

PROFESSIONAL TRAINING REPORT

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

By

P.PRIYANGA / 39890012



SCHOOL OF BUILDING AND ENVIRONMENT
DEPARTMENT OF ARCHITECTURE

SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

Accredited with Grade "A" by NAAC

JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600 119



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

(Est U/s(3) of UGC Act, 1956) Accredited with Grade "A" by NAAC (A Christian Minority Institution)

JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHEMMENCHERY, CHENNAI – 600119. TAMILNADU.

PHONE: 2450 1443/9941912481 INTERNET: www.sathyabama.ac.in

E-mail: archhod@sathyabama.ac.in



SCHOOL OF BUILDING AND ENVIRONMENT
DEPARTMENT OF ARCHITECTURE
M. Arch (Sustainable Architecture)

PROFESSIONAL TRAINING PORTFOLIO
DEC 2020

Name of the Student : Priyanga. P

Semester : III

Reg No. : 39890012

Batch : 2019-2021



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SCHOOL OF BUILDING AND ENVIRONMENT

DEPARTMENT OF ARCHITECTURE

M. Arch (Sustainable Architecture)

BONAFIDE CERTIFICATE

This is to certify that the professional training is the work of **P.PRIYANGA / 39890012** had undergone training in **Ela Green Buildings & Infrastructure Consultants Pvt. Ltd** and has been monitored by the continuous assessment during **Dec 2020 to Jan 2021**.

A handwritten signature in blue ink, appearing to read 'Devyani G.', is placed over a grey rectangular background.

DR.DEVYANI GANGOPADHYAY

DEAN,

School of Building and
Environment

Department of Architecture

A handwritten signature in blue ink, appearing to read 'Sheetal A.', is placed over a grey rectangular background.

Submitted for Viva voce Examination held on **28.01.2021**

Internal Examiner

External Examiner

(Annexure III)



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E-mail: archhod@sathyabama.ac.in



DECLARATION

I **P.PRIYANGA** hereby declare that the Professional Training Report **3rd DEC 2020 – 19th JAN 2021** done by me under the guidance of Ar. **SIVASHANKAR.T.S** is submitted in partial fulfillment of the requirements for the completion of practical training session.

DATE : 19th January, 2021

PLACE : Chennai

A handwritten signature in blue ink, appearing to read 'P. Priyanga', with a long horizontal stroke extending to the right.

SIGNATURE OF CANDIDATE

ACKNOWLEDGEMENT

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

I convey my thanks to **Dr. Devyani Gangopadhyay**, Dean and Head of Department , School of building and Environment, Dept. of architecture for providing me necessary support and details at the right time during the progressive training session.

I would like to express my sincere and deep sense of gratitude to **Ar.SIVASHANKAR.T.S / Associate Architect / Ela Green Buildings & Infrastructure Consultants Pvt. Ltd** for his valuable guidance, suggestions and constant encouragement paved way for the successful completion of my project work. My sincere thanks to **Ar.Sheetal Kalamkar**, Professional Training Coordinator for her motivation.

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 the project.

Also thanks to, **Ar.SIVASHANKAR.T.S / Ela Green Buildings & Infrastructure Consultants Pvt. Ltd, Pallavaram, Chennai.,**



01-12-2020

Chennai

To
The Head of the Department,
Sathyabama Institute of Science and Technology,
Chennai - 600 119,
Tamil Nadu.

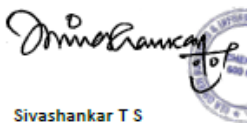
Respected Sir/ Madam,

Subject: Confirmation letter

This is to confirm that Ms. P.Priyanga (Reg no: 39890012), pursuing M.Arch - Sustainable in Sathyabama Institute of Science and Technology, will be undergoing her internship at our firm from 03-12-2020 to 20-01-2021, for a period of 35 days.

Yours sincerely,

For Ela Green Buildings & Infrastructure Consultants,



Sivashankar T S
Associate Architect



21-01-2021

Chennai

To
The Head of the Department,
Sathyabama Institute of Science and Technology,
Chennai - 600 119,
Tamil Nadu.

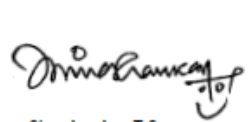
Respected Sir/ Madam,

Subject: Completion letter

This is to inform that Ms. P.Priyanga (Reg no: 39890012), pursuing M.Arch - Sustainable in Sathyabama Institute of Science and Technology, has completed her internship successfully at our firm from 03-12-2020 to 20-01-2021.

Yours sincerely,

For Ela Green Buildings & Infrastructure Consultants,



Sivashankar T S
Associate Architect





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DEPARTMENT OF ARCHITECTURE

M. Arch (Building management)

Continuous Assessment Report for Professional training

(Continuous progress report of the trainee architect/Project Manager for the period of 30 working days in the office to be submitted to HOD by the Trainee attending the training session)

- Name of the office / organization : Ela Green Buildings + Infrastructures consultants Private Limited.
- Address & Contact Number : chennai - 600043
- Name of the student : P. Priyanga
- Duration : From 3.12.20 To 12.12.20
- Total No. of days : 9

6. Evaluation of Performance criteria shall be on

* Note: Kindly grade the student as per his/her overall performance in the office during the assessment month, which will be converted to the allotted marks by the department.

Description of works	Excellent	Good	Fair	Poor	NA
Understanding of office culture and methodology		✓			
Active participation in the project activities	✓				
Documentation and tracking of project		✓			
Presentation skills developed	✓				
Understanding of construction details and techniques		✓			
Participation and contribution in project meetings		✓			
Understanding of codes and standards		✓			
Schedule preparation and tracking activities		✓			
Preparation/ Management of drawings		✓			
Learning/ Application of software in projects	✓				
Preparation of concept for projects		✓			
Site management/ Discussion with clients		✓			

Overall Grading*

(A - 8.0, B - 7.0, C - 6.0, D - 5.5, E - 5.0, F - <5)

7. Any other Remarks :

8. Signature of the Head of the Office /

[Signature]
[Stamp]

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(Continuous progress report of the trainee architect/Project Manager for the period of 30 working days in the office to be submitted to HOD by the Trainee attending the training session)

- Name of the office / organization : Ela Green Buildings + Infrastructures consultants Private Limited.
- Address & Contact Number : chennai - 600043
- Name of the student : P. Priyanga
- Duration : From 14.12.20 To 23.12.20
- Total No. of days :
- Evaluation of Performance criteria shall be on

* Note: Kindly grade the student as per his/her overall performance in the office during the assessment month, which will be converted to the allotted marks by the department.

Description of works	Excellent	Good	Fair	Poor	NA
Understanding of office culture and methodology		✓			
Active participation in the project activities		✓			
Documentation and tracking of project		✓			
Presentation skills developed		✓			
Understanding of construction details and techniques		✓			
Participation and contribution in project meetings		✓			
Understanding of codes and standards		✓			
Schedule preparation and tracking activities		✓			
Preparation/ Management of drawings		✓			
Learning/ Application of software in projects		✓			
Preparation of concept for projects		✓			
Site management/ Discussion with clients		✓			

Overall Grading*

(A - 8.0, B - 7.0, C - 6.0, D - 5.5, E - 5.0, F - <5)

7. Any other Remarks :

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(Continuous progress report of the trainee architect/Project Manager for the period of 30 working days in the office to be submitted to HOD by the Trainee attending the training session)

- Name of the office / organization : *Ela Green Buildings & Infrastructures consultants Private Limited.*
- Address & Contact Number : *Chennai - 600043*
- Name of the student : *P. Priyanga*
- Duration : From *24.12.20* To *2.1.21*
- Total No. of days : *8*

6. Evaluation of Performance criteria shall be on

* Note: Kindly grade the student as per his/her overall performance in the office during the assessment month, which will be converted to the allotted marks by the department.

Description of works	Excellent	Good	Fair	Poor	NA
Understanding of office culture and methodology		✓			
Active participation in the project activities	✓				
Documentation and tracking of project		✓			
Presentation skills developed	✓				
Understanding of construction details and techniques		✓			
Participation and contribution in project meetings		✓			
Understanding of codes and standards		✓			
Schedule preparation and tracking activities		✓			
Preparation/ Management of drawings		✓			
Learning/ Application of software in projects	✓				
Preparation of concept for projects		✓			
Site management/ Discussion with clients		✓			

Overall Grading*

(A - 8.0, B - 7.0, C - 6.0, D - 5.5, E - 5.0, F - <5)

7. Any other Remarks :

8. Signature of the Head of the Office /

[Signature]

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(Continuous progress report of the trainee architect/Project Manager for the period of 30 working days in the office to be submitted to HOD by the Trainee attending the training session)

- Name of the office / organization : *Ela Green Building & Infrastructures consultants Private Limited.*
- Address & Contact Number : *Chennai - 600043*
- Name of the student : *P. Priyanga*
- Duration : From *3.1.21* To *12.1.21*
- Total No. of days : *8*

6. Evaluation of Performance criteria shall be on

* Note: Kindly grade the student as per his/her overall performance in the office during the assessment month, which will be converted to the allotted marks by the department.

Description of works	Excellent	Good	Fair	Poor	NA
Understanding of office culture and methodology		✓			
Active participation in the project activities	✓				
Documentation and tracking of project		✓			
Presentation skills developed	✓				
Understanding of construction details and techniques		✓			
Participation and contribution in project meetings		✓			
Understanding of codes and standards		✓			
Schedule preparation and tracking activities		✓			
Preparation/ Management of drawings		✓			
Learning/ Application of software in projects		✓			
Preparation of concept for projects	✓				
Site management/ Discussion with clients		✓			

Overall Grading*

(A - 8.0, B - 7.0, C - 6.0, D - 5.5, E - 5.0, F - <5)

7. Any other Remarks :

8. Signature of the Head of the Office /

[Signature]



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1. Name of the office / organization : *Ela Green Buildings & Infrastructures consultants Private Limited.*
2. Address & Contact Number : *Chennai - 600043*
3. Name of the student : *P. Priyanga*
4. Duration : From *13.1.21* To *19.1.21*
5. Total No. of days : *4*
6. Evaluation of Performance criteria shall be on

* Note: Kindly grade the student as per his/her overall performance in the office during the assessment month, which will be converted to the allotted marks by the department.

Description of works	Excellent	Good	Fair	Poor	NA
Understanding of office culture and methodology		✓			
Active participation in the project activities	✓				
Documentation and tracking of project		✓			
Presentation skills developed		✓			
Understanding of construction details and techniques		✓			
Participation and contribution in project meetings	✓				
Understanding of codes and standards		✓			
Schedule preparation and tracking activities		✓			
Preparation/ Management of drawings		✓			
Learning/ Application of software in projects	✓				
Preparation of concept for projects		✓			
Site management/ Discussion with clients		✓			

Overall Grading*

(A - 8.0, B - 7.0, C - 6.0, D - 5.5, E - 5.0, F - <5)

7. Any other Remarks :

8. Signature of the

Head of the Office /

Dr. M. Ramesh

WORK DIARY

Date	PROJECT NAME	WORK DONE
3 rd – 8 th Dec	Residence	Developing 3d Structural model
9 th – 13 th Dec	Residence-1	Developing 3d interiors for residence
14 th - 16 th Dec	Guest House	Understanding the daylight analysis with the guidelines of ECBC
17 th – 21 st th Dec	Guest House	IGBC Manual calculations for Resident Health and Well being
22 nd Dec -25 th Dec	Office	Tabulations for quality views based on LEED guidelines
26 th -28 th Dec	Hospital – 1	Learning of Ecotect software for Artificial lighting Analysis
29 th Dec – 3 rd Jan	Hospital – 1	Analysis & Simulation of Artificial Lighting using Dialux Software
4 th – 8 th th Jan	Hospital – 2	Analysis & Simulation of Artificial Lighting using Dialux Software
9 th – 13 th Jan	Office	3D Modelling in Revit
14 th - 15 th Jan	Residence -2	Understanding the electrical Drawing and Drafting the 2D interior elevations
16 th – 19 th Jan	Residence -1	Understanding the electrical Drawing and Drafting the 2D interior elevations

Associate Architect's Signature:

Office seal :



ABOUT THE FIRM

Ela Green Buildings & Infrastructure Consultants Pvt. Ltd. started by a young dynamic professional is today one of India's upcoming Green Building Consultancy firms and has emerged as a pioneer in providing solutions to a wide range of projects across Commercial, Residential, Industrial, Retail, Hospitality and others.

