22	24	23	23	24	23	24	23	21	20



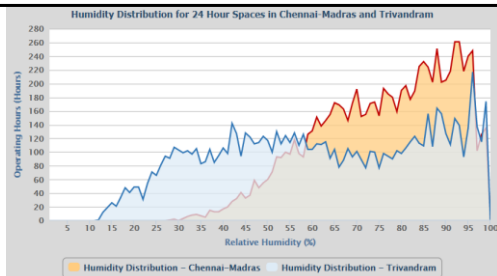
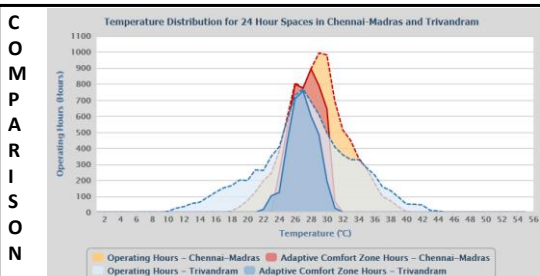
Chennai has highest mean temperature from April to July and also feels hot during these months seeing the adaptive comfort chart. Other months are slightly comfortable.

TRIVANDRUM

Secondary city :	Trivandram														
Climate Zone :	Warm Humid Zone														
Latitude("N) :	8.47			Longitude("E) :			76.93			Altitude(m) :			64		
Dry-bulb temperature (in °C)															
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Maximum	32	35	39	42	44	39	37	35	39	39	35	32			
Mean	20	22	27	30	32	31	29	27	28	29	26	22			
Minimum	10	10	15	20	23	25	23	24	22	20	17	6			



Trivandrum has maximum temperature from April to June and rest of the months feeling slightly cold or comfortable.

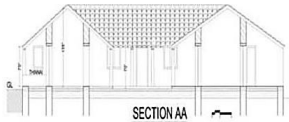
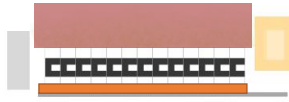


Trivandrum has more comfortable hours compared to Chennai w.r.t outdoor temperature.

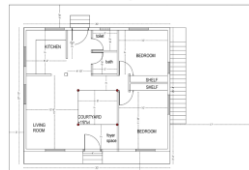
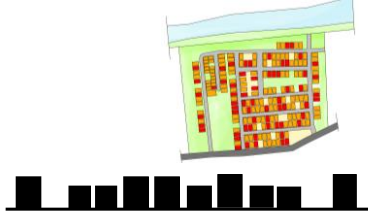
The RH level seem to be high level in Chennai but Trivandrum having distributed RH level throughout the year.

SUSTAINABLE PRINCIPLES OF VASTU

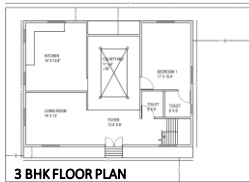
HEIGHT OF BUILDINGS



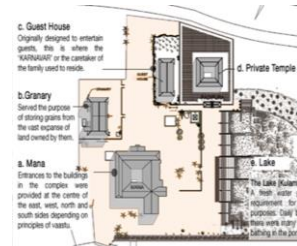
SECTION AA



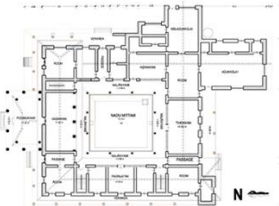
2BHK FLOOR PLAN WITH COURTYARD



3 BHK FLOOR PLAN

TOTAL NO. OF
UNITS : 119TOTAL NO. OF
UNITS : 81

Site Plan - Varikozhy Mana

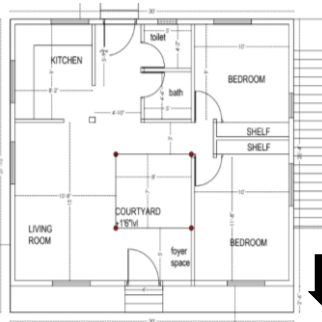
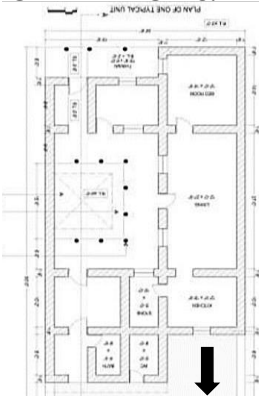


Ground floor Plan of the Mana



SUSTAINABLE PRINCIPLES OF VASTU

ORIENTATION & LAYING OF ROOMS (VASTU PRUSHA MANDALA)



Living Areas
Dining
Kitchen
Granary
Corridor
Bedroom
Toilet
Store/Utility

Granary	Bedroom	Corridor
Living Areas	Dining	Kitchen
Store/Utility	Toilet	Bedroom

Structural Positions	North	South	East	West	North East	North West	South East	South West
Kitchen	X	Good	Good	X	BEST	Good	Good	X
Staircase	X	Good	X	Good	Good	Good	Good	BEST
Toilet	Ok	Good	X	Good	BEST	Good	Good	X
Boring or U-Ground Tank	Good	X	Good	X	BEST	Good	Good	X
Temple	Good	X	Good	Good	BEST	Good	Good	X
Over Head Tank	X	Good	X	BEST	X	X	X	Good
Master Bed-Room	Ok	Good	X	Good	X	X	Good	BEST
Kids Room	X	Good	Good	Good	X	Good	X	Good
Guest Room	Good	X	Good	Good	X	BEST	Good	X
Living Room	Good	X	Good	Good	Good	BEST	Good	X

Structural Positions	North	South	East	West	North East	North West	South East	South West
Kitchen	X	Good	Good	X	BEST	Good	Good	X
Staircase	X	Good	X	Good	Good	Good	Good	BEST
Toilet	Ok	Good	X	Good	BEST	Good	Good	X
Boring or U-Ground Tank	Good	X	Good	X	BEST	X	X	Good
Temple	Good	X	Good	Good	BEST	Good	Good	X
Over Head Tank	X	Good	X	Good	BEST	X	X	Good
Master Bed-Room	Ok	Good	X	Good	X	X	Good	BEST
Kids Room	X	Good	Good	Good	X	Good	X	Good
Guest Room	Good	X	Good	Good	X	BEST	Good	X
Living Room	Good	X	Good	Good	Good	BEST	Good	X

Structural Positions	North	South	East	West	North East	North West	South East	South West
Kitchen	X	Good	Good	X	BEST	Good	Good	X
Staircase	X	Good	X	Good	Good	Good	Good	BEST
Toilet	Ok	Good	X	Good	BEST	Good	Good	X
Boring or U-Ground Tank	Good	X	Good	X	BEST	X	X	Good
Temple	Good	X	Good	Good	BEST	Good	Good	X
Over Head Tank	X	Good	X	Good	BEST	X	X	Good
Master Bed-Room	Ok	Good	X	Good	X	X	Good	BEST
Kids Room	X	Good	Good	Good	X	Good	X	Good
Guest Room	Good	X	Good	Good	X	BEST	Good	X
Living Room	Good	X	Good	Good	Good	BEST	Good	X

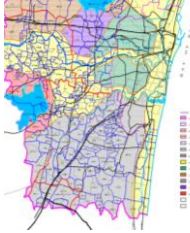


SUSTAINABLE PRINCIPLES OF VASTU

SOIL & CONSTRUCTION MATERIALS

SOIL TYPE : LATERITE SOIL

- FOUNDATION - 1'6" Clay Bricks
- WALL - 1'6" Clay Brick wall with Lime Mortar Joint (U Value - 1.8)
- ROOFING - Madras Terrace Roofing (U Value - 1.2)



SOIL TYPE : SILTY CLAY LOAMY SOIL

The basic construction materials used are Building Construction -

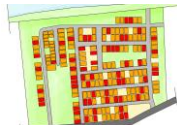
- Plinth & Beam Construction**
- Structure : Concrete
- Walls : Burnt Clay Bricks & Cement Plaster
- Wall Finish : External gypsum plaster & wall Paint
- Flooring : Vitrified Tiles
- Door & Windows : Teak Wood
- Railing : Stainless Steel
- Roads : Paver Blocks

SOIL TYPE : Lateritic soil

- Wall** : Structure : Load bearing wall, Beam & column
- Walls** : Laterite Stones, Clay Bricks & Lime Plaster
- Wall Finish** : Exposed bricks & Plastering
- Flooring** : Stone & Plastering Polished
- Door & Windows** : Teak Wood
- Railing** : Brick & Plaster

VEGETATION & SOIL

Agriculture was done on north of Agraharam which has been transformed into bus terminal presently creating urban Island effect.



Grass Area



Coconut Trees



Dense Trees of tropical and evergreen species of trees surrounds the complex with minimal vegetation in-between the buildings in complex.



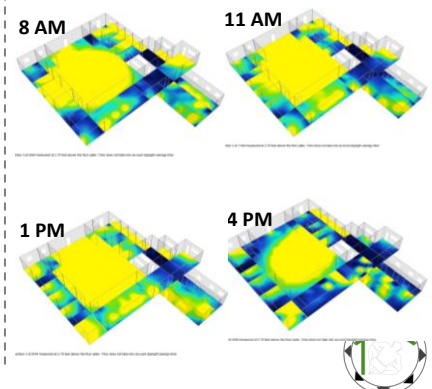
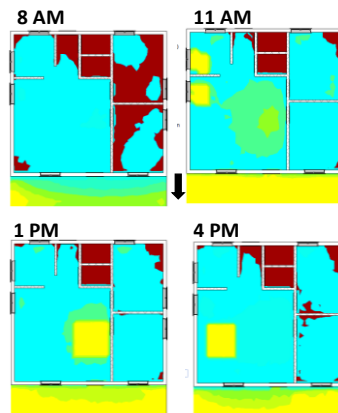
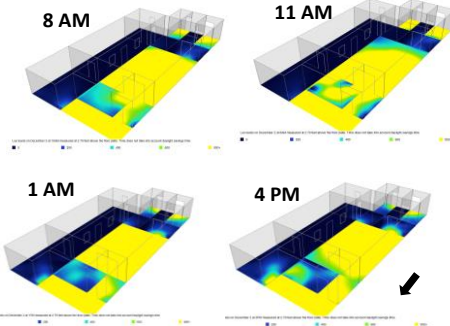
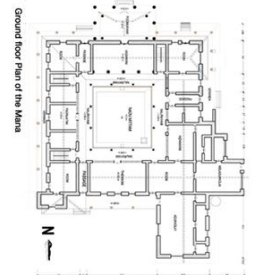
SUSTAINABLE PRINCIPLES OF VASTU

DAY LIGHTING

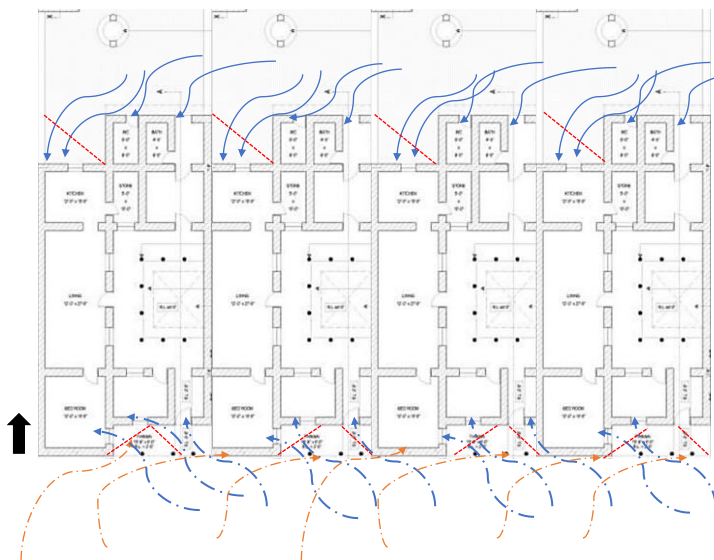
The most used space is Courtyard and corridor surrounding, followed by Thinnai. The regularly used spaces seem to be well lit except the Kitchen & Living which has very less lux level.



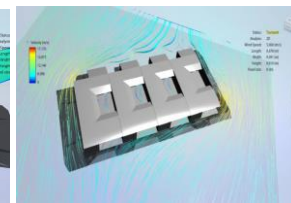
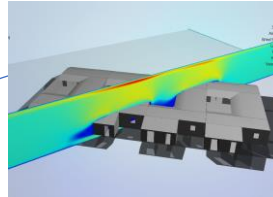
All the spaces are lit through out the day and also the lux level is more than average which can cause glare.



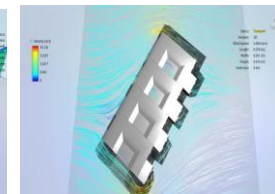
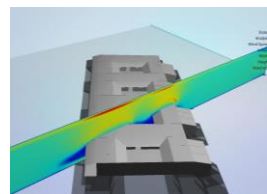
VENTILATION – AGRAHARAM



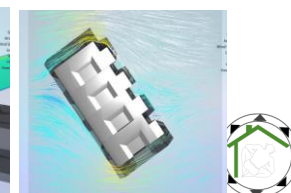
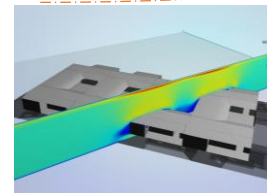
North East Winds →



South East Winds →

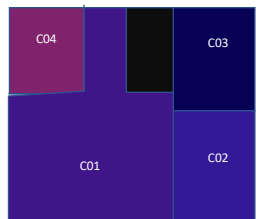
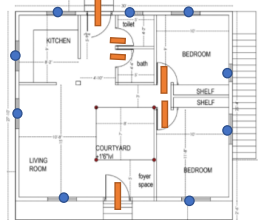
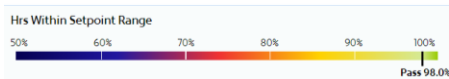
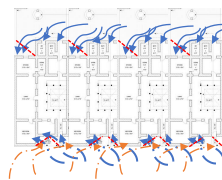
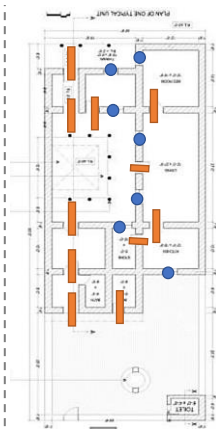
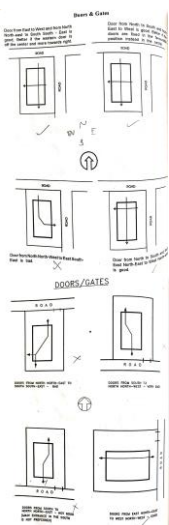


South West Winds →



THERMAL COMFORT ANALYSIS

WIND MOVEMENT – Door & Window positions



WINTER

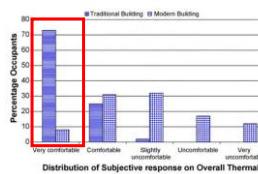


Fig. 4. Distribution of subjective response on overall thermal comfort in winter season.

SUMMER

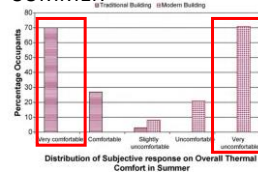


Fig. 8. Distribution of subjective response on overall thermal comfort in summer season.

RAINY

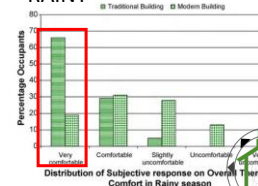


Fig. 12. Distribution of subjective response on overall thermal comfort in rainy season.

GREEN BUILDING SYSTEM – COMPLETELY SUSTAINABLE?

AIM :

To find the comfort level of occupants in LEED rated buildings in India & it's efficiency.

METHODOLOGY

Few buildings under LEED certified (Silver, Gold & Platinum) were selected & quantitatively analyzed the building performance, IAQ as shown in table below. They were then taken average & represent as graph for Analysis.

CONCLUSION

Most of the people were affected either by head ache or were feeling tired. This helps us to know that there is some factor which has to be seen upon to overcome this factor.

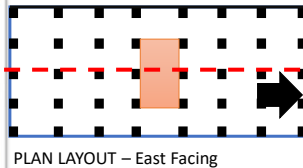
Prevalence of SBS Symptoms in Silver, Gold and Platinum Buildings

	Silver	Gold	Platinum
Number of surveys	40	50	50
Eye irritation, %	0.02	0.02	0.05
Nose irritation, %	0	0	0
Throat dryness, %	0	0.02	0.07
Tiredness/lethargy, %	54.1	48.8	31.7
Headaches, %	43.2	48.8	56.1
Skin dryness, %	0	0.02	0

2000 TOWER OAKS BOUVELARD, MARY LAND, US

Orientation of the building:

- East-facing buildings are associated with good fortune, creativity, and alertness.
- North-facing, with financial success.
- All other directions create loss, ill health and quarrelling.
- East-facing allows a greater amount of sunlight into a building, further reducing demand for artificial light and reducing heat load in the building. "Human beings need to experience the full range of daylight to create biological chemicals that keep us balanced and focused,
- Research had shown that receptors in human eyes were able to detect changes in the color of light and were involved in setting the human biological clock.



PLAN LAYOUT – East Facing



SECTION LAYOUT

- Basement parking is below the main structure.
- Each floor has clear height of 9'3" according to Vastu

Proportion: Height, width, length all are considers. These are the basic considerations in of architecture followed by designers of Vastu.

Center point: In this building, the brahmasthan stone in the main elevator lobby is the representation of the center.

Fencing or surrounds: The building should be encapsulated or surrounded with a fence, or a wall, or a garden. This is the classic use of the word, "Vastu," a defined fence surrounding the building. The building is placed within the vastu, following defined proportions.



REF :IMPACT OF INDOOR ENVIRONMENT QUALITY ON SICK BUILDING SYNDROME IN INDIAN LEED CERTIFIED BUILDINGS
Jagannathan MOHAN

ENERGY EFFICIENT STRATEGIES & BUILDING SYTEMS

ENERGY EFFICIENT STRATEGIES

The notable energy efficient features that are included in this building are

- Chiller/Compreser Units** - low-friction magnetic bearing centrifugal chiller/compressor
- Enthalpy wheel** -
- Co2 Monitoring Systems.**

ANALYSIS & INFERENCE

- As most of the buildings re-use return air which reduces the quality of Indoor Air, is not followed here.
- As seen earlier, Most of problem caused to occupants were due to IEQ. This quality has been met in this particular building.
- As it an principle also in Vastu, as seen in traditional architecture, complete air exchange is required for healthy environment.

