



SATHYABAMA

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

Accredited "A" Grade by NAAC | 12B Status by UGC | Approved by AICTE

www.sathyabama.ac.in

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

**PROFESSIONAL TRAINING (S89APT)
JUL 2022 - AUG 2022**

Name of the Student : Swathi. G

Reg No. : 41890020

Semester : III

Batch : 2021-2023



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M. Arch (Sustainable Architecture)

VIVA-VOCE EXAMINATION

This is to certify that the Professional Training Report (S89APT) is the work of SWATHI.G who had undergone training in **Arch-e-Studio** and has been monitored by the continuous assessment during Jul 2022 to Aug 2022.

Dr. Devyani Gangopadhyay
HOD AND DEAN

Submitted for Viva voce Examination held on 22 December 2022

Internal Examiner

External Examiner

Type your te



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DECLARATION

I **SWATHI.G** hereby declare that this Professional Training Report done by me under the guidance of **Ar. Vennila Thirumavalan** is submitted in partial fulfillment of the requirements for the completion of practical training session.

DATE : 20 December 2022

PLACE : Chennai

A handwritten signature in black ink, reading 'Swathi.G', written in a cursive style.

scanned sign

SIGNATURE OF CANDIDATE

ACKNOWLEDGEMENTS

I am pleased to acknowledge my sincere thanks to Board of Management of **SATHYABAMA INSTITUTE OF SCIENCE & TECHNOLOGY** 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, School of building and Environment** for providing me necessary support and details at the right time during the progressive reviews.

I would like to express my sincere and deep sense of gratitude to **Ar. Vennila Thirumavalan** for her valuable guidance, suggestions and constant encouragement paved way for the successful completion of my Training.

I would also like to express my sincere thanks to Ar. Catherine Selvaraj (Internal Coordinator) for her valuable guidance, during the entire Professional Training period.

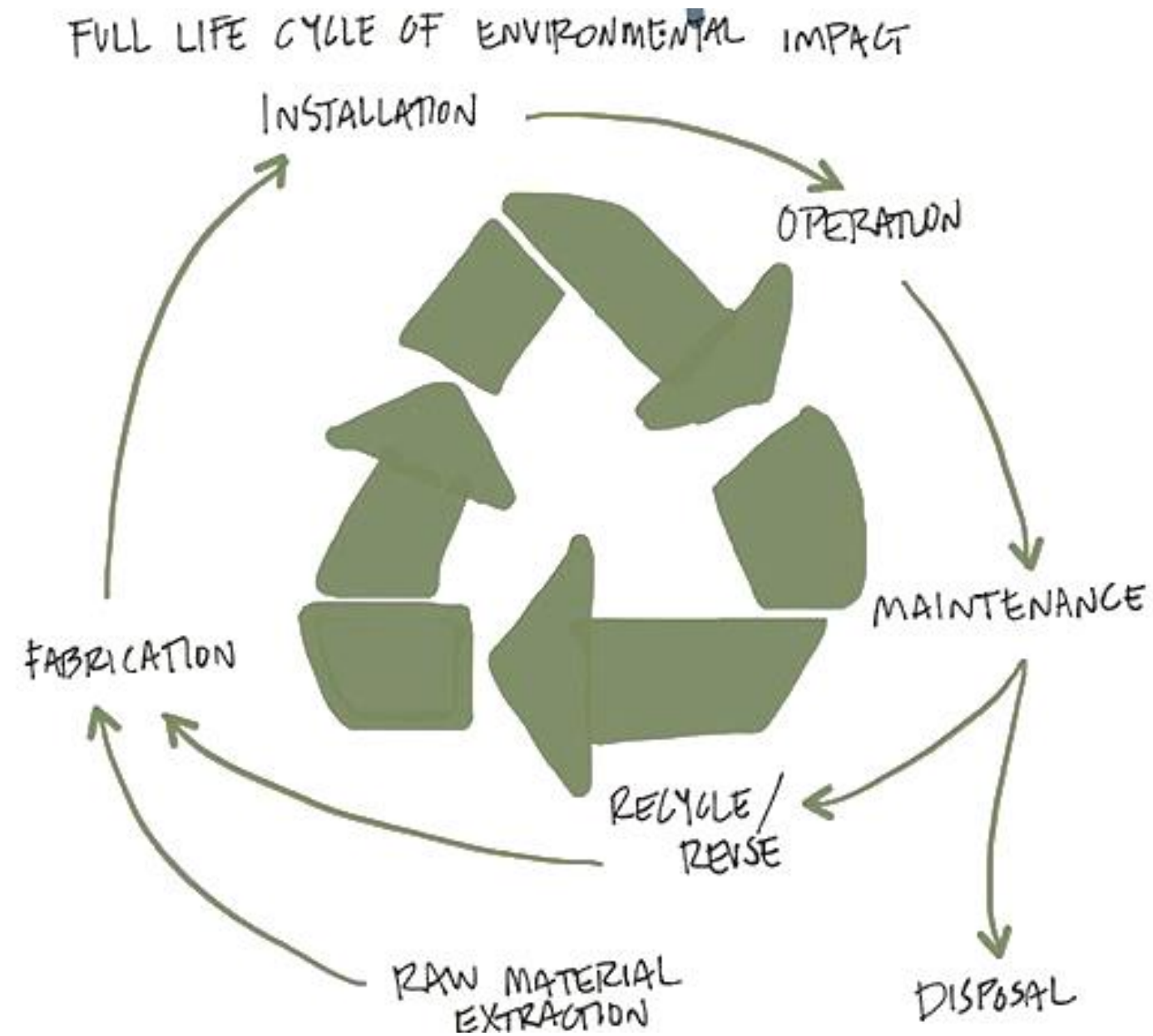
I wish to express my thanks to all Teaching and Non-teaching staff members of the Department of Architecture who were helpful in many ways for the completion of the project.

<u>DATE</u>	<u>PROJECT</u>	<u>WORK DONE</u>
(11/7/2022)	Industrial Building @ IIT Tirupati	Daylighting Simulation - Velux
(12/7/2022)		
(13/7/2022)		
(14/7/2022)		
(15/7/2022)	Industrial Building @ IIT Tirupati	Solar Radiation – Formit Analysis
(16/7/2022)	Industrial Building @ IIT Tirupati	Wind Flow Analysis – Flow Design
(17/7/2022)	Review On Water Management Video Presented By Thali Talks	Review Of Water Management Video Presented By Thali Talks
(18/7/2022)		
(19/7/2022)	Recording Studio @ Royapettah,chennai	Site Visit, As Built Dwg Measurements And Lux Lvl Calculation
(20/7/2022)	Industrial Building @ IIT Tirupati	Solar Radiation – Formit Analysis
(21/7/2022)		
(22/7/2022)		
(23/7/2022)		
(25/7/2022)	Life Cycle Cost Assessment	Presentation On LCA And Eco-friendly Interior Materials
(26/7/2022)		
(27/7/2022)	IIT Madras – Core Office	Daylighting Simulation - Velux
(28/7/2022)		
(29/7/2022)		
(01/8/2022)		
(02/8/2022)	SVA-GRIHA	Review & understanding
(03/8/2022)		
(04/8/2022)	GRIHA	Review & understanding
(05/8/2022)		
(06/8/2022)	Tutorial on software	Conducted a session on how to use Velux daylighting software
(08/8/2022)	NBC – Sustainable related standards	Review & understanding

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5.	LITERATURE STUDY – SVA GRIHA	
6.	INDUSTRIAL BUILDING – SOLAR ANALYSIS	
7.	INDUSTRIAL BUILDING – WIND ANALYSIS	
8.	INDUSTRIAL BUILDING – DAYLIGHTING ANALYSIS	
9.	OFFICE BUILDING FLOOR – DAYLIGHTING ANALYSIS	
10.	OFFICE BUILDING FLOOR – ILUMINANCE	

LITERATURE STUDIES



REVIEW OF WATER MANAGEMENT VIDEO PRESENTED BY THALI TALKS

All traditions across the world have a special reverence for water. Very broadly, water is considered a purifier in many religions. Civilizations began at places where water required for agricultural and human needs was readily available, i.e., close to springs, lakes, rivers and at low sea levels.

Ar. Rukkumany Ma'am has briefed about how water plays a important role in ancient Tamil Nadu.



Eri - One of the oldest water conservation systems in India, it is still widely used across the state. Eris are fed through channels that divert river water, or rain-fed ones. They are usually interconnected to balance the water in case of excess or scarce supply.

kullam, kuttai, Aaru, Thaangal, Karanai etc. these are the water bodies with different size & needs created by the farmers by every villages in Tamil Nadu for agriculture and human needs.

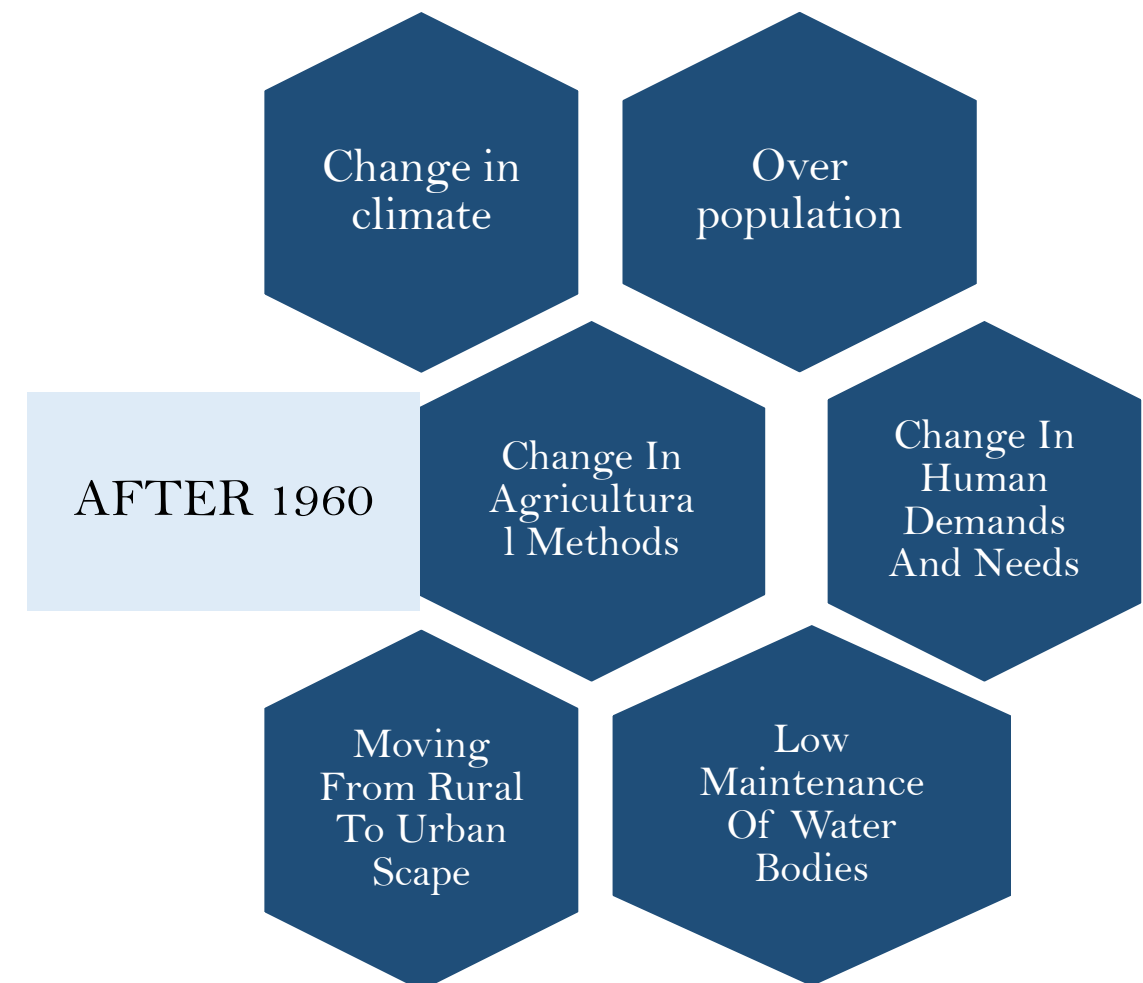
PROBLEM IN SAVING WATER BODIES

ANCIENT WATER MANAGEMENT OF TAMIL NADU

Before 1960s each village will have a specific panchayat board who appoints a person to look after the eri, Kulam etc., in order to keep the waterbodies clean and he will distributes water to the field according to the farmers requirement.

After 1960s the waterbodies were left without proper maintenance some became very polluted, industries, factories were build around the villages, where people move from rural to urban. These waterbodies can only be maintained if the whole village or the settlement take step to preserve them and use it for agriculture.

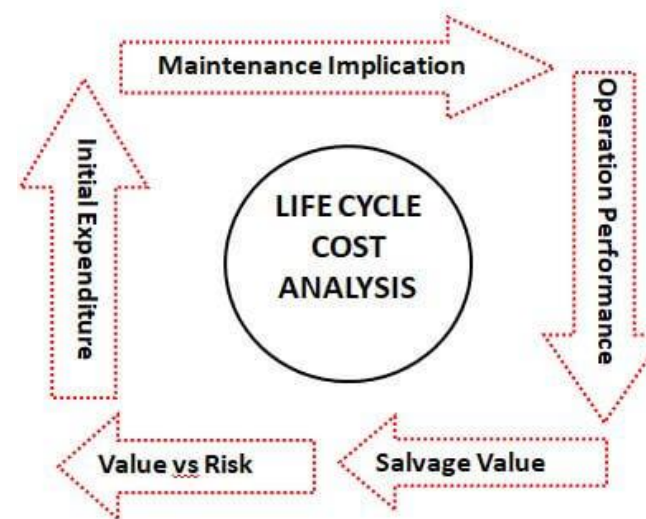
Only one or two villages in Tamil nadu still use this system for agricultural and human needs, due insufficient availability of ground water.



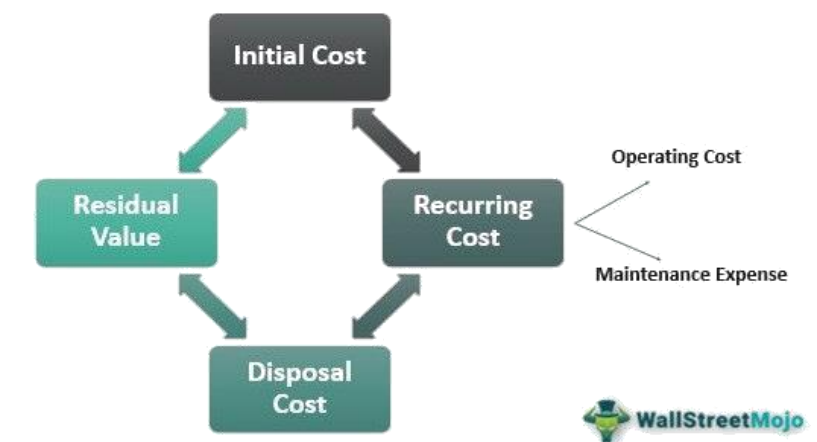
What is life cycle cost analysis?

LCCA (life cycle cost analysis) is a process of evaluating the **economic performance of a building over its entire life**. Sometimes known as “**whole cost accounting**” or “**total cost of ownership**,” LCCA balances initial monetary investment with the long-term expense of owning and operating the building. LCCA is based upon the assumptions that multiple building design options can meet programmatic needs and achieve acceptable performance, and that these options have differing

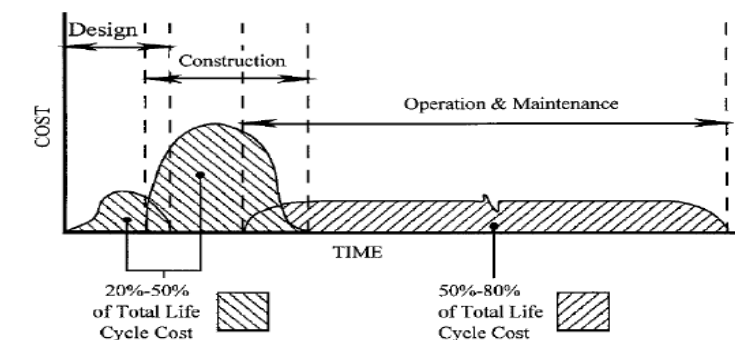
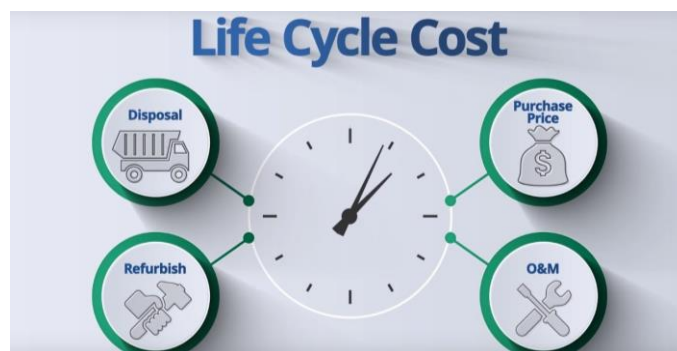
- ✓ Initial costs
- ✓ Operating costs
- ✓ Maintenance costs
- ✓ Possibly different life cycles.



Life Cycle Costing

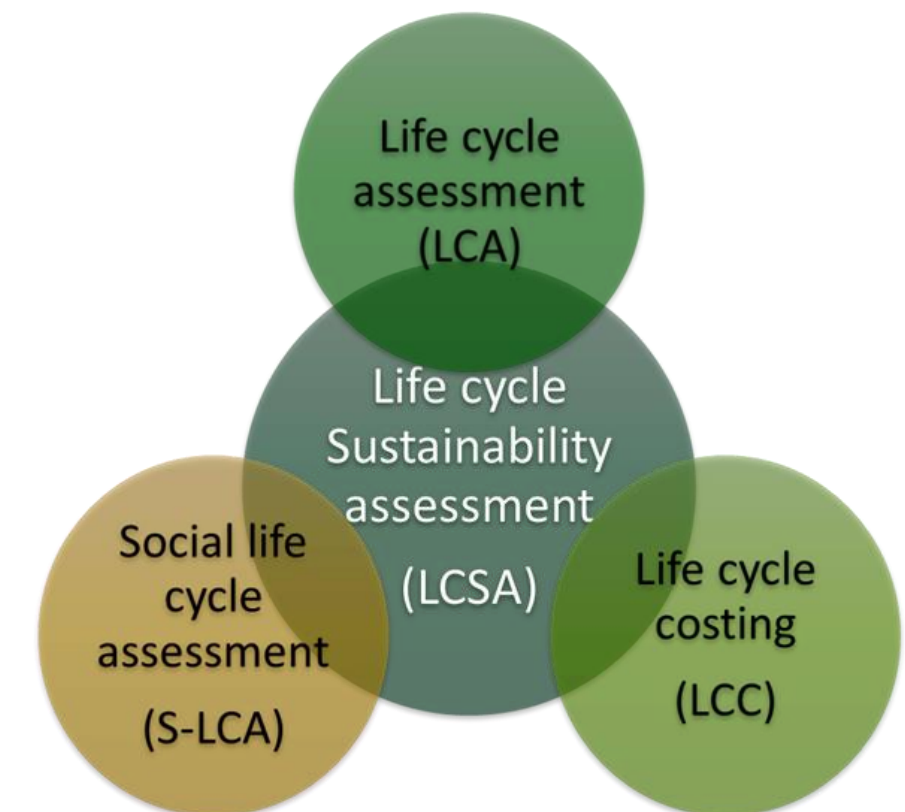


For a given design, LCCA estimates the total cost of the resulting building, **from initial construction through operation and maintenance, for some portion of the life of the building (generally referred to as the LCCA “study life”)**. By comparing the life cycle costs of various design configurations, **LCCA can explore trade-offs between low initial costs and long-term cost savings, identify the most cost-effective system for a given use, and determine how long it will take for a specific system to “pay back” its incremental cost**. Because creating an exhaustive life cycle cost estimate for every potential design element of a building would not be practical, the Guidelines for LCCA focus on features and systems most likely to impact long-term costs.