In a very short span Ela has been able to create value and expertise in the areas of Green Building Consultancy by using the design techniques, skills on knowledge of materials, renewable energy methods and energy analysis, best customized to the client's needs

SERVICES

Ela offers a range of Green Building Design Consulting Services, that use various design techniques, skills on knowledge of materials, renewable energy methods and energy analysis, best customized to the client's needs.



Feasibility study analysis

Analyzing project details in terms of green parameters and suggesting improvements required, financial implications along with a cost benefit analysis.



Facilitate Green Building Certification for various building types

We provide green building consultancy services and undertake the entire process of registration, document collection, collation and submission to appropriate Authority for Certification.



Energy simulation for buildings

We believe in conducting our business with the highest standards of honesty, integrity and professionalism.



Lighting simulation and day-lighting analysis

Lighting and day-lighting analysis of the proposed building taking into consideration shading devices used and/or glazing characteristics using software tools.



Commissioning

Fundamental and enhanced building system commissioning as per project requirements and design brief report to meet the requirements of the rating system.



Water efficiency analysis & fixture selection

Analysing the water consumption and suggesting measures to minimize usage through appropriate design strategies appropriate use of fixtures.



Thermal comfort analysis

Analysing thermal design of buildings on the principles of human comfort.



Material selection

Appropriate selection of materials with focus on extending the life of reusable materials, using rapidly renewable materials and materials with recycled content.



Water, Sewage & Waste Management

Advisory services on setting up of suitable water treatment, water recycling and waste management plants.



Municipal & Local Body Infrastructure on Water & Drainage

Planning, assessment, designing and project management of water, storm water and drainage systems.

GREEN PRINCIPLES IN BUILDINGS CAN BE ADOPTED THROUGH GREEN DESIGN FEATURES

• Building design to integrate existing site features

Solar Path analysis, Soil analysis, design in accordance with site contours, design to integrate existing water bodies and trees

• Design to reduce water demand

Rainwater reuse, treated grey water reuse, low flow fixtures, design of landscape to reduce water demand

• Design to reduce energy demand

Efficient air-conditioning equipment, efficient building envelope, proper lighting design

• Appropriate use of materials

Reuse materials, use materials with recycled content, rapidly renewable materials, locally available materials

• Waste management

Maximise waste reuse, proper segregation of wastes, organic waste treatment

• Improved indoor environment

Use of low VOC materials, adequate day-lighting, fresh air ventilation & views, thermal comfort

Green measures during construction

- Erosion & sedimentation control measures
- Reduced water use during construction
- Construction waste management



SUSTAINABLE SCOPE OF WORK

TYPOLOGY : Office (INFOSYS)

No. of Floors : G+ 9

Total Built- up area : 57999.19 sq. m

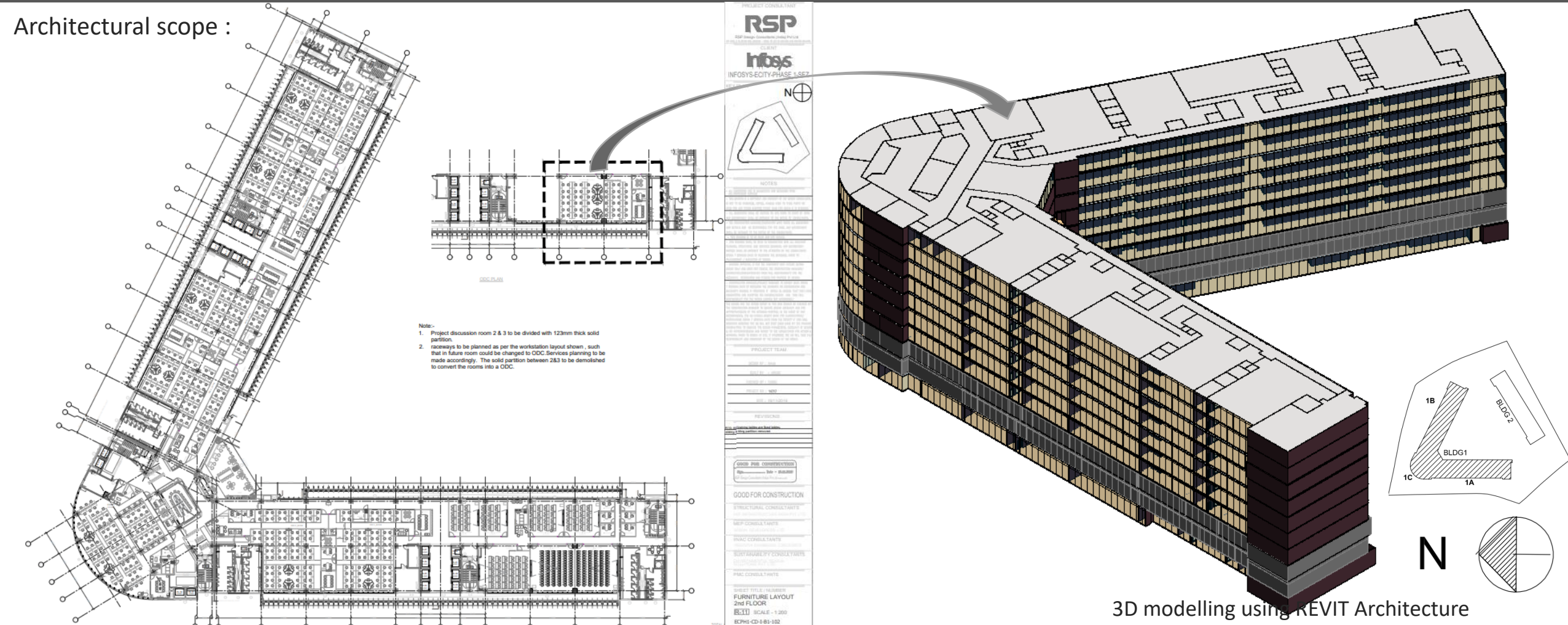
Scope of work :GRIHA, LEED

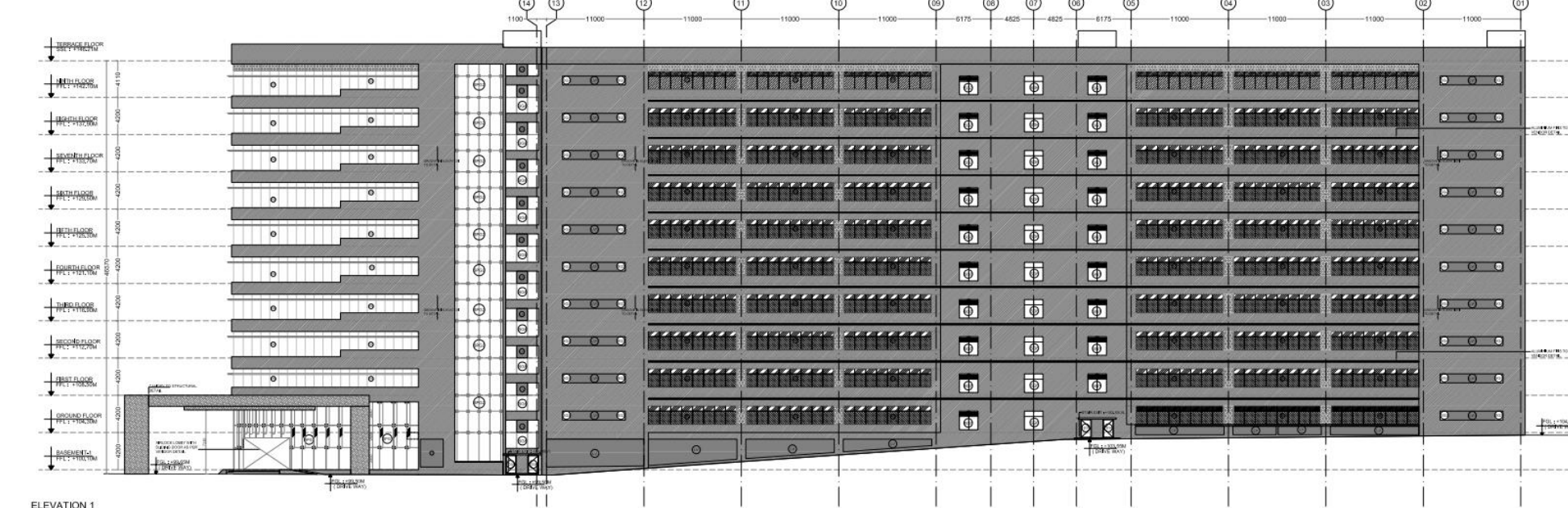
Certifications, Revit – 3d modeling

Project Description

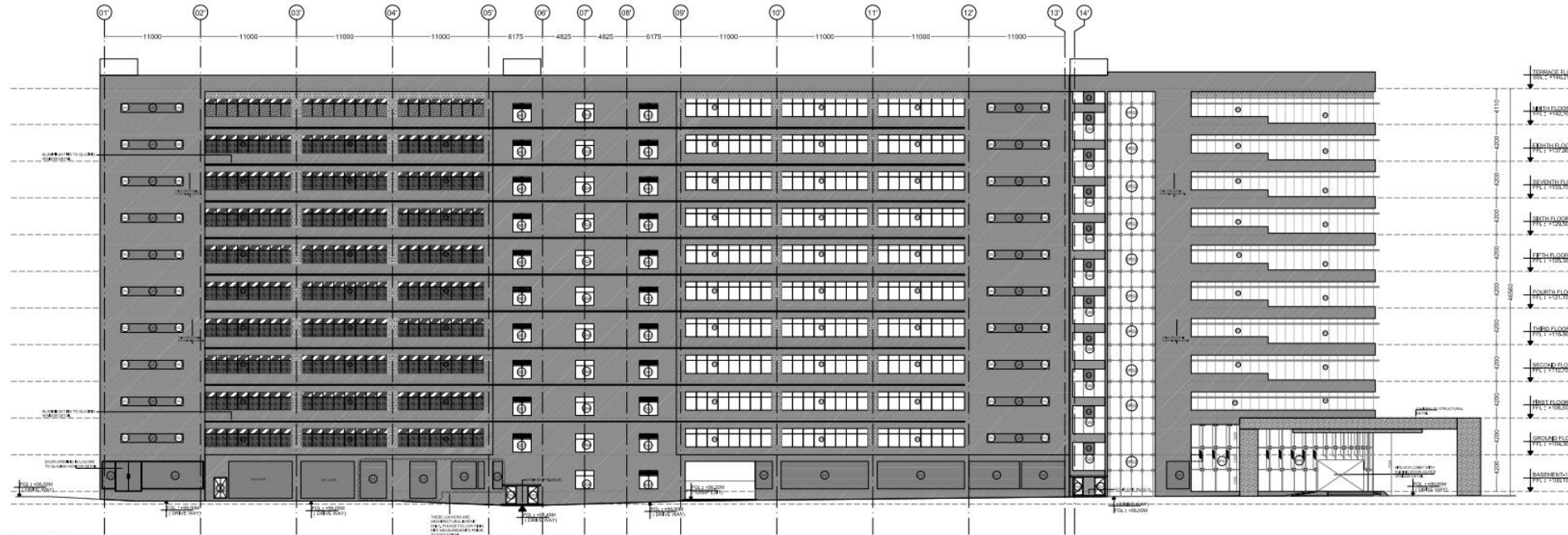
Topics covered for this project : 3D Modelling using Revit Architecture software , Framing Griha Guidelines for approval of certifications, structuring the Quality views of LEED guidelines

Architectural scope :





ELEVATION 1
WING - 1A



ELEVATION 2
WING - 1B

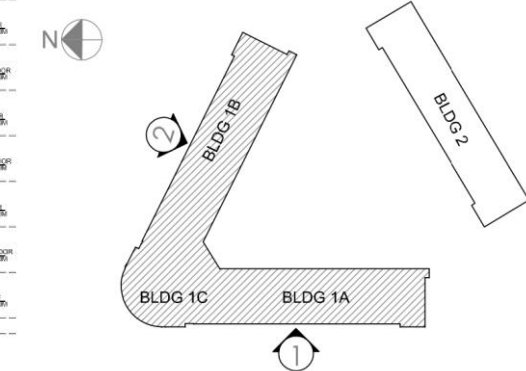
About INFOSYS:

Infosys' total carbon footprint stood at 290,909 metric tonnes of CO₂ equivalent (tCo₂e), after accounting for energy efficiency measures and renewable energy usage. An equivalent volume from its carbon offset projects made its fiscal 2020 emissions net zero, according to its 'Environmental, Social and Governance' (ESG) Vision 2030 document.