2000 Tower Oaks Boulevard

LEED BD+C: Core and Shell (v2.0)

PLATINUM, AWARDED APR 2009

SUSTAINABLE SITES	AWARDED: 12 / 15
SS01 Construction activity pollution prevention	REQUIRED
SS01 Site selection	1/1
SS02 Development density and connectivity	8/1
SS03 Brownfield redevelopment	8/1
SS04.1 Alternative transportation - public transportation access	8/1
SS04.2 Alternative transportation - bicycle storage and changing rooms	1/1
SS04.3 Alternative transportation - low emitting and fuel efficient vehicles	1/1
SS04.4 Alternative transportation - parking capacity	1/1
SS04.1 Site development - protect or restore habitat	1/1
SS04.2 Site development - maximize open space	1/1
SS04.1 Stormwater design - quantity control	1/1
SS04.2 Stormwater design - quality control	1/1
SS04.1 Heat island effect - non roof	1/1
SS04.2 Heat island effect - roof	1/1
SS04.1 Light pollution reduction	1/1
SS04.1 Tenant design and construction guidelines	1/1
WATER EFFICIENCY	AWARDED: 4 / 5
WE01.1 Water efficient landscaping - reduce by 50%	1/1
WE02.1 Water efficient landscaping - no potable water use or no irrigation	1/1
WE02.2 Innovative wastewater technologies	8/1
WE02.1 Water use reduction - 20% reduction	1/1
WE02.2 Water use reduction - 30% reduction	1/1
ENERGY & ATMOSPHERE	AWARDED: 11 / 14
EA01 Fundamented commissioning of the building energy systems	REQUIRED
EA02 Minimum energy performance	REQUIRED
EA03 Fundamented refrigerant Mgmt	REQUIRED
EA01 Optimize energy performance	8/1
EA02 On-site renewable energy	8/1
EA03 Enhanced Commissioning	1/1
EA04 Enhanced refrigerant Mgmt	1/1
EA04.1 Measurement and verification - base building	1/1
EA04.2 Measurement and verification - tenant subbuilding	1/1
EA04.1 Green power	1/1

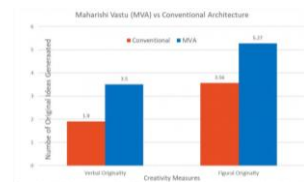
MATERIAL & RESOURCES	CONTINUED
MR01.3 Building reuse - maintain 75% of existing walls, floors and roof	8/1
MR01.1 Construction waste - divert 75% from disposal	1/1
MR01.2 Construction waste - divert 75% from disposal	1/1
MR02 Materials reuse - 35%	8/1
MR04.1 Recycled content - 10% (post consumer + 1/2 pre consumer)	1/1
MR04.2 Recycled content - 20% (post consumer + 1/2 pre consumer)	1/1
MR05 Regional materials - 20% extracted, processed and manufactured regionally	1/1
MR05.2 Regional materials - 20% extracted, processed and manufactured regionally	1/1
MR06 Certified wood	8/1
INDOOR ENVIRONMENTAL QUALITY	AWARDED: 8 / 12
EQ01 Minimum IAQ Performance	REQUIRED
EQ02 Environmental Tobacco Smoke (ETS) control	REQUIRED
EQ04 Outdoor air delivery monitoring	1/1
EQ02 Increased ventilation	1/1
EQ03 Construction IAQ Mgmt plan - during construction	1/1
EQ04.1 Low emitting materials - adhesives and sealants	1/1
EQ04.2 Low emitting materials - paints and coatings	8/1
EQ04.3 Low emitting materials - carpet systems	8/1
EQ04.4 Low emitting materials - composite wood and agfiber products	8/1
EQ05 Indoor chemical and pollutant source control	1/1
EQ04.1 Controllability of systems - thermal comfort	8/1
EQ04.2 Thermal comfort - design	1/1
EQ04.3 Daylight and views - daylight 10% of spaces	8/1
EQ04.3 Daylight and views - views for 10% of spaces	1/1
INNOVATION	AWARDED: 5 / 5
ID01 Innovation in design	1/1
ID02 LEED Accredited Professional	1/1
TOTAL	46 / 62

METHODOLOGY: A few number of workers were shifted from conventional office to this office to test their efficiency in work & for any changes due to difference in built environment.

They were tested earlier & after 4 months in Office with Vastu principle, using the method of hypothesis to quantify the difference.

RESULTS : There was increase in efficiency of workers who worker in office built following Vastu principles which is shown in graph below.

INFERENCE : We understand that Vastu principles can bring positive change in occupants which helps to improve environmental, social & economical sustainability which is the goal to be achieved.



Source: Anil K. Maheshwari & Margaret Rose P. Ward (2016). Architecture and Creativity: Examining the Impact of Maharshi Vastu on Workplace Creativity. Creativity Research Journal, 28(1), 10-18. DOI: 10.1080/10439862.2016.1147777



REF : DESIGN CREATES FORTUNE – 2000 TOWER OAKS BOULEVARD, By JOHN D. MACOMBER & GRIFFIN H. JAMES

DESIGN – LIVE PROPOSAL

LOCATION : PERUNGALATHUR, CHENNAI



- 4.57 acres of land (Casagrand Vistaaz) boasts of an efficient building footprint where 65% of land area is open space
- 7.2 m & 6m wide two way driveways are planned across the site for comfortable vehicular movement
- Community providing ample indoor amenities for the residents
- 20,000 sqft. of greenscape is sprawled with leisure amenities for all age groups

INDOOR AMENITIES

1. Multi-purpose party hall
2. AV Room
3. Gym
4. Outdoor functional training
5. Indoor games room
6. Hooky ring toss
7. Dartboard wall
8. Kids' play area
9. Kids' ball pool
10. Board games corner

OUTDOOR AMENITIES

11. Entrance plaza
12. Multi-purpose sports court
13. Hangout plaza
14. Party lawn
15. Kids' play area
16. Senior citizens' court
17. Sand pit
18. Toilet
19. Hopsotch
20. Amphitheatre
21. Outdoor gym
22. Reflexology path
23. Walking/jogging track
24. Jungle gym
25. Cycle parking
26. Rock climbing wall
27. Trampoline
28. Interactive sculpture court
29. Chalkboard wall
30. Activity lawn
31. Skating rink
32. Meditation lawn (fragrant court)
33. Chompaka court
34. Swimming pool
35. Kids' pool

- Elegantly crafted 101 villas spread across a sprawling (3BHK & 4BHK Villas)
- Ground floor + 1st floor + terrace design structure
- Chennai's first luxurious British styled villas
- Thoughtfully designed boutique community with exclusive 3 BHK villas
- 65% open space with abundant greenery for ample light & ventilation
- Offers 30+ lifestyle amenities & features that include swimming pool, party hall, outdoor gym, mini theatre, children play area & many more
- Stylishly designed 4500 sqft. Clubhouse – Club Victoria
- 100% Vaastu compliant homes with zero dead space design
- Surrounded by prominent companies, educational institutions & other hub



SITE ANALYSIS

SURROUNDINGS & AMINITIES



HOSPITAL/CLINICS



RETAIL STORE



GYMS



PARKS



RESTAURANTS



MARKET

CONNECTIVITY

Vandalur- Kelambakkam Road- 400Mts
Kolapakkam Bus Stop- 400Mts
Vandalur Railway Station- 7Kms
Perungalathur Railway Station- 5Kms
Airport- 19Kms

SCHOOLS

SSM School- 3Kms
GKM Vidyashram School- 3Kms
Euro Kids School- 6Kms
The Park School- 6Kms
Ebenezer Matric. School- 6Kms

HOSPITALS

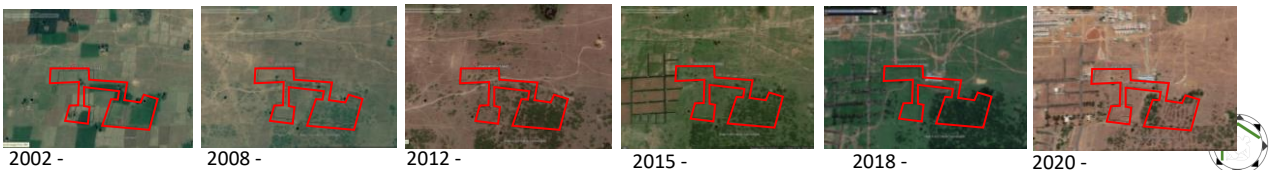
Tagore Medical Hospital- 3Kms
Hindu Mission Hospital- 3Kms
Deepam Hospital- 6Kms

SITE PICTURES



The current condition on Site is that, existing bushes and thorny shrubs have been cleared off from site and the slope level is still maintained on site. The surrounding have sparsely located residential buildings of G-G+1 height and mostly barren lands.

SITE CHRONOLOGY



SITE ANALYSIS

SOIL TYPE :

HARD ROCK SOIL

Types of Soil	Bearing Capacity (Kg/m ²)	Bearing Capacity (kN/m ²)
Soft rocks	45000	450

Being hard rock soil at site , it is difficult to develop high rise structure & vegetation cannot be deep rooted trees.



SANITATION & WATER SUPPLY

The water does not have any direct water supply lines currently. The water is to be outsourced from nearby Chembarabakkam lake or through bore wells.

SLOPE ANALYSIS

The site seems to have slope towards the North & East overall. This would aptly suit the Vastu guidelines where the Slope should be from SW to NE which provides the various advantages as seen earlier.



Section 1



Section 2



Section 5



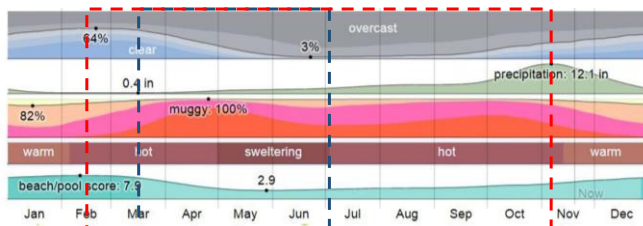
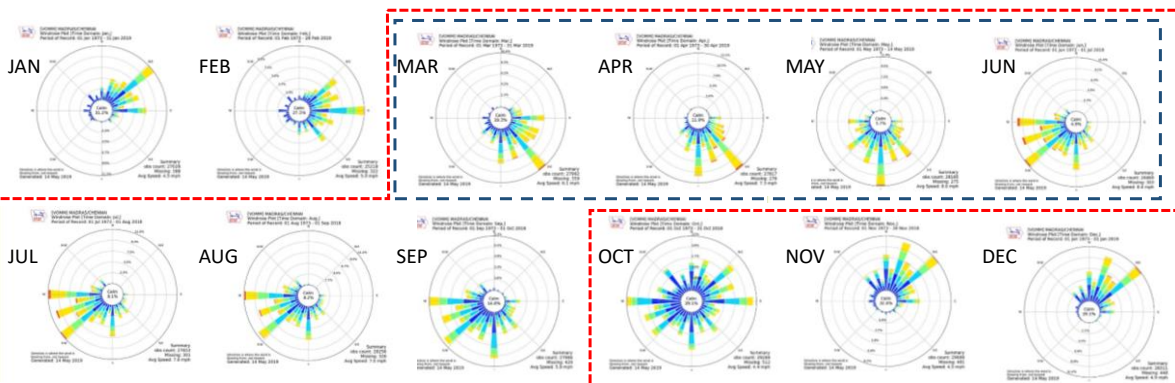
Section 3



Section 4



CLIMATE ANALYSIS - CHENNAI



ANALYSIS

TEMPERATURE - The hottest temperature is during may & june reaching 81F to 98F & coldest during november to january with temprature from 71F-84F which is comfortable during morning time of the day.

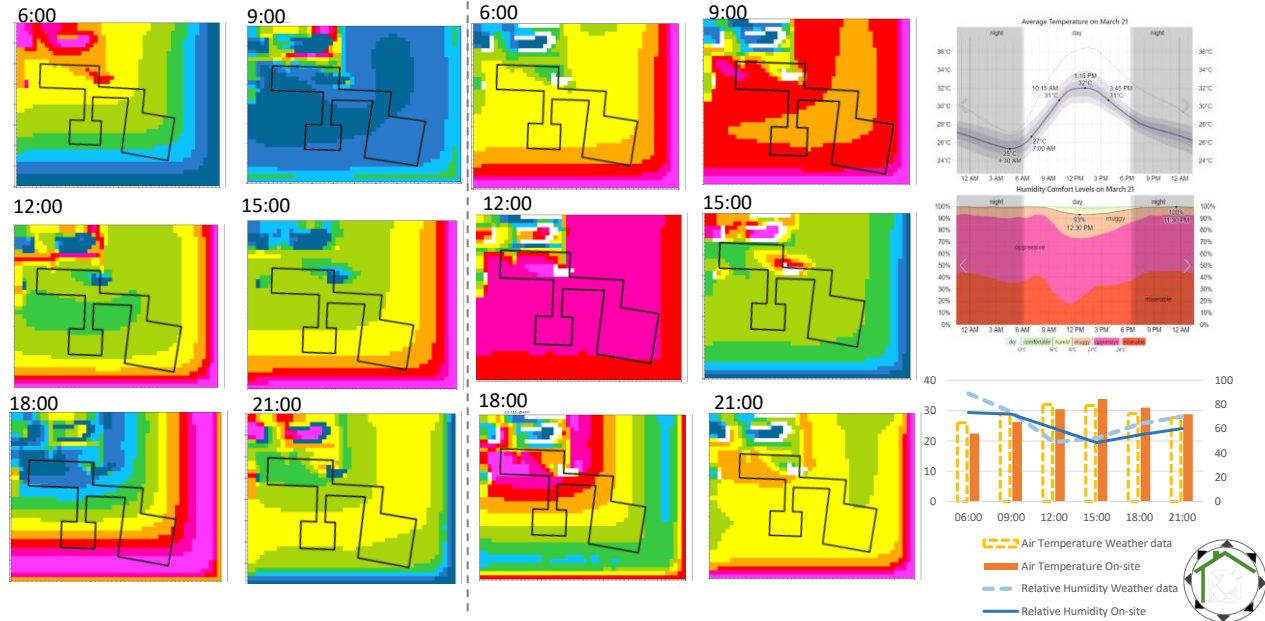
HUMIDITY - The relative humidity is comparitively high during all months causing major discomfort during april with 100% RH.

RAINFALL & PRECIPITATION - Highest during november with 12in rainfall.



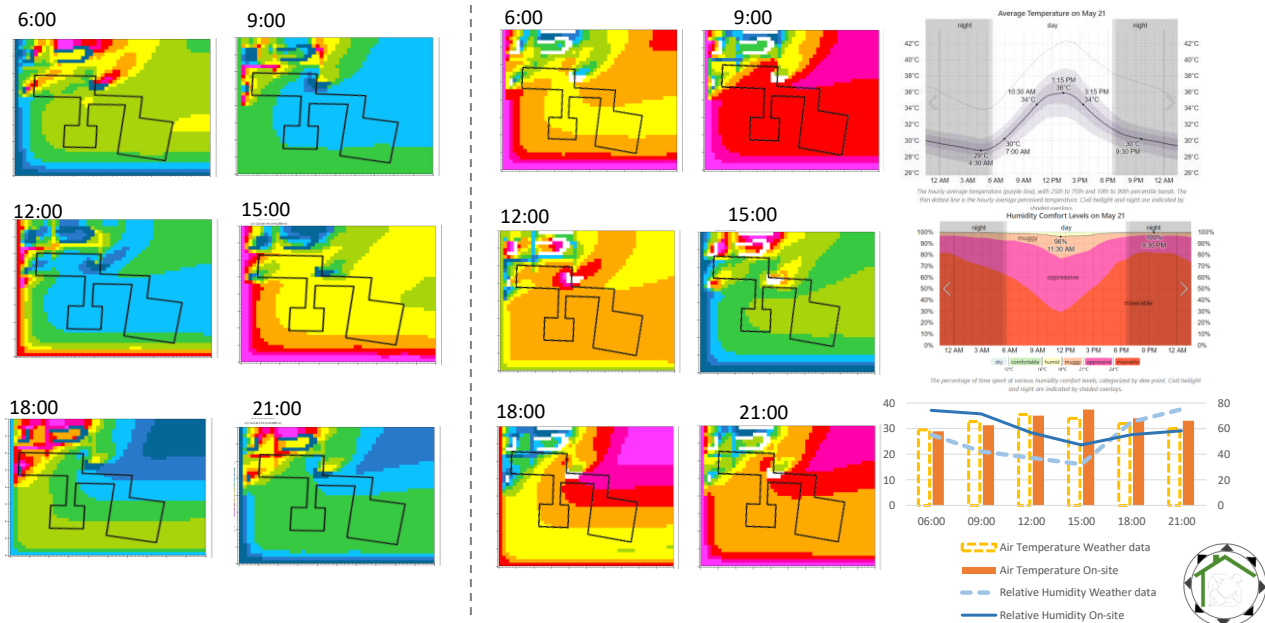
SITE ANALYSIS - CLIMATE

March – AIR TEMPERATURE & RELATIVE HUMIDITY



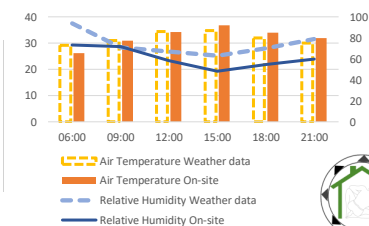
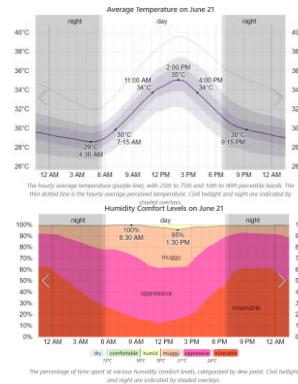
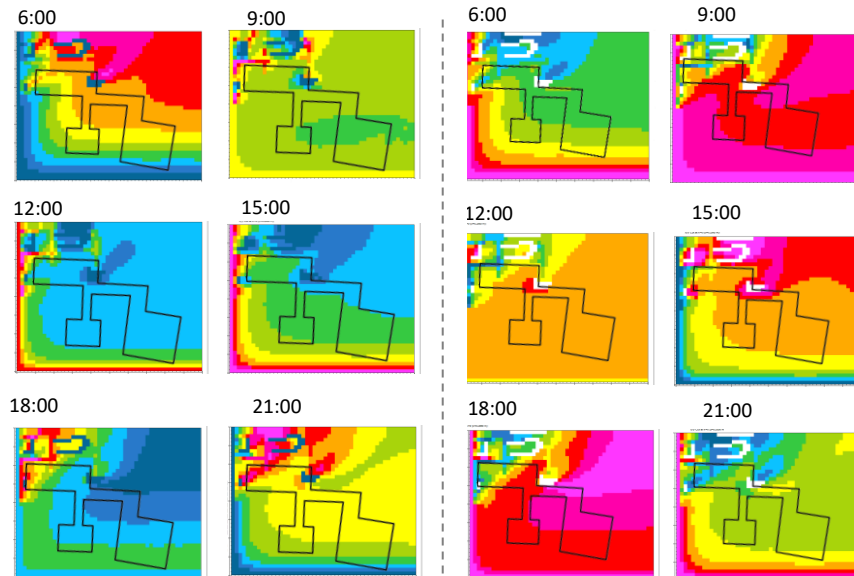
SITE ANALYSIS - CLIMATE