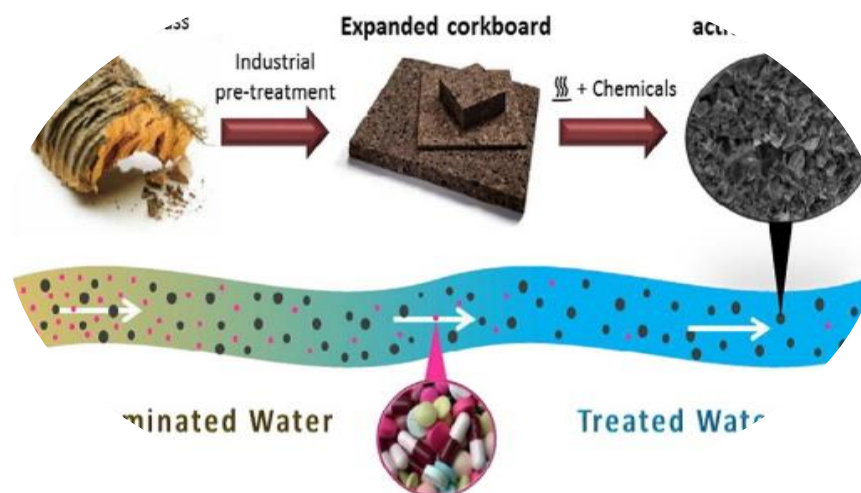
LIFE CYCLE COST ASSESSMENT**What Is The Role Of Life Cycle Cost Analysis In Sustainability?**

- ✓ Sustainability is defined as a balanced concern for community, economy, and ecology.
- ✓ Sustainable buildings use energy, water, and other natural resources efficiently and provide a safe and productive indoor environment.
- ✓ As a quality assurance tool, LCCA is related to – but not synonymous with – sustainability.
- ✓ LCCA is a cost-based process; its goal is to identify the most cost-efficient building design and construction strategies over the life of the asset.
- ✓ LCCA addresses values that can be stated in currency, not subjective issues such as occupant comfort or environmental impact.
- ✓ The most cost-effective solution is not always the most environmentally ideal choice. For example, a building system might consume very little energy but cost more to maintain than it saves in energy costs.
- ✓ Very often, however, LCCA points to solutions that are environmentally desirable.
- ✓ Careful design choices that result in efficient use of energy and water often do yield long-term cost savings.
- ✓ Or, if environmentally favorable choices do not actually save money, LCCA may reveal that their additional cost over time is minimal.
- ✓ At the heart of “sustainability” is a balance between human concerns (e.g., cost, health, comfort) and environmental concerns (e.g., resource use, ecological degradation).

PRESENTATION ON LCA AND ECO-FRIENDLYINTERIOR MATERIALS

SUSTAINABLE INTERIOR MATERIALINTERIOR MATERIALS**CORK**

Cork may be best known for its history with wine and the office pin board, but in reality, it is an incredibly green and versatile product when applied to interiors. Today, many design projects are directed by ethical and sustainable initiatives and architects and designers are choosing cork as a leading building and interiors material. Aesthetically cork, like hardwood timber floors, has a raw and timeless appeal as it is sourced from nature itself. No piece is the same, offering a multitude of grain, texture and colour finishes.



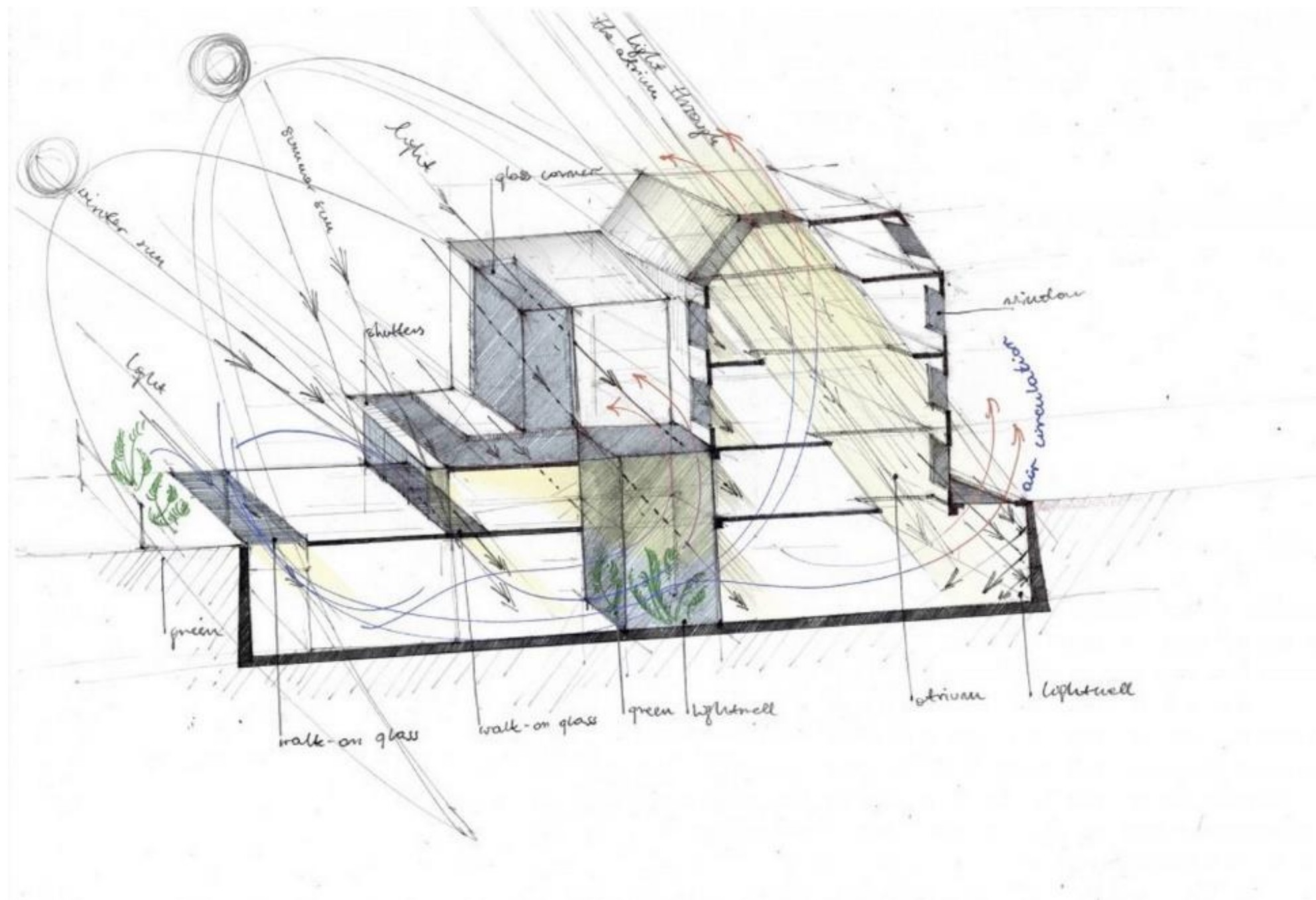
Cork's naturally anti-microbial attributes combat mold and its anti-static surface eliminates dust and toxin absorption, making it ideal for people with allergies and a material that contributes to cleaner air space. Its soft surface also results in less pressure on people with knee problems or seniors looking for absorption support under their feet

**FIVE REASONS TO CONSIDER CORK IN INTERIOR DESIGN**

Cork can earn points toward Green Star and LEED certification for its renewable and biodegradable properties. According to the World Wildlife Federation, a cork tree that has its bark removed every nine years will absorb up to five times as much CO2 than a similar tree that is left idle.

**DURABILITY AND LONGEVITY****SUSTAINABLY CERTIFIED****HEALTH BENEFITS****MULTIPLE USES****RENEWABLE**

SUSTAINABLE SCOPE OF WORKS



DAYLIGHT FACTOR

LOCATION TIRUPATI, ANDHRA PRADESH, INDIA

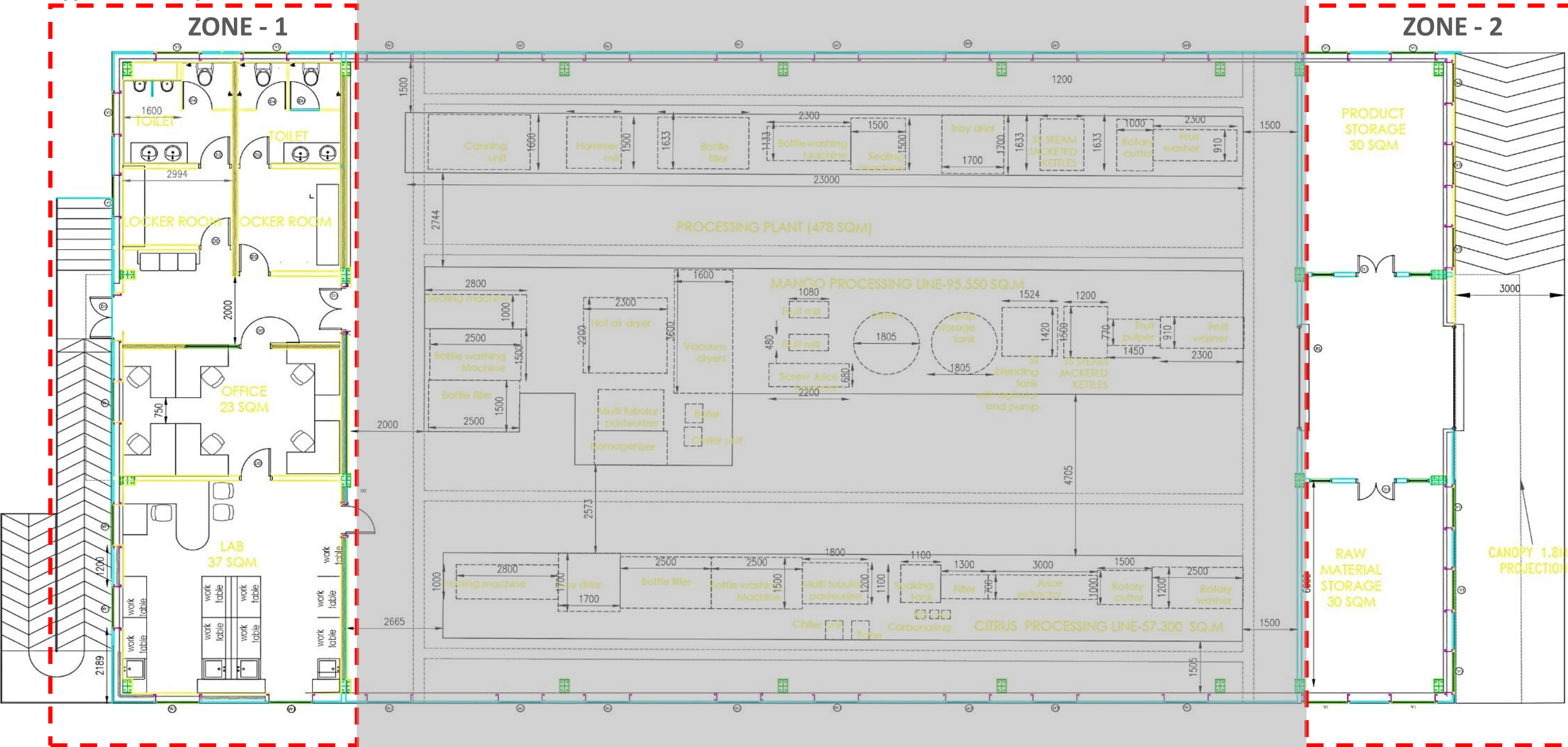
Latitude 13° 37' 44.6340" N

Longitude 79° 25' 28.0056" E

Building Type Industrial Building

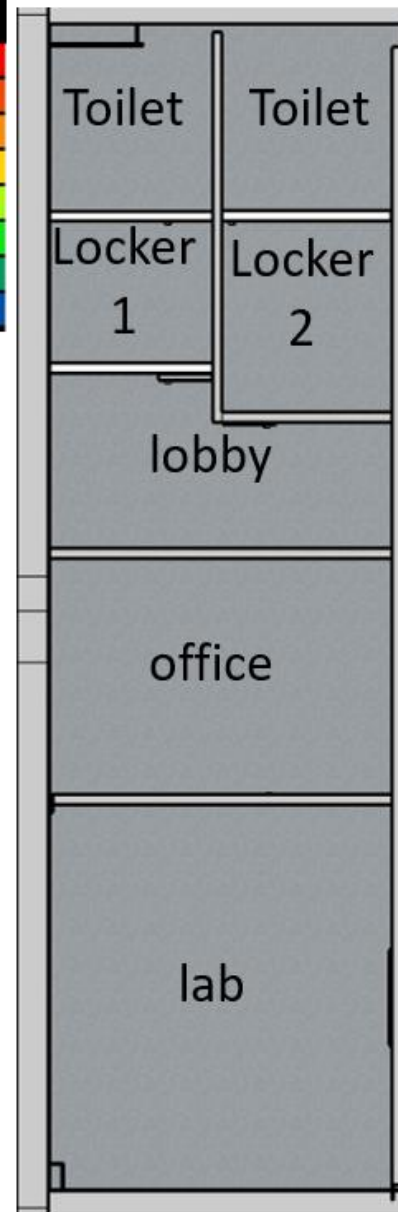
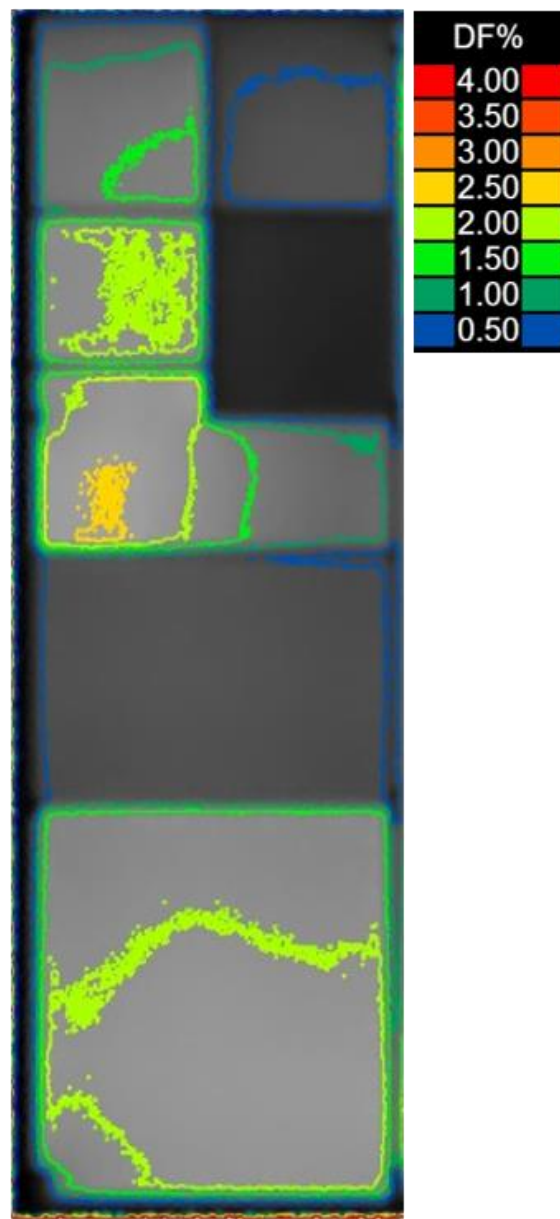
Climate Type Tropical

VLT of glazing – 76% - 0.76 (Default - values are not provided)



DAYLIGHT FACTOR

Zone - 1



West side fenestration

About 3.5 % of DF is analysed near the windows and it reduces to 1.5%.

sufficient amount of daylight inside the lab area is analysed. (near the west side window it comes around 4% DF, shading devices has to be designed to provide visual comfort)



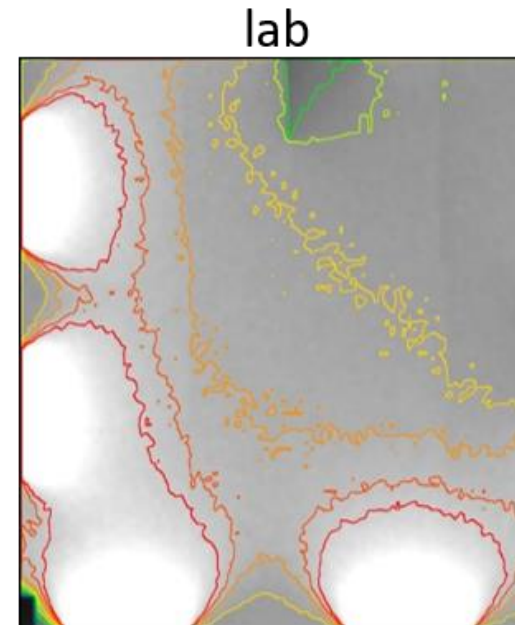
VLT of glazing – 76% - 0.76 (Default - values are not provided)

Sky Condition - Overcast Sky

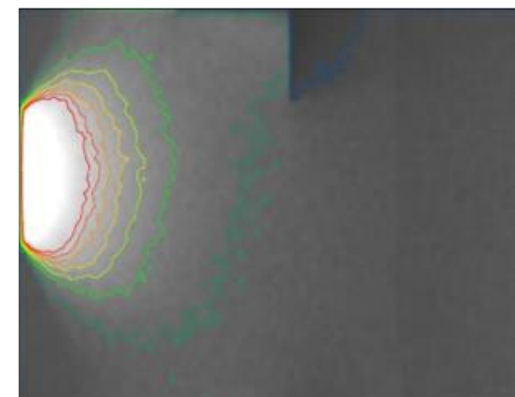
Time - 12 Noon

Work plane set @ 850mm from FFL .