In FY2020, over 44% of Infosys' electricity consumption was met through renewable energy sources. The company has invested in installing 60 MW of solar PV capacity.

KEY PLAN

SCALE 1:1000



LEED works :

GROUND FLOOR							
Block	Space Description	Specific Spaces	Space Area (sq.m)	Floor Area accessible to	Applicable Views		
					Type 1	Type 2	Type 3
A	ODC 1	Workstation	123.53	97.87		●	●
		Collab	123.53	12.47		●	●
	ODC 2	Workstation	163.55	129.65		●	●
		Meeting Room	163.55	19.64	●	●	●
	ODC 3 / 39 PAX	Workstation	187.08	140.44		●	●
	ODC 4 / 70 PAX	Workstation	313.65	252.31		●	●
	ODC 5 / 72 PAX	Workstation	319.76	252.61		●	●
Block	Space Description	Specific Spaces	Space Area (sq.m)	Floor Area accessible to	Applicable Views		
B					Type 1	Type 2	Type 3
	ODC 6 / 72 PAX	Workstation	328.95	260.57		●	●
	ODC 7 / 70 PAX	Workstation	346.71	246.68		●	●
		QT room	346.71	57.35		●	●
	RECEPTION	Lobby	147.03	147.03	●	●	●
	ODC 8 / 44 PAX	Workstation	232.77	161.57		●	●
		Meeting Room / 9 PAX	232.77	18.40		●	●
	ODC 9 / 31 PAX	Workstation	214.18	113.08	●	●	●
		Meeting Room / 10 PAX	214.18	26.15	●	●	●
		5S Meeting Room	214.18	17.09	●	●	●
	ODC 10 / 29 PAX	Workstation	194.91	103.62		●	●



INDOOR ENVIRONMENTAL QUALITY CREDIT

Quality Views

This credit applies to:

New Construction (1 point)
Core and Shell (1 point)
Schools (1 point)
Retail (1 point)

Data Centers (1 point)
Warehouses and Distribution Centers (1 point)
Hospitality (1 point)
Healthcare (1-2 points)

Additionally, 75% of all regularly occupied floor area must have at least two of the following four kinds of views:

- multiple lines of sight to vision glazing in different directions at least 90 degrees apart;
- views that include at least two of the following: (1) flora, fauna, or sky; (2) movement; and (3) objects at least 25 feet (7.5 meters) from the exterior of the glazing;
- unobstructed views located within the distance of three times the head height of the vision glazing; and
- views with a view factor of 3 or greater, as defined in “Windows and Offices; A Study of Office Worker Performance and the Indoor Environment.”

Source : LEED – Reference Guide for Building Design and construction (Vol.4)

FIRST FLOOR							
Block	Space Description	Specific Spaces	Space Area (sq.m)	Floor Area accessible to	Applicable Views		
					Type 1	Type 2	Type 3
A	ODC 1 / 77 PAX	Workstation	358.22	289.75		●	●
	ODC 2 / 58	Workstation	290.70	236.04		●	●
	ODC 3 / 70 PAX	Workstation	332.50	264.43		●	●
		QT Room	332.50	57.35	●	●	●
	ODC 4 / 75 PAX	Workstation	355.09	287.7		●	●

Block	Space Description	Specific Spaces	Space Area (sq.m)	Floor Area accessible to	Applicable Views		
					Type 1	Type 2	Type 3
B	ODC 6 / 73 PAX	Workstation	351.23	281.07		●	●
	ODC 7 / 58	Workstation	358.22	289.75		●	●
	ODC 8 / 70 PAX	Workstation	290.70	236.04		●	●

FOURTH FLOOR							
Block	Space Description	Specific Spaces	Space Area (sq.m)	Floor Area accessible to	Applicable Views		
					Type 1	Type 2	Type 3
A	ODC - 1 / 90 PAX	5S meeting room	413.71	19.82	●	●	●
		Workstation	413.71	304.7		●	●
		Meeting Room / 8 PAX	413.71	19.43	●	●	●
	ODC - 2 / 66 PAX	Workstation	351.23	263.85		●	●
	ODC - 3 / 84 PAX	4S meeting room	363.43	9.77	●	●	●
		Workstation	363.43	304.7		●	●
	ODC - 4 / 94 PAX	Meeting Room /	413.71	19.43	●	●	●
		Workstation	413.71	316.98		●	●
		BM Cabin	413.71	9.65	●	●	●

- By referring the guidelines of LEED , the types of criteria are marked as blue dots for the respective spaces of the building .

Source : LEED – Reference Guide for Building Design and construction (Vol.4)

SECOND FLOOR							
Block	Space Description	Specific Spaces	Space Area (sq.m)	Floor Area accessible to views	Applicable Views		
					Type 1	Type 2	Type 3
A	PROJECT DISC ROOM	84 Seats	nil	10.10		●	●
		32 seats	nil	78.22		●	●
		24 seats	nil	10.10		●	●
		60 seats	nil	14.05		●	●
	ODC - 1 / 84 PAX	4S meeting room	363.43	9.77	●	●	●
		Workstation	363.43	304.7		●	●
	ODC - 2 / 94 PAX	Meeting Room / 8 PAX	413.71	19.43	●	●	●
		Workstation	413.71	316.98		●	●
		BM Cabin	413.71	9.65	●	●	●

Block	Space Description	Specific Spaces	Space Area (sq.m)	Floor Area accessible to views	Applicable Views		
					Type 1	Type 2	Type 3
B	PROJECT DISC	84 Seats	nil	10.10		●	●
		32 seats	nil	78.22		●	●
		24 seats	nil	10.10		●	●
		60 seats	nil	14.05		●	●
	ODC - 5 / 84 PAX	4S meeting room	363.43	9.77	●	●	●
		Workstation	363.43	304.7		●	●
	ODC - 4 / 94 PAX	Meeting Room / 8 PAX	413.71	19.43	●	●	●
		Workstation	413.71	316.98		●	●
	ODC - 6 / 76 PAX	Meeting Room / 10 PAX	363.43	23.99	●	●	●
		Workstation	363.43	294.7		●	●
	ODC - 7 / 90 PAX	5S meeting room	413.71	19.82	●	●	●
		Workstation	413.71	304.7		●	●
		Meeting Room / 8 PAX	413.71	19.43	●	●	●

GRIHA works:

GRIHA RFI DRAWINGS	GENERAL DOCUMENTS
Site Plan & its surrounding areas (up to 0.5 km radius)	DTCP Approval document
Floor plans and terrace plans	Approved plans with area statement
Elevations & Sections with D/W Schedule	Fire NOC certificate/Licence
HVAC plans with TFA layout	Building occupancy certificate.
Landscape plan with the list of species and area breakup of each species	Occupancy details/Load Certificate/Licence
Landscape plan highlighting uprooted, newly planted and existing trees along with their species mentioned.	PERT Chart with respect to construction carried out
Parking Plans	Tender document showing safety code and air pollution control measures
Initial site survey plan indicating number of trees present on site before tree transplanting	Soil Test Report (ICAR Accredited laboratory)
Level/Contour drawing	Recent water test report – STP, Rainwater, Municipal, Bore well, etc for Drinking and construction purposes
Interior and exterior lighting layout with wattage details	Operation and Maintenance manual of all the building's systems (Including Mechanical and Electrical) after installation supported with contract document mutually signed
Storm water drain layout	1. Sewage Treatment Plant
Section of Utility Corridors	2. Lifts
Rain water harvesting pit detail drawings with tank capacity and location	3. Escalators
Plumbing layout drawings with details of pipelines, irrigation	4. Water treatment plant
Dual Plumbing Plan	5. Solar photovoltaic system
Methods for landscape, position of water tanks, etc.	6. Organic waste composter
Wet riser Diagram	7. Rainwater harvesting pits
Process Flow Diagram of STP	and other electrical and mechanical systems installed in the project.
Location of Renewable energy systems installed	-Provision proof for a core facility/service group responsible for the O&M of the buildings systems after installation.
Please submit building plan showing the location where noise levels has been measured	Lighting Load sheet
Drawing highlighting the different interior material with different layers, hatch and a legend	Wiring Diagrams of Interior and Exterior Lighting Controls
a) sub-assemble material,	List of utilities considered in building water demand
b) internal partitions,	Test certificate indicating the percentage of recycled content in all the materials used in the interiors
c) panelling,	Test certificate indicating the percentage of recycled content for all flooring materials
d) in-build furniture	Test certificate indicating the percentage of recycled content in the material used for door
e) Flooring	Indoor and outdoor noise audit report - Day & Night time
f) Ceilings	Provide canteen and kitchen hot water usage for cooking and dishwashing (if water supply is provided).
	Water quality checking frequency and sampling plan of the treatment plant
	Characteristics of wastewater and expected characteristics after treatment
	Details regarding chiller timer control and temperature control
	Details regarding controls for cooling towers.
	Copy of contractual tie-up done with the external agency for disposal of waste
	NABL certificate on quality of potable water
	Test certificate of transformers indicating losses at 50% and 100%
	Third party test report indicating the specification along with Solar system performance and efficiency - Hot water/ Solar PV
	Test certificate of wood product indicating that the products are free from urea formaldehyde
	Inventory list of all motors indicating the location, power consumption, efficiency, number of poles and power consumption

POs & DATASHEETS	PHOTOGRAPHS
BOQ, Datasheet & PO of Plumbing Fixtures	Photos of 5 basic amenities within 0.5 km radius
BOQ & MTC of fly ash, OPC, steel, etc.	Photos of daylighting provisions
MTC, Datasheet & PO of Renewable Energy Systems	Photos of irrigation systems installed
BOQ, Datasheet & PO of Interior & Exterior Lighting Fixtures	Photographs of the spaces indicating sufficient artificial lighting in the space
Cut sheet & PO of the irrigation system used	Photographs of exitsigns
Datasheet & PO of STP	Photographs showing the bins at source & at site level
Datasheet & PO of Admixtures	Submit the photographs of treated hard paved area
Datasheet & PO of Interior and Exterior Lighting Controls	Photographs of OWC located at site
Po & Datasheet of Piping Duct	Photographs of metering and sub-metering
Datasheet & PO of insulations used	Submit photographs of 'No Smoking' signs with penalty clause displayed in the building and on site
PO of dustbins	Photos of SRI paints used on hardscape areas/ Vegetated roof/ tree shaded area
Brochure /specifications sheet/ 3rd party test certificate and POs of	Photos of top soil preserved and reused on site
a) sub-assemble material,	Photos of preserved trees during construction
b) internal partitions,	Chiller Name Plate
c) panelling,	Multi Colored Bins
d) in-build furniture	Renewable Energy Systems
e) Flooring	Waste Materials reused on site
f) Ceilings	Transplanted trees
Datasheet & PO of OWC	Photos of reuse of rainwater on site
Datasheet & PO of Transformers	Photographs of, lifts with braille and audio assistance and dedicated parking
Datasheet & PO of paints, adhesives and sealants	DECLARATION LETTER
POs & BOQ for sound absorbent materials used in project.	Declaration stating the efficiency in water use during construction
PO, Brochure /specifications sheet/ MTC of , panelling, door/window frames, Glazing fixtures, Glass	Permission letter obtained to cut trees
Scrap log sheet and Invoices	Certificate from landscape architect about the top soil preservation/Re use, soil stabilization.
Datasheet & PO of Composite wood products	Declaration stating the outdoor lighting has been provided with 100% automatic control system
Datasheet & PO of HVAC systems - AHU/ Chiller/ Cooling towers, Pumps etc	Declaration from architect/engineer/manufacture stating that insulation used in buildings are 100% CFC, HCFC free
Datasheet & PO of Energy & water meters	
PO of Newly Planted trees	
PO and Datasheets of Primary, Secondary, Condenser, Fire, Bore pumps	

[Source :Manual Voll.pdf \(grihaindia.org\)](#)

TYPOLOGY : Residence (Guest house)

No. of Floors : G+ 2

Total Built- up area : 10902 sqm

Scope of work : ECBC and
IGBC Calculations for Resident Health
and Wellbeing

MANUAL CALCULATIONS REFERRING ECBC & IGBC GUIDELINES

Project Description

Topics covered for this project : Area Statement, Window – Wall Ratio , Type of Openings , Enhanced Daylighting, Enhanced Cross ventilation, Enhanced Ventilation, Equivalent SHGC , Building Envelope RETV, Connectivity to exteriors.