MAY – AIR TEMPERATURE & RELATIVE HUMIDITY



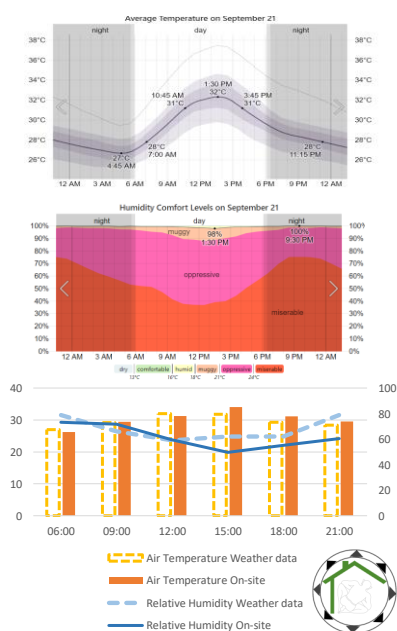
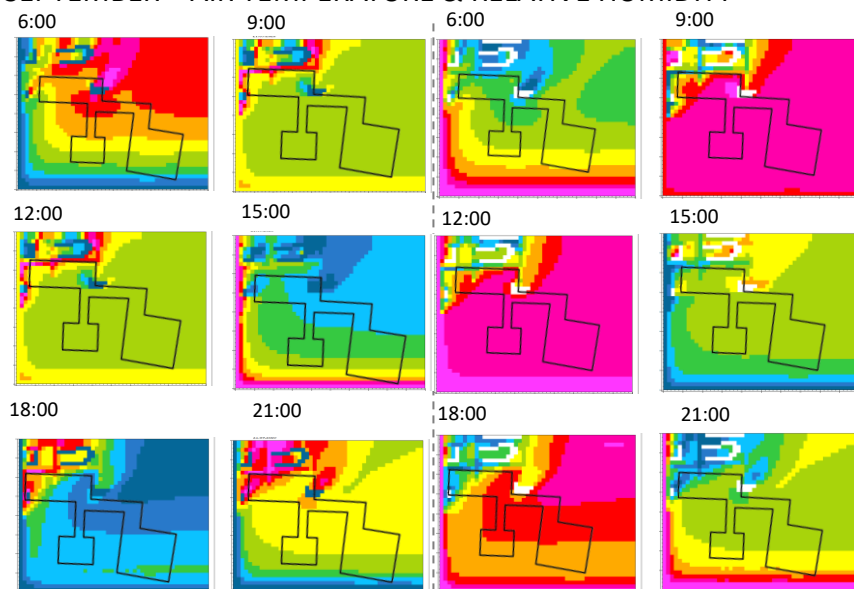
SITE ANALYSIS - CLIMATE

JULY – AIR TEMPERATURE & RELATIVE HUMIDITY



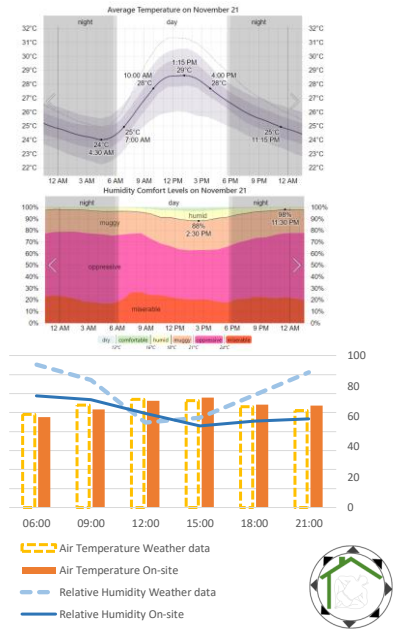
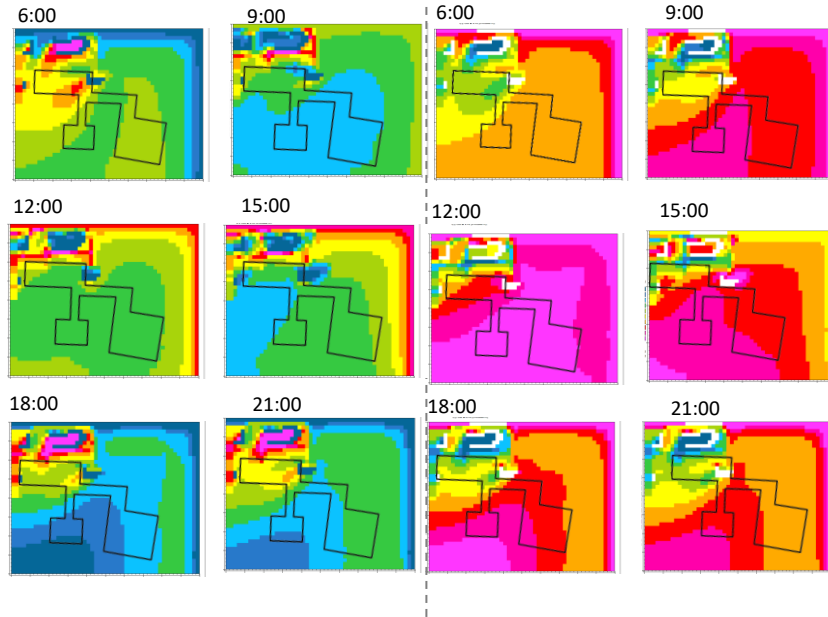
SITE ANALYSIS - CLIMATE

SEPTEMBER – AIR TEMPERATURE & RELATIVE HUMIDITY



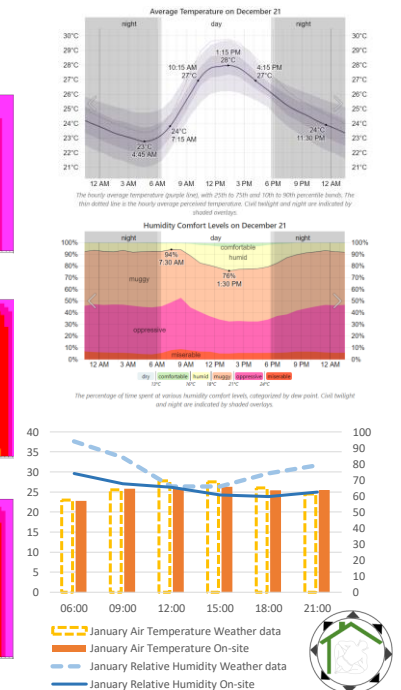
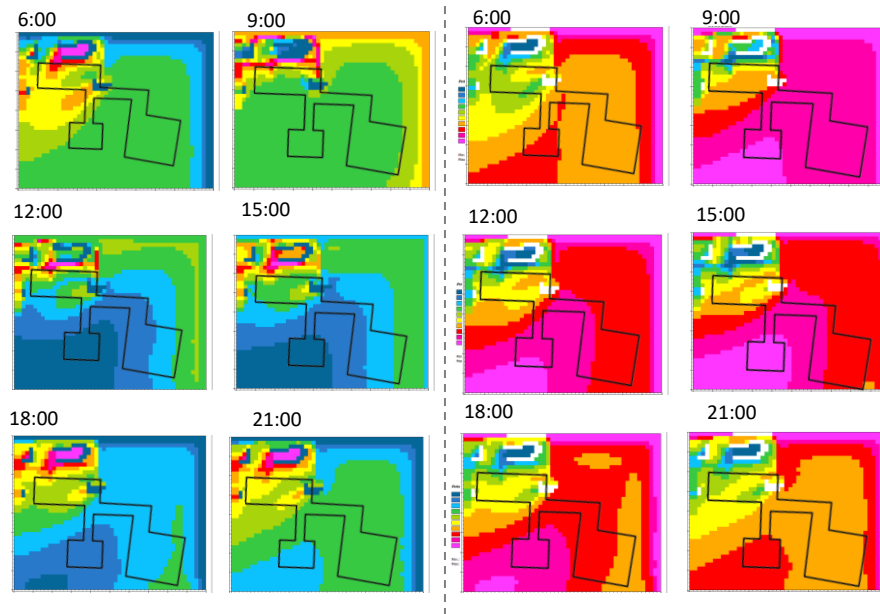
SITE ANALYSIS - CLIMATE

NOVEMBER – AIR TEMPERATURE & RELATIVE HUMIDITY



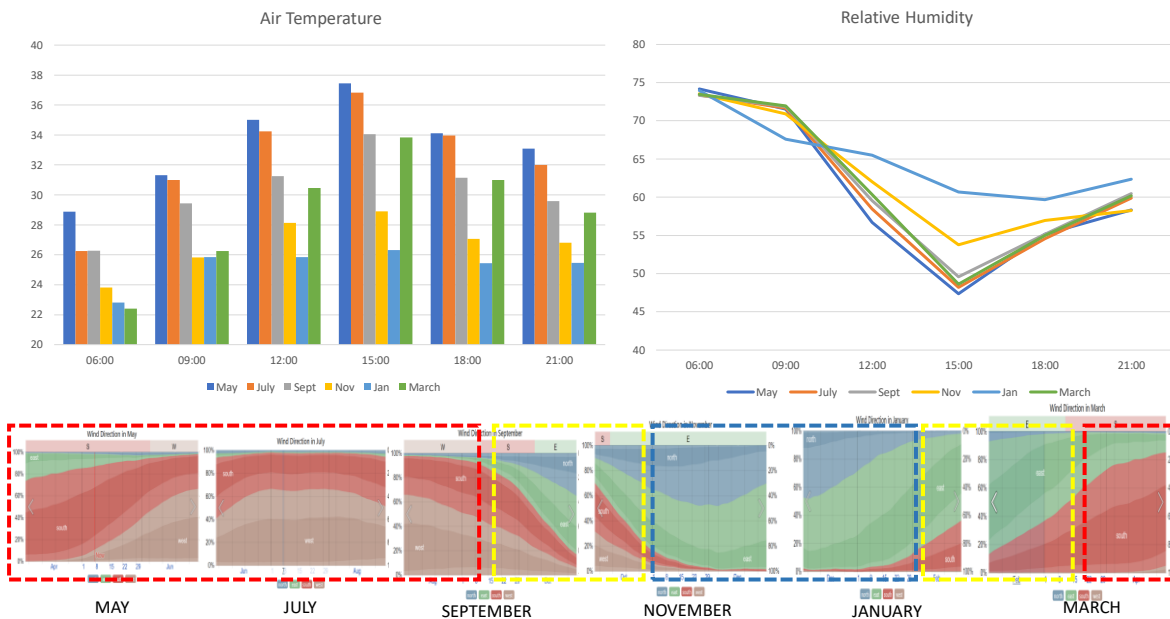
SITE ANALYSIS - CLIMATE

JANUARY – AIR TEMPERATURE & RELATIVE HUMIDITY



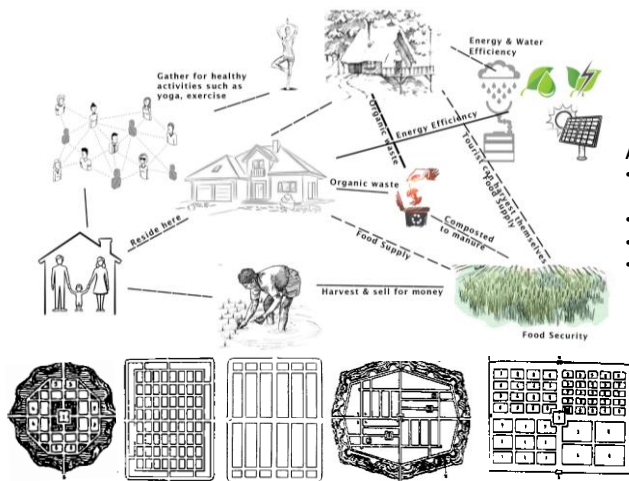
SITE ANALYSIS

ENVIMET – ANNUAL CLIMATE

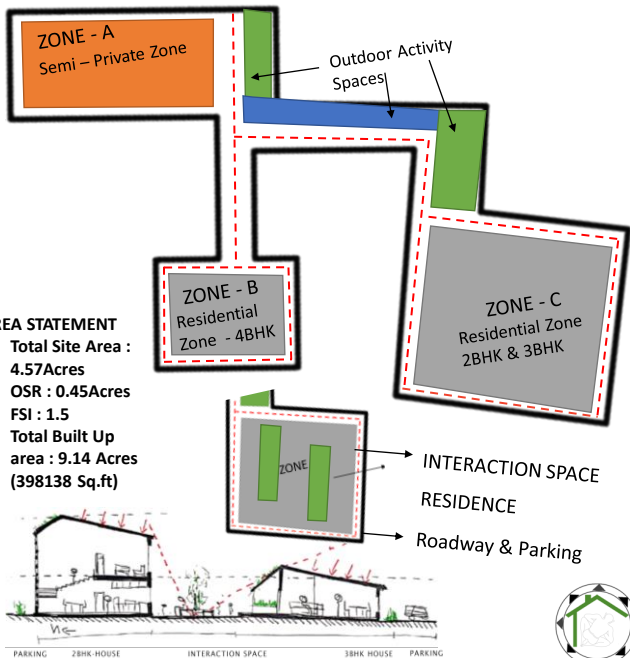


DESIGN PROPOSAL - Revised

A green township design with reference to IGBC guidelines which are enhanced by sustainable Strategies of Vastu Shastra for sustainable development in terms of Health & Environmental well-being.



SITE ZONING



SITE ZONING

PADMAKA

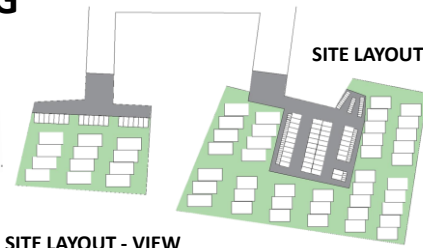


ZONE B

- Total Area : 2721 Sq.m
- Plot coverage : 783 Sq.m
- Green Cover: 1229 Sq.m
- Road & Parking Area : 709 Sq.m

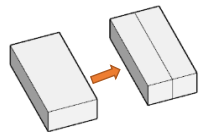
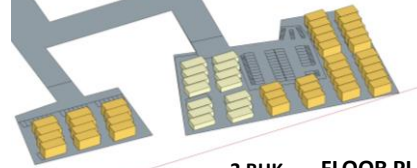
ZONE C

- Total Area : 7573 Sq.m
- Plot coverage : 2695 Sq.m
- Green Cover: 3088 Sq.m
- Road & Parking Area : 1790 Sq.m

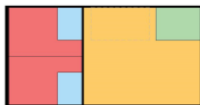


SITE LAYOUT

SITE LAYOUT - VIEW



2 BHK



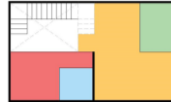
- LIVING/DINING
- KITCHEN
- BEDROOM
- TOILET
- BALCONY

3 BHK FLOOR PLANS

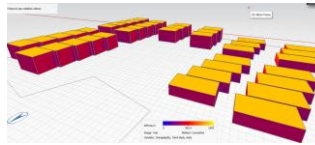
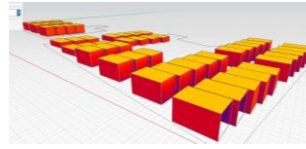
FIRST FLOOR



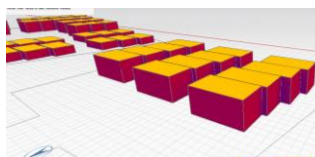
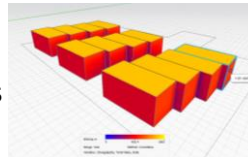
GROUND FLOOR



ZONE - C



ZONE - B



SOLAR ANALYSIS

NORTH EAST WINDS



SOUTH EAST WINDS



SOUTH WEST WINDS

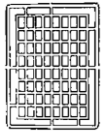


WIND ANALYSIS



SITE ZONING

SARVATOBHADRA

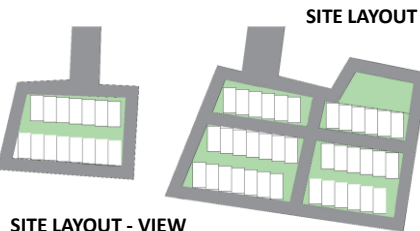


ZONE B

- Total Area : 2721 Sq.m
- Plot coverage : 1165 Sq.m
- Green Cover: 443 Sq.m
- Road : 1112 Sq.m

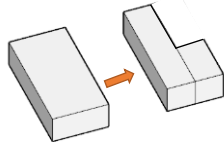
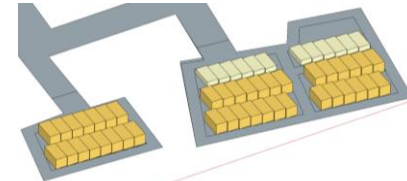
ZONE C

- Total Area : 7573 Sq.m
- Plot coverage : 2897 Sq.m
- Green Cover: 1695 Sq.m
- Road : 2981 Sq.m



SITE LAYOUT

SITE LAYOUT - VIEW

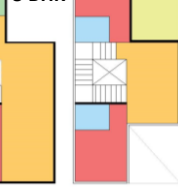


- LIVING/DINING
- KITCHEN
- BEDROOM
- TOILET
- BALCONY
- CAR PARK

2 BHK

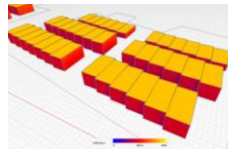
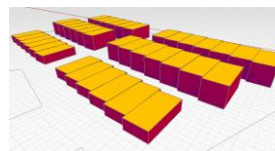


3 BHK

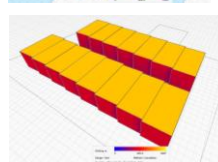
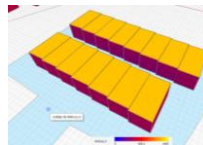