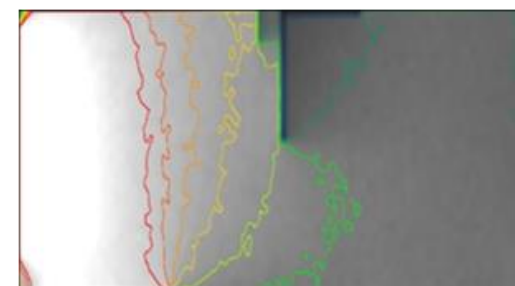
DF % threshold set from minimum 0 to maximum 4%.



office



Lobby 1



Lobby 2

Default

Average	$D_{average}$	3.80 DF[%]
Median	D_{median}	3.04 DF[%]
Minimum	D_{min}	0.05 DF[%]
Maximum	D_{max}	17.03 DF[%]

Default

Average	$D_{average}$	1.21 DF[%]
Median	D_{median}	0.79 DF[%]
Minimum	D_{min}	0.28 DF[%]
Maximum	D_{max}	10.79 DF[%]

Default

Average	$D_{average}$	3.09 DF[%]
Median	D_{median}	1.71 DF[%]
Minimum	D_{min}	0.06 DF[%]
Maximum	D_{max}	18.37 DF[%]

Default

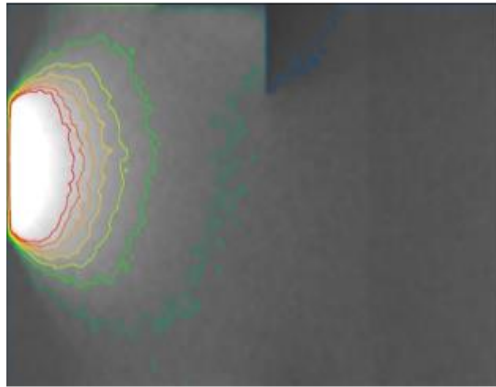
Average	$D_{average}$	2.75 DF[%]
Median	D_{median}	2.81 DF[%]
Minimum	D_{min}	0.19 DF[%]
Maximum	D_{max}	5.43 DF[%]

DAYLIGHT FACTOR

DF%

4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50

office

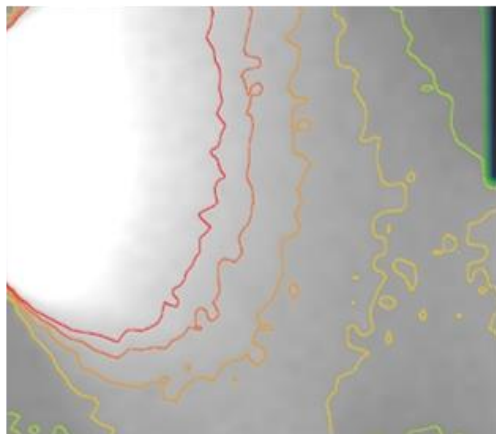
**Default**

Average
Median
Minimum
Maximum

$D_{average}$	1.21 DF[%]
D_{median}	0.79 DF[%]
D_{min}	0.28 DF[%]
D_{max}	10.79 DF[%]

Office - 3.5 % of DF is analysed near the windows and it reduces to 0.5%.
sufficient amount of daylight inside the office area is achieved near the window side. (hence the other interior side of the office space receives only 0.50% of DF) (LIGHTSHELVES CAN BE PROVIDED FOR BETTER VISUAL COMFORT)``

Locker room 1

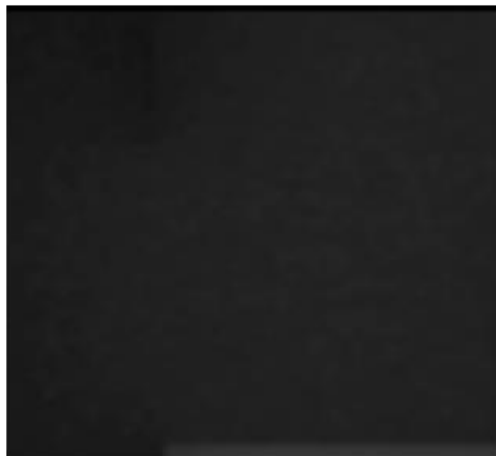
**Default**

Average
Median
Minimum
Maximum

$D_{average}$	3.81 DF[%]
D_{median}	2.84 DF[%]
D_{min}	0.11 DF[%]
D_{max}	14.06 DF[%]

Locker 1 - 3.5 % of DF is analysed near the windows and it reduces to 2 %.
sufficient amount of daylight inside the locker area is achieved. (hence its a locker room visual comfort due to glare may not be a problem)

Locker room 2

**Default**

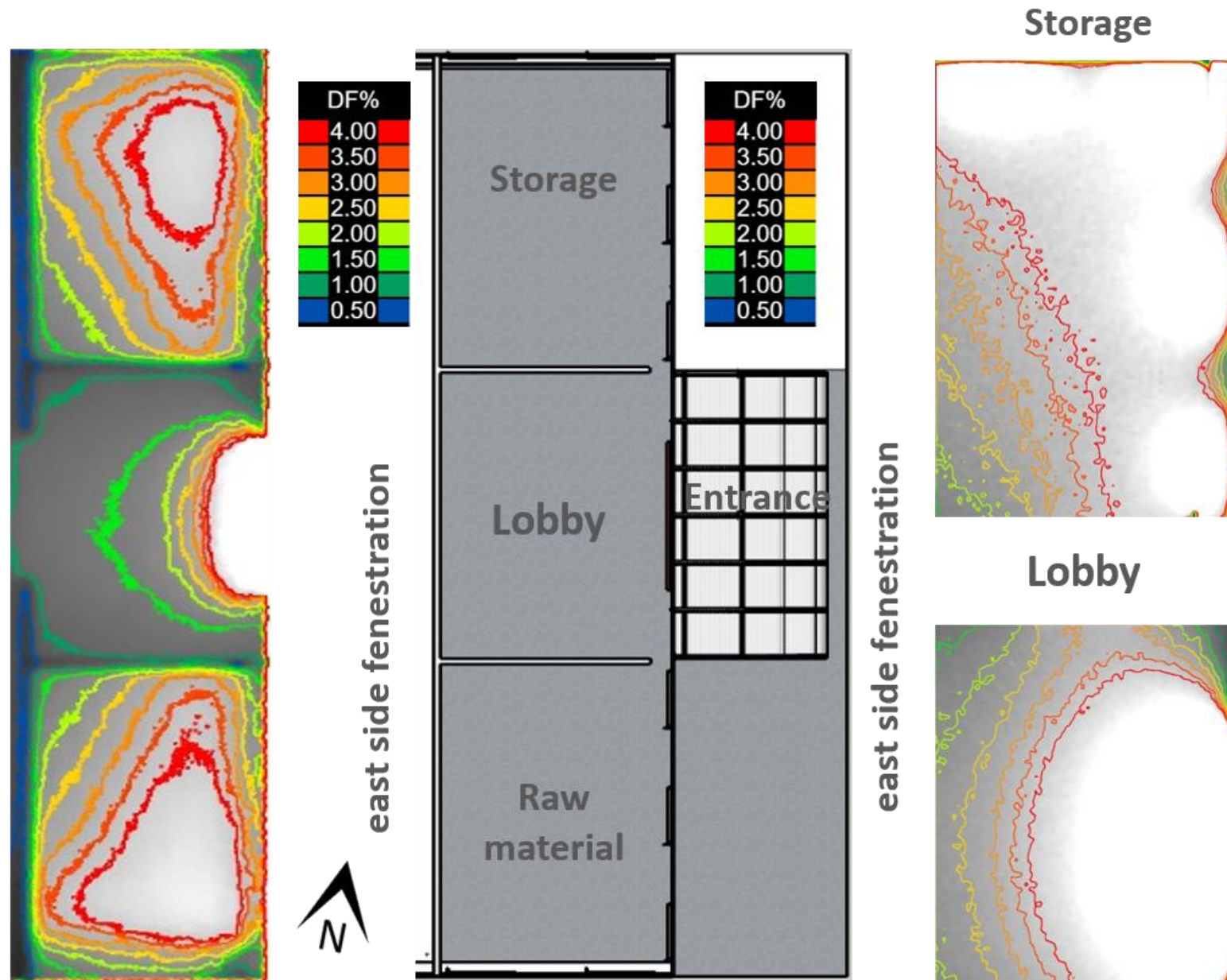
Average
Median
Minimum
Maximum

$D_{average}$	0.11 DF[%]
D_{median}	0.11 DF[%]
D_{min}	0.04 DF[%]
D_{max}	0.30 DF[%]

Locker 2 - 0 % of DF is analysed near the windows and it reduces to 0 %.
No source for DF.



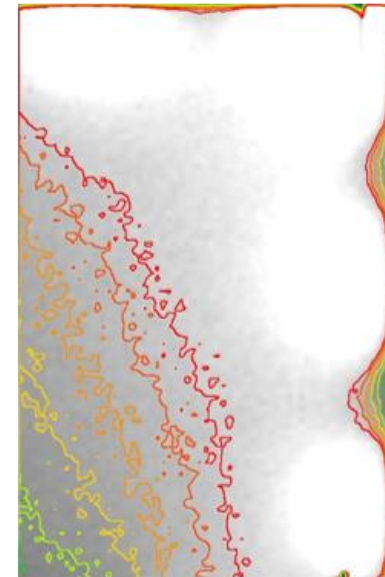
DAYLIGHT FACTOR



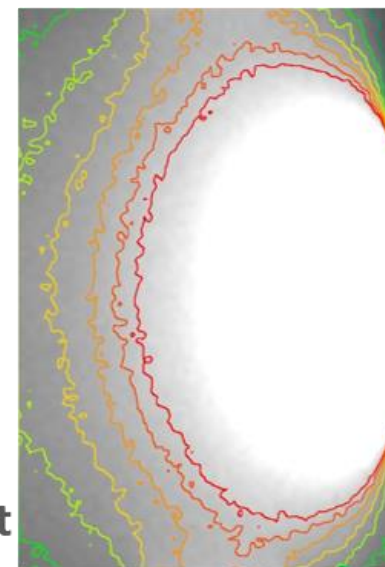
About 4 % of DF is analysed near the windows and it reduces to 1.5%.

sufficient amount of daylight inside is analysed. (near the east side window it comes around 4% DF, shading devices has to be designed to provide visual comfort)

Storage



Lobby



Default

Average	$D_{average}$	5.12 DF[%]
Median	D_{median}	4.60 DF[%]
Minimum	D_{min}	0.03 DF[%]
Maximum	D_{max}	14.08 DF[%]

About 4 % of DF is analysed inside the room. More than sufficient amount of daylight inside is analysed. (near the east side window it comes around 4% DF, shading devices has to be designed to provide visual comfort)

Default

Average	$D_{average}$	7.28 DF[%]
Median	D_{median}	3.55 DF[%]
Minimum	D_{min}	0.04 DF[%]
Maximum	D_{max}	44.53 DF[%]

Default

Average	$D_{average}$	5.14 DF[%]
Median	D_{median}	4.56 DF[%]
Minimum	D_{min}	0.04 DF[%]
Maximum	D_{max}	13.71 DF[%]

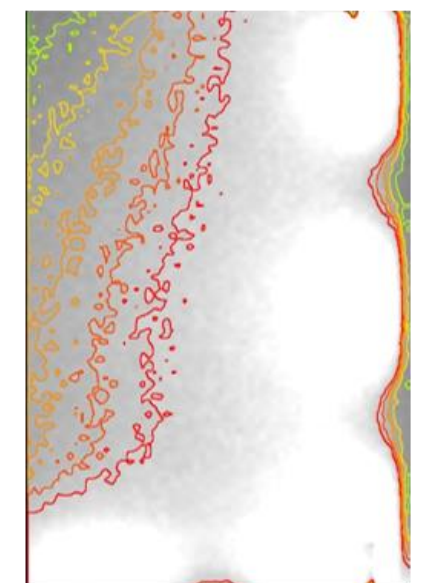
sp41

TABLE 2 RECOMMENDED DAYLIGHT FACTORS FOR INTERIORS

(Clause 3.4)
(1 percent DF = 80 lux)

SL No.	LOCATION	DAYLIGHT FACTOR, PERCENT
i) Dwellings		
	Kitchen	2.5
	Living room	0.625
	Study room	1.9
	Circulation	0.313
ii) Schools		
	Class room desk top, black board	1.9-3.8
	Laboratory	2.5-3.8
iii) Offices		
	General	1.9
	Drawing, typing	3.75
	Enquiry	0.625-1.9
iv) Hospitals		
	General wards	1.25
	Pathological laboratory	2.5-3.75
v) Libraries		
	Stack room	0.9-1.9
	Reading room	1.9-3.75
	Counter area	2.5-3.75
	Catalogue room	1.9-2.5

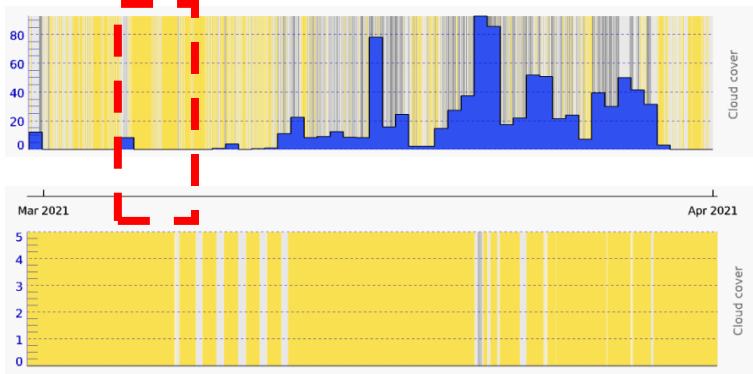
Raw material



DAYLIGHT FACTOR

LOCATION TIRUPATI, ANDHRA PRADESH, INDIA
Latitude 13° 37' 44.6340" N
Longitude 79° 25' 28.0056" E
Building Type Industrial Building
Climate Type Tropical

VLT of glazing – 76% - 0.76
(Default - values are not provided)



In The Office, 500 Lux Lighting Is Required And 100 Lux Lighting Is Sufficient In The Living Room. In Areas Like Drawing Offices, Textile Mills And Laboratories Require High Light Levels Such As 1.000 Lux.

This Month is With More Sunny Days.

Cloud cover during the March.