WWR					6	Second floor - West wall		sq.m				
1	Ground floor - North wall			sq.m		Total wall area		85.98				
	Total wall area			143.33		Total opening		27.19				
	Total opening			20.5		WWR		0.32		32%		
	WWR			0.14		14%						
2	First floor - North wall			sq.m		Total wall area		85.98				
	Total wall area			65.92		Total opening		56.55				
	Total opening			8.63		WWR		0.66		66%		
	WWR			0.13		13%						
3	Second floor - North wall			sq.m		Total wall area		62.12				
	Total wall area			25.98		Total opening		7.9				
	Total opening			0		WWR		0.13		13%		
	WWR			0		0%						
4	Ground floor - West wall			sq.m		Total wall area		36.21				
	Total wall area			102.01		Total opening		7.9				
	Total opening			30.35		WWR		0.22		22%		
	WWR			0.30		29%						
5	First floor - West wall			sq.m		Total wall area		29.05				
	Total wall area			102.67		Total opening		3.56				
	Total opening			30.35		WWR		0.12		12%		
						Second floor - East wall		sq.m				
						Total wall area		29.4				
						Total opening		1.47				
						WWR		0.05		5%		

Openings type																		
North wall				West wall			South wall			East wall								
Ground Floor				First Floor			Second Floor			Ground Floor			First Floor			Second Floor		
W1	Al. frame finished with wood			2	1	—	3	3	1	2	1	1	—	2	—	—		
SFD	Al. wood finish sliding folding door			1	—	—	—	—	—	—	—	—	—	—	—	—		
V	Ventilator with finsished wooden frame			—	4	—	3	3	2	2	2	2	—	—	—	—		
W4	Al. frame finished with wood			—	—	—	1	1	1	—	—	—	—	—	—	—		
D2	Toilet Door - TW Frame - TW Panel			—	—	—	—	—	—	1	—	—	—	—	—	—		
W2	Al. frame finished with wood - Kitchen window			—	—	—	—	—	—	3	—	—	—	—	—	—		
W3	Al. frame finished with wood			—	—	—	—	—	—	—	—	—	—	—	—	2		

PLAN

IGBC - ENHANCED DAYLIGHTING

GLAZING FACTOR CALCULATION - GROUND FLOOR										
Regularly occupied space	Type of regularly occupied space	Floor Area (sqm)	Window Area (sq.m)	Window glazing VLT %	Skylight Area (sqm)	Skylight glazing VLT %	Glazing factor achieved	Glazing factor to be achieved	Regularly occupied spaces meet or exceed the criteria	Area of regularly occupied space meeting the criteria
Living & Dining	Entrance Foyer	36.4	5.25	50%	0	0	1.4	1	YES	36.4
	Presidential Suite Lobby	18.7	8	50%	0	0	4.3	1	YES	18.7
	Presidential Suite Lounge	15.5	3	50%	0	0	1.9	1	YES	15.5
	Dining	31.9	15.75	50%	0	0	4.9	1	YES	31.9
Bedroom	VIP room 1	16.3	5.25	50%	0	0	3.2	1	YES	16.3
	VIP room 2	17.8	5.25	50%	0	0	2.9	1	YES	17.8
	Presidential Suite room	32.2	10.5	50%	0	0	3.3	1	YES	32.2
	Children's Bedroom	14.1	6.75	50%	0	0	4.8	1	YES	14.1
Kitchen	Kitchen	9.8	1.8	50%	0	0	1.8	1	YES	9.8
TOTAL		192.7								192.7
PERCENTAGE										100%

Enhanced Daylighting

RHW Credit 1

Points: 2

Intent:

Ensure connectivity between the interior and the exterior environment, by providing adequate daylighting.

Glazing factors for Regularly Occupied Spaces

Type of Regularly Occupied Spaces	Glazing Factor (GF)*
Living/ Bedroom	1
Study room	1
Kitchen	2

Note:

For other regularly occupied spaces* which are not listed in the above table, a minimum glazing factor of 1 should be achieved.

Glazing Factor Calculation

Glazing factor can be calculated using the formula given below:

Glazing Factor



$$\frac{\text{Window area (sq.m)} \times \text{Glass VLT} \times \text{Constant} \times 100}{\text{Floor Area (sq.m)}}$$

Constant Values:

Windows on wall : 0.2

Window on roof (skylight) : 1.0

* Regularly occupied spaces include living room, bed rooms, dining room, study room & kitchen

Source : IGBC Green Homes Rating System - Version 3.0

GLAZING FACTOR CALCULATION - FIRST FLOOR										
Regularly occupied space	Type of regularly occupied space	Floor Area (sqm)	Window Area (sq.m)	Window glazing VLT %	Skylight Area (sqm)	Skylight glazing VLT %	Glazing factor achieved	Glazing factor to be achieved	Regularly occupied spaces meet or exceed the criteria	Area of regularly occupied space meeting the criteria
Living & Dining	Lobby	18.7	8	50%	0	0	4.3	1	YES	18.7
	Presidential Suite Lounge 1	15.5	3	50%	0	0	1.9	1	YES	15.5
	Presidential Suite Lounge 2	15.6	5.25	50%	0	0	3.4	1	YES	15.6
Bedroom	VIP room 1	16.3	5.25	50%	0	0	3.2	1	YES	16.3
	VIP room 2	17.8	5.25	50%	0	0	2.9	1	YES	17.8
	Presidential Suite room 1	32.2	10.5	50%	0	0	3.3	1	YES	32.2
	Children's Bedroom	14.1	6.75	50%	0	0	4.8	1	YES	14.1
	Presidential Suite room 2	15.9	5.25	50%	0	0	3.3	1	YES	15.9
	Room 1	25.9	5.25	50%	0	0	2.0	1	YES	25.9
	Room 2	14.8	5.25	50%	0	0	3.5	1	YES	14.8
TOTAL		186.8								186.8
PERCENTAGE										100%

GLAZING FACTOR CALCULATION - SECOND FLOOR										
Regularly occupied space	Type of regularly occupied space	Floor Area (sqm)	Window Area (sq.m)	Window glazing VLT %	Skylight Area (sqm)	Skylight glazing VLT %	Glazing factor achieved	Glazing factor to be achieved	Regularly occupied spaces meet or exceed the criteria	Area of regularly occupied space meeting the criteria
Living & Dining	Presidential Suite Lobby	18.7	8	50%	0	0	4.3	1	YES	18.7
	Presidential Suite Lounge	15.5	3	50%	0	0	1.9	1	YES	15.5
Bedroom	VIP room	17.8	5.25	50%	0	0	2.9	1	YES	17.8
	Presidential Suite room	26.6	10.5	50%	0	0	3.9	1	YES	26.6
	Children's Bedroom	14.1	6.75	50%	0	0	4.8	1	YES	14.1
TOTAL		92.7								92.7
PERCENTAGE										100%

Source : IGBC Green
Homes Rating System
- Version 3.0

Enhanced Ventilation - Ground Floor											
Type	Length (m)	Width (m)	Carpet area (sqm)	Type of Window	Window Dimensions		Openable Type	Window Area (sq.m)	Openable window area (sqm)	% of openable area to carpet area - required	% of openable area to carpet area - achieved
					Length (m)	Height (m)					
Entrance Foyer	6.35	5.73	36.4	W1	2.5	2.1	Openable Type	5.25	5.25	12%	14%
Presidential Suite Lobby	4.85	3.85	18.7	nil	3.8	2.1	Openable Type	7.98	8	12%	43%
Presidential Suite Lounge	4.78	3.25	15.5	W3 (2nos)	1	1.5	Openable Type	3	3	12%	19%
Dining	4.1	7.8	32.0	W1 (3nos)	2.5	2.1	Openable Type	15.75	15.75	12%	49%
VIP room 1	4.8	3.4	16.3	W1	2.5	2.1	Openable Type	5.25	5.25	12%	32%
VIP room 2	5	3.55	17.8	W2	2.5	2.1	Openable Type	5.25	5.25	12%	30%
Presidential Suite room	8.5	7.83	66.6	W1 (2nos)	2.5	2.1	Openable Type	10.5	10.5	12%	16%
Children's Bedroom	3.08	4.58	14.1	W1	2.5	2.1	Openable Type	6.75	6.75	12%	48%
				W3	1	1.5					
Kitchen	2.58	3.8	9.8	W2	1.8	1	Openable Type	1.8	1.8	10%	18%
VIP room 1 Toilet	2	2.5	5.0	V	0.6	0.6	Louvres	0.36	0.36	5%	7%
Toilet	1.8	2.5	4.5	V	0.6	0.6	Louvres	0.36	0.36	5%	8%
Maid room Toilet	2.78	1.6	4.4	V	0.6	0.6	Louvres	0.36	0.36	5%	8%
VIP room 2 Toilet	2	2.55	5.1	V	0.6	0.6	Louvres	0.36	0.36	5%	7%
Suite room Toilet	1.6	2.95	4.7	V	0.6	0.6	Louvres	0.36	0.36	5%	8%
Children's room Toilet	1.6	2.5	4.0	V	0.6	0.6	Louvres	0.36	0.36	5%	9%

RESIDENT HEALTH & WELLBEING

Enhanced Ventilation Design

RHW Credit 2

Points: 2

Intent:

Avoid indoor pollutants affecting indoor air quality by providing adequate outdoor air ventilation.