GROUND FLOOR FIRST FLOOR

ZONE - C

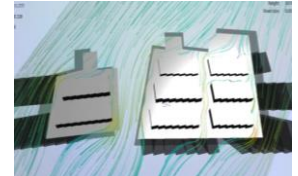


ZONE - B

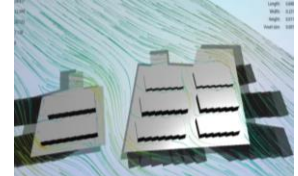


SOLAR ANALYSIS

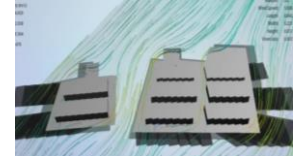
NORTH EAST WINDS



SOUTH EAST WINDS



SOUTH WEST WINDS

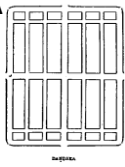


WIND ANALYSIS



SITE ZONING

DANDAKA



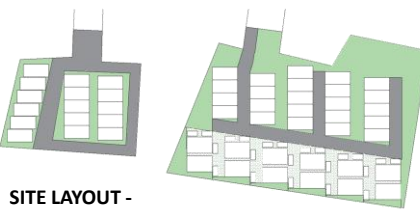
ZONE B

- Total Area : 2721 Sq.m
- Plot coverage : 968 Sq.m
- Green Cover: 850 Sq.m
- Road : 903 Sq.m

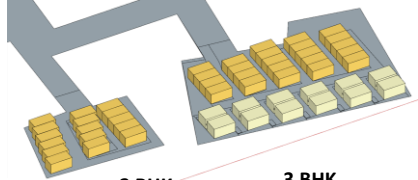
ZONE C

- Total Area : 7573 Sq.m
- Plot coverage : 3386 Sq.m
- Green Cover: 2257 Sq.m
- Road : 1180 Sq.m
- Parking : 750 Sq.m

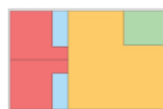
SITE LAYOUT



SITE LAYOUT - VIEW



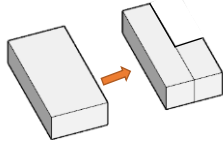
2 BHK



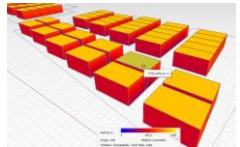
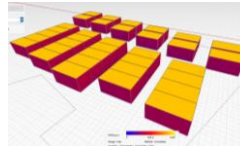
3 BHK



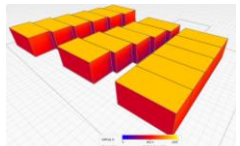
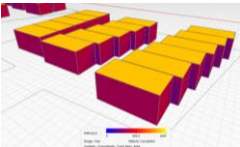
- LIVING/DINING
- KITCHEN
- BEDROOM
- TOILET
- BALCONY



ZONE - C

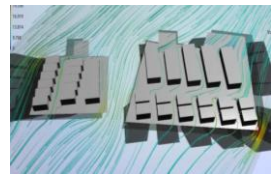


ZONE - B

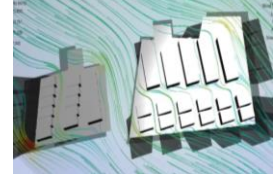


SOLAR ANALYSIS

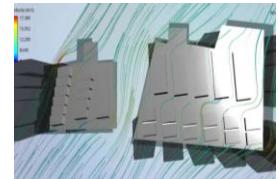
NORTH EAST WINDS



SOUTH EAST WINDS



SOUTH WEST WINDS

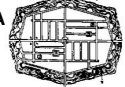


WIND ANALYSIS



SITE ZONING

SWASTIKA



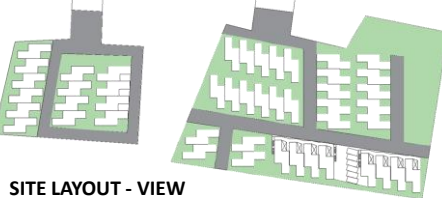
ZONE B

- Total Area : 2721 Sq.m
- Plot coverage : 883 Sq.m
- Green Cover: 1024 Sq.m
- Road & : 814 Sq.m

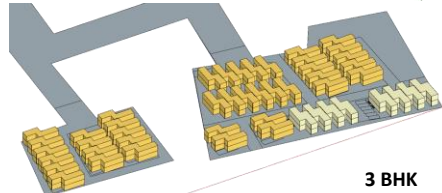
ZONE C

- Total Area : 7573 Sq.m
- Plot coverage : 2923 Sq.m
- Green Cover: 3045 Sq.m
- Road & Parking : 1605 Sq.m

SITE LAYOUT



SITE LAYOUT - VIEW



2 BHK



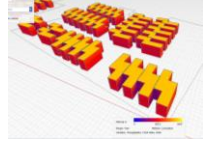
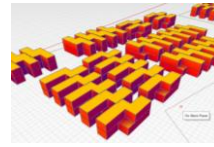
3 BHK



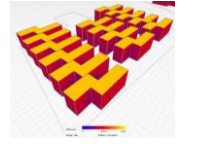
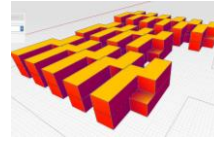
- LIVING / DINING
- KITCHEN
- BEDROOM
- TOILET
- BALCONY
- CAR PARK

GROUND FLOOR FIRST FLOOR

ZONE - C

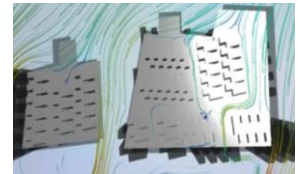


ZONE - B



SOLAR ANALYSIS

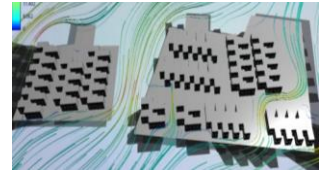
NORTH EAST WINDS



SOUTH EAST WINDS



SOUTH WEST WINDS

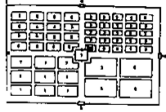


WIND ANALYSIS



SITE ZONING

PRASTARA

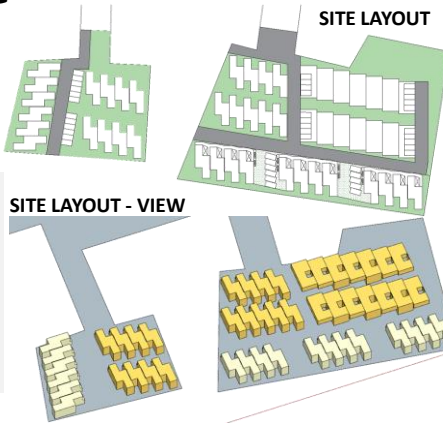


ZONE B

- Total Area : 2721 Sq.m
- Plot coverage : 1003 Sq.m
- Green Cover: 1306 Sq.m
- Road & Parking : 412 Sq.m

ZONE C

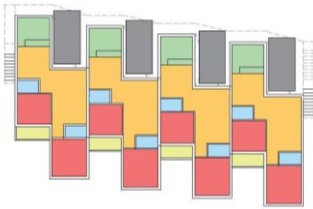
- Total Area : 7573 Sq.m
 - Plot coverage : 3619 Sq.m
 - Green Cover: 2486 Sq.m
 - Road : 1198 Sq.m
- Paver Area : 2725sq.m



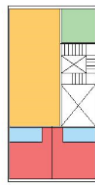
SITE LAYOUT - VIEW

SITE LAYOUT

2 BHK



2 BHK

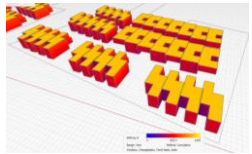
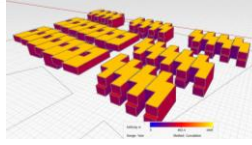


3 BHK

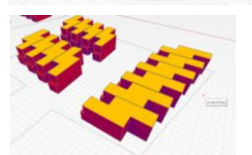
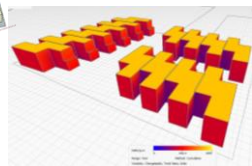


GROUND FLOOR FIRST FLOOR

ZONE - C

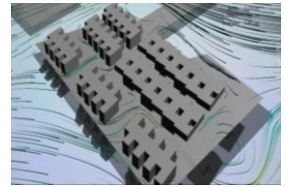


ZONE - B

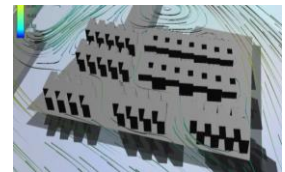


SOLAR ANALYSIS

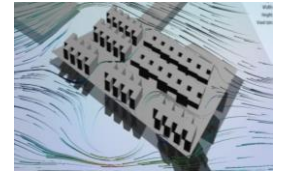
NORTH EAST WINDS



SOUTH EAST WINDS



SOUTH WEST WINDS



WIND ANALYSIS



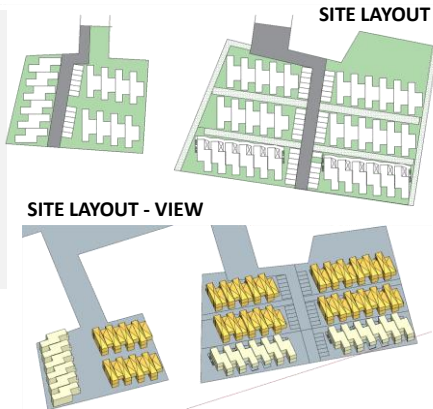
SITE ZONING

ZONE B

- Total Area : 2721 Sq.m
- Plot coverage : 999 Sq.m
- Green Cover: 1294 Sq.m
- Road & Parking Area : 428 Sq.m

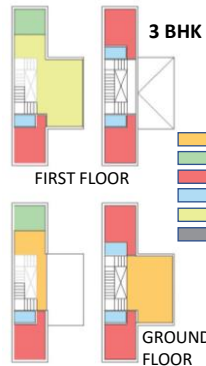
ZONE C

- Total Area : 7573 Sq.m
- Plot coverage : 3076 Sq.m
- Green Cover: 2650 Sq.m
- Road & Parking Area : 827 Sq.m
- Paver Area : 1020 Sq.m



SITE LAYOUT - VIEW

SITE LAYOUT

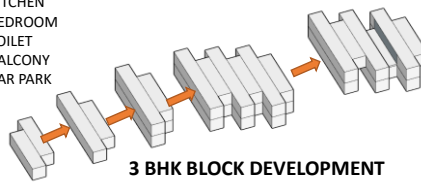


3 BHK

- LIVING/DINING
- KITCHEN
- BEDROOM
- TOILET
- BALCONY
- CAR PARK

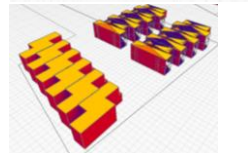
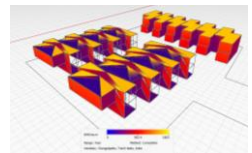
FIRST FLOOR

GROUND FLOOR

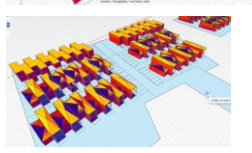
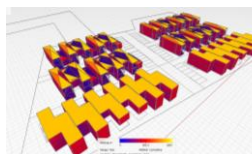