DAYLIGHT FACTOR ANALYSIS

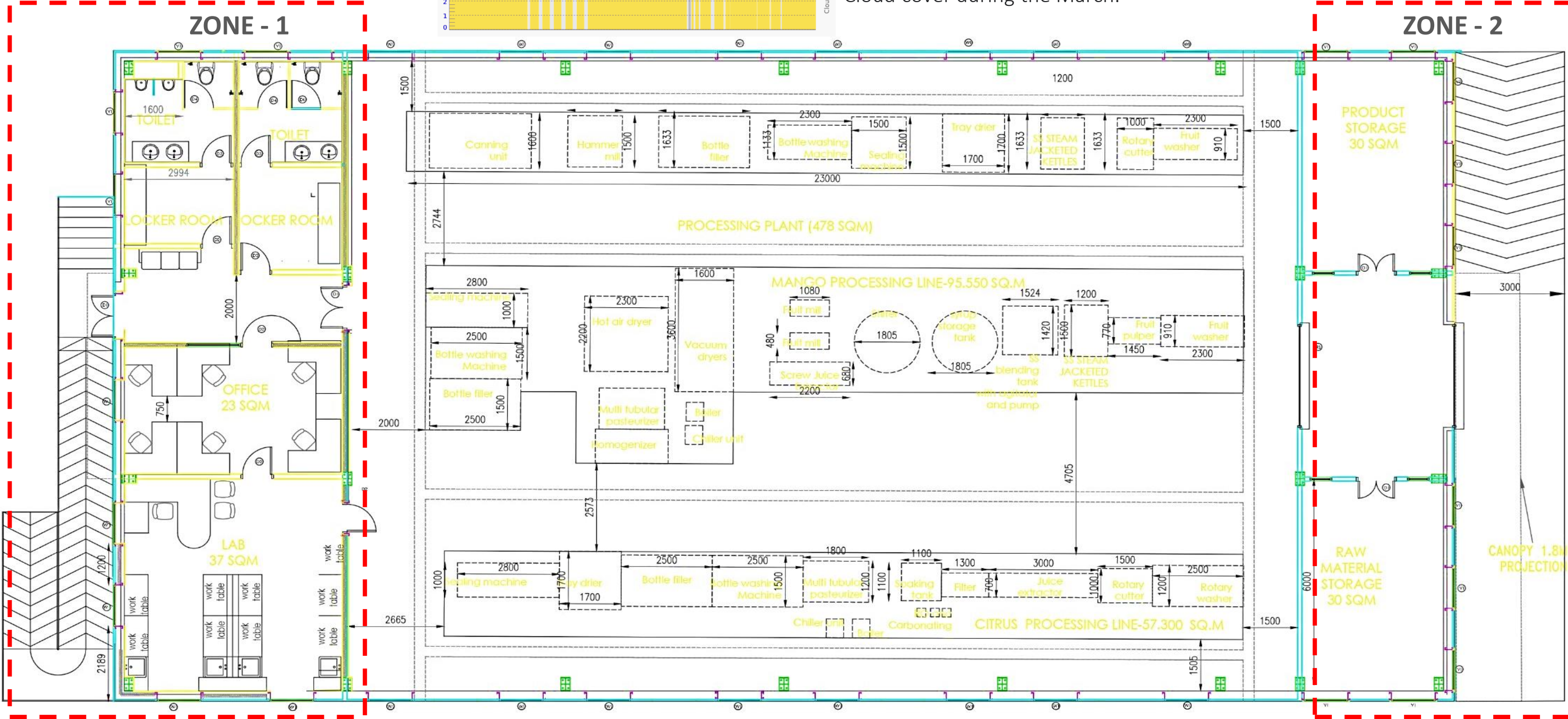
Illuminance

Cloud Cover Data

March – 21ST 9am, 12pm, 3pm

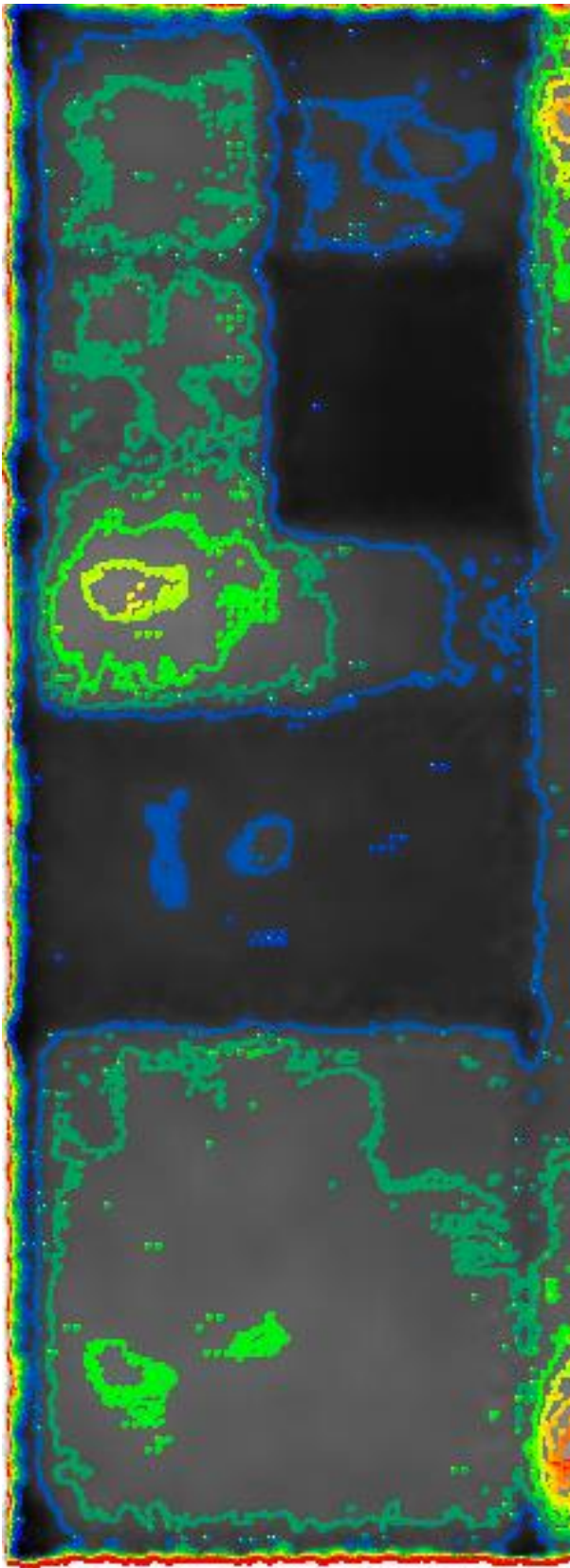


KEY PLAN

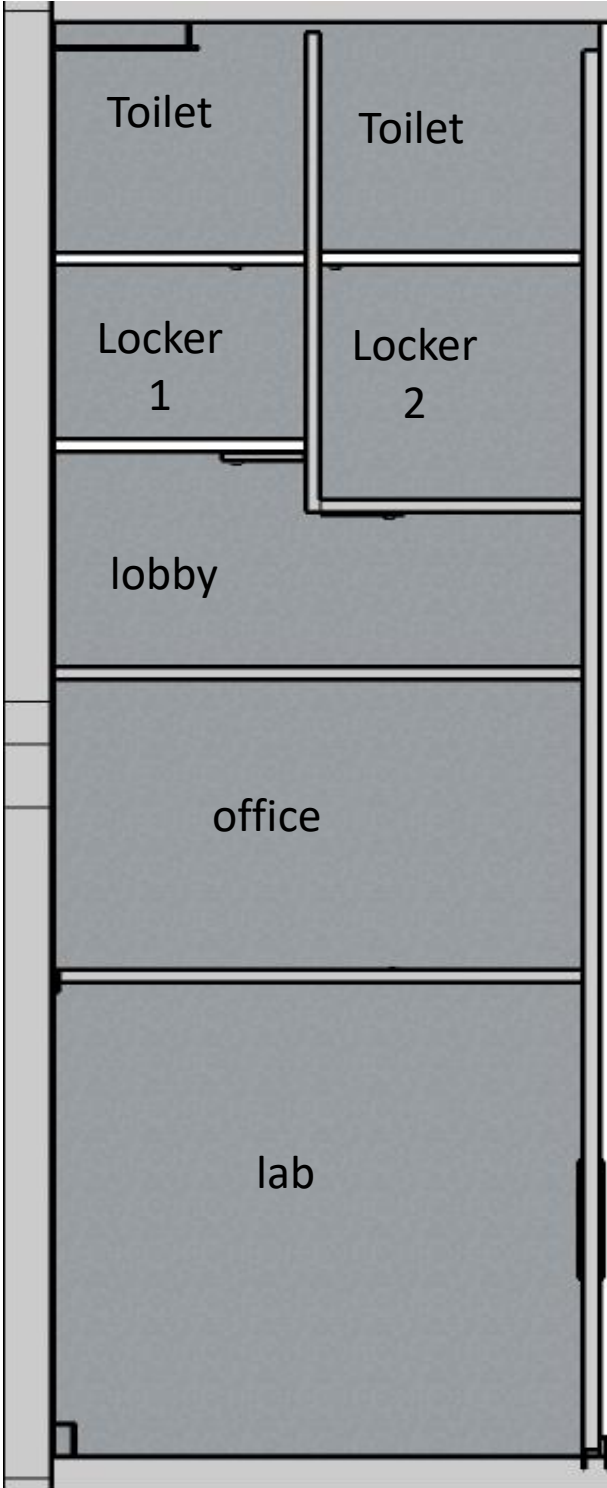


DAYLIGHT FACTOR

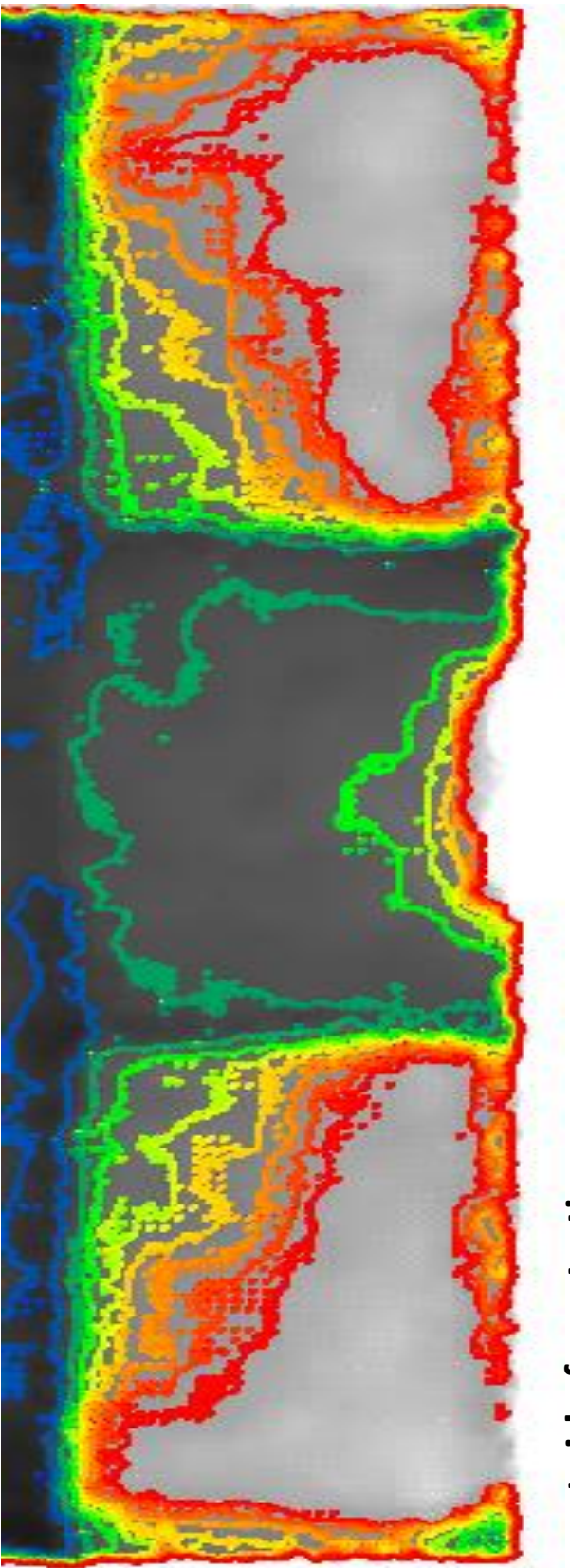
ZONE - 1



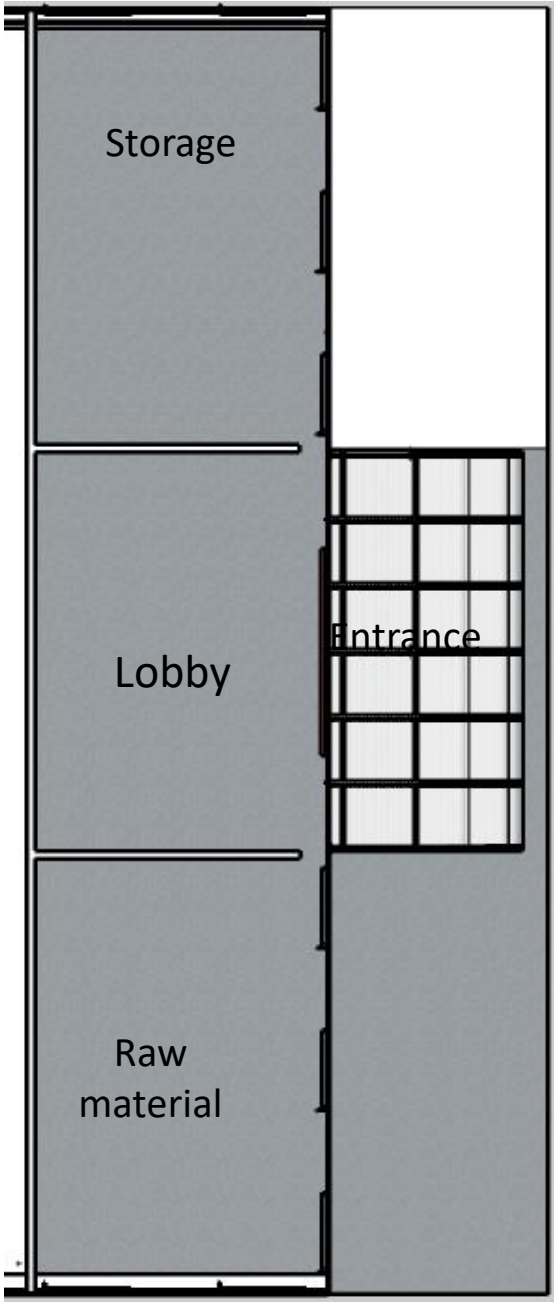
west side fenestration



ZONE - 2



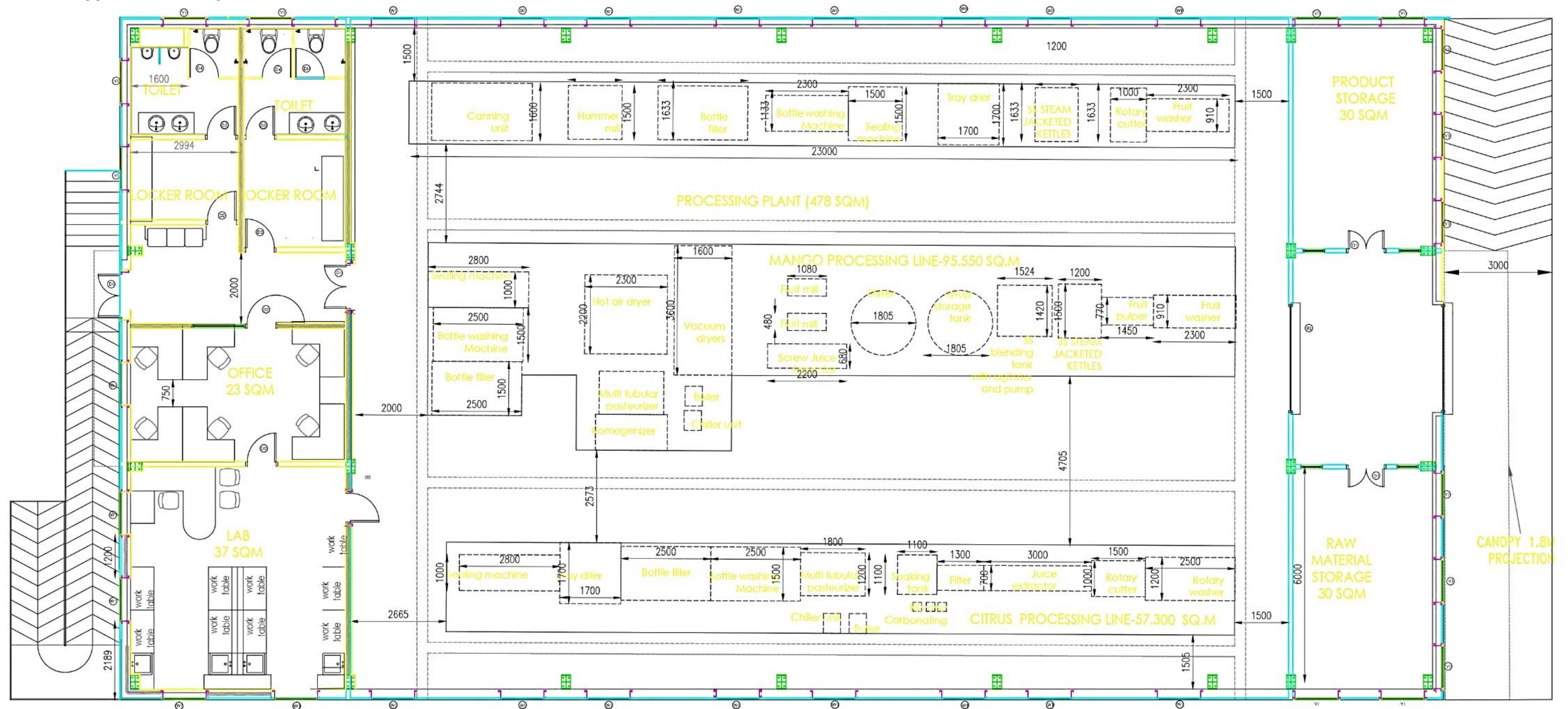
east side fenestration



WIND FLOW ANALYSIS

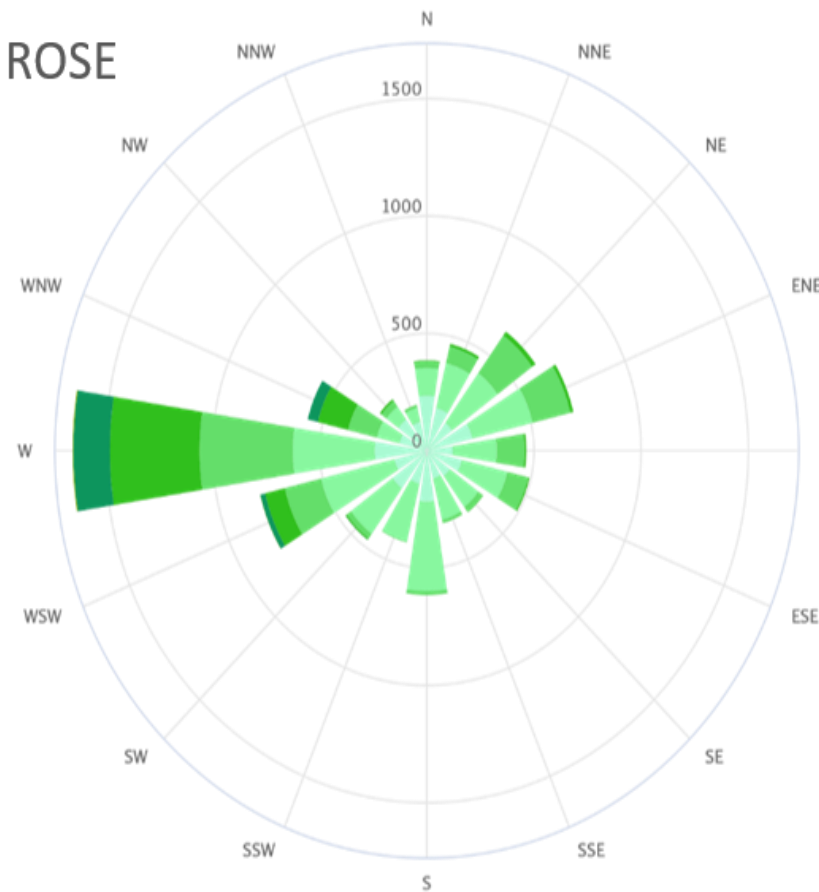
LOCATION	TIRUPATI, ANDHRA PRADESH, INDIA
Latitude	13° 37' 44.6340" N
Longitude	79° 25' 28.0056" E
Building Type	Industrial Building
Climate Type	Tropical

The wide-area hourly average wind vector (speed and direction) at 5 meters above the ground. The wind experienced at any given location is highly dependent on local topography and other factors, and instantaneous wind speed and direction vary more widely than hourly averages



WIND FLOW ANALYSIS

WIND ROSE

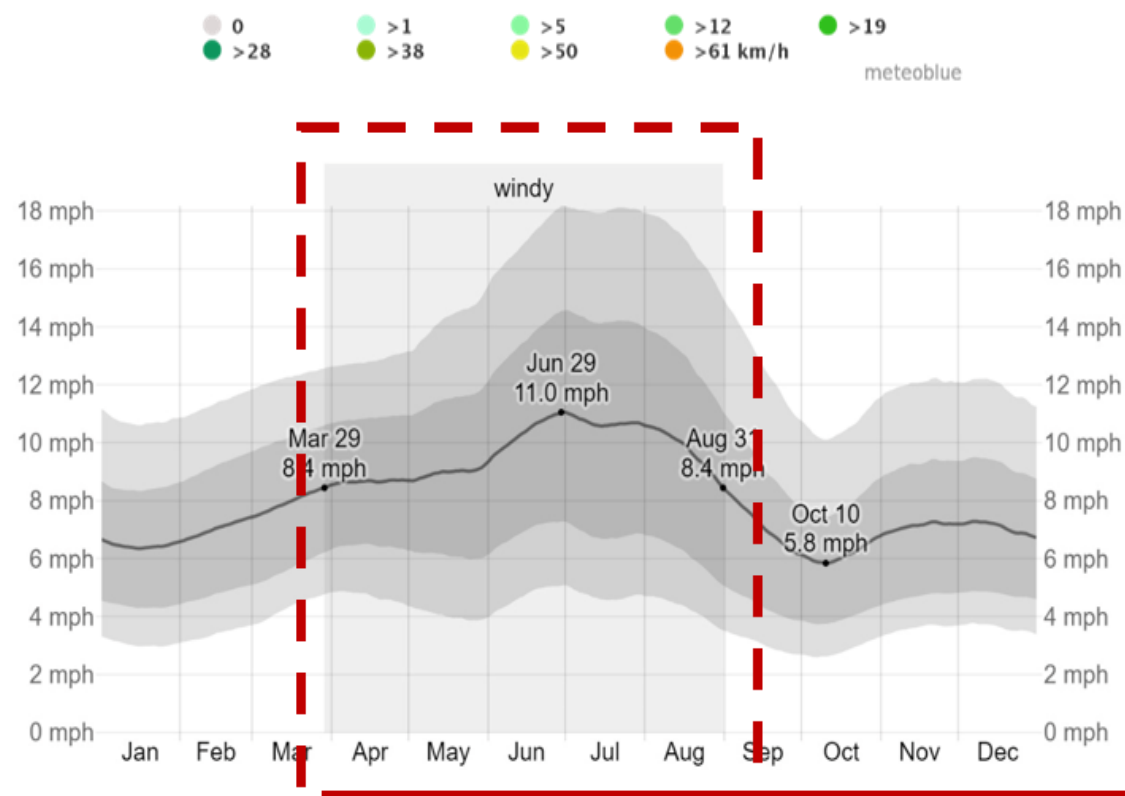
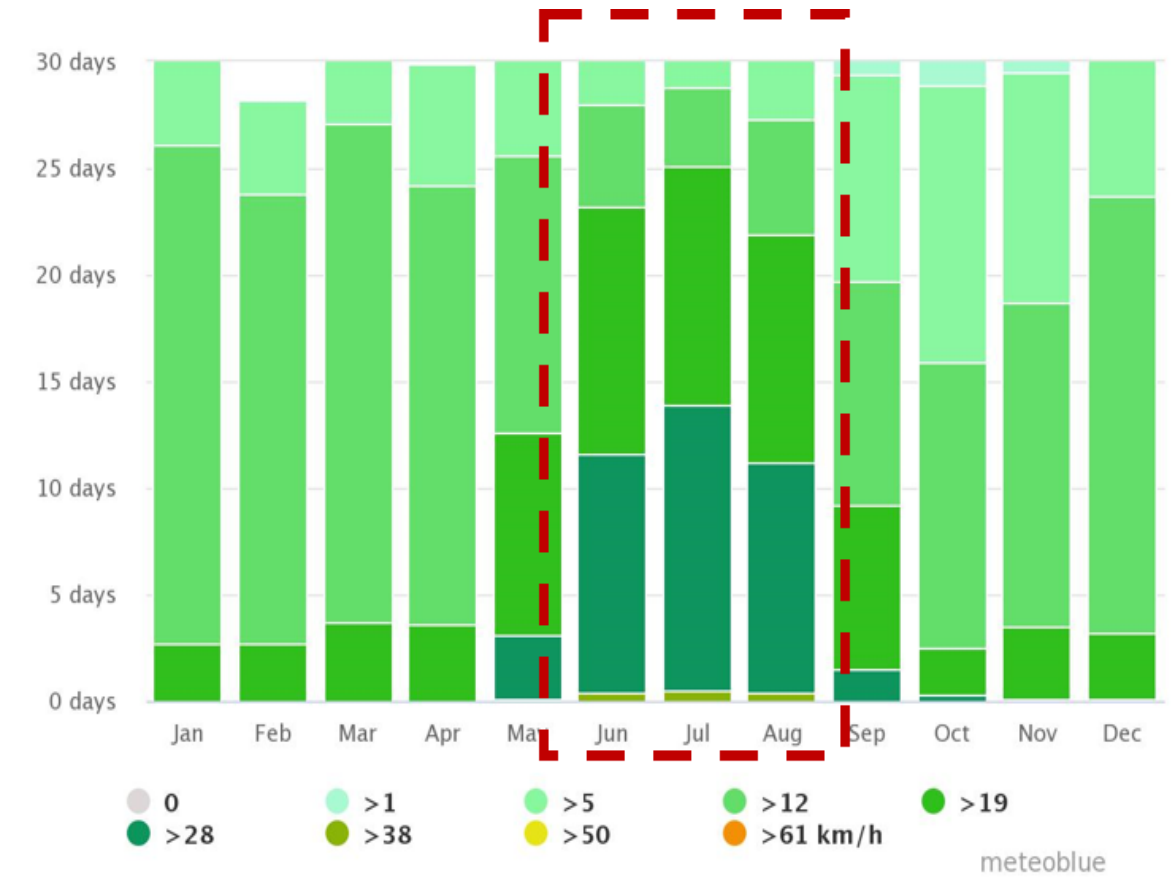


The wind rose for Tirupati shows how many hours per year the wind blows from the indicated direction.