Compliance Options:

Naturally Ventilated Spaces:

Option 1:

Provide openable windows or doors to the exteriors in all regularly occupied spaces of each dwelling unit such that the openable area is designed to meet the criteria as outlined in the table below:

Case 1: Less than 5 floors	
Design Criteria for Openable Windows and Doors to the Exteriors	
Space type	Openable area as a percentage of total carpet area
Living Spaces	12%
Kitchen	10%
Bathrooms*	5%

- Notes:*
- Regularly occupied spaces include living room, bed rooms, dining room, study room, kitchen etc.,*
 - For sliding windows / doors, only openable area to the exteriors shall be considered in calculations*

Source : IGBC Green Homes Rating System - Version 3.0

Enhanced Ventilation - First Floor											
Type	Length (m)	Width (m)	Carpet area (sqm)	Type of Window	Window Dimensions		Openable Type	Window Area (sq.m)	Openable window area (sqm)	% of openable area to carpet area - required	% of openable area to carpet area - achieved
					Length (m)	Height (m)					
Presidential Suite Lobby	4.85	3.85	18.7	nil	3.8	2.1	Openable Type	7.98	8	12%	43%
Presidential Suite Lounge 1	4.78	3.25	15.5	W3 (2nos)	1	1.5	Openable Type	3	3	12%	19%
Presidential Suite Lounge 2	4.1	3.81	15.6	W1	2.5	2.1	Openable Type	5.25	5.25	12%	34%
VIP room 1	4.8	3.4	16.3	W1	2.5	2.1	Openable Type	5.25	5.25	12%	32%
VIP room 2	5	3.55	17.8	W2	2.5	2.1	Openable Type	5.25	5.25	12%	30%
Presidential Suite room 1	8.5	7.83	66.6	W1 (2nos)	2.5	2.1	Openable Type	10.5	10.5	12%	16%
Children's Bedroom	3.08	4.58	14.1	W1	2.5	2.1	Openable Type	6.75	6.75	12%	48%
				W3	1	1.5					
Presidential Suite room 2	4.1	3.89	15.9	W1	2.5	2.1	Openable Type	5.25	5.25	12%	33%
Room 1	4.31	6	25.9	W1	2.5	2.1	Openable Type	5.25	5.25	12%	20%
Room 2	4.4	3.37	14.8	W2	2.5	2.1	Openable Type	5.25	5.25	12%	35%
VIP room 1 Toilet	2	2.5	5.0	V	0.6	0.6	Louvres	0.36	0.36	5%	7%
Toilet	3.33	1.66	5.5	V	0.6	0.6	Louvres	0.36	0.36	5%	7%
Maid room Toilet	2.78	1.6	4.4	V	0.6	0.6	Louvres	0.36	0.36	5%	8%
VIP room 2 Toilet	2	2.55	5.1	V	0.6	0.6	Louvres	0.36	0.36	5%	7%
Suite room 1 Toilet	1.6	2.95	4.7	V	0.6	0.6	Louvres	0.36	0.36	5%	8%
Children's room Toilet	1.6	2.5	4.0	V	0.6	0.6	Louvres	0.36	0.36	5%	9%
Suite room 2 Toilet	2.5	1.7	4.3	V	0.6	0.6	Louvres	0.36	0.36	5%	8%
Room 2 Toilet	1.95	2.35	4.6	V	0.6	0.6	Louvres	0.36	0.36	5%	8%

Enhanced Ventilation - Second Floor											
Type	Length (m)	Width (m)	Carpet area (sqm)	Type of Window	Window Dimensions		Openable Type	Window Area (sq.m)	Openable window area (sqm)	% of openable area to carpet area - required	% of openable area to carpet area - achieved
					Length (m)	Height (m)					
Presidential Suite Lobby	4.85	3.85	18.7	nil	3.8	2.1	Openable Type	7.98	8	12%	43%
Presidential Suite Lounge	4.78	3.25	15.5	W3 (2nos)	1	1.5	Openable Type	3	3	12%	19%
VIP room	5	3.55	17.8	W2	2.5	2.1	Openable Type	5.25	5.25	12%	30%
Presidential Suite room	6.8	7.83	53.2	W1 (2nos)	2.5	2.1	Openable Type	10.5	10.5	12%	20%
Children's Bedroom	3.08	4.58	14.1	W1	2.5	2.1	Openable Type	6.75	6.75	12%	48%
				W3	1	1.5					
VIP room Toilet	2	2.55	5.1	V	0.6	0.6	Louvres	0.36	0.36	5%	7%
Suite room Toilet	1.6	2.95	4.7	V	0.6	0.6	Louvres	0.36	0.36	5%	8%
Children's room Toilet	1.6	2.95	4.7	V	0.6	0.6	Louvres	0.36	0.36	5%	8%

Enhanced ventilation was calculated based on the % of openable area to carpet area for the regularly occupied spaces in every floor in the Guest House and was found to achieve the required openable area %. Hence every space complies to the credit.

Source : IGBC Green Homes Rating System - Version 3.0

IGBC - ENHANCED CROSS VENTILATION

Enhanced Cross Ventilation - Ground Floor				
Regularly occupied space	Type of regularly occupied space	Floor Area (sqm)	Regularly occupied spaces meet or exceed the criteria	Area of regularly occupied space meeting the criteria
Living & Dining	Entrance Foyer	36.4	YES	36.4
	Presidential Suite Lobby	18.7	YES	18.7
	Presidential Suite Lounge	15.5	NO	0
	Dining	31.9	YES	31.9
Bedroom	VIP room 1	16.3	NO	0
	VIP room 2	17.8	NO	0
	Presidential Suite room	32.2	YES	32.2
	Children's Bedroom	14.1	YES	14.1
Kitchen	Kitchen	9.8	NO	0
TOTAL		192.7		133.3
PERCENTAGE				70%
POINTS				2

Enhanced cross ventilation was analyzed for the regularly occupied spaces in every floor based on the opening positions in the room and the % of area receiving cross ventilation. Rooms without cross ventilation does not comply to the credit.

Source : IGBC Green Homes Rating System - Version 3.0

Enhanced Cross Ventilation - First Floor				
Regularly occupied space	Type of regularly occupied space	Floor Area (sqm)	Regularly occupied spaces meet or exceed the criteria	Area of regularly occupied space meeting the criteria
Living & Dining	Lobby	18.7	YES	18.7
	Presidential Suite Lounge 1	15.5	NO	0
	Presidential Suite Lounge 2	15.6	YES	15.6
Bedroom	VIP room 1	16.3	NO	0
	VIP room 2	17.8	NO	0
	Presidential Suite room 1	32.2	YES	32.2
	Children's Bedroom	14.1	YES	14.1
	Presidential Suite room 2	15.9	NO	0
	Room 1	25.9	YES	25.9
	Room 2	14.8	YES	14.8
	TOTAL	186.8		121.3
PERCENTAGE				65%
POINTS				2

Enhanced Cross Ventilation - Second Floor				
Regularly occupied space	Type of regularly occupied space	Floor Area (sqm)	Regularly occupied spaces meet or exceed the criteria	Area of regularly occupied space meeting the criteria
Living & Dining	Presidential Suite Lobby	18.7	YES	18.7
	Presidential Suite Lounge	15.5	NO	0
Bedroom	VIP room	17.8	YES	17.8
	Presidential Suite room	26.6	YES	26.6
	Children's Bedroom	14.1	YES	14.1
TOTAL		92.7		77.2
PERCENTAGE				83%
POINTS				3

Compliance Options:

Ensure that minimum 25% of the regularly occupied spaces (by area) in each dwelling unit shall have an opening (doors/ ventilators/ windows) to the outdoor environment, in atleast two of the orientations.

Points are awarded as below:

Percentage of regularly occupied spaces with cross ventilation	Points
≥ 25%	1
≥ 50%	2
≥ 75%	3
≥ 95%	4

RESIDENT HEALTH & WELLBEING

Cross Ventilation

RHW Credit 3

Points: 4

Intent:

Encourage adequate cross ventilation in the dwelling units thereby, providing a healthy environment

RHW

IGBC – CONNECTIVITY TO EXTERIORS

CONNECTIVITY TO EXTERIORS - GROUND FLOOR			
Regularly occupied space	Type of regularly occupied space	Floor Area (sqm)	Area of regularly occupied space meeting the criteria
Living & Dining	Entrance Foyer	36.4	30.5
	Presidential Suite Lobby	18.7	15.6
	Presidential Suite Lounge	15.5	12.9
	Dining	31.9	29.3
Bedroom	VIP room 1	16.3	13.4
	VIP room 2	17.8	14.1
	Presidential Suite room	32.2	22.1
	Children's Bedroom	14.1	11.8
Kitchen	Kitchen	9.8	7.9
TOTAL		192.7	157.4
PERCENTAGE			82%
POINTS			2

Connectivity to Exteriors

RHW Credit 4

Intent:

Ensure connectivity between the interior and exterior spaces, to achieve visual delight to occupants

Source : IGBC Green Homes Rating System - Version 3.0

Percentage of regularly occupied spaces with connectivity to exteriors	Points
≥ 50%	1
≥ 75%	2

CONNECTIVITY TO EXTERIORS - FIRST FLOOR			
Regularly occupied space	Type of regularly occupied space	Floor Area (sqm)	Area of regularly occupied space meeting the criteria
Living & Dining	Lobby	18.7	15.6
	Presidential Suite Lounge 1	15.5	12.9
	Presidential Suite Lounge 2	15.6	12.9
	VIP room 1	16.3	13.4
Bedroom	VIP room 2	17.8	14.1
	Presidential Suite room 1	32.2	22.1
	Children's Bedroom	14.1	11.8
	Presidential Suite room 2	15.9	12.9
	Room 1	25.9	20.1
	Room 2	14.8	12.7
	TOTAL	186.8	148.5
PERCENTAGE			79%
POINTS			2

Points: 2

CONNECTIVITY TO EXTERIORS - SECOND FLOOR			
Regularly occupied space	Type of regularly occupied space	Floor Area (sqm)	Area of regularly occupied space meeting the criteria
Living & Dining	Presidential Suite Lobby	18.7	15.6
	Presidential Suite Lounge	15.5	12.9
Bedroom	VIP room	17.8	14.1
	Presidential Suite room	26.6	22.1
	Children's Bedroom	14.1	11.8
TOTAL		92.7	76.5
PERCENTAGE			83%
POINTS			2

Compliance Options:

Achieve direct line of sight to vision glazing between 0.9 meters (3 feet) and 2.1 meters (7 feet) above the finished floor level, for building occupants in atleast 50% of all regularly occupied spaces in each dwelling unit. Also, the project shall comply with the following criteria:

- ❖ The building occupants must not have any obstruction of views atleast 8 meters (26.2 feet) from the exterior vision glazing.
- (OR)
- ❖ The building occupants must have access either to sky or flora & fauna or both.

ECBC – RESIDENTIAL ENVELOPE TRANSMITTANCE VALUE

CALCULATION FOR RETV					
CALCULATION FOR TERM - 1					
Orientation	Component	a) Area (sqm)	b) U value (W.m/K)	c) Orientation Fator	a x b x c
North	Opaque Area	206.1	0.73	0.659	99.15
South	Opaque Area	111.96	0.73	0.966	78.95
East	Opaque Area	53.42	0.73	1.155	45.04
West	Opaque Area	202.77	0.73	1.156	171.11
TERM 1 TOTAL					394.26
CALCULATION FOR TERM - 2					
Orientation	Component	a) Area (sqm)	b) U value (W.m/K)	c) Orientation Fator	a x b x c
North	Non Opaque Area	29.13	5	0.659	95.98
South	Non Opaque Area	72.35	5	0.966	349.45
East	Non Opaque Area	5.03	5	1.155	29.05
West	Non Opaque Area	87.89	5	1.156	508.00
TERM 2 TOTAL					982.49

Envelope materials transmittance calculations was done based on the regulations of Eco-Niwas Samhita 2018. The calculated RETV value less than 15 W/m2 is said to comply to the requirement.