3 BHK BLOCK DEVELOPMENT

ZONE - C

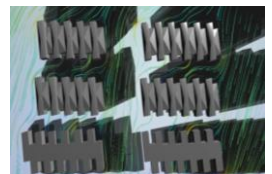


ZONE - B

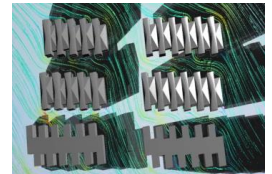


SOLAR ANALYSIS

NORTH EAST WINDS



SOUTH EAST WINDS



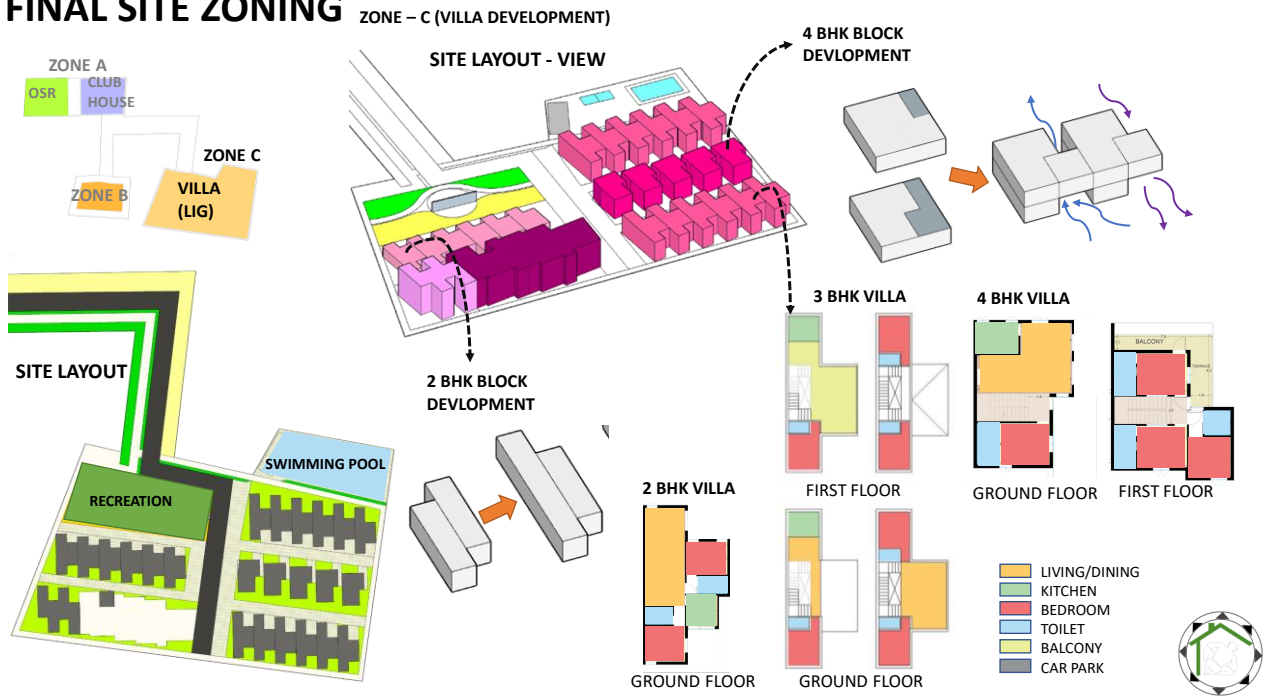
SOUTH WEST WINDS



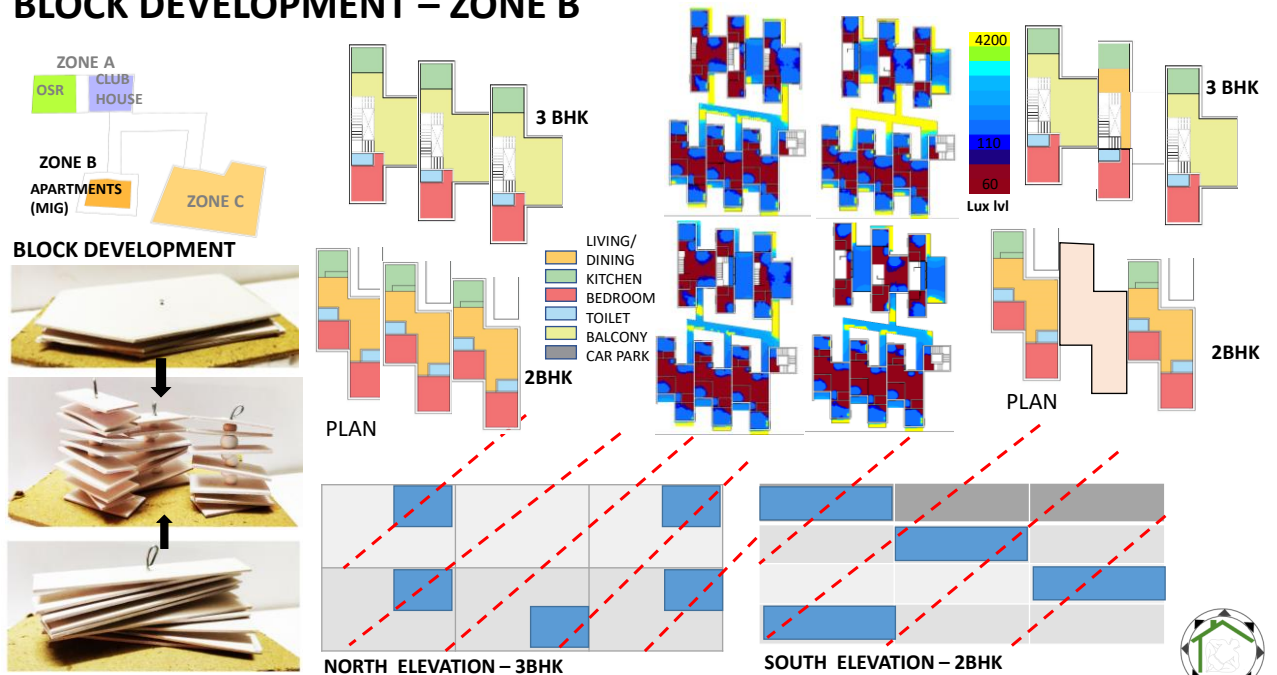
WIND ANALYSIS



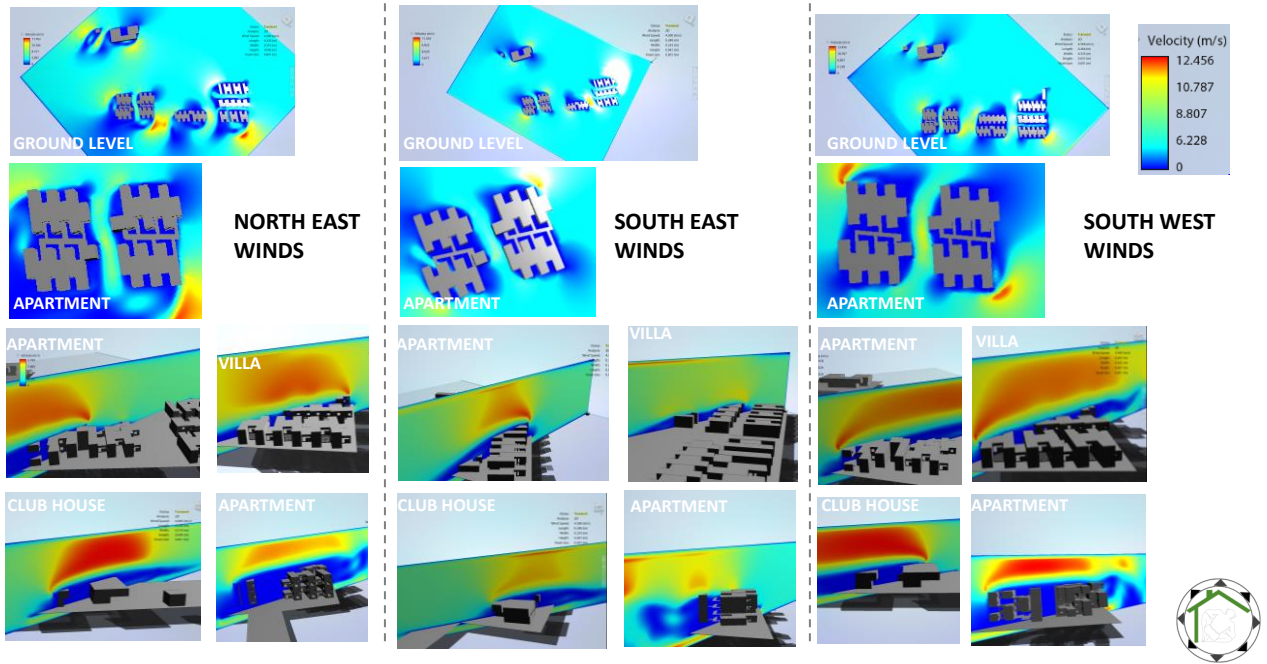
FINAL SITE ZONING



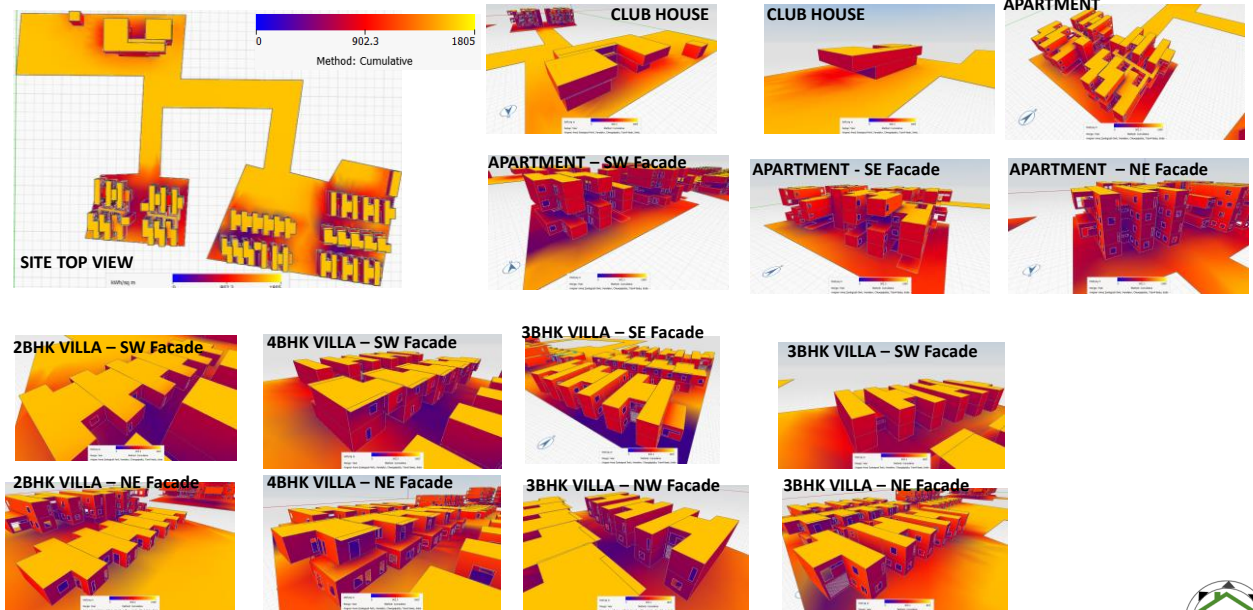
BLOCK DEVELOPMENT – ZONE B



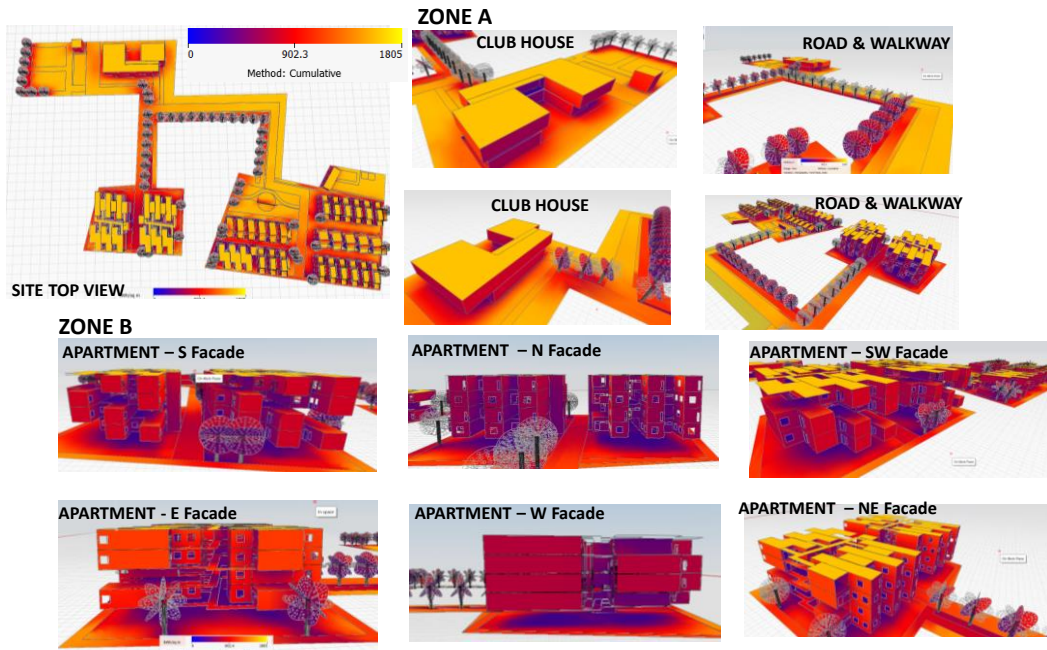
WIND ANALYSIS (Flow design)



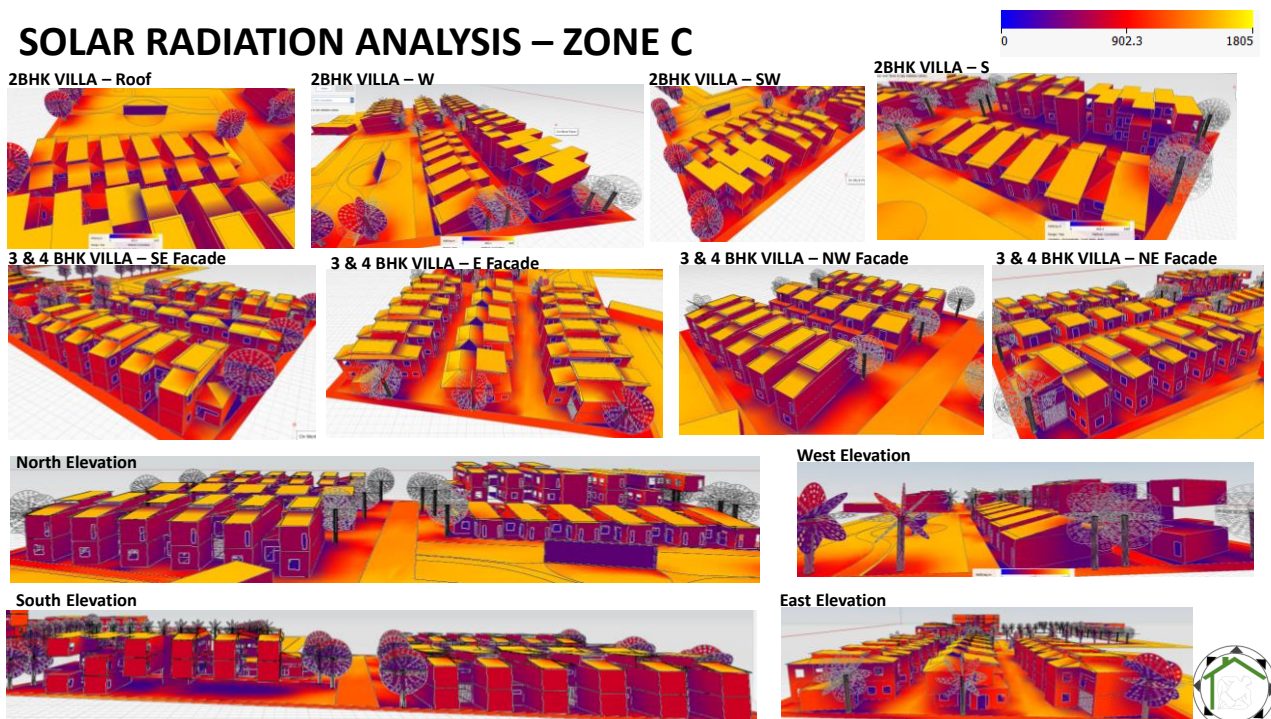
SOLAR RADIATION ANALYSIS (Autodesk FORM It)



SOLAR RADIATION ANALYSIS - PROPOSAL



SOLAR RADIATION ANALYSIS – ZONE C



SITE PLAN & SECTIONS

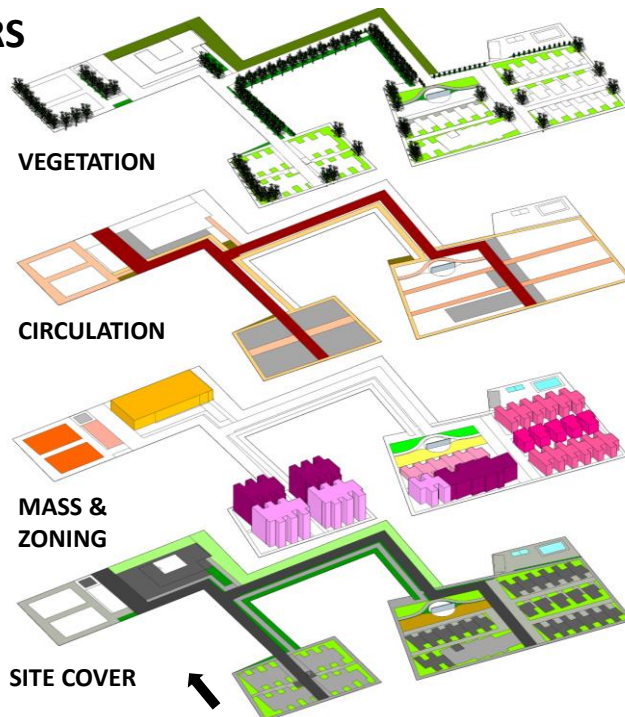


SITE PLAN - LAYERS

- CIRCULATION**
- Car Parking : 10+60 Nos
 - 2-wheeler Parking : 30+125 Nos
 - Bicycle Parking : Common Areas
 - Car/Truck Way – Concrete
 - 2-wheeler way – Grass Pavers
 - Walk/Bicycle way – Paver Blocks



- SITE COVER**
- Vegetation : 4288 Sq.m
 - Cement : 3411 Sq.m
 - Pavers : 3621 Sq.m
 - Grass Pavers : 2635 Sq.m
 - Plot Cover : 2497 Sq.m



- VEGETATION**
- Farming : 1977 Sq.m
 - Urban farming : 1650 Sq.m
 - Tree Cover : 297 Sq.m
 - Shrub Cover : 178 Sq.m
 - Turf & Flora, other species: 1560 Sq.m

- MASSING & ZONING**
- 2BHK Villa (G) : 6 Nos
 - 3BHK Villa (G+1): 12 Nos
 - 4BHK Villa (G+1): 5 Nos
 - 2BHK Apartments (G+3), (S+4): 22 Nos
 - 3BHK Apartments (S+4): 9 Nos
 - Club House
 - Wellness Garden : 435 Sq.m
 - Kids Play : 339 Sq.m
 - Pool Area : 703 Sq.m
 - Outdoor Sports : 1493 Sq.m
 - Market : 211 Sq.m

IGBC Credits : 17

FLOOR PLANS - APARTMENT

FIRST FLOOR PLAN



Area Statement

Room /Space	Type	Area (Sq.m)
Common Area		291
Corridor		246
Staircase & Lift		126

2 BHK

S.No	Room /Space	Type	Area (Sq.m)
1	Living		18.6
2	Dining		10.3
3	Kitchen		7.8
4	Bedroom		9.5
5	Toilet 1		2.8
6	Bedroom 2		10.3
7	Toilet 2		3.2
8	Balcony		3.8
			66.3
	Total built up Area		75.2

GROUND FLOOR PLAN



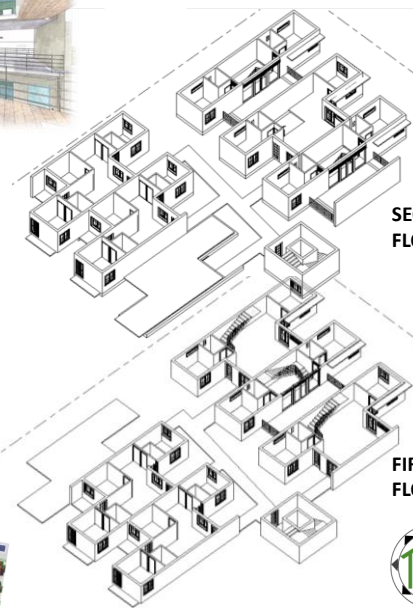
3 BHK

S.No	Room /Space	Type	Area (Sq.m)
1	Living		22.7
2	Dining		10.3
3	Staircase		7.6
4	Kitchen		9.2
5	Bedroom		10.7
6	Toilet 1		3.4
7	Corridor		4.8
8	Bedroom 2		10.7
9	Toilet 2		3.4
10	Bedroom 3		10.7
11	Toilet 3		3.4
			27.5
			124.4
	Total built up Area		156

CORRIDOR VIEW



ISOMETRIC VIEW



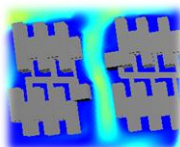
SECOND FLOOR

FIRST FLOOR

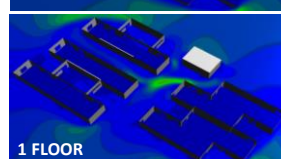
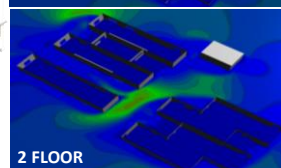
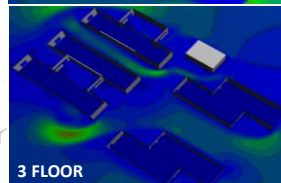
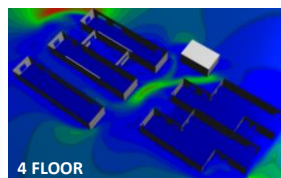
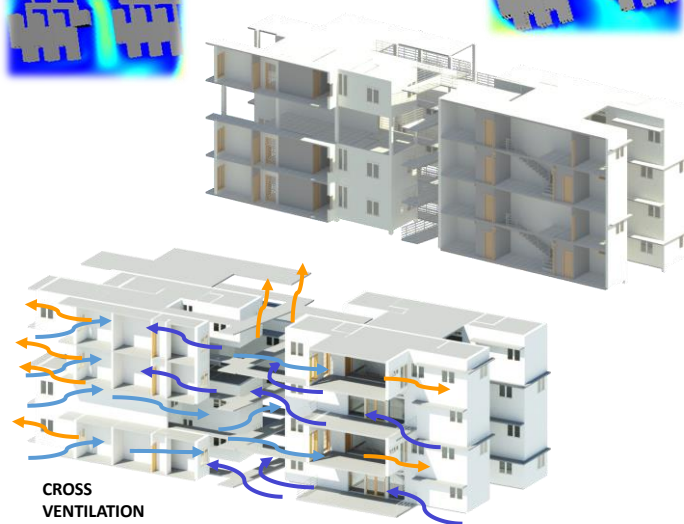
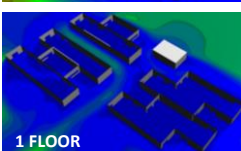
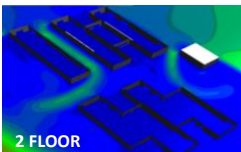
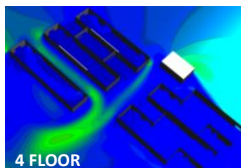
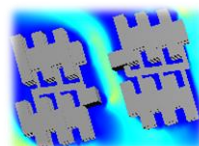


VENTILATION (Flow design)

NORTH EAST WINDS

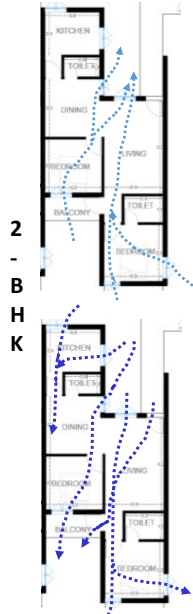


SOUTH EAST WINDS



VENTILATION - APARTMENTS

NORTH EAST WINDS



OPENABLE AREA

S.No	Room	Carpet Area (Sq.m)	Type of Window	Openable Area (Sq.m)	Total Openable Area (Sq.m)	% of Openable Area to Carpet Area - Achieved
1	Living, Dining	28.9	W1	1.296	5.994	20.74
			W1	1.296		
			GD1	3.402		
2	Bedroom 1	9.5	W1	1.296	1.296	13.64
3	Bedroom 2	10.3	W1	1.296	2.754	26.74
			W2	1.458		
4	Kitchen	7.8	W1	1.296	2.592	33.23
			W1	1.296		

OPENABLE AREA

S.No	Room	Carpet Area (Sq.m)	Type of Window	Openable Area (Sq.m)	Total Openable Area (Sq.m)	% of Openable Area to Carpet Area - Achieved
1	Living, Dining	34.2	W2	1.458	8.197	23.97
			W1	1.296		
			V1	0.34		
			GD1	3.402		
			GD2	1.701		
2	Bedroom 1	10.7	W1	1.296	1.636	15.29
			V1	0.34		
3	Bedroom 2	10.7	W1	1.296	1.636	15.29
			V1	0.34		
4	Bedroom 3	10.7	W1	1.296	1.636	15.29
			V1	0.34		
5	Kitchen	9.2	W1	1.296	2.592	28.17
			W1	1.296		