The wind from the south for 2.1 months, from March 12 to May 15, with a peak percentage of 61% on April 15.

The wind is most often from the west for 4.8 months, from May 15 to October 8, with a peak percentage of 91% on July 1.

The wind is most often from the east for 5.1 months, from October 8 to March 12, with a peak percentage of 73% on January 1.



The percentage of hours in which the mean wind direction is from each of the four cardinal wind directions, excluding hours in which the mean wind speed is less than 1.0 mph. The lightly tinted areas at the boundaries are the percentage of hours spent in the implied intermediate directions (northeast, southeast, southwest, and northwest).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind Speed (mph)	6.5	7.0	8.0	8.7	9.0	10.4	10.7	9.7	7.1	6.2	7.1	7.1

SOURCE : https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/tirupati_india_1254360

WIND FLOW ANALYSIS

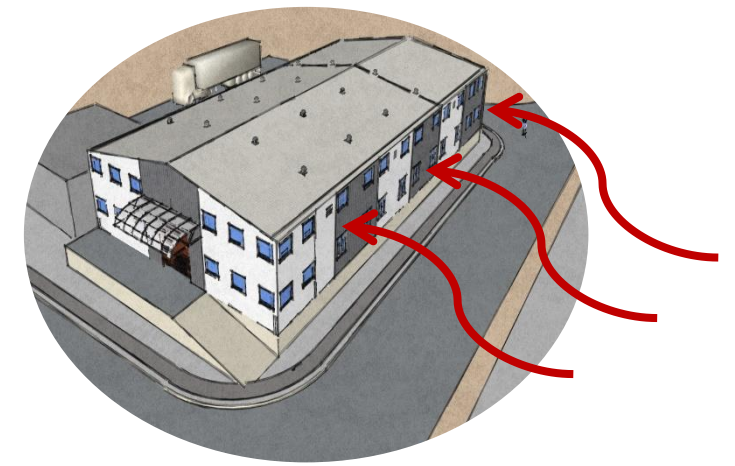
The windier part of the year lasts for 5.1 months, from March 29 to August 31, with average wind speeds of more than 8.4 miles per hour.

The windiest month of the year in Tirupati is July, with an average hourly wind speed of 10.7 miles per hour.

The calmer time of year lasts for 6.9 months, from August 31 to March 29.

The calmest month of the year in Tirupati is October, with an average hourly wind speed of 6.2 miles per hour

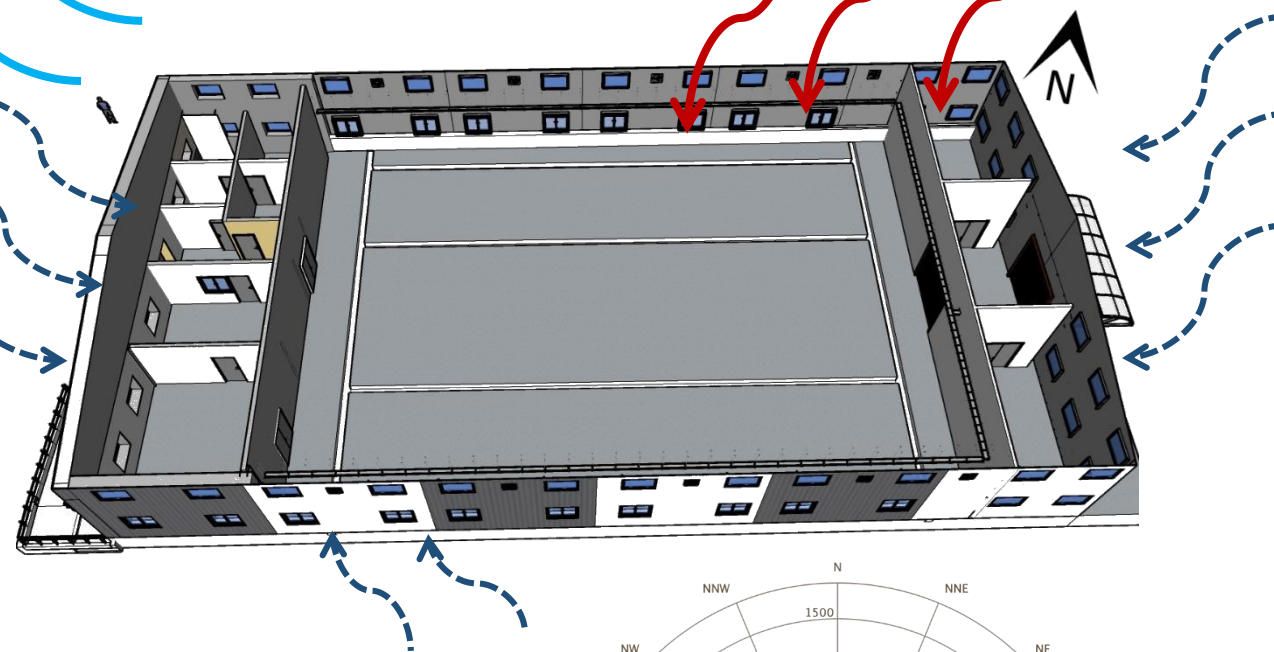
NORTH EAST SIDE



calmer time of year lasts for 6.9 months, from August 31 to March 29. (EAST)

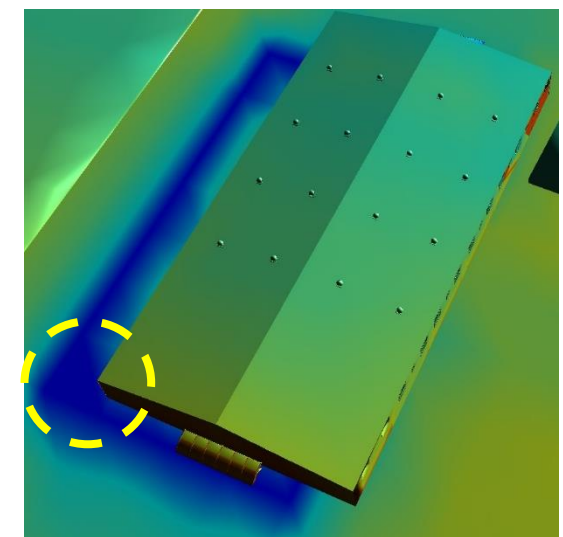
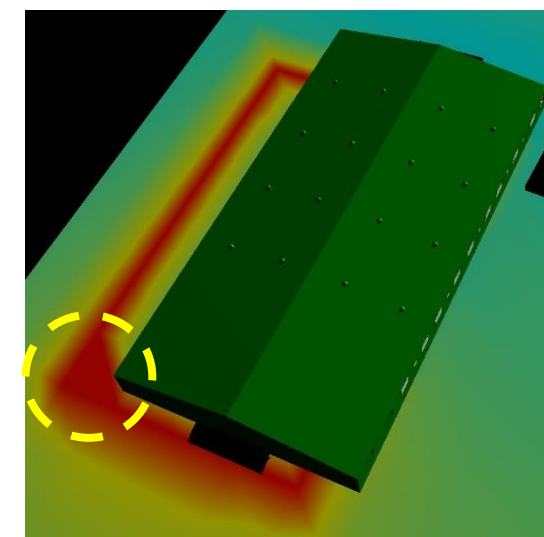
NORTH WEST SIDE

windier part of the year lasts for 5.1 months, from March 29 to August 31, with average wind speeds of more than 8.4 miles per hour. (SOUTH WEST)



windiest month of the year in Tirupati is July, with an average hourly wind speed of 10.7 miles per hour. (WEST)

PRESSURE

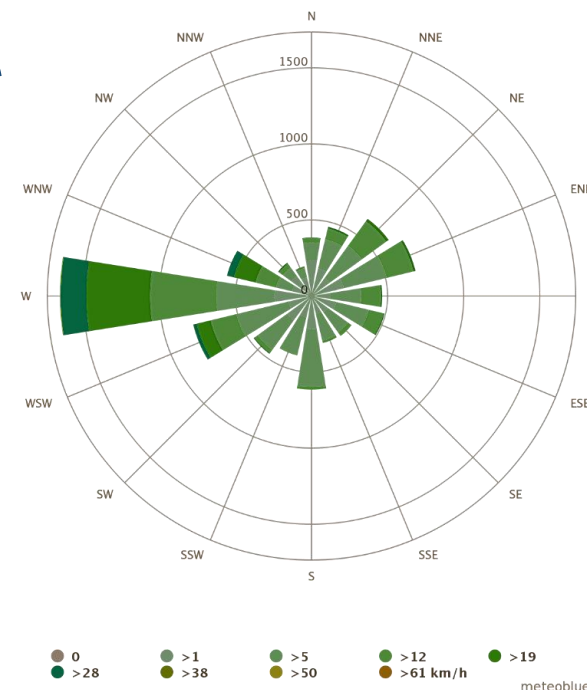


Status: **Transient**
Analysis: 3D
Wind Speed: 11.000 (m/s)
Length: 4444.811 (m)
Width: 77.639 (m)
Height: 184.392 (m)
Voxel size: 4.852 (m)

Pressure (Pa)
0
-15.231
-30.463
-45.694
-60.925

Status: **Transient**
Analysis: 3D
Wind Speed: 11.000 (m/s)
Length: 4444.811 (m)
Width: 77.639 (m)
Height: 184.392 (m)
Voxel size: 4.852 (m)

Velocity (m/s) [Pressure (Pa)]
13.977 [3.081]
12.104 [-10.595]
9.883 [-24.271]
6.988 [-37.947]
0 [-51.623]

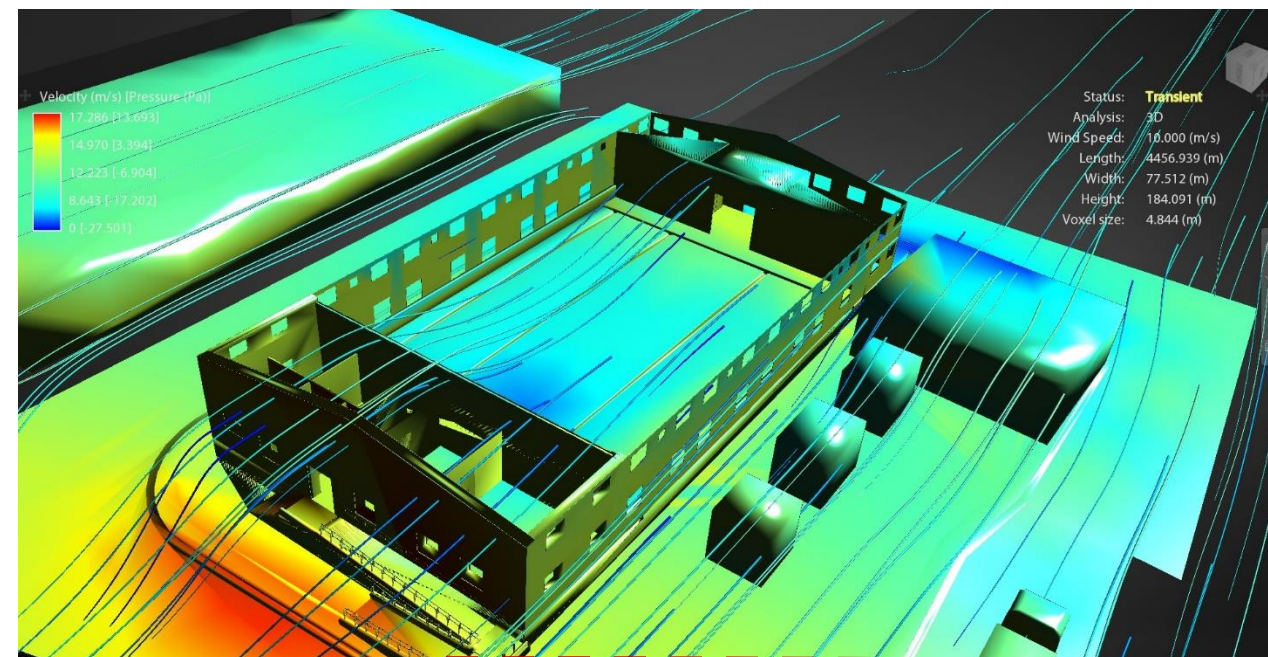
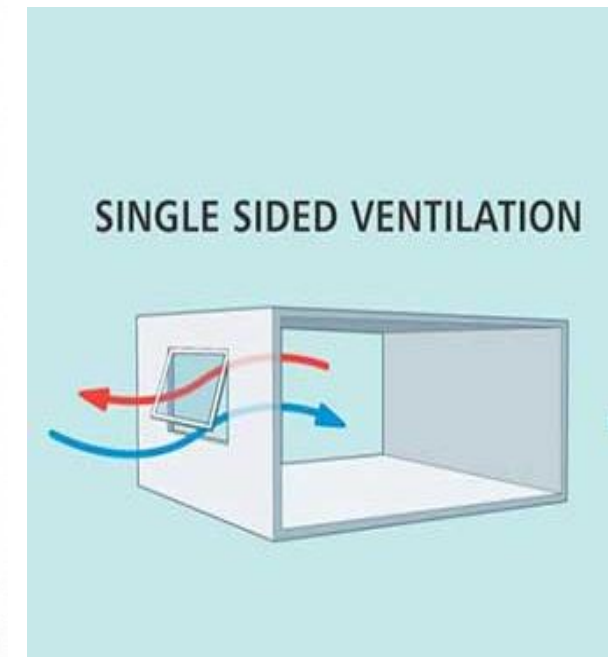
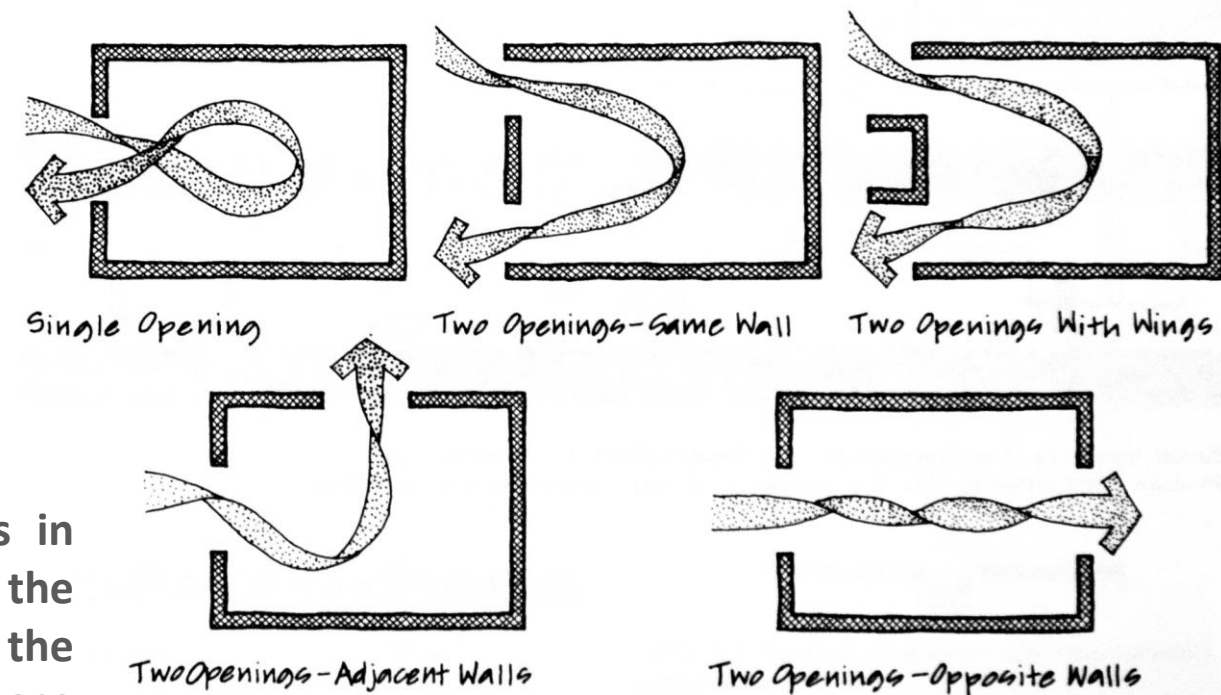
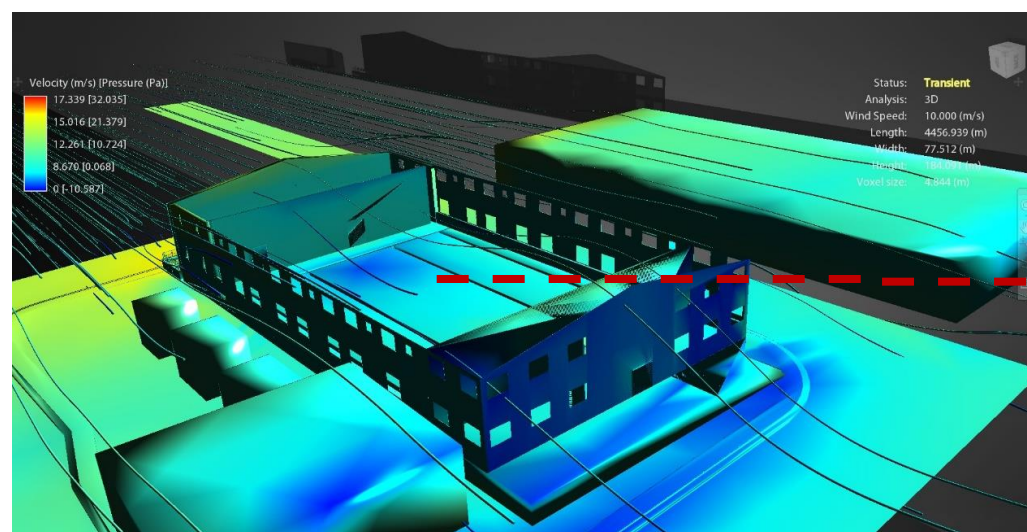


The wind analysis of tirupati shows that dominant wind flow from the west much of the time, about 20% of all hourly wind directions. Windward side would be the west and south west Leeward side would be the north.