Source : Eco-Niwas Samhita 2018

CALCULATION FOR TERM - 3					
Orientation	Component	a) Area (sqm)	b) Equivalent SHGC	c) Orientation Fator	a x b x c
North	Non Opaque Area	29.13	0.45	0.659	8.64
South	Non Opaque Area	72.35	0.45	0.966	31.45
East	Non Opaque Area	5.03	0.45	1.155	2.61
West	Non Opaque Area	87.89	0.45	1.156	45.72
TERM 3 TOTAL					88.42

$RETV = 1/768.65 \times (5.15 \times 394.26) + (1.31 \times 982.49) + (65.21 \times 88.42)$

RETV = 11.80 W/m2

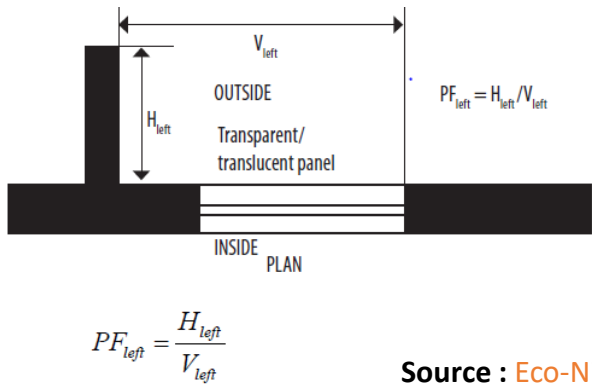
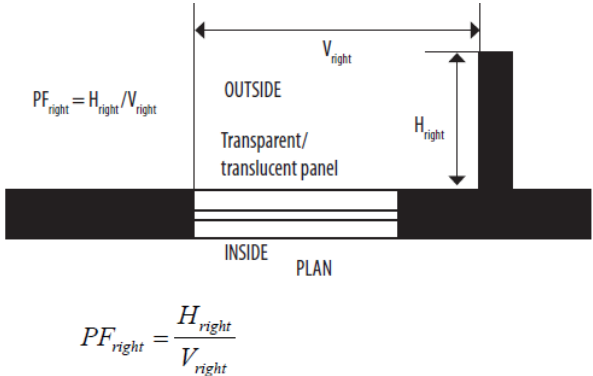
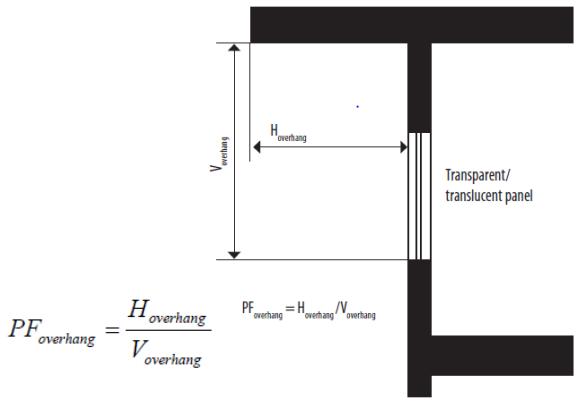
This is less than max RETV of 15 W/m2. Hence it complies to the requirement.

TABLE 3 Coefficients (a, b, and c) for RETV formula

Climate zone	a	b	c
Composite	6.06	1.85	68.99
Hot-Dry	6.06	1.85	68.99
Warm-Humid	5.15	1.31	65.21
Temperate	3.38	0.37	63.69
Cold	Not applicable (Refer Section 3.5)		

ECBC – EQUIVALENT SOLAR HEAT GAIN COEFFICIENT (SHGC)

CALCULATION OF EQUIVALENT SHGC																			
Orientation	Name	Width of glass (m)	Height of glass (m)	No. of Windows	Glass Area (sqm)	H overhang (m)	V overhang (m)	PF overhang	H right (m)	V right (m)	PF right	H left (m)	V left (m)	PF left	ESF overhang	ESF right	ESF left	ESF total	SHGC eq
North	W1	2.5	2.1	3	5.25	0.45	2.1	0.21	0.1	2.5	0.04	0.1	2.5	0.04	0.888	1.000	1.000	0.888	0.53
	W2	1.8	1.0	0	1.80	0.45	1.0	0.45	0.1	1.8	0.06	0.1	1.8	0.06	0.838	1.000	1.000	0.838	0.49
	W3	1.0	1.5	0	1.50	0.45	1.5	0.30	0.1	1.0	0.1	0.1	1.0	0.1	0.86	0.962	0.962	0.795	0.47
	W4	1.8	2.1	0	3.78	0.45	2.1	0.21	0.1	1.8	0.06	0.1	1.8	0.06	0.888	1.000	1.000	0.888	0.53
South	W1	2.5	2.1	4	5.25	0.45	2.1	0.21	0.1	2.5	0.04	0.1	2.5	0.04	0.816	1.000	1.000	0.816	0.50
	W2	1.8	1.0	3	1.80	0.45	1.0	0.45	0.1	1.8	0.06	0.1	1.8	0.06	0.708	1.000	1.000	0.708	0.46
	W3	1.0	1.5	0	1.50	0.45	1.5	0.30	0.1	1.0	0.1	0.1	1.0	0.1	0.754	0.962	0.962	0.697	0.45
	W4	1.8	2.1	0	3.78	0.45	2.1	0.21	0.1	1.8	0.06	0.1	1.8	0.06	0.816	1.000	1.000	0.816	0.51
East	W1	2.5	2.1	0	5.25	0.45	2.1	0.21	0.1	2.5	0.04	0.1	2.5	0.04	0.855	1.000	1.000	0.855	0.52
	W2	1.8	1.0	0	1.80	0.45	1.0	0.45	0.1	1.8	0.06	0.1	1.8	0.06	0.747	1.000	1.000	0.747	0.48
	W3	1.0	1.5	2	1.50	0.45	1.5	0.30	0.1	1.0	0.1	0.1	1.0	0.1	0.797	0.975	0.984	0.764	0.48
	W4	1.8	2.1	0	3.78	0.45	2.1	0.21	0.1	1.8	0.06	0.1	1.8	0.06	0.855	1.000	1.000	0.855	0.53
West	W1	2.5	2.1	7	5.25	0.45	2.1	0.21	0.1	2.5	0.04	0.1	2.5	0.04	0.854	1.000	1.000	0.854	0.53
	W2	1.8	1.0	0	1.80	0.45	1.0	0.45	0.1	1.8	0.06	0.1	1.8	0.06	0.746	1.000	1.000	0.746	0.47
	W3	1.0	1.5	0	1.50	0.45	1.5	0.30	0.1	1.0	0.1	0.1	1.0	0.1	0.796	0.984	0.975	0.763	0.19
	W4	1.8	2.1	3	3.78	0.45	2.1	0.21	0.1	1.8	0.06	0.1	1.8	0.06	0.854	1.000	1.000	0.854	0.53



Source : Eco-Niwas Samhita 2018

TYPOLOGY : Hospital

No. of Floors : G+ 7

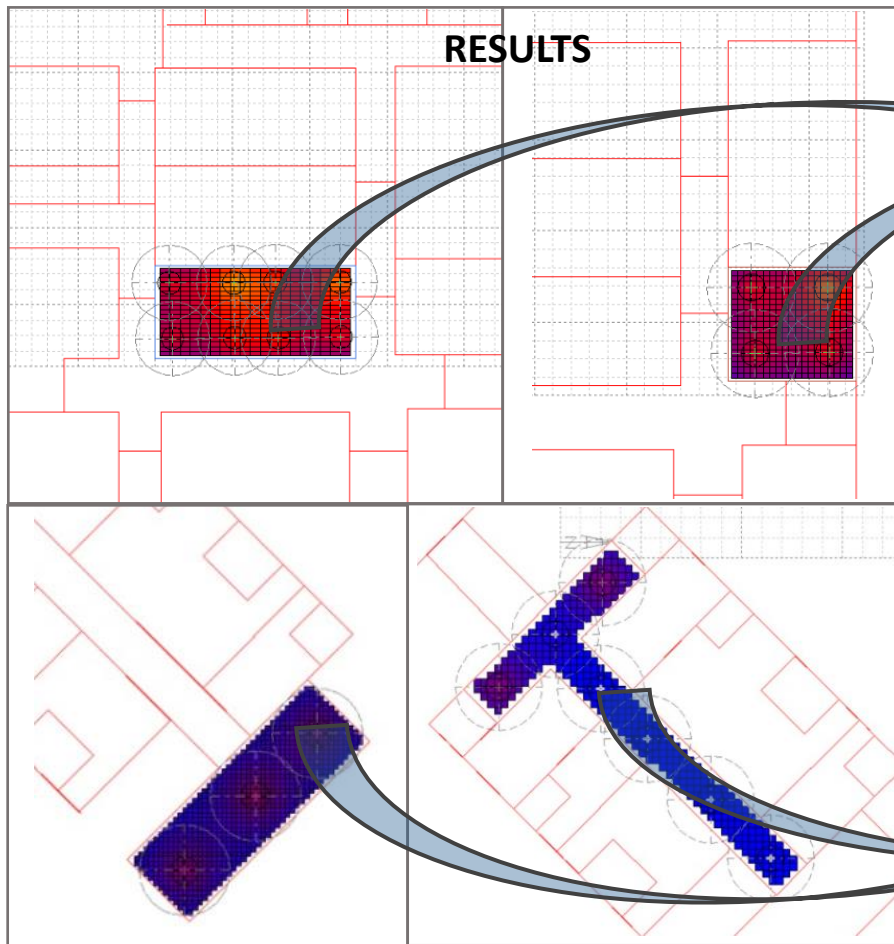
Total Built- up area : 36,032.36 sq. m

Scope of work : Artificial Lighting
Simulation

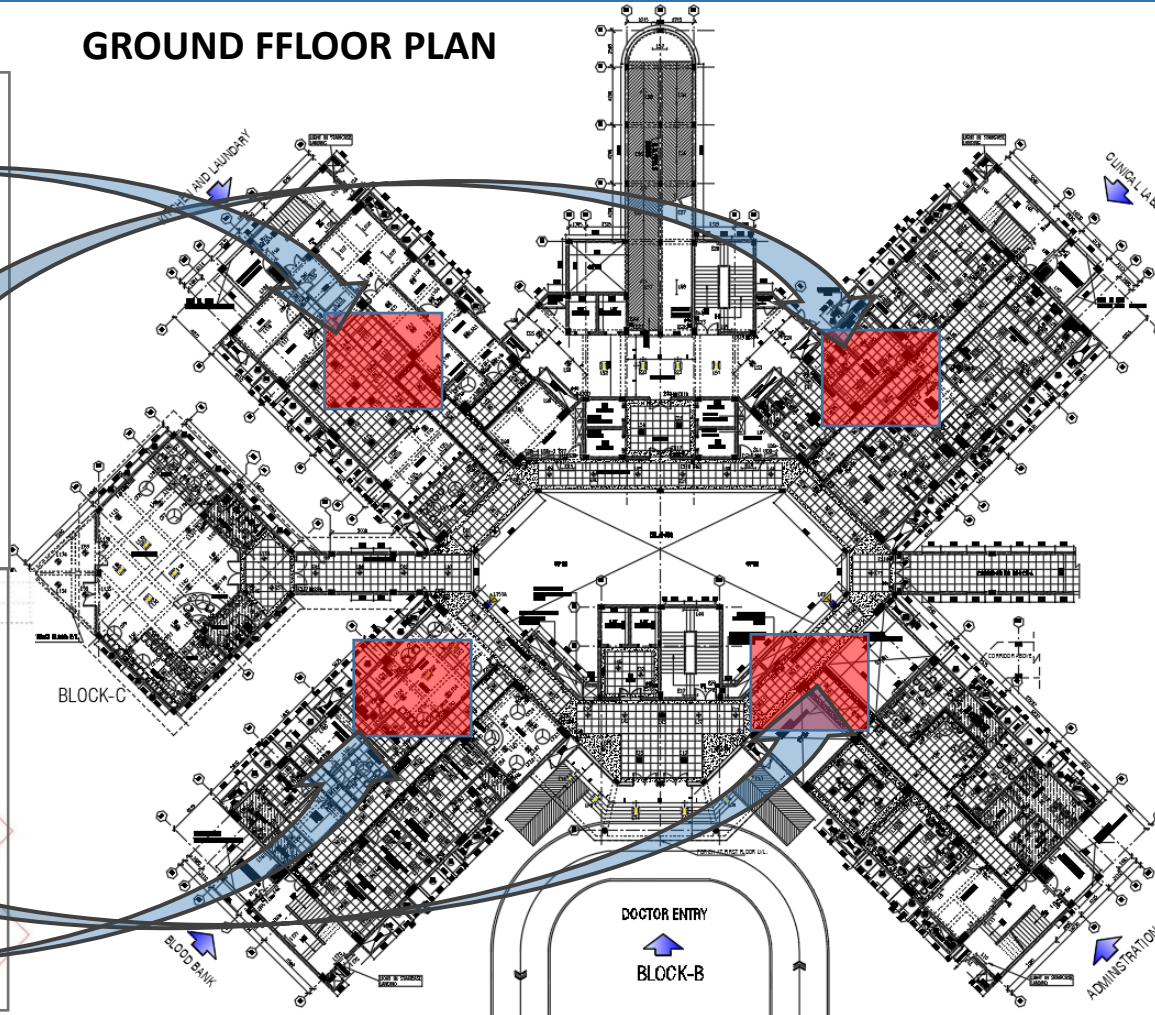
Project Description

Topics covered for this project : Referring NBC standards for artificial lighting for each spaces in the hospital, Lighting simulation using Ecotect & Dialux software , Tabulating and cross - checking with the requirements of NBC standards