SOUTH EAST WINDS

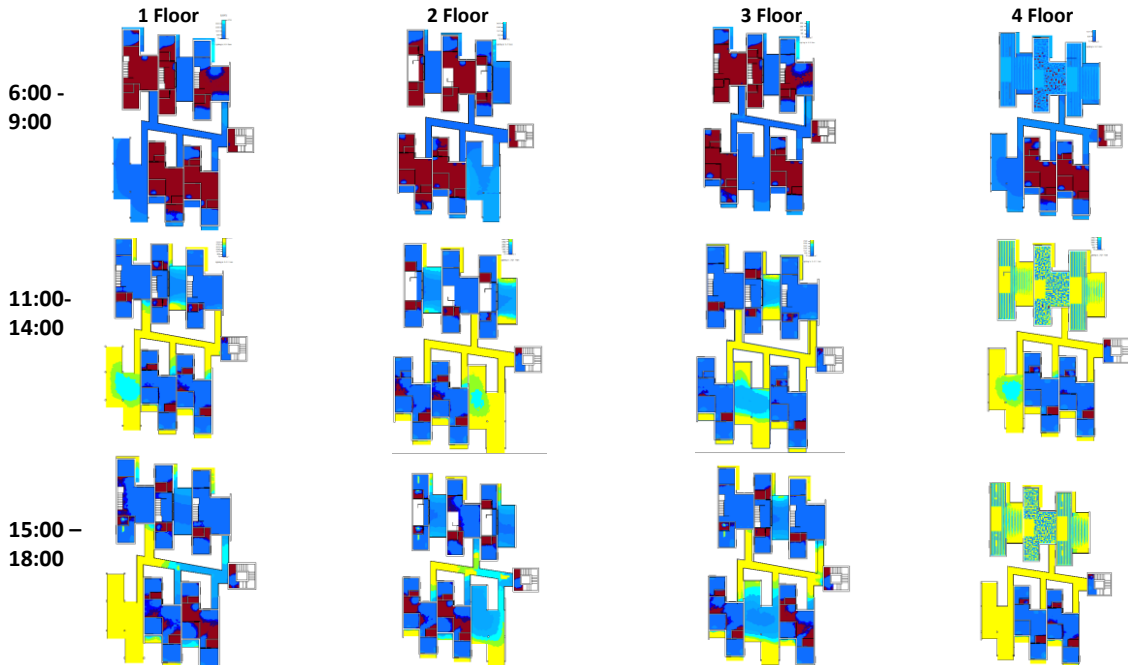
NORTH EAST WINDS



SOUTH EAST WINDS

DAY – LIGHTING

APARTMENTS – ZONE B



FLOOR PLANS – 2BHK VILLA

NORTH FACADE VIEW

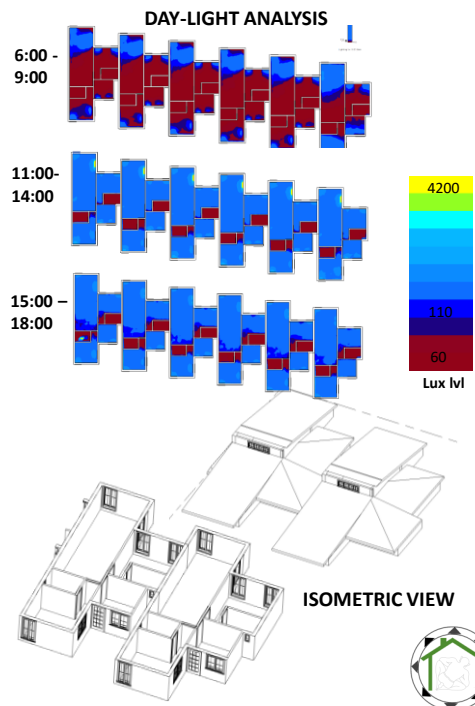


SOUTH FACADE VIEW



Area Statement

S.No	Room /Space	Type	Area (Sq.m)
1	Foyer		8.8
2	Living		17.1
3	Dining		10
4	Kitchen		6.4
5	Bedroom		10.3
6	Toilet 1		4.1
7	Bedroom 2		11.4
8	Toilet 2		3.4
9	Backyard		9.9
	Total built up Area		81.4
			74.9



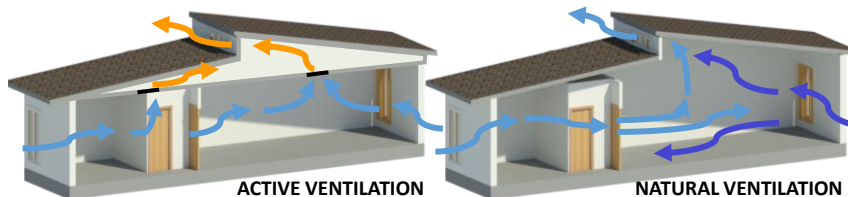
JOINERY SCHEDULE & VENTILATION

Joinery Schedule

Code	Type of Joinery	Type of opening	Length (m)	Height (m)	Area (Sq.m)	Openable Area (Sq.m)	Frame Area (Sq.m)	Glazing Area (Sq.m)
W1	Window	Awning	1.2	1.2	1.44	1.296	0.46	0.98
W2	Window	Awning	0.9	1.8	1.62	1.458	0.58	1.04
W3	Window	Awning	1.2	1.8	2.16	1.944	0.66	1.5
V1	Ventilator	Sliding	1.5	0.45	0.675	0.34	0.265	0.41
V2	Ventilator	Awning	0.45	0.6	0.27	0.243	0.09	0.18
GD1	Glass Door	Pivot	1.8	2.1	3.78	3.402	1.3	2.48
GD2	Glass Door	Pivot	0.9	2.1	1.89	1.701	0.74	1.15
D1	Wooden Door	Pivot	0.9	2.1	1.89	1.701	1.89	0
D2	Wooden Door	Pivot	0.75	2.1	1.575	1.4175	1.575	0

OPENABLE AREA

S.No	Room	Carpet Area (Sq.m)	Type of Window	Openable Area (Sq.m)	Total Openable Area (Sq.m)	% of Openable Area to Carpet Area - Achieved
1	Living, Dining	27	W2	1.458	4.86	18.00
			GD1	3.402		
2	Bedroom 1	10.2	W2	1.458	1.944	19.06
3	Bedroom 2	10.5	W1	1.296	2.997	28.54
			GD2	1.701		
4	Kitchen	6.4	W1	1.296	1.296	20.25



FLOOR PLANS – 3BHK

Area Statement

S.No	Room /Space Type	Area (Sq.m)
1	Foyer	12
2	Living	22.7
3	Backyard	12.1
4	Dining	11.5
5	Kitchen	9.2
7	Bedroom 1	10.7
8	Toilet 1	3.4
9	Staircase	7.6
10	Corridor	4.8
11	Bedroom 2	10.7
12	Toilet 2	3.4
13	Bedroom 3	10.7
14	Toilet 3	3.4
		122.2
	Total built up Area	135

SOUTH FACADE VIEW



NORTH FACADE VIEW



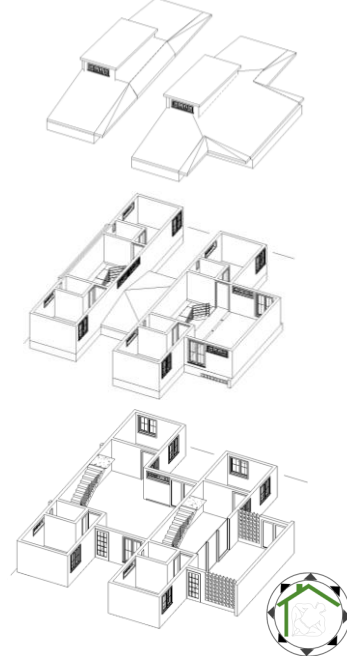
FIRST FLOOR PLAN



GROUND FLOOR PLAN



ISOMETRIC VIEW

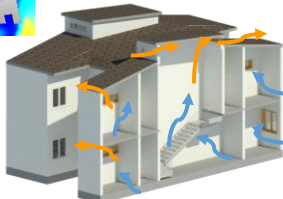


VENTILATION – 3BHK VILLA

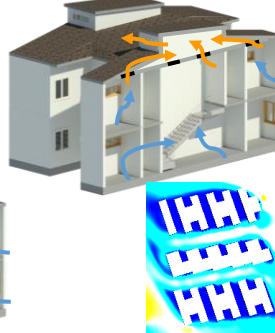
SOUTH EAST WINDS



NATURAL VENTILATION



ACTIVE VENTILATION



NORTH EAST WINDS

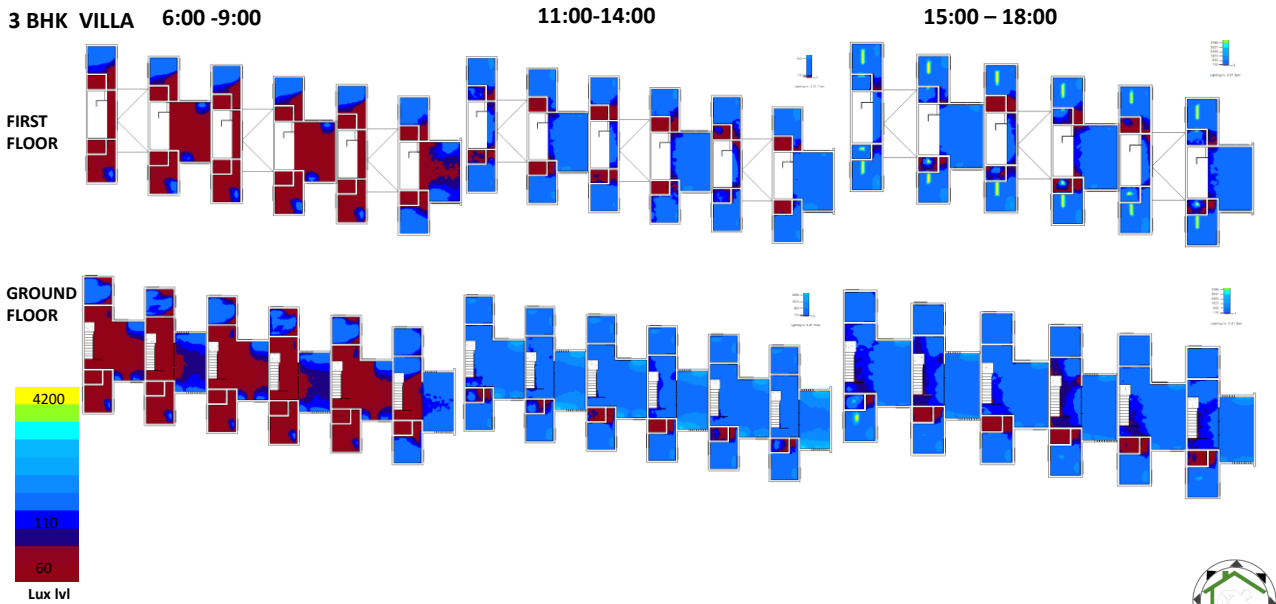


OPENABLE AREA

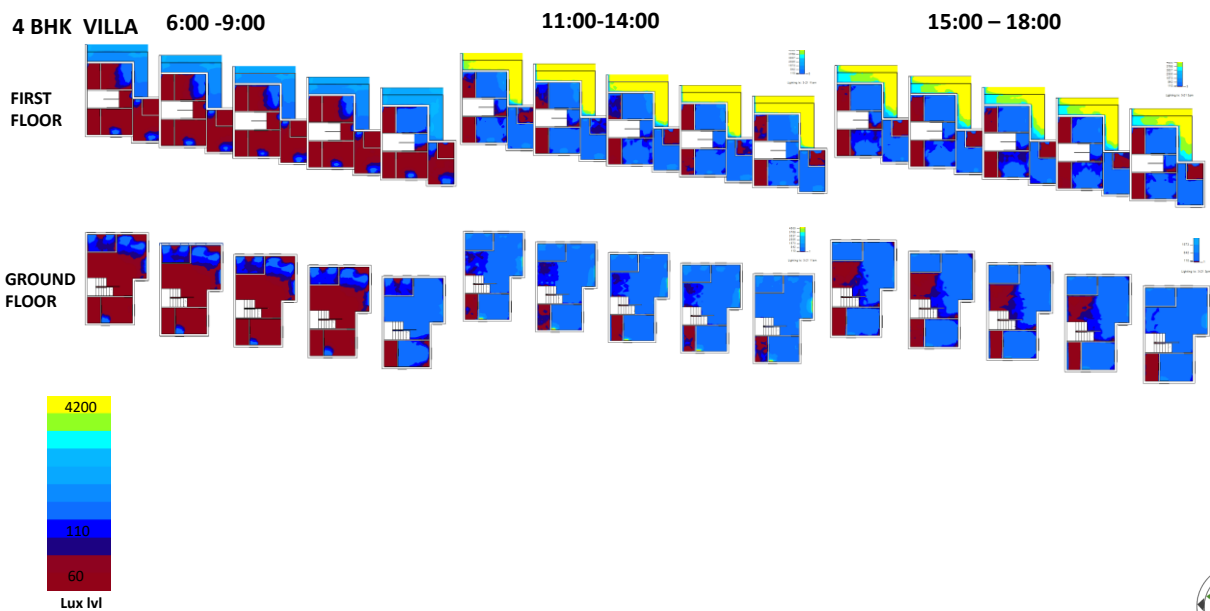
S.No	Room	Carpent Area (Sq.m)	Type of Window	Openable Area (Sq.m)	Total Openable Area (Sq.m)	% of Openable Area to Carpent Area - Achieved
1	Living, Dining	34.2	W2	1.458	8.197	23.97
			W1	1.296		
			V1	0.34		
			GD1	3.402		
			GD2	1.701		
2	Bedroom 1	10.7	W1	1.296	1.636	15.29
			V1	0.34		
3	Bedroom 2	10.7	W1	1.296	1.636	15.29
			V1	0.34		
4	Bedroom 3	10.7	W1	1.296	1.636	15.29
			V1	0.34		
5	Kitchen	9.2	W1	1.296	2.592	28.17
			W1	1.296		



DAY – LIGHTING



DAY – LIGHTING



FLOOR PLANS – 4BHK

Area Statement

S.No	Room /Space Type	Area (Sq.m)
1	Foyer	8.4
2	Living	20.4
3	Backyard	18.5
4	Dining	7.5
5	Kitchen	6
6	Staircase	10.4
7	Bedroom 1	10.7
8	Toilet 1	4.5
9	Bedroom 2	10.7
10	Toilet 2	4.5
11	Bedroom 3	10.7
12	Toilet 3	4.5
13	Room 4	10.7
14	Toilet 4	3.5
15	Balcony	5.9
16	Terrace	8.3
Total Carpet Area		145.2
Total built up Area		149

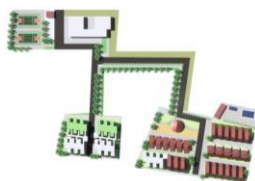
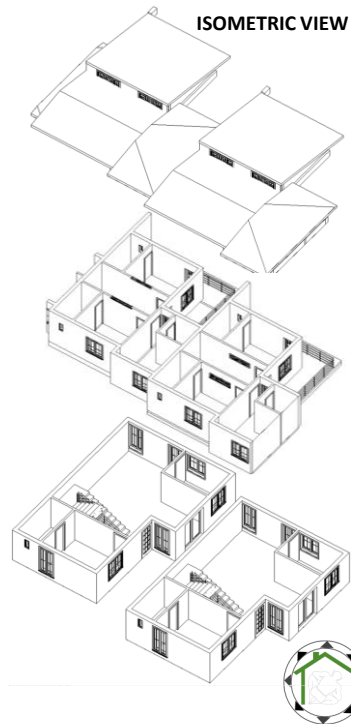
NORTH FACADE VIEW



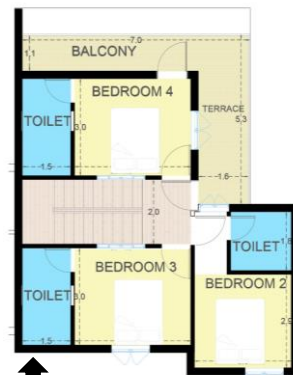
SOUTH FACADE VIEW



ISOMETRIC VIEW



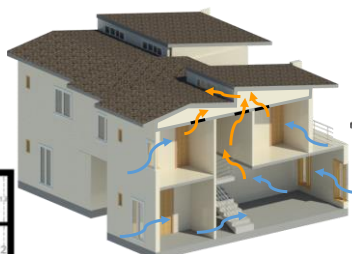
GROUND FLOOR PLAN



FIRST FLOOR PLAN

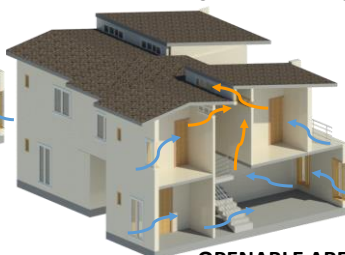
VENTILATION – 4BHK VILLA

NORTH EAST WINDS



ACTIVE VENTILATION

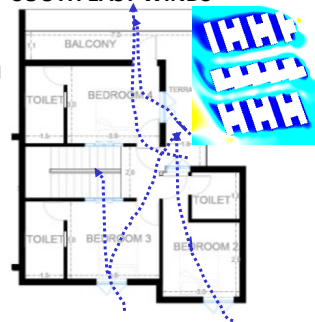
NATURAL VENTILATION



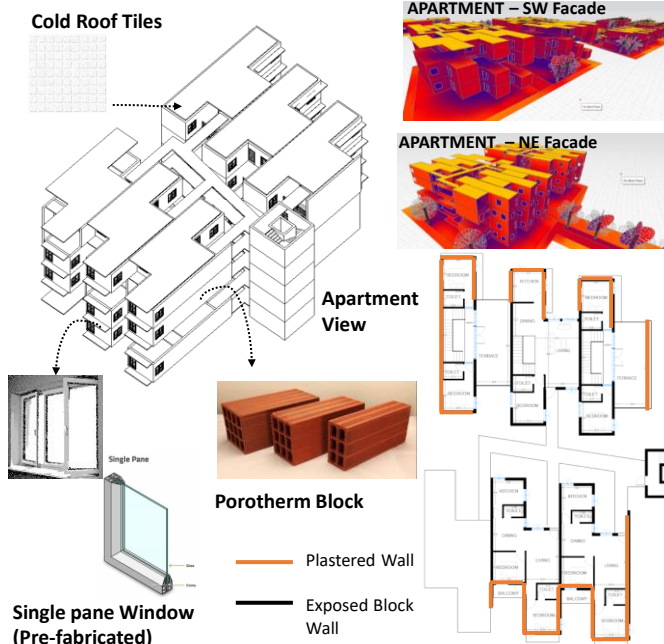
OPENABLE AREA

S.No	Room	Carpet Area (Sq.m)	Type of Window	Openable Area (Sq.m)	Total Openable Area (Sq.m)	% of Openable Area to Carpet Area - Achieved
1	Living, Dining	24.9	W2	1.458	6.075	24.40
			W2	1.458		
			W2	1.458		
			GD2	1.701		
2	Bedroom 1	10.7	W1	1.296	2.754	25.74
			W2	1.458		
3	Bedroom 2	10.7	W1	1.296	2.754	25.74
			W2	1.458		
4	Bedroom 4	10.7	W1	1.296	4.698	43.91
			GD1	3.402		
5	Bedroom 3	10.7	W1	1.296	1.296	12.11
			W2	1.296		
6	Kitchen	9	W1	1.296	2.592	28.80
			W1	1.296		