WIND FLOW ANALYSIS



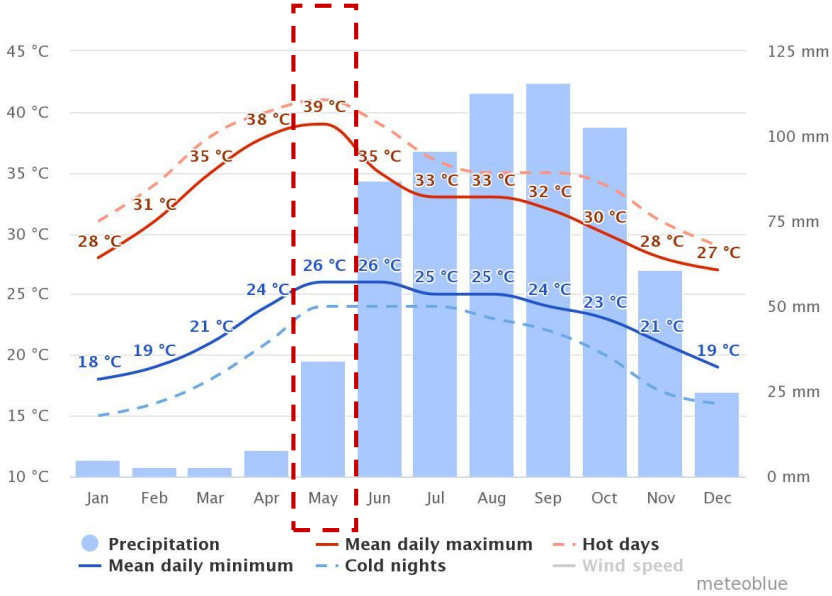
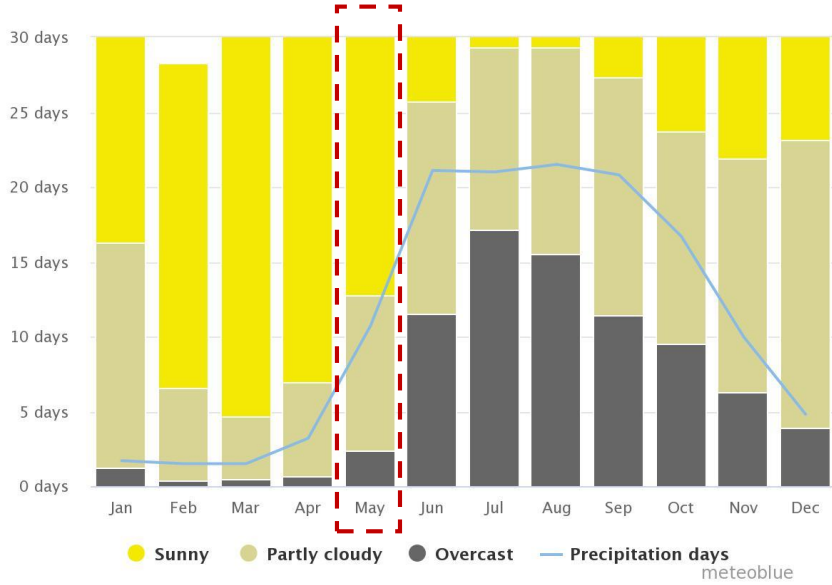
Since the windward side is in west direction, for most the months. West side of the building is the office space oriented so the wind flow is restricted only around the office spaces, the production space have the openings on north and south side, in which north side receives very less wind throughout the year, south, south east, south west receives average wind flow.



As the building is double ceiling height the office space has a false ceiling above that openings can be added for the wind flow inside the production area, thus the below space acts as office with single way ventilation.

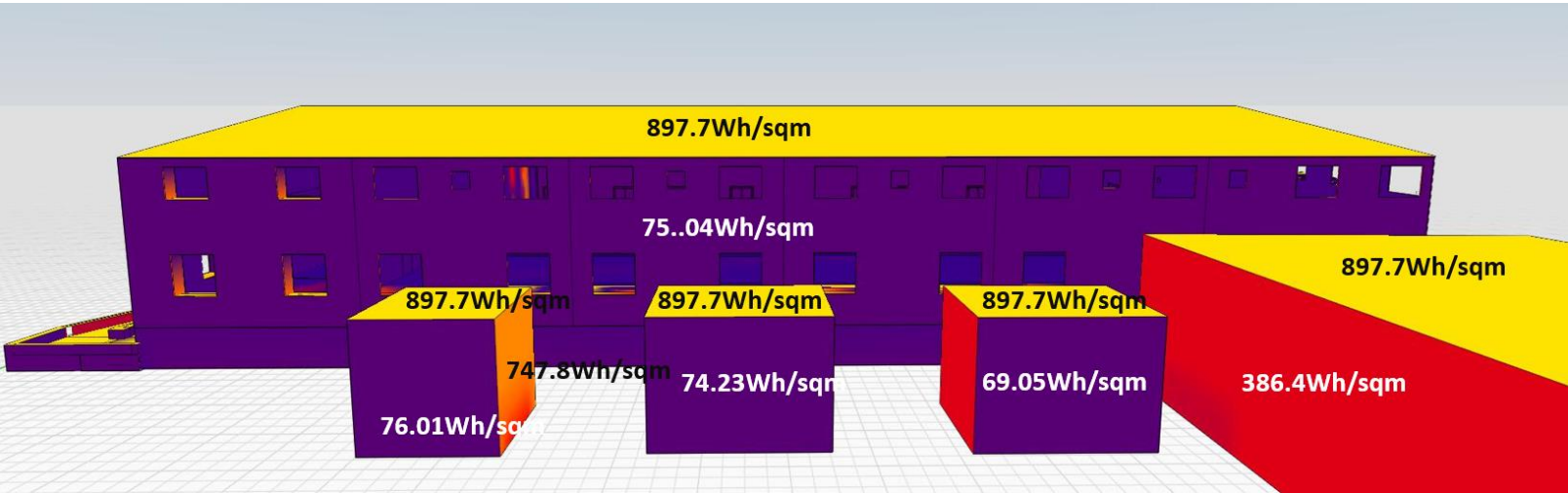
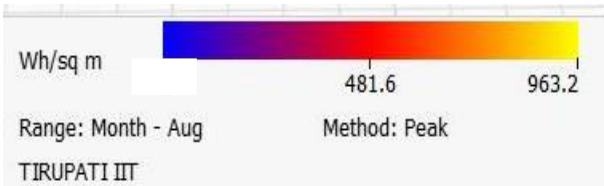
The wall being the barrier for the west side wind to flow inside the production space, the leeward side is the north direction, where the long side of the building facing north and south, the production area in the middle receives wind flow only in south direction on a specific months of the year.

SOLAR RADIATION

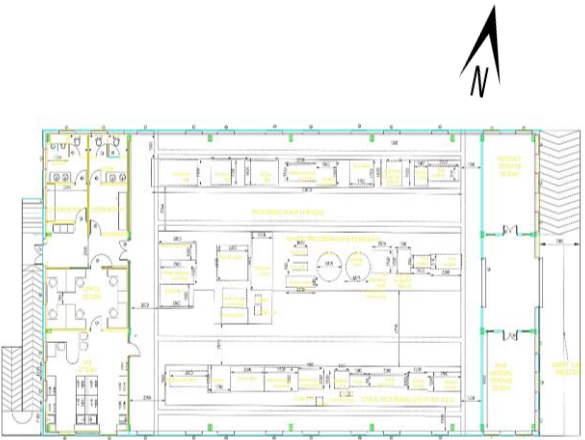


NORTH

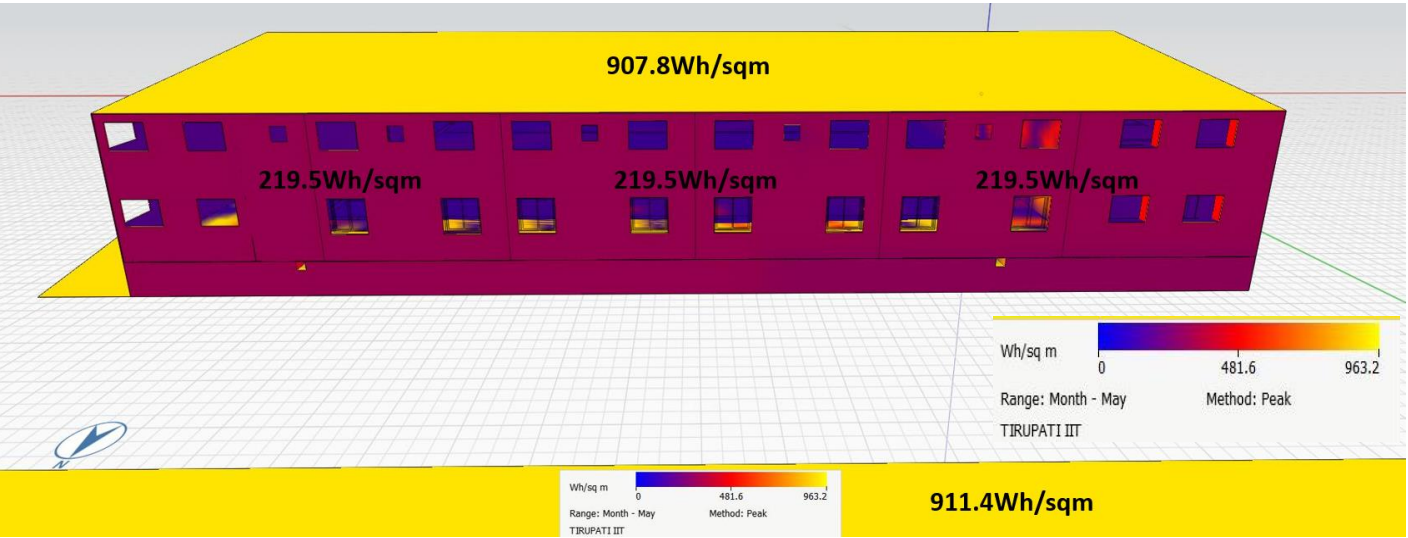
MAY – 12 pm
Summer Season
Direction Of Solar Radiation – Falling Overhead
Building Facing – west
Orientation Of Analysis – north



The facing of the building is in west,
12pm in noon where the sun hits direct on the building When it rises, the solar
radiation will be moderate on the Relevant time on month of may (summer
season).
The north side of the building have a complete shade because of the other
residence building which is located on south side.



Location	Tirupati, Andhra Pradesh, India
Latitude	13° 37' 44.6340" N
Longitude	79° 25' 28.0056" E
Building Type	Industrial Building
Climate Type	Tropical



MAY – 12 pm
Summer Season
Direction Of Solar Radiation – Falling Overhead
Building Facing – west
Orientation Of Analysis – south

The facing of the building is in west,
12pm in noon where the sun hits direct on the building When it rises, the solar
radiation will be moderate on the Relevant time on month of may (summer season).
The south side of the building have a complete shade because the sun hits on
top of the building.

SOLAR RADIATION

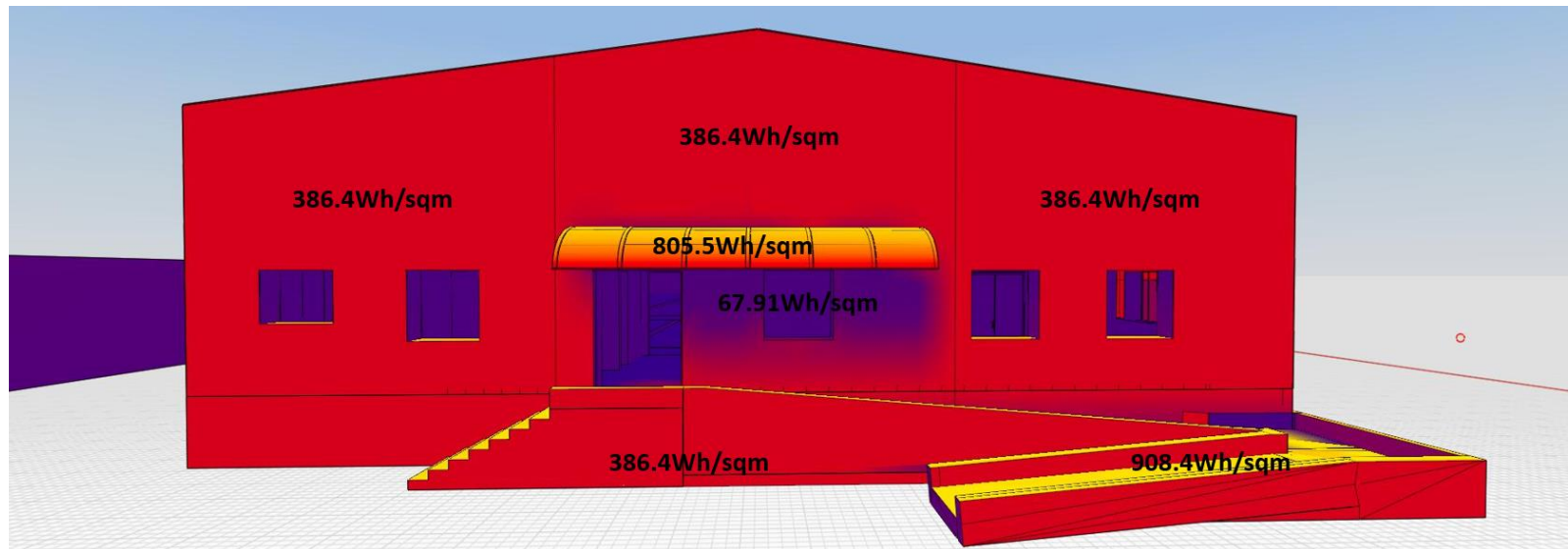
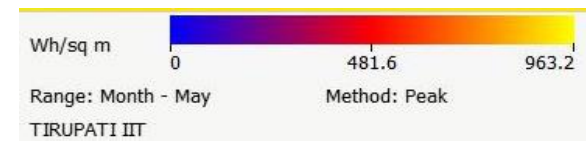
MAY – 12 pm

Summer Season

Direction Of Solar Radiation – Falling Overhead

Building Facing – west

Orientation Of Analysis – East



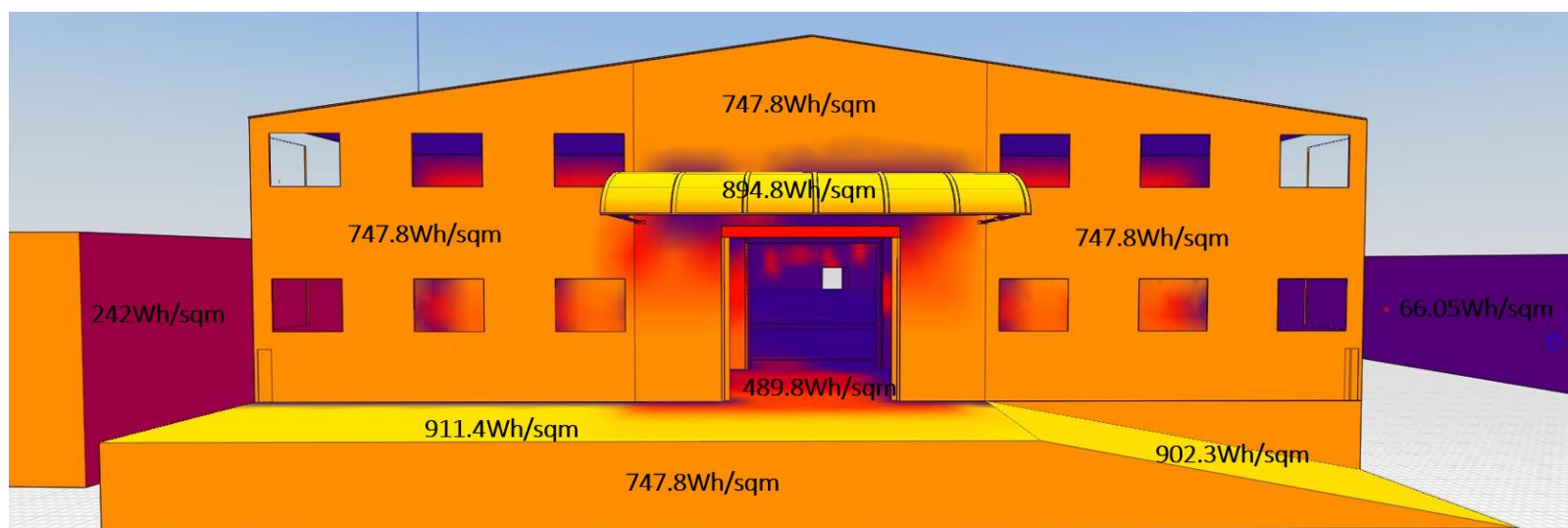
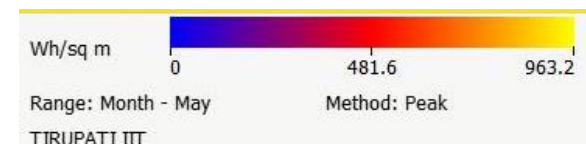
MAY – 12 pm

Summer Season

Direction Of Solar Radiation – Falling Overhead

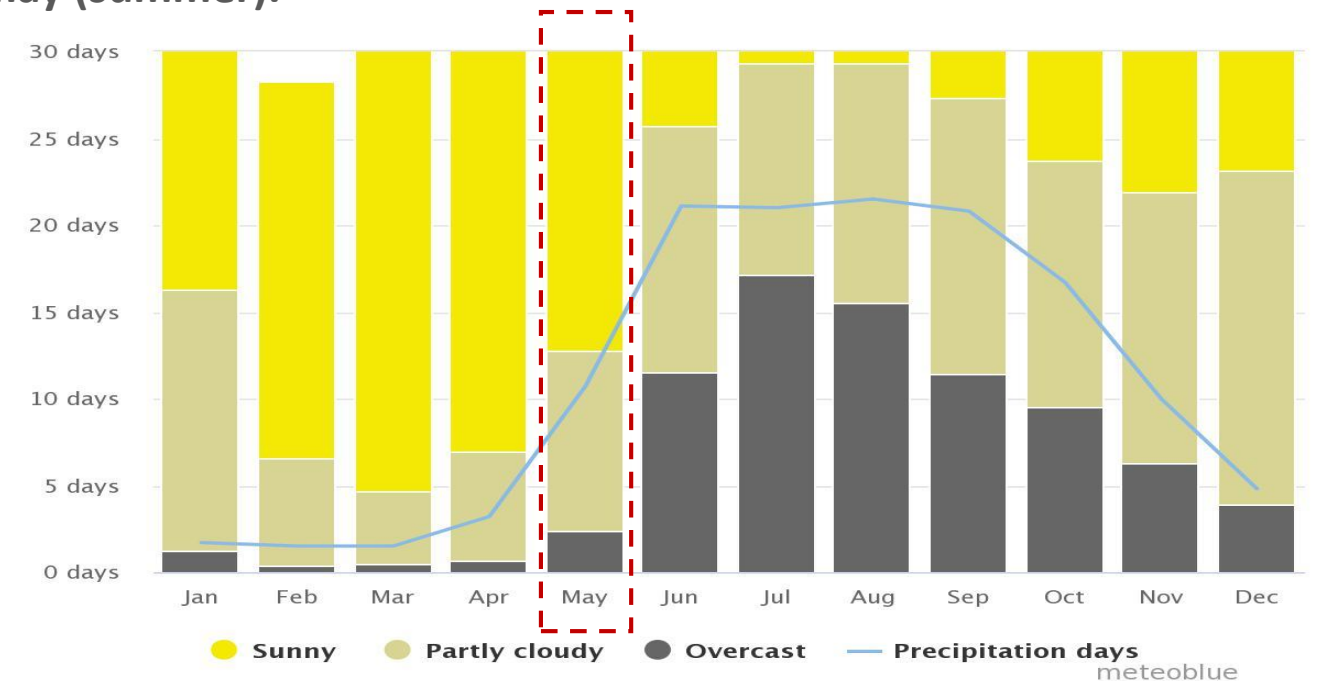
Building Facing – west

Orientation Of Analysis – WEST



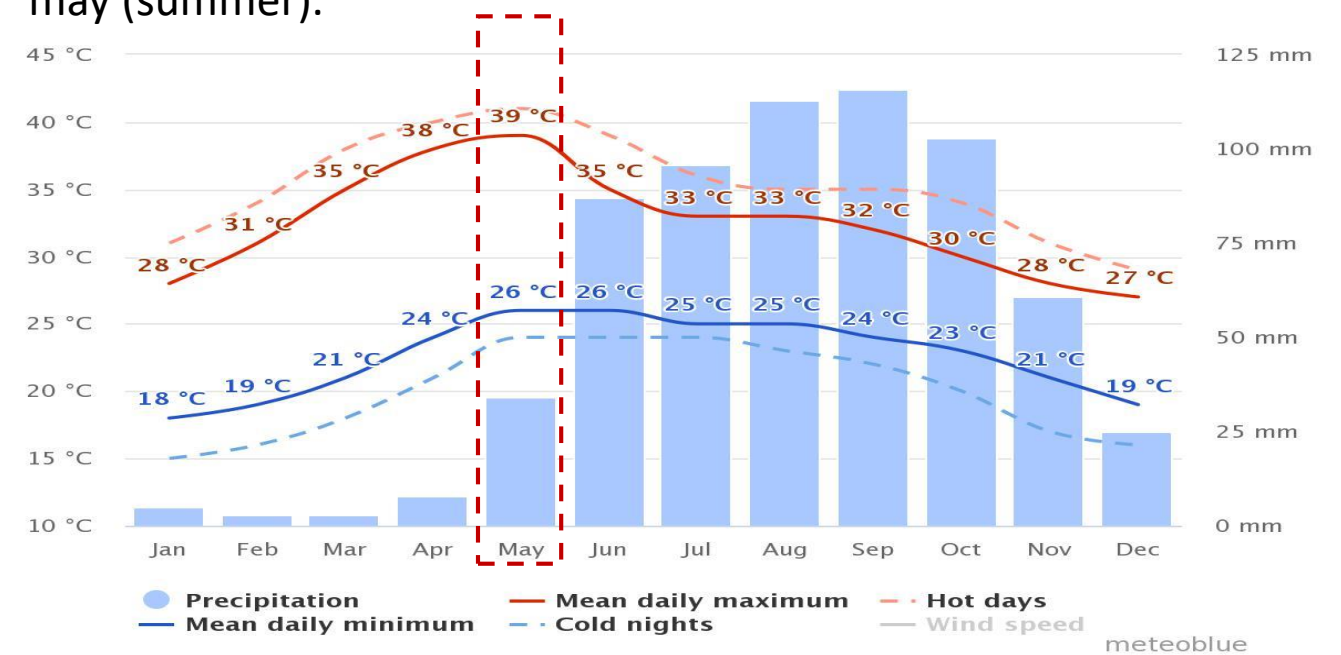
The facing of the building is in east,

12pm in afternoon where the sun hits direct on the building ,the solar radiation will be high on the Relevant time on month of may (summer).