Artificial Lighting Analysis using Ecotect Software :



GROUND FFLOOR PLAN



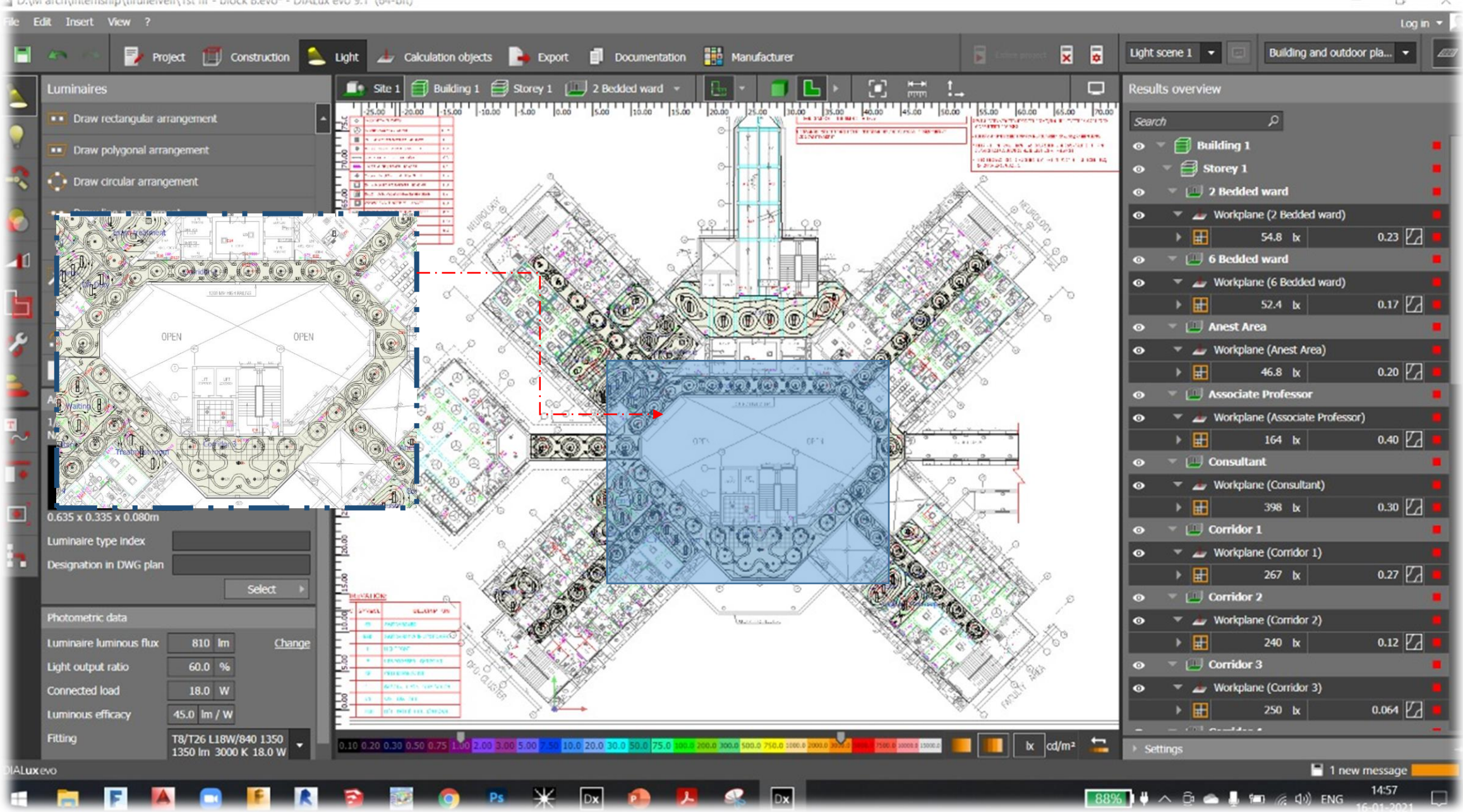
About Ecotect Software :

Autodesk Ecotect Analysis is an [environmental analysis](#) tool that allows [designers](#) to simulate building [performance](#) from the earliest stages of [conceptual design](#). It combines [analysis functions](#) with an [interactive](#) display that presents analytical results directly within the context of the building [model](#).

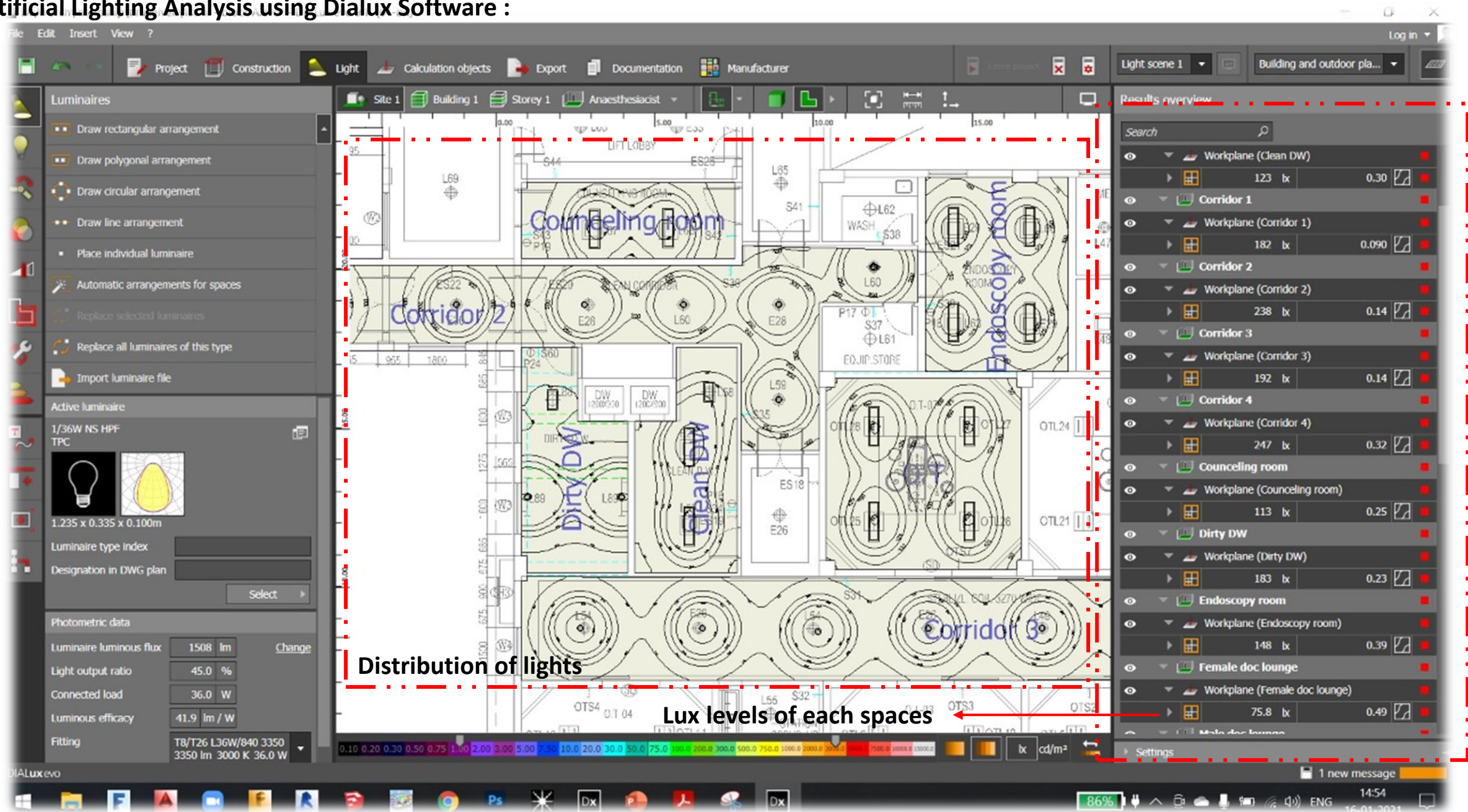
Inference:

The artificial lighting was done in ecotect analysis by fixing the respective lights with respective wattage. But the results could not be obtained . So we switched on to Dialux Software for simulation.

Artificial Lighting Analysis using Dialux Software :



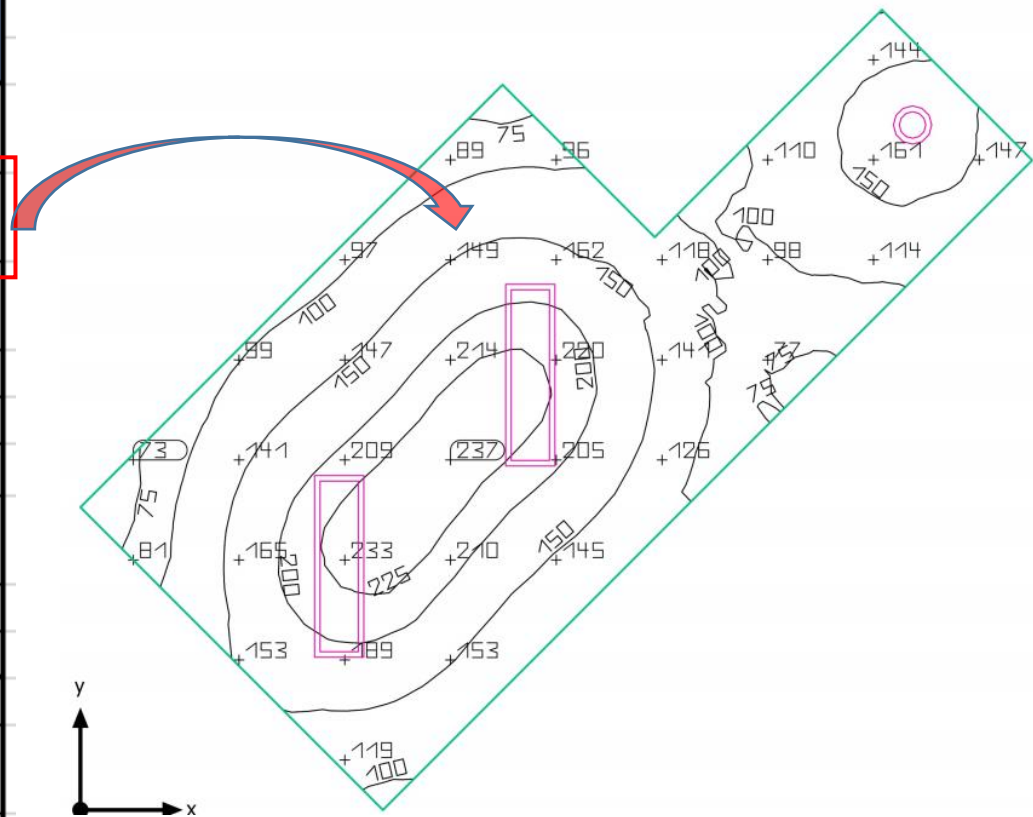
Artificial Lighting Analysis using Dialux Software :