SOUTH EAST WINDS



BUILDING MATERIALS – APARTMENT BLOCK



ROOF ASSEMBLY – U Value

Material	Conductivity (W/mk)	Thickness (mm)	Resistance (m2k/W)
Roof - Apartments			
Cold Roof Tile (SRI-92)	0.451		0.397
Cement plaster	0.7	10	0.01428571
Porotherm block			1
RCC	1.58	150	0.09493671
			1.50622242
Total Resistance = R _{si} + R + R _{se} = 0.13 + 1.506 + 0.04 = 1.67			
U = 1/6.036 = 0.59			

Porotherm Block wall– U Value

Location: State: City:

Assembly Type: ☒ Wall ☐ Roof

Selected No. of Layers: 1

Select Material: Thickness: 230 mm, Outside

Calculate **Save my assembly**

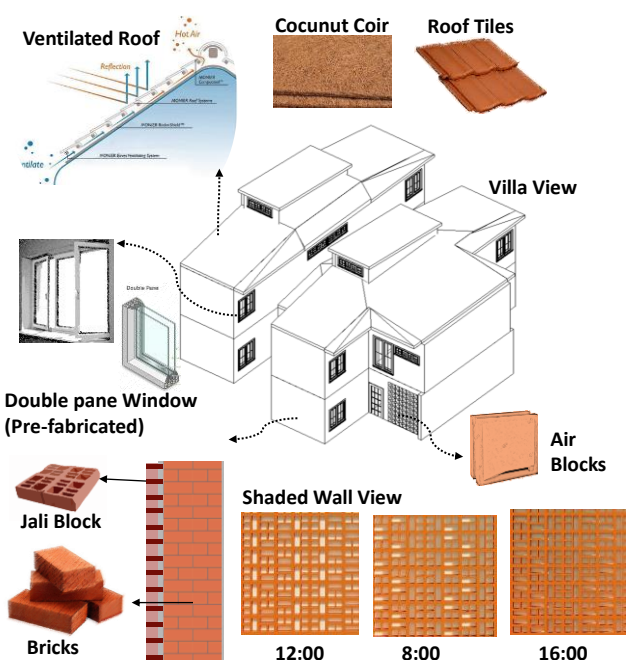
Thermal Properties of Individual Layers					
Material Name	Conductivity (W/m.K)	Specific Heat (MJ/m³.K)	Density (kg/m³)	Sample Source	Material Information
Layer 1: Compressed Mud Blocks	1.21	0.59	1840		Block

Surface Heat Transfer Coefficient Calculations					
Calculation Method	State	City	Internal Surface Resistance (m².K/W)	External Surface Resistance (m².K/W)	Additional Information
Static	AI	AI	0.13	0.04	Details
Dynamic	--Select State--	--Select City--	0	0	Details

Thermal Properties of Assemblies			
Assembly	Self Heat Trans Coeff Calc Method	Surface to Surface to Factor (W/m².K)	Overall U Factor (W/m².K)
Layers 1	Static	5.3	2.8
Layers 1	Dynamic	5.3	5.3



BUILDING MATERIALS - VILLA



ROOF ASSEMBLY – U Value

Material	Conductivity (W/mk)	Thickness (mm)	Resistance (m2k/W)
Roof - Villas			
Mangrove Tile (SRI-22)	0.6	20	0.03333333
Air cavity	0.14	25	0.17857143
Insulation	0.055	30	0.54545455
RCC	1.58	150	0.09493671
			0.85229602

Total Resistance = R_{si} + R + R_{se} = 0.13 + 0.85 + 0.04 = 1.01

$$U = 1/1.01 = 1$$

9" Brick Wall with Plaster– U Value

Location: State: City:

Assembly Type: ☒ Wall ☐ Roof

Selected No. of Layers: 3

Select Material: Thickness: 25 mm, Outside

Calculate **Save my assembly**

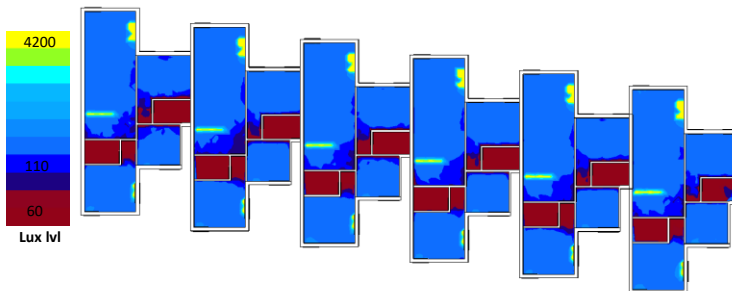
Thermal Properties of Individual Layers					
Material Name	Conductivity (W/m.K)	Specific Heat (MJ/m³.K)	Density (kg/m³)	Sample Source	Material Information
Layer 1: Cement Plaster	1.21	0.97	1840		Block
Layer 2: Brick - Burnt Red Clay	1.27	1.29	2040		Block
Layer 3: Cement Plaster	1.21	0.97	1840		Block

Surface Heat Transfer Coefficient Calculations					
Calculation Method	State	City	Internal Surface Resistance (m².K/W)	External Surface Resistance (m².K/W)	Additional Information
Static	AI	AI	0.13	0.04	Details
Dynamic	Tamil Nadu	Chennai	0.14	0.06	Details

Thermal Properties of Assemblies			
Assembly	Self Heat Trans Coeff Calc Method	Surface to Surface to Factor (W/m².K)	Overall U Factor (W/m².K)
Layers 1+2+3	Static	4.8	2.6
Layers 1+2+3	Dynamic	4.8	3.4



DAY – LIGHTING & LPD – 2BHK



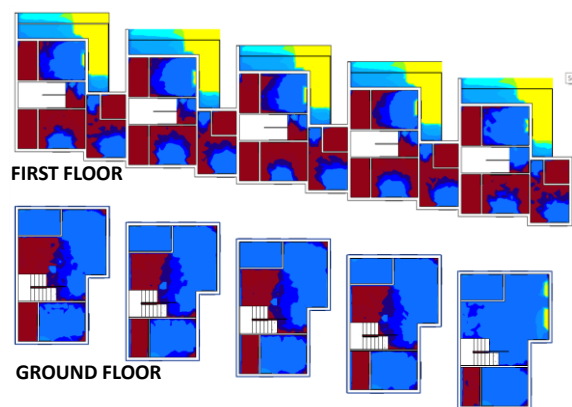
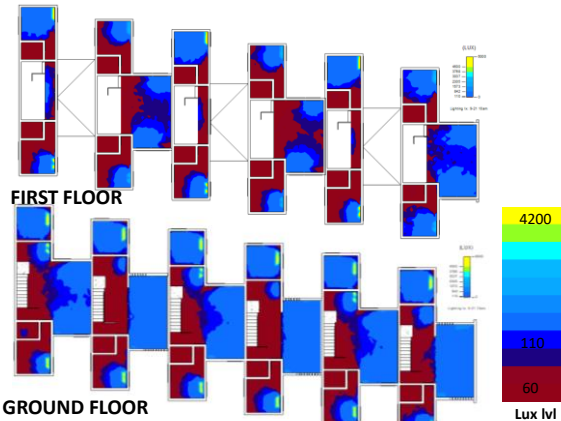
ARTIFICIAL LIGHTING

Type of Fixture	Wattage	Lumen of fixture	Description	Used for
A	20	2100	Tube	Living area, Bedroom
B	5	435	Spot	Toilet
C	38	3300	Surface	Dining, Recreation
D	12	1100	Surface	Circulation, Balcony, Staircase
E	43	4800	Wal, Susp	Retail, Market, Kitchen
F	28	2300	Wal, Susp	Office
H	2	120	Wall, Susp	Building Entrance
I	8.5	500	Bollard	Outdoor Seating area, Garden
J	Street pole (Solar)			Roadway
K	Pole Lamp (Solar)			Parking
L	4	50	Step light	Walkway



Typology	Rooms	Area (Sq.m)	No.s	Recommended Lux Level	Total Lumens required	Type of Fixture	Power (W)	Lumen of fixture	No. of fixtures Req'd	Lighting Power Density (LPD)
2 BHK VILLA	Living	17.1	1	300	5130	A	20	2100	2	2.9
	Kitchen & Dining	16.4	1	300	4920	A	20	2100	2	2.9
	Foyer	8.8	1	100	880	D	12	1100	1	1.1
	Bedroom	21.7	1	300	6510	A	20	2100	3	2.9
	Restroom	7.5	1	100	750	B	5	435	2	1.1
	Backyard	9.9	1	150	1485	D	12	1100	1	1.6

DAY – LIGHTING & LPD – 3BHK & 4BHK



Rooms	Area (Sq.m)	No.s	Recommended Lux Level	Total Lumens required	Type of Fixture	Power (W)	Lumen of fixture	No. of fixtures Req'd	Lighting Power Density (LPD)
Foyer	12	1	150	1800	D	12	1100	2	1.6
Living	22.7	1	300	6810	A	20	2100	3	2.9
Kitchen & Dining	20.7	1	300	6210	A	20	2100	3	2.9
Bedroom	32.1	1	300	9630	A	20	2100	4	2.5
Restroom	10.3	1	100	1030	B	5	435	2	1.1
Staircase	12.4	1	150	1860	D	12	1100	2	1.6
Backyard	12.1	1	100	1210	D	12	1100	1	1.1
Garden Living	22.7	1	150	3405	D	12	1100	3	1.6

Rooms	Area (Sq.m)	No.s	Recommended Lux Level	Total Lumens required	Type of Fixture	Power (W)	Lumen of fixture	No. of fixtures Req'd	Lighting Power Density (LPD)
Foyer	8.4	1	150	1260	D	12	1100	1	1.6
Living	20.4	1	300	6120	A	20	2100	3	2.9
Kitchen & Dining	17.5	1	300	5250	A	20	2100	3	2.9
Bedroom	42.8	1	300	12840	A	20	2100	4	1.9
Restroom	17	1	100	1700	B	5	435	4	1.1
Staircase	10.6	1	150	1590	D	12	1100	1	1.6
Backyard	18.5	1	100	1850	D	12	1100	2	1.1
Terrace	8.3	1	100	830	D	12	1100	1	1.1

RETV CALCULATIONS

		Brick Wall				Aluminium				Double Pane Glazing									
S.No	Orientation	OF	Co-eff (a)	Area (Sq.m)	U-value (W/Sq.m K)	OF	Co-eff (a)	Area (Sq.m)	U-value (W/Sq.m K)	OF	Co-eff (B)	Area (Sq.m)	U-value (W/Sq.m K)	OF	Co-eff (c)	Area (Sq.m)	SHGC	Total	
1	North	0.55	5.15	15	1.9	0.55	5.15	0.8	2.6	0.55	1.31	2.2	2.9	0.55	65.21	2.2	0.49	129.8776	
2	South	1.08	5.15	18.2	1.9	1.08	5.15	0.9	2.6	1.08	1.31	2.5	2.9	1.08	65.21	2.5	0.49	301.8792	
3	East	1.15	5.15	26.9	1.9	1.15	5.15	2.2	2.6	1.15	1.31	3.7	2.9	1.15	65.21	3.7	0.49	488.7	
4	West	1.14	5.15	21	1.9	1.14	5.15	0.1	2.6	1.14	1.31	0.2	2.9	1.14	65.21	0.2	0.49	243.9308	
																		Total	1164.388
																		Total Wall envelope area (Sq.m)	93.7

RETV (W/Sq.m) 12.4268

		Brick Wall				Aluminium				Double Pane Glazing									
S.No	Orientation	OF	Co-eff (a)	Area (Sq.m)	U-value (W/Sq.m K)	OF	Co-eff (a)	Area (Sq.m)	U-value (W/Sq.m K)	OF	Co-eff (B)	Area (Sq.m)	U-value (W/Sq.m K)	OF	Co-eff (c)	Area (Sq.m)	SHGC	Total	
1	North	0.55	5.15	25.31	1.9	0.55	5.15	2.02	2.6	0.55	1.31	3.87	2.9	0.55	65.21	3.87	0.49	227.1863	
2	South	1.08	5.15	25.26	1.9	1.08	5.15	1.96	2.6	1.08	1.31	3.98	2.9	1.08	65.21	3.98	0.49	448.9625	
3	East	1.15	5.15	74.33	1.9	1.15	5.15	2.56	2.6	1.15	1.31	5.31	2.9	1.15	65.21	5.31	0.49	1094.156	
4	West	1.14	5.15	80.17	1.9	1.14	5.15	0.8	2.6	1.14	1.31	1.23	2.9	1.14	65.21	1.23	0.49	956.6313	
																		Total	2726.936
																		Total Wall envelope area (Sq.m)	226.8

RETV (W/Sq.m) 12.0235

		Brick Wall				Aluminium				Double Pane Glazing									
S.No	Orientation	OF	Co-eff (a)	Area (Sq.m)	U-value (W/Sq.m K)	OF	Co-eff (a)	Area (Sq.m)	U-value (W/Sq.m K)	OF	Co-eff (B)	Area (Sq.m)	U-value (W/Sq.m K)	OF	Co-eff (c)	Area (Sq.m)	SHGC	Total	
1	North	0.55	5.15	41	1.9	0.55	5.15	2.2	2.6	0.55	1.31	4.1	2.9	0.55	65.21	4.1	0.49	317.4742	
2	South	1.08	5.15	41.18	1.9	1.08	5.15	2.08	2.6	1.08	1.31	4.04	2.9	1.08	65.21	4.04	0.49	621.254	
3	East	1.15	5.15	32.72	1.9	1.15	5.15	3.98	2.6	1.15	1.31	7.9	2.9	1.15	65.21	7.9	0.49	754.282	
4	West	1.14	5.15	44.6	1.9	1.14	5.15	0	2.6	1.14	1.31	0	2.9	1.14	65.21	0	0.49	497.5085	
																		Total	2190.519
																		Total Wall envelope area (Sq.m)	183.8

RETV (W/Sq.m) 11.9179

RETV CALCULATIONS

2 BHK APARTMENT																			
		Porotherm Blocks				Aluminium				Single Pane Glazing									
S.No	Orientation	OF	Co-eff (a)	Area (Sq.m)	U-value (W/Sq.m K)	OF	Co-eff (a)	Area (Sq.m)	U-value (W/Sq.m K)	OF	Co-eff (B)	Area (Sq.m)	U-value (W/Sq.m K)	OF	Co-eff (c)	Area (Sq.m)	SHGC	Total	
1	North	0.55	5.15	13.29	1	0.55	5.15	2.22	2.6	0.55	1.31	4.44	5.8	0.55	65.21	4.44	0.748	191.6611	
2	South	1.08	5.15	16.89	1	1.08	5.15	1.04	2.6	1.08	1.31	2.02	5.8	1.08	65.21	2.02	0.748	231.9697	
3	East	1.15	5.15	23.45	1	1.15	5.15	1.48	2.6	1.15	1.31	3	5.8	1.15	65.21	3	0.748	356.1664	
4	West	1.14	5.15	24.15	1	1.14	5.15	1.3	2.6	1.14	1.31	2.48	5.8	1.14	65.21	2.48	0.748	321.0123	
																		Total	1100.809
																		Total Wall envelope area (Sq.m)	95.76

RETV (W/Sq.m) 11.4955

3 BHK APARTMENT																			
		Porotherm Blocks				Aluminium				Single Pane Glazing									
S.No	Orientation	OF	Co-eff (a)	Area (Sq.m)	U-value (W/Sq.m K)	OF	Co-eff (a)	Area (Sq.m)	U-value (W/Sq.m K)	OF	Co-eff (B)	Area (Sq.m)	U-value (W/Sq.m K)	OF	Co-eff (c)	Area (Sq.m)	SHGC	Total	
1	North	0.55	5.15	25.31	1	0.55	5.15	2.02	2.6	0.55	1.31	3.87	5.8	0.55	65.21	3.87	0.748	206.5612	
2	South	1.08	5.15	25.26	1	1.08	5.15	1.96	2.6	1.08	1.31	3.98	5.8	1.08	65.21	3.98	0.748	411.1627	
3	East	1.15	5.15	74.33	1	1.15	5.15	2.56	2.6	1.15	1.31	5.31	5.8	1.15	65.21	5.31	0.748	823.894	
4	West	1.14	5.15	80.17	1	1.14	5.15	0.8	2.6	1.14	1.31	1.23	5.8	1.14	65.21	1.23	0.748	561.9389	
																		Total	2003.557
																		Total Wall envelope area (Sq.m)	226.8

RETV (W/Sq.m) 8.83402



COMPARISON ANALYSIS

S.No	CRITERIA		VILLAS			APARTMENTS	
			2BHK	3BHK	4BHK	2BHK	3BHK
1	Carpet Area (Sq.m)		81.4	122	145	66	124
2	Built up Area (Sq.m)		74.9	135	149	70	140
3	House Orientation		N-S	N-S	N-S	N-S	N-S
4	House Propotions (W:L)		1 ; 2	1:2.2	1 ; 1.4	1 ; 2.4	1 ; 2.2
5	Exterior area (Sq.m)		202	310	293	95	226
6	Room directions	Living	NW	E	E-W	E	E
		Dining	W	W	NE	W	W
		Kitchen	SE	NW	NW	NW	NW
		Bedroom	NE, SW	NW, SW	SW,SE,NW	SW, SE	NW, SW
7	Room Propotions (W:L)	Living	1;1.8	1;2.3	2.3; 1	1; 1.7	1;2.3
		Dining	1;1	1; 1.1	1;0.6	1;1	1; 1.1
		Kitchen	1;0.9	1;1	1;0.7	1;0.8	1;1
		Bedroom	1;1.1	1;1	1.2;1, 1;1(SE)	1.1;1 & 1;1.1	1;1
8	Daylighting (%)	Living	100	92	65	25-40	40-65
		Dining	90	68	100	15-40	50-55
		Kitchen	90	97	100	80-90	90-95
		Bedroom	95, 95	100,70	75,70,90	60-70, 90-95	30-70
9	LPD Value	Living	2.9	2.9	2.9	2.9	2.9
		Dining	2.9	2.9	2.9	2.9	2.9
		Kitchen	2.9	2.9	2.9	2.9	2.9
		Bedroom	2.9	2.5	1.9	2.5	2.5