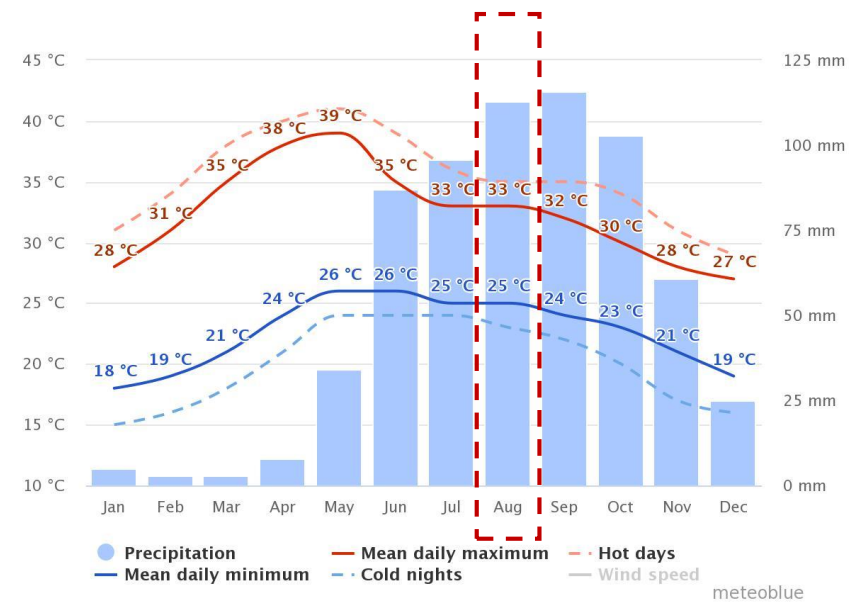
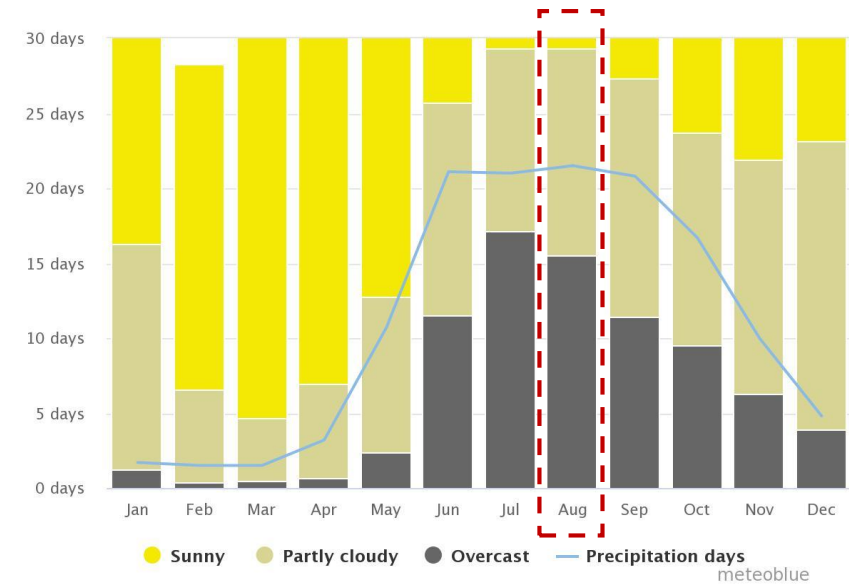


The facing of the building is in west,

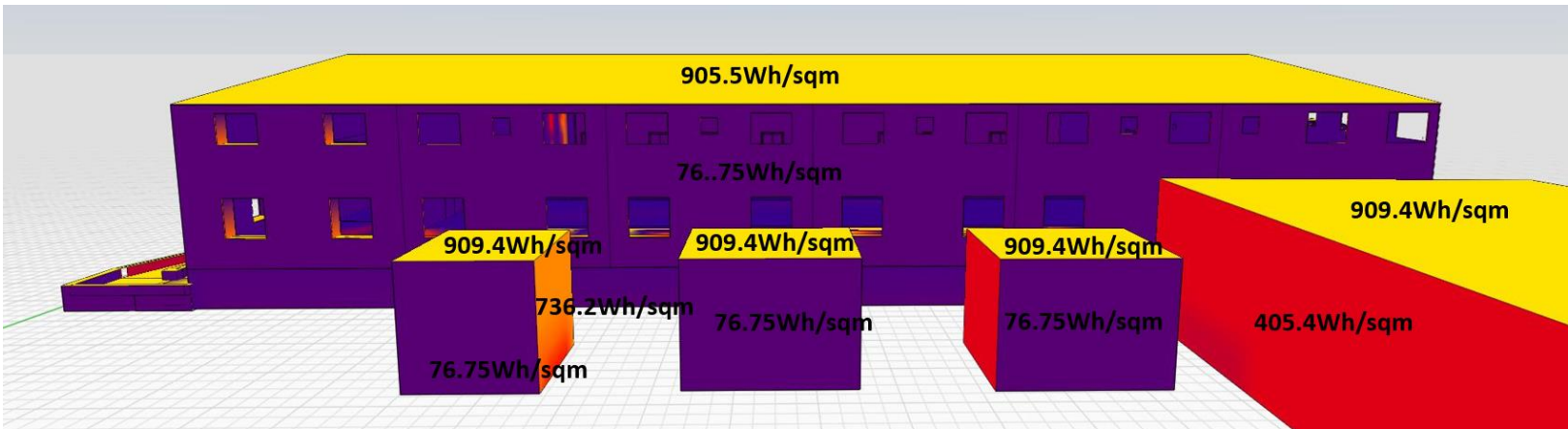
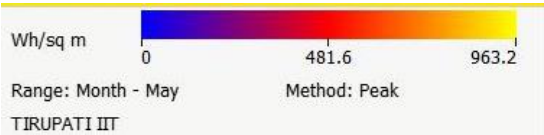
12pm in afternoon where the sun hits direct on the building ,the solar radiation will be average on the Relevant time on month of may (summer).



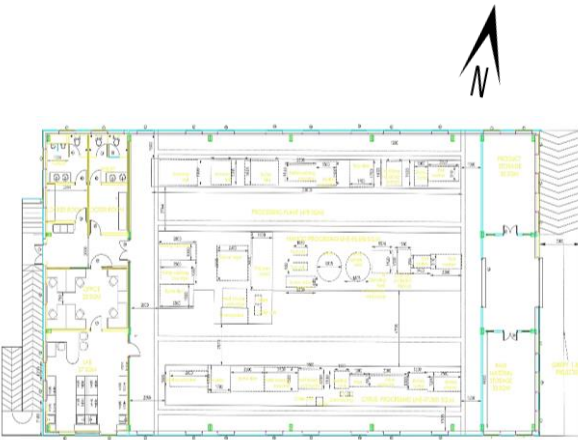
SOLAR RADIATION



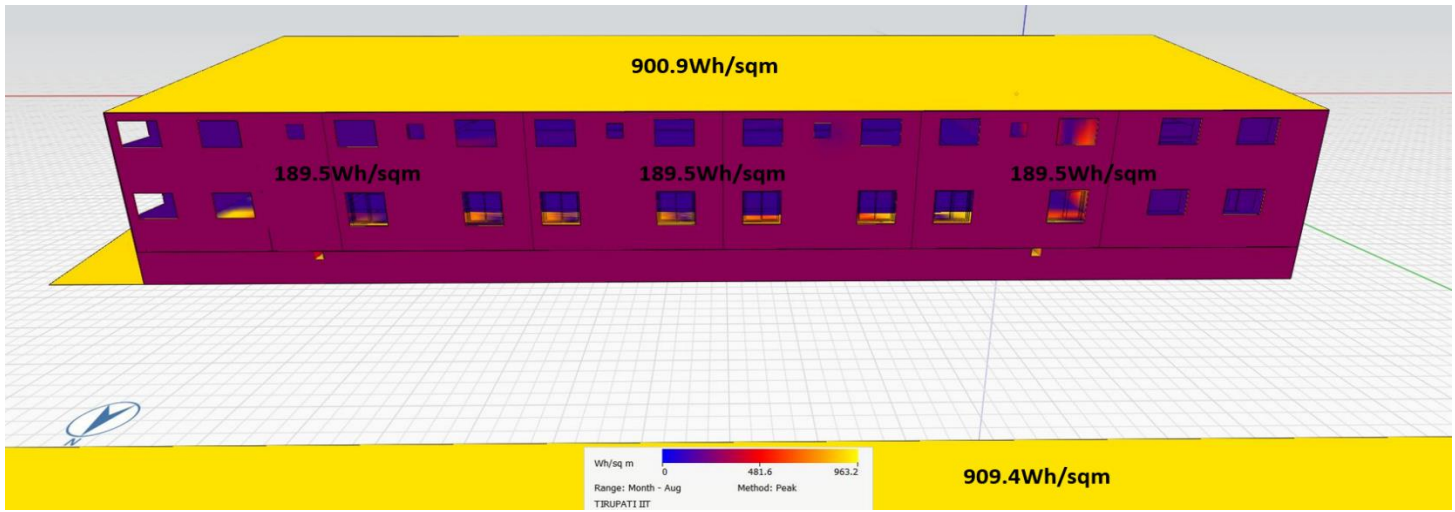
August – 12 pm
Summer Season
Direction Of Solar Radiation – Falling Overhead
Building Facing – west
Orientation Of Analysis – north



The facing of the building is in west,
12pm in noon where the sun hits direct on the building When it rises, the solar radiation will be moderate on the Relevant time on month of AUGUST (summer season).
The north side of the building have a complete shade because of the other residence building which is located on south side.



Location	Tirupati, Andhra Pradesh, India
Latitude	13° 37' 44.6340" N
Longitude	79° 25' 28.0056" E
Building Type	Industrial Building
Climate Type	Tropical

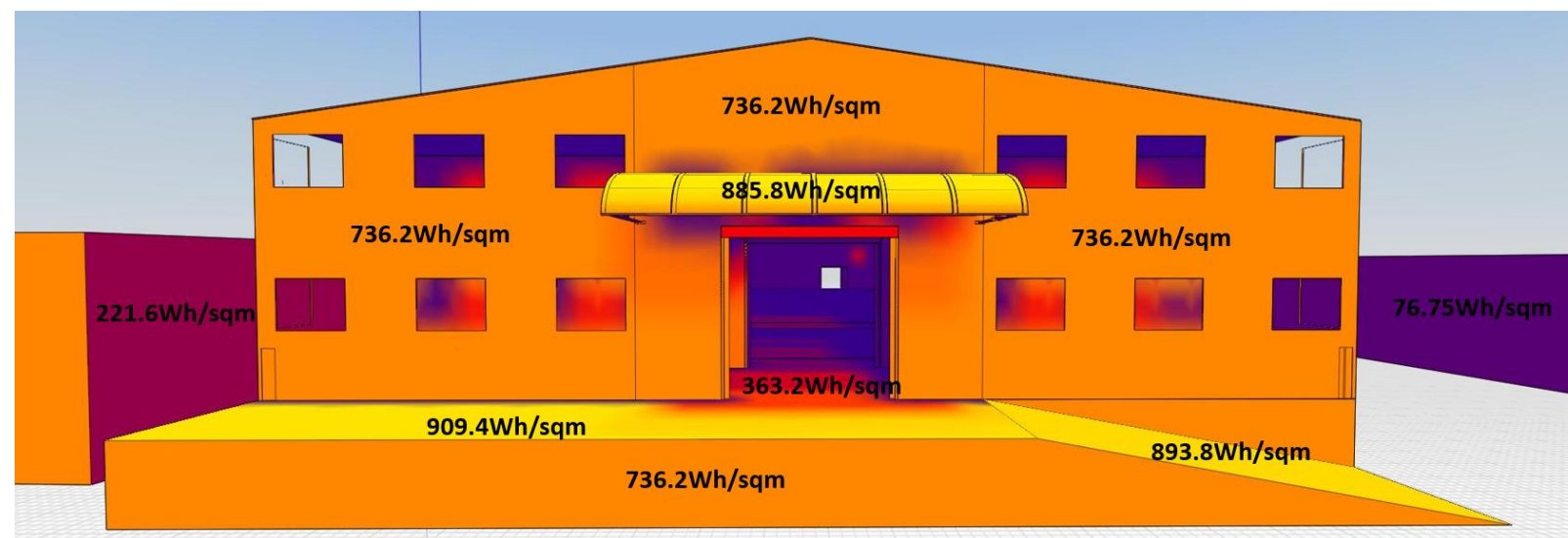
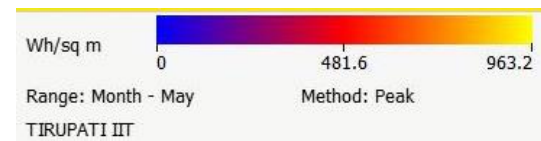


August – 12 pm
Summer Season
Direction Of Solar Radiation – Falling Overhead
Building Facing – west
Orientation Of Analysis – SOUTH

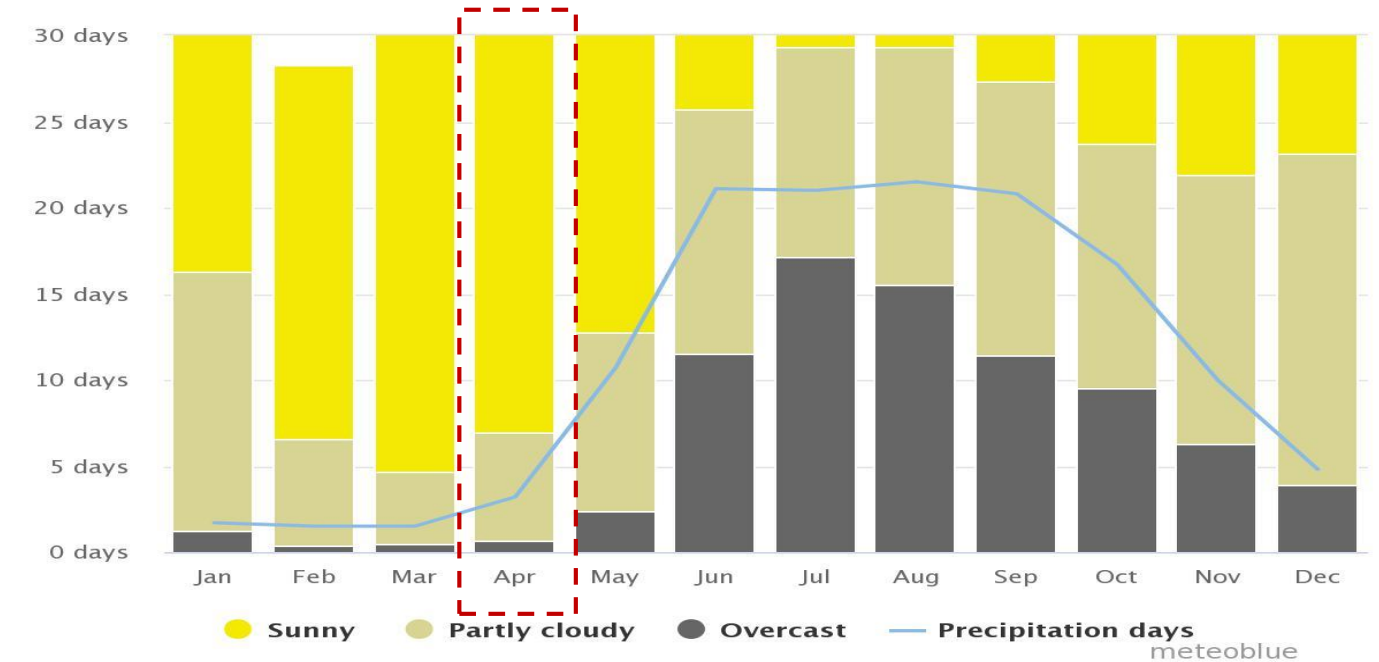
The facing of the building is in west,
12pm in noon where the sun hits direct on the building When it rises, the solar radiation will be moderate on the Relevant time on month of august (summer season).
The south side of the building have a complete shade because the sun hits on top of the building.

SOLAR RADIATION

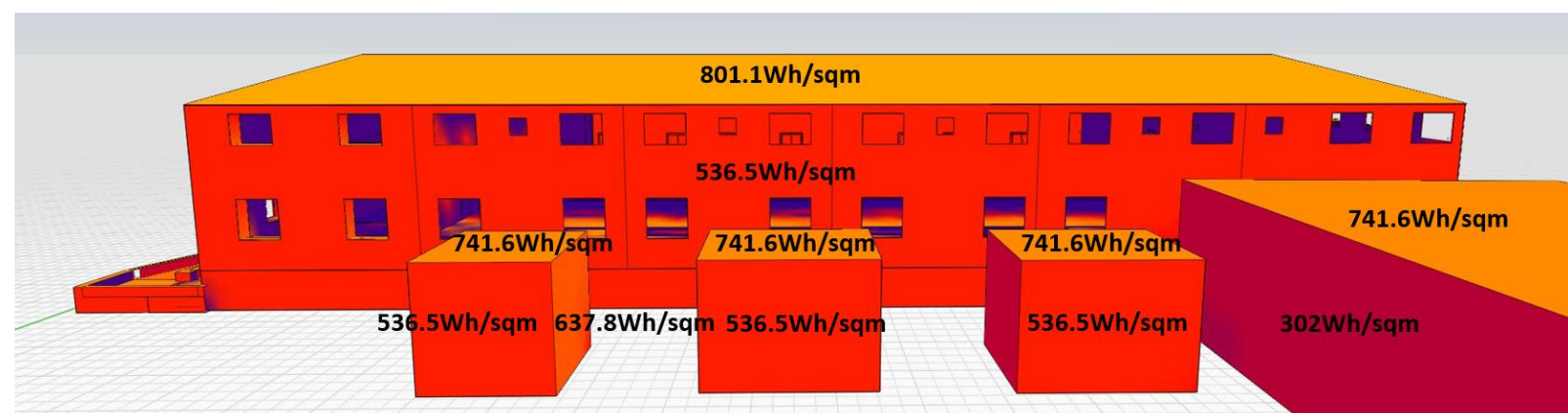
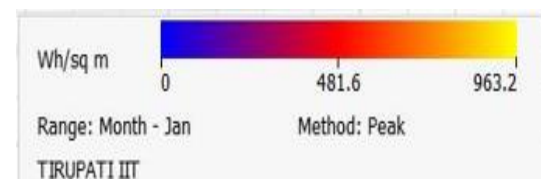
August – 12 pm
 Summer Season
 Direction Of Solar Radiation – Falling Overhead
 Building Facing – west
 Orientation Of Analysis – WEST



The facing of the building is in west,
 12pm in afternoon where the sun hits direct on the building ,the solar radiation will be average on the Relevant time on month of may (summer).