GROUND FLOOR		
Block A	Req Lux Level	Achieved Lux Level
Radiographer	30-50	190
Faculty	100 – 200	162
Demo	300 - 750	215
MRI	50 – 150	108
CT	50 – 150	131
X-RAY	50 – 150	133
Meeting room	100 – 200	160
Computer room	500-700	742
Ultrasound	500-700	643
MRI	50 – 150	108
Equip room	150 – 300	161
Back office	200 – 500	194
CCTV Monitoring room	200 – 500	239
Information and Registration	150 – 300	184
Entrance foyer	150 – 300	133
Waiting	100 - 200	108
Control	100 - 200	116

1ST FLOOR		
Block A	Req Lux Level	Achieved Lux Level
Pre- operation	100 - 150	130
Store	150 - 300	260
Nursing station	100 - 150	109
Treatment Room	100 - 150	144
Anaesthesiacist	100 - 150	102
Male Doc Lounge	50 - 100	82.6
Female Doc Lounge	50 - 100	74.3
Trolley transfer	50 - 100	89.7
Counselling Room	100 - 150	112
Endoscopy Room	100 - 150	149
O.T	100 - 150	119
Diry D.W	100 - 200	183
Clean D.W	100 - 200	123
T.S.SU	150 - 500	152
Mobile X-ray	150 - 500	152
Corrider 1	100 - 150	182
Corrider 2	100 - 150	238
Corrider 3	100 - 150	192
Corrider 4	100 - 150	247

2ND & 3RD FLOOR		
	Req Lux Level	Achieved Lux Level
Associate Professor	150 - 500	164
Assistant Professor	150 - 500	150
Professor	150 - 500	151
6 bed ward	30 - 50	52.1
Dr duty	100 - 150	181
Exam/treatment	200 - 500	228
SR room	200 - 500	242
2 bed ward	30 - 50	54.8
Demo	100 - 150	186
Consultant	200 - 500	403
Prodecure room	200 - 500	226
Waiting area	100 - 200	144
Lobby	50 - 300	85.2
Corrider 1	100 - 150	267
Corrider 2	100 - 150	240
Corrider 3	100 - 150	251
Corrider 4	100 - 150	246
Corrider 5	100 - 150	263
Corrider 6	100 - 150	257



Results

	Symbol	Calculated	Target	Check
Workplane	E	150 lx	≥ 500 lx	✗
	g _i	0.41	-	-
Consumption values	Consumption	230 kWh/a	max. 550 kWh/a	✓
Lighting power density	Room	5.54 W/m ²	-	-
		3.71 W/m ² /100 lx	-	-

INFERENCE :

The Lighting Levels are tabulated with the references of NBC standards and the simulation is done by Dialux Software to meet the needs as per NBC standards. The drawing mentioned is the final output of the dialux software .

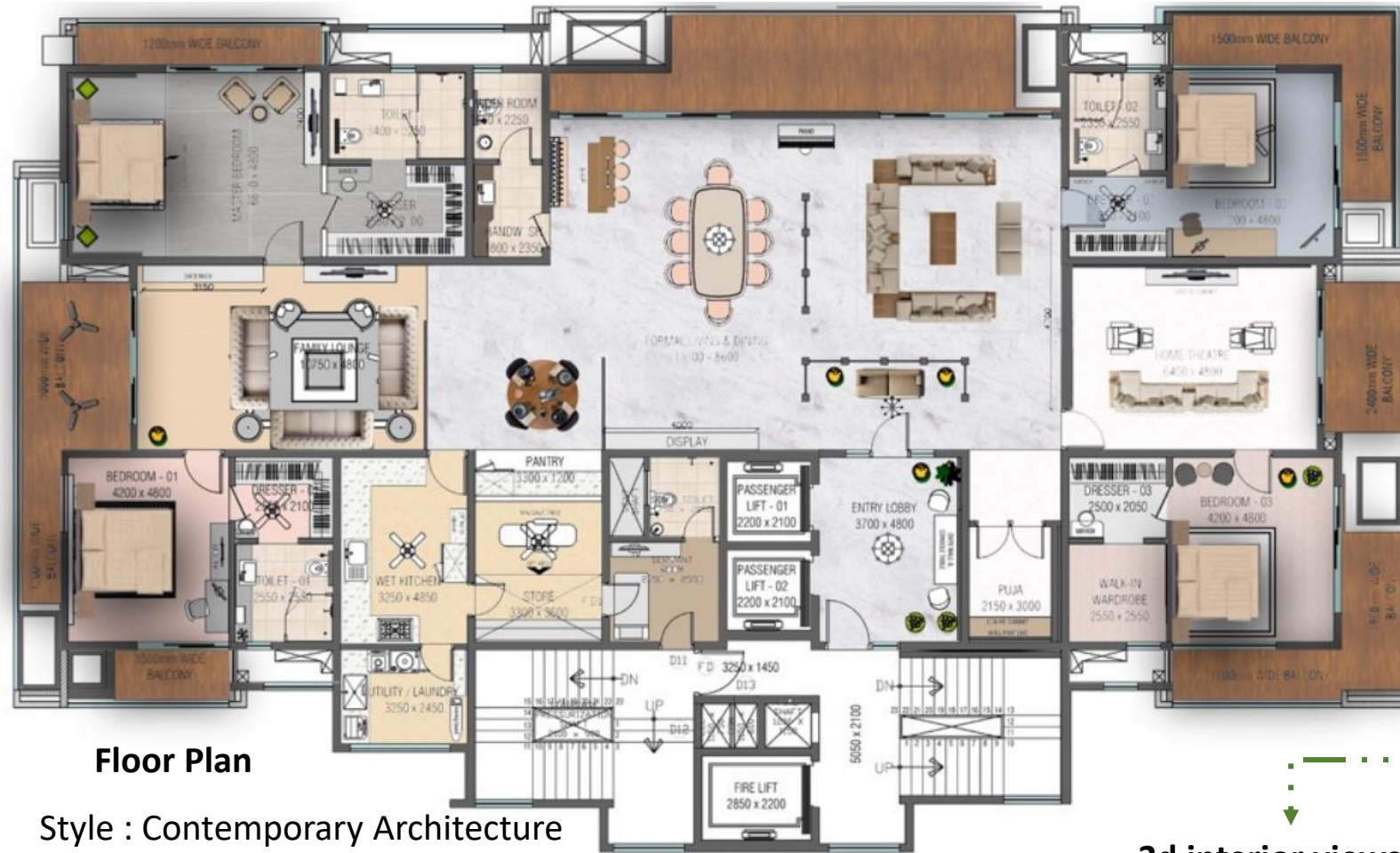


ARCHITECTURAL SCOPE OF WORK

TYPOLOGY : Residence for Mrs. Neeraja
 No. of Floors : 1st floor
 Total Built- up area : 703.98 sq. m
 Scope of work : conceptual 3d modelling, Services Drawing

Project Description

Topics covered for this project : 3d modelling , Detailed 2d interior elevations with reference to structural layout & fire fighting systems) , Electrical layouts in 2d Interior elevations



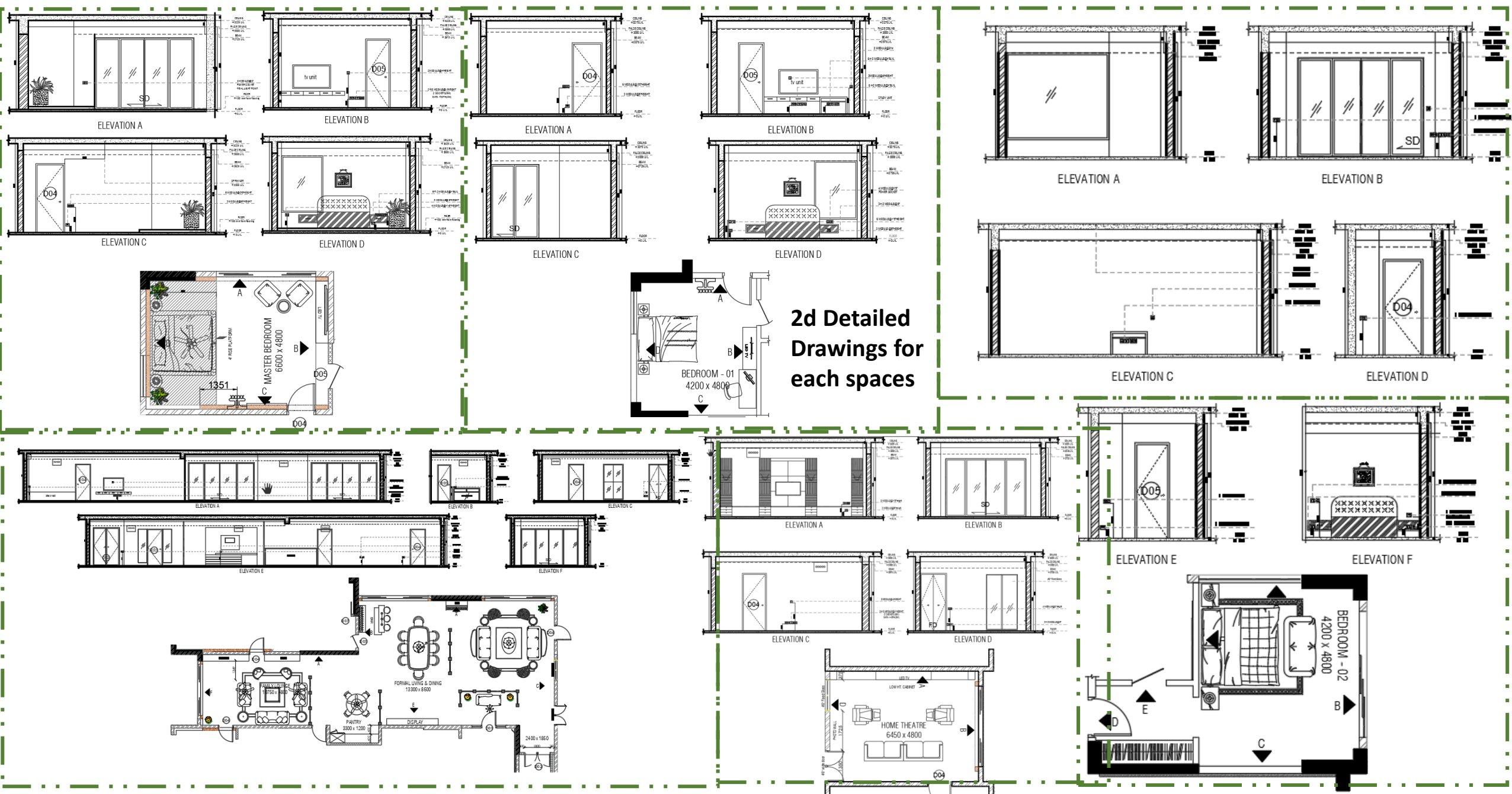
Floor Plan

Style : Contemporary Architecture
 Style (Client's Requirement)

3d interior views

SPACE	CEILING TOP TO FLOOR BOTTOM (mm)	SLAB THICKNESS (mm)	FLOOR THICKNESS (mm)	CLEAR HEIGHT (mm)
Family Lounge	3500	200	75	3300
Formal Living and Dining	3500	275	75	3150
Home Theatre	3500	200	75	3300
Master Bedroom	3500	200	75	3300
Bedroom 01	3500	150	75	3250
Bedroom 02	3500	150	75	3250
Bedroom 03	3500	150	75	3250
Study room	3500	150	75	3250
Kitchen	3500	150	75	3250





TYPOLOGY : Residence for Mr. Murali
 No. of Floors : 2nd floor
 Total Built- up area : 703.98 sq. m
 Scope of work : conceptual 3d modelling, Services Drawing

Project Description

Topics covered for this project : 3d modelling , Detailed 2d interior elevations with reference to structural layout & fire fighting systems) , Electrical layouts in 2d Interior elevations



Floor Plan

Style : Vernacular Architecture Style
 (Client's Requirement)

3d interior views



Thank You