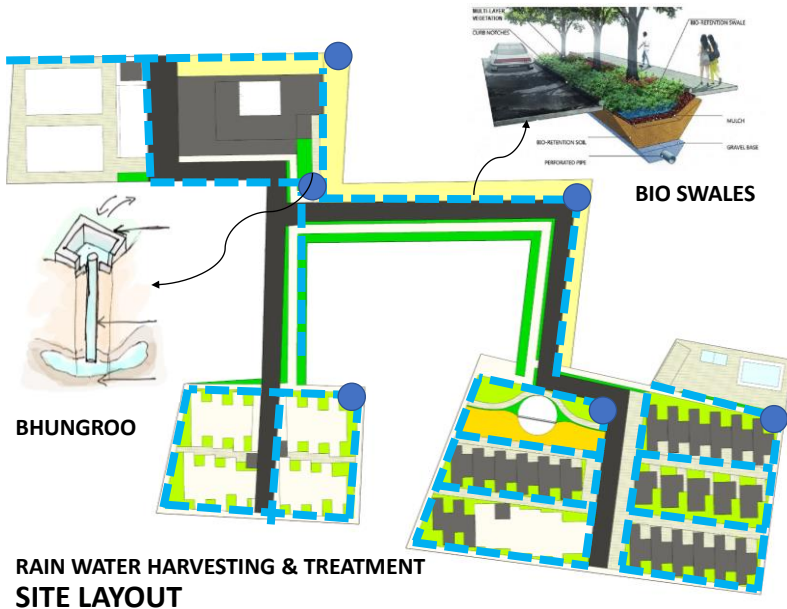


COMPARISON ANALYSIS

S.No	CRITERIA		2BHK	3BHK	4BHK	2BHK	3BHK
9	LPD Value	Living	2.9	2.9	2.9	2.9	2.9
		Dining	2.9	2.9	2.9	2.9	2.9
		Kitchen	2.9	2.9	2.9	2.9	2.9
		Bedroom	2.9	2.5	1.9	2.5	2.5
10	Exterior Opening %	Living					
		Dining	18	24	24.5	20.74	23.97
		Kitchen	20.3	28.17	28.8	33.23	28/17
		Bedroom	22, 26	15.29	12.11, 25.74, 43	13.64, 26.74	15.29
11	Cross Ventlation	Living	YES	YES	YES	YES	YES
		Dining	NO	NO	NO	NO	NO
		Kitchen	NO	YES	YES	YES	YES
		Bedroom	YES, YES	YES	YES	NO, YES	YES
12	RET Value		12.4	12	11.9	11.5	8.8
13	IGBC Credits earned		24	25	25	22	24



SITE PLAN- Rain Water Harvesting



Avg Normal Rainfall (Chennai)				
Year	Peak Rain Month	Rainfall (mm)	Number of Rainy days	Normal Rainfall/Day (mm)
2016	Oct	285	20	14.25
2017	Nov	311	18	17.2777778
2018	Dec	267	16	16.6875
2019	Oct	246	17	14.4705882
2020	Nov	308	19	16.2105263
Average normal rainfall/ day (mm)			15.7792785	
Average normal rainfall/ day (m)			0.01577928	

RWH Calculations				
S.No	Surface type	Run-off coefficient (c)	Area (a) (m ²)	Impervious Area (m ²) I=c X a
1	Tiled Roof	0.95	4727	4490.65
2	Concrete Road	0.95	2661	2527.95
3	Play Ground	0.35	339	118.65
4	Turf	0.35	650	227.5
5	Vegetation	0.2	2955	591
6	Concrete Pavement	0.95	3116	5260
7	Grid Pavers (Grass)	0.5	3970	1050
Total impervious area in sq.m. (Σ I)				14265.75
Average normal rainfall/ day (m)				0.0157
Total roof and non-roof run-off volume in cu.m (Σ I × R)				223.972275
Storage capacity of pond/ tank etc. in cu.m				35
Harvesting capacity of recharge pits in cu.m (60's)				210
Percentage (%) of run-off volume harvested				93%

IGBC Credits : 6



WATER CONSUMPTION

Treated water requirement

(Per Day)

Residences - 8.25kL

Club house - 0.6kL

Vegetation - 8.45kL

Total - 17.3kL

Grey water available for treatment

(Per Day)

Residences - 38kL

Club house - 0.7kL

Water Usage (Residence)					
Fixture Type	Duration	Daily uses per person / per day	Users	Flow Rate/ Capacity (fb)	Total Water use (L) Tb = n X fb
Water Closets	1	2	282	4	2256
Health Faucet	0.25	2	282	2.5	352.5
Shower	5	1	282	9.5	1339.5
Faucet/ Taps	5	6	282	2	16920
Kitchen Sink	15	1	60	2	1800
Laundry	1	1	60	100	6000
Total water use (litres/day)					40723.5
Number of working days					365
Total Annual water use in litres (Total water use x Number of working days)					14864077.5
Grey Water available for Recycling (L)					13911975

IGBC Credits : 5

Vegetation	Area (Sq.m)	Water Req'd (L)	Total Water Req'd (L)
Landscape	1904	1.5	2856
Farming	2238	2.5	5595
Total water required per day (L)			8451
Total water required Annually (L)			3084615
Total water required Annually (kL)			3084.615

Water required swimming pool (Weekly) = 135kL
Water required swimming pool (Annually) = 6988kL

Water Usage (Commercial)					
Fixture Type	Duration	Daily uses per person / per day	Users	Flow Rate/ Capacity (fb)	Total Water use (L) Tb = n X fb
Water Closets	1	1	200	4	800
Urinals	1	1	100	0	0
Health Faucet	0.25	2	200	2	200
Faucet/ Taps	0.25	2	200	2	200
Shower	2	1	25	9.5	475
Total water use (litres/day)					1675
Number of working days					365
Total Annual water use in litres (Total water use x Number of working days)					611375
Grey Water available for Recycling (L)					246375

FAUCETS – AERATORS



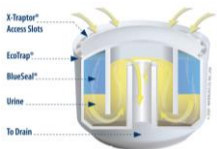
SHOWERS –LOW FLOW



WC – DUAL FLUSH



URINAL – WATERLESS



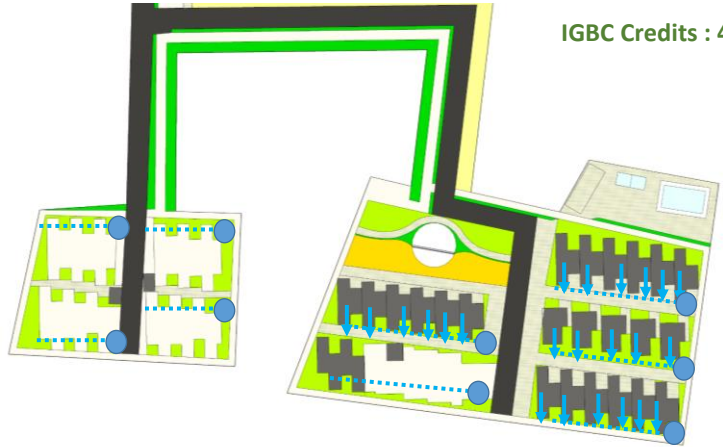
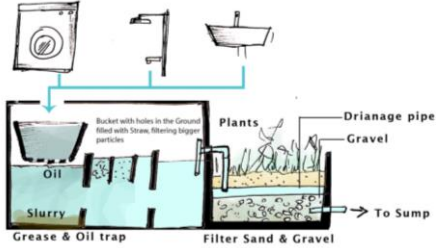
GREY WATER TREATMENT

IGBC Credits : 4

RESIDENCES

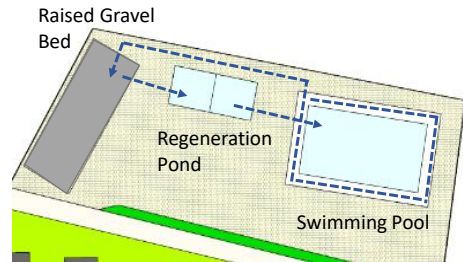
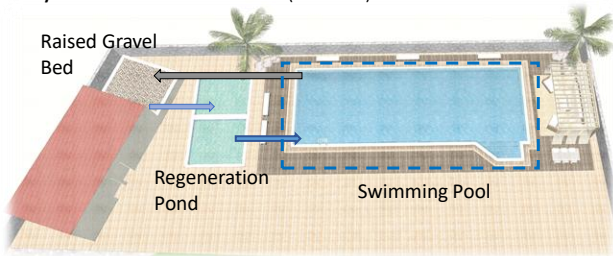
Grey water available for treatment (Per Day)

Residences - 38kL



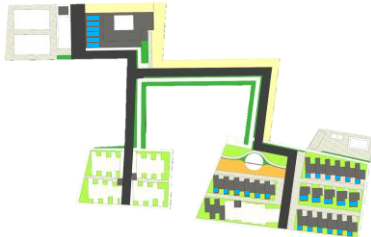
SWIMMING POOL

Grey water available for treatment (Per Week) - 135kL



RENEWABLE ENERGY HARVESTING

SOLAR POWER CALCULATIONS



S.No	Block Type	No of Panels installed (Unit)	Total No. of blocks	Total No. of PV panels	Power generation Capacity (Kwh)
1	12 BHK Villa	2	6	12	1.5
2	23 BHK Villa	2	12	24	1.5
3	4 BHK Villa	3	5	15	1.5
4	Apartment Block - A	56	2	112	25
5	Apartment Block - B	18	1	18	15
6	Club House	15	1	15	10.5

Estimated 1st Year Generation: 33,348 kWh

Estimated 1st Year Generation: 2,129 kWh



ORGANIC WASTE MANAGEMENT

Total Waste Production

Zone	Occupancy(No.s)	Qty (Kg)	Qty/Day (Kg)	Qty/Year (Kg)
Residence	282	0.25	70.5	25732.5
Restaurant	182	0.48	87.36	31886.4
Total				57618.9
Food waste produced(C:N - 15:1)				3841.26
Area of plantation requiring compost				2954
Compost per Sq.m area for 6 mo.s interval (Kg)				0.225
Total Compost required for 6 mo.s interval (Kg)				664.65
Total Compost required yearly (Kg)				1329.3
Additional compost produced on Site				2511.96

Waste Production - Residences

Zone	Occupancy(No.s)	Qty (Kg)	Qty/Day (Kg)	Qty/Year (Kg)
Residence	282	0.25	70.5	25732.5
Food waste produced(C:N - 15:1)				1715.5
Area of plantation requiring compost				2954
Compost per Sq.m area for 6 mo.s interval (Kg)				0.225
Total Compost required for 6 mo.s interval (Kg)				664.65
Total Compost required yearly (Kg)				1329.3
Additional compost produced on Site				386.2

IGBC Credits : 6



IGBC Credit - VASTU

Credit	Intent	Vastu Inference	Design Strategy	Sustainability
SD MR1	Ensure that the building(s) complies with necessary statutory regulatory codes.	Vastu itself an building science earlier.	Followed as per Local regulations	Followed as per Local regulations
SD MR2	Control soil erosion and sedimentation thereby, reducing negative impacts to the site and surroundings.			
SD 1	Minimize disturbances to the natural topography of the site, promote local habitat and bio-diversity thereby reduce the related long-term environmental impacts.	The selection of site is based on existing slope (SW to NE) and categorized from Good to Bad	The site has natural slope from SW to NE which helps in enhancing microclimate based on planning except for few bumps on site to be treated.	Minimal interference in altering the natural topography would not impact the site & surroundings in various factors.
SD 2	Reduce heat islands to minimize negative impacts on microclimate and local bio-diversity.	The roads and other exposed surfaces are natural and maintained as it is.	The roads and pedestrian cycle lanes, are provided with pervious material/ Treatment.	Minimal intervention on surfaces without disturbing the natural structure of site.
SD 3	Adopt passive architectural measures to design an efficient building envelope, reduce energy consumption and the related negative environmental impacts.	The VPM planning is based on natural daylighting to all spaces & cross ventilation etc.	The daylighting inside the house is based on user occupied hours and opening for daylight provided accordingly. The openings (Doors, Windows, Clearstory) are based on cross ventilation throughout the day.	Reduces the requirement of Artificial lighting and maximum NE daylight also improves health of the people.
SD 6	Reduce negative environmental impact due to emissions from automobiles by providing basic house-hold amenities, thereby, enhancing the quality of life.	The amenities were centrally located (surrounded by residences) as there was no vehicles earlier, providing equally distributed walking distance.	The facilities such as fitness, play, garden etc are provided with access through comfortable pedestrian and bicular lanes.	Encourages people of all ages to access all amenities by non fuel vehicular means reducing environmental impact.



IGBC Credit - VASTU Relevance

Credit	Intent	Vastu Inference	Design Strategy	Sustainability
WC MR1	Minimise dependence on municipal and bore water, by reducing water consumption	Well/Pond was used which reduced water consumption to drastically low level.	Required quantity of fixtures with high water efficiency and used of naturally treated water for secondary purposes.	Reduces the demand & wastage of potable water.
WC MR2	Enhance ground water table and reduce municipal water demand by harvesting rain water	The location of well is provided based on site slope which enhances RWH	Existing slope is taken advantage to harvest rainwater from possible catchment areas.	There is minimal requirement of excess modification/addition for RWH due to pre-planned forms.
WC 1	Minimise dependence on municipal and bore water, by reducing water consumption.	Well was used which reduced water consumption to drastically low level.	Required quantity of fixtures with high water efficiency and used of naturally treated water for secondary purposes.	Reduces the demand & wastage of potable water.
WC 2	Design landscape to ensure minimum water consumption	Only native trees are mentioned in Vastu which has minimal water consumption.	The native food crops/trees are considered in order to reduce water requirement.	Not only consumes less amount of water, but also meets the food demands of the community people.
WC 3	Reduce water demand for irrigation through water efficient management systems and techniques.	On macro-level the residences were built on higher edge of slope which irrigates low lying agriculture fields etc.	The waste water is treated naturally through vegetation on site using the advantage of topography of Site.	This reduces the water requirement & also excess treated water can be recharge groundwater.
WC 4	Reduce consumption of potable water and waste water generation to minimise the burden on municipal water supply	Well/Pond was used which reduced water consumption to drastically low level.	Natural treatment of water to reduce energy consumption which is supplied for secondary purposes.	Reduces the demand & wastage of potable water.
WC 6	Enhance ground water table and reduce municipal water demand through effective rain water management.	The location of well is provided based on site slope which enhances RWH	Existing slope is taken advantage to harvest rainwater from possible catchment areas.	There is minimal requirement of excess modification/addition for RWH due to pre-planned forms.



IGBC Credit - VASTU Relevance

Credit	Intent	Vastu Inference	Design Strategy	Sustainability
EE MR1	Avoid use of refrigerants and ozone depleting gases which has negative impact to the environment.	NA		
EE MR2	Improve energy efficiency of the proposed building(s) and system(s) to reduce environmental impacts from excessive energy use.	The VPM planning is based on natural daylighting to all spaces & cross ventilation ensuring thermal & visual comfort to users.	The strategies of VPM has been analyzed and interior room layouts and openings are designed accordingly.	Reduces the requirement of Artificial lighting and HVAC equipment's which reduces the energy consumption drastically and also reduces monthly expenses for power consumption.
EE 1	Enhance energy efficiency of the building(s) to reduce environmental impacts from excessive energy use.	The passive strategies followed in building itself made zero requirement for active systems.	The provided strategies are analyzed and the best output is selected to be energy efficient.	

Credit	Intent	Vastu Inference	Design Strategy	Sustainability
MR MR1	Facilitate segregation of house-hold waste at source so as to prevent such waste being sent to land-fills.	Nil		
MR 2	Encourage optimum use of construction materials to reduce dependence on natural resources.	The prevention on construction waste due to standard proportions of room layouts, height & building elements	The reduction in building materials would be achieved by providing layout based on structural load transfer to reduce unwanted load bearing structures.	Helps in reducing Carbon emissions and also for economic sustainability
MR 4	Encourage use of building materials available locally thereby minimizing the associated environmental impacts resulting from transportation.	The materials specified were natural & locally available such as stone, timber brick etc.	Abundantly available natural and locally manufactured materials are used majorly.	Reduces the carbon footprint of the township improving economic & environmental sustainability.
MR 7	Encourage practices to manage construction waste, thereby, avoiding waste being sent to land-fills.	The prevention on construction waste due to standard proportions of room layouts, height & building elements	Avoid Wastage by using standardized building materials & elements (Door, Window, etc)	Helps in reducing Carbon emissions and also for economic sustainability
MR 8	Ensure effective organic waste management, post-occupancy, so as to prevent waste being sent to land-fills.	NA		



IGBC Credit - VASTU Relevance

Credit	Intent	Vastu Inference	Design Strategy	Sustainability
RHW MR1	Design habitable spaces to have access to natural daylight, thereby enhancing the quality of life of the occupants	VPM itself is based on user hours and daylighting to specific spaces based on time.	The daylighting inside the house is based on user occupied hours and opening for daylight provided accordingly.	Reduces the requirement of Artificial lighting and maximum NE daylight also improves health of the people.
RHW MR2	Avoid indoor pollutants affecting indoor air quality by providing adequate outdoor air ventilation.	The central courtyard & various opening provides adequate cross air-ventilation	The openings (Doors, Windows, Clearstory) are based on cross ventilation throughout the day.	Provides natural & fresh air to the interior spaces ensuring good health of users.
RHW MR3	Minimise exposure of non-smokers to the adverse health impacts arising due to passive smoking, post occupancy.	NA		
RHW 1	Ensure connectivity between the interior and the exterior environment, by providing adequate daylighting.	VPM itself is based on user hours and daylighting to specific spaces based on time.	The daylighting inside the house is based on user occupied hours and opening for daylight provided accordingly.	Reduces the requirement of Artificial lighting and maximum NE daylight also improves health of the people.
RHW 2	Avoid indoor pollutants affecting indoor air quality by providing adequate outdoor air ventilation.	The central courtyard & various opening provides adequate cross air-ventilation	The openings (Doors, Windows, Clearstory) are based on cross ventilation throughout the day.	Provides natural & fresh air to the interior spaces ensuring good health of users.
RHW 3	Encourage adequate cross ventilation in the dwelling units thereby, providing a healthy environment.			
RHW 4	Ensure connectivity between the interior and exterior spaces, to achieve visual delight to occupants	The central courtyard connects to external environment and shaded patio in front helps providing interaction and connectivity to exterior spaces.	Main views are oriented towards landscape area.	Visual comfort of users are considered.
RHW 6	Promote occupant well-being so as to enhance physical, emotional and spiritual well-being of building occupants	NA	Physical fitness for all ages and gathering spaces, community areas are provided in greenscapes which would provide comfort for users.	Mental & physical Health of community people would be developed without negligence of environmental wellness.