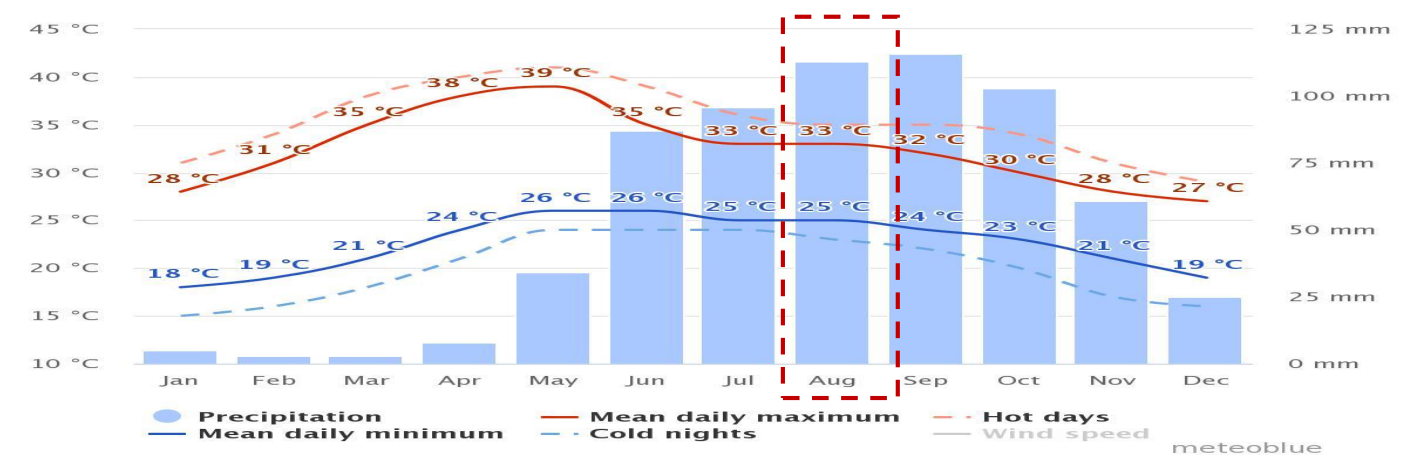


JANUARY – 12 pm
 Summer Season
 Direction Of Solar Radiation – Falling Overhead
 Building Facing – west
 Orientation Of Analysis – NORTH

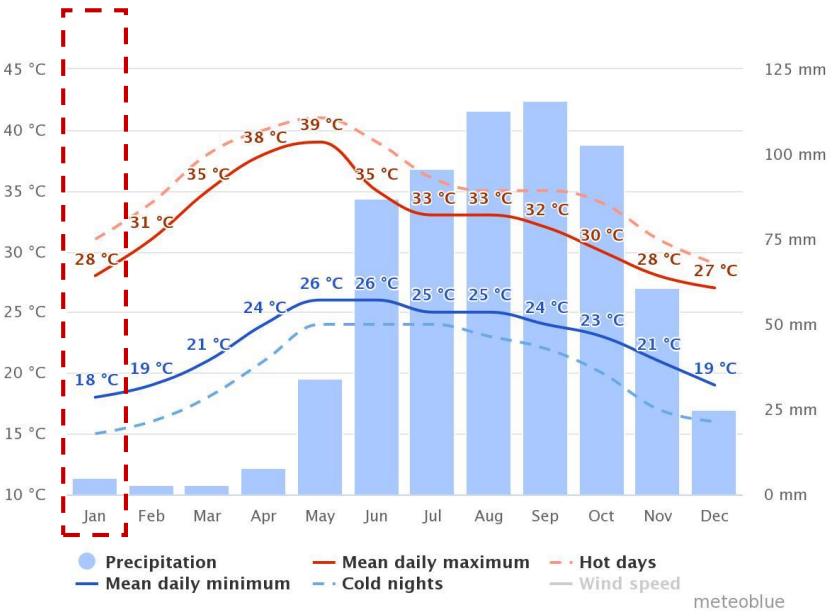
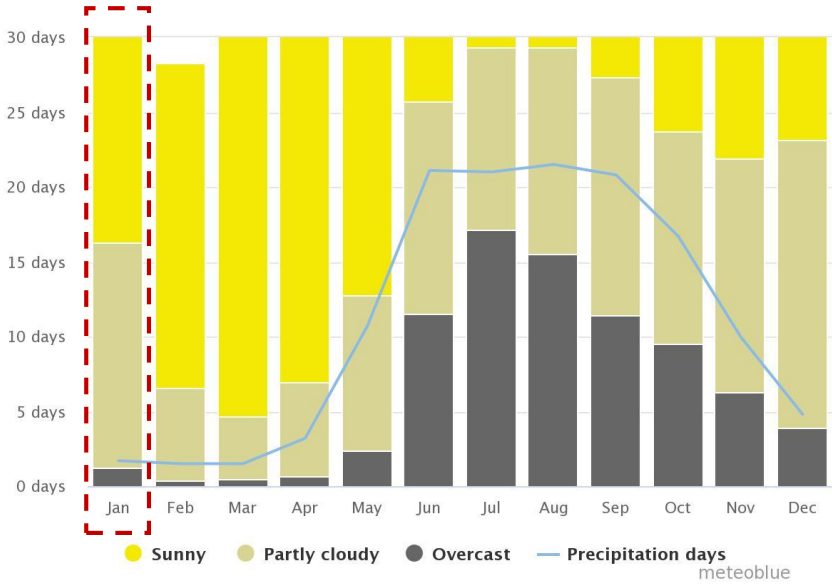


The facing of the building is in west,
 12pm in noon where the sun hits direct on the building When it rises,
 the solar radiation is very low on the Relevant time on month of January (winter season).

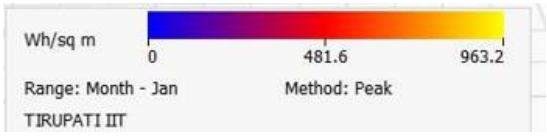
The north side of the building have a complete shade because of the other residence building which is located on south side.



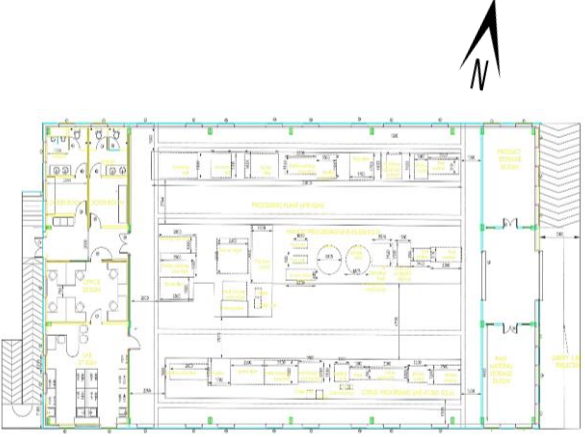
SOLAR RADIATION



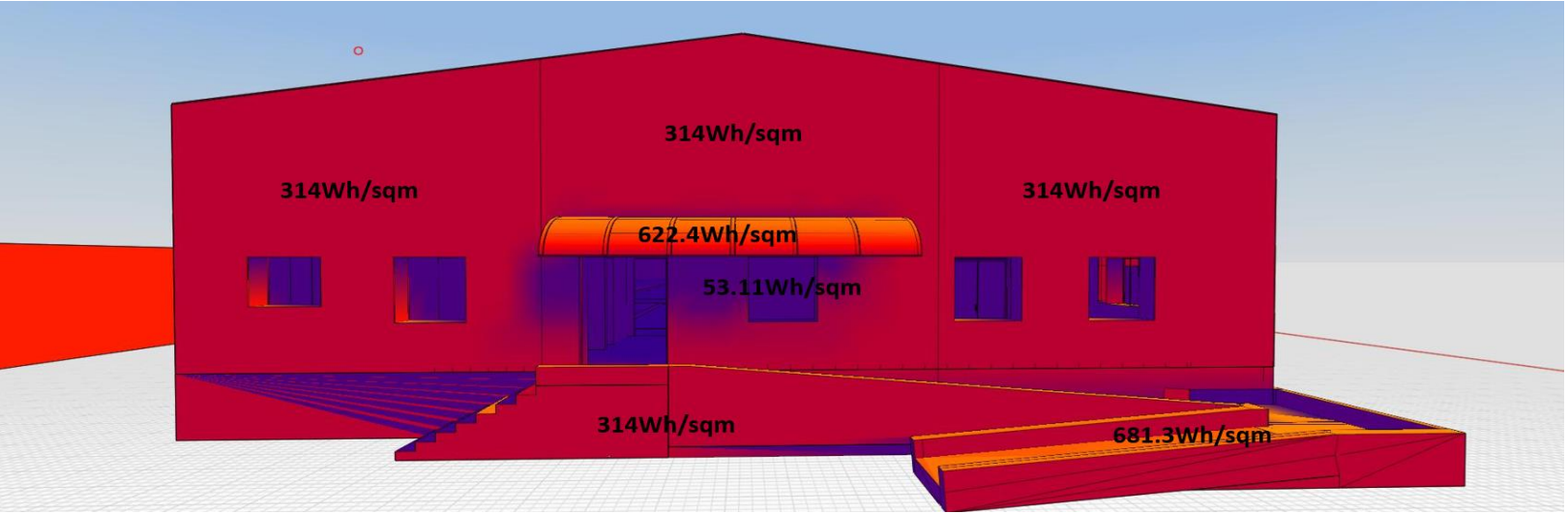
JANUARY – 12 pm
Summer Season
Direction Of Solar Radiation – Falling Overhead
Building Facing – west
Orientation Of Analysis – SOUTH



The facing of the building is in west,
12pm in noon where the sun hits direct on the building When it rises, the solar radiation will be VERY LESS on the Relevant time on month of JANUARY (WINTER season).



Location	Tirupati, Andhra Pradesh, India
Latitude	13° 37' 44.6340" N
Longitude	79° 25' 28.0056" E
Building Type	Industrial Building
Climate Type	Tropical



JANUARY – 12 pm
Summer Season
Direction Of Solar Radiation – Falling Overhead
Building Facing – west
Orientation Of Analysis – EAST



The facing of the building is in east,
12pm in afternoon where the sun hits direct on the building ,the solar radiation will be VERY LOW on the Relevant time on month of JANUARY (WINTER).

SOLAR RADIATION

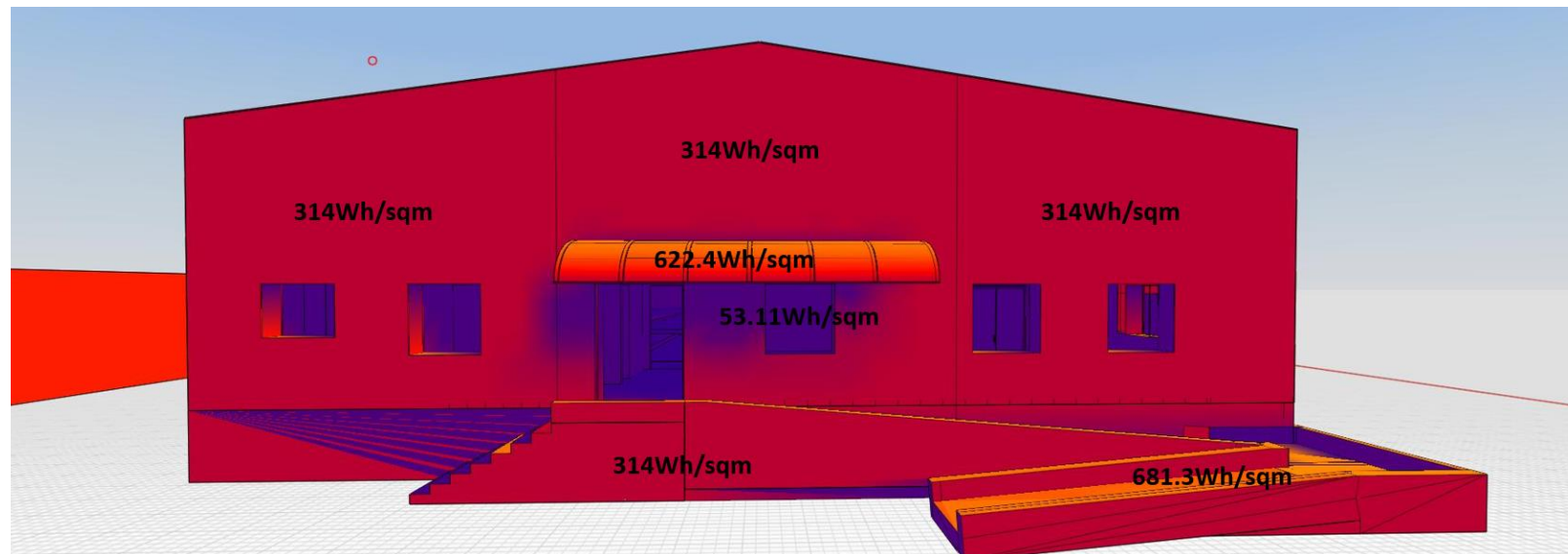
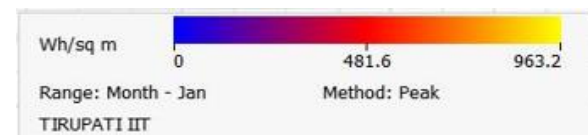
JANUARY – 12 pm

Summer Season

Direction Of Solar Radiation – Falling Overhead

Building Facing – west

Orientation Of Analysis – EAST



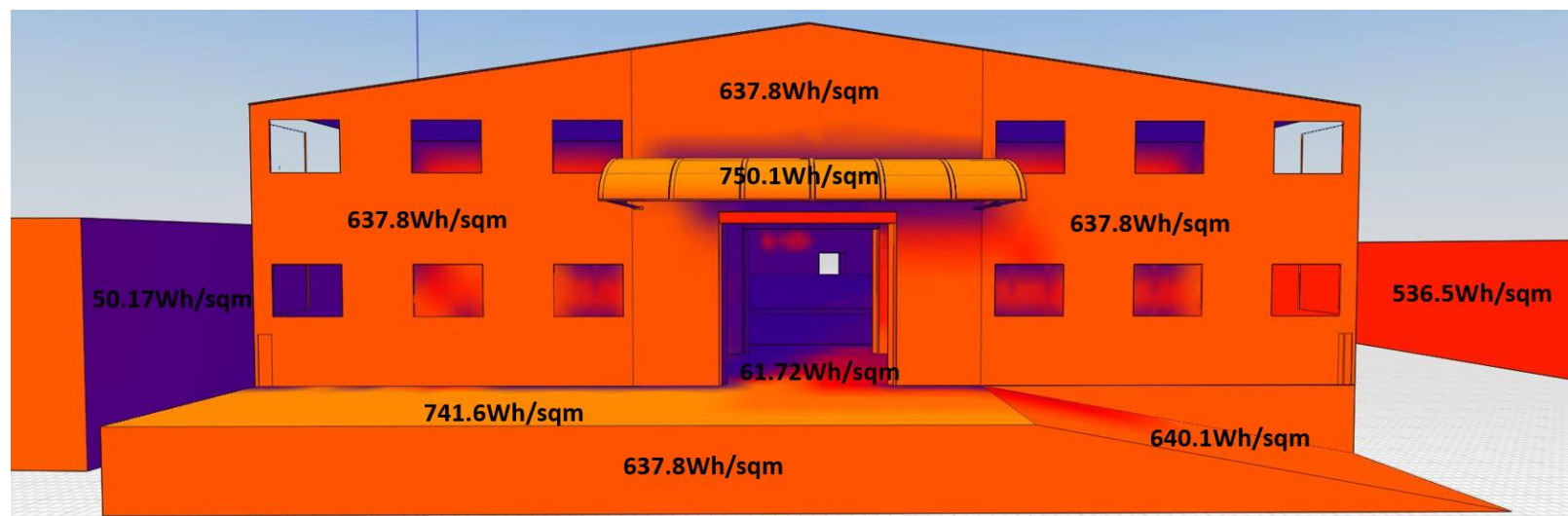
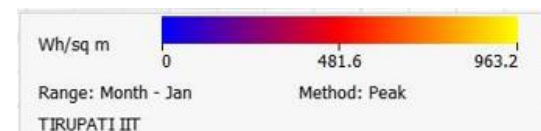
JANUARY – 12 pm

Summer Season

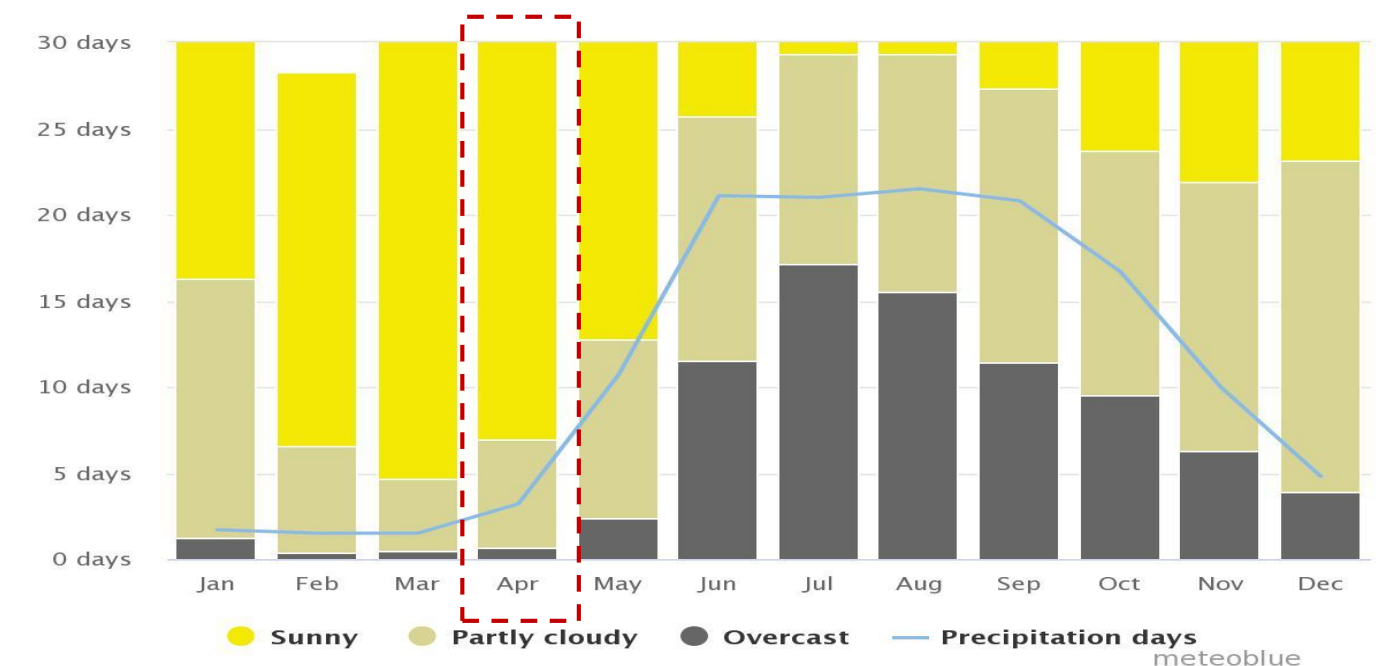
Direction Of Solar Radiation – Falling Overhead

Building Facing – west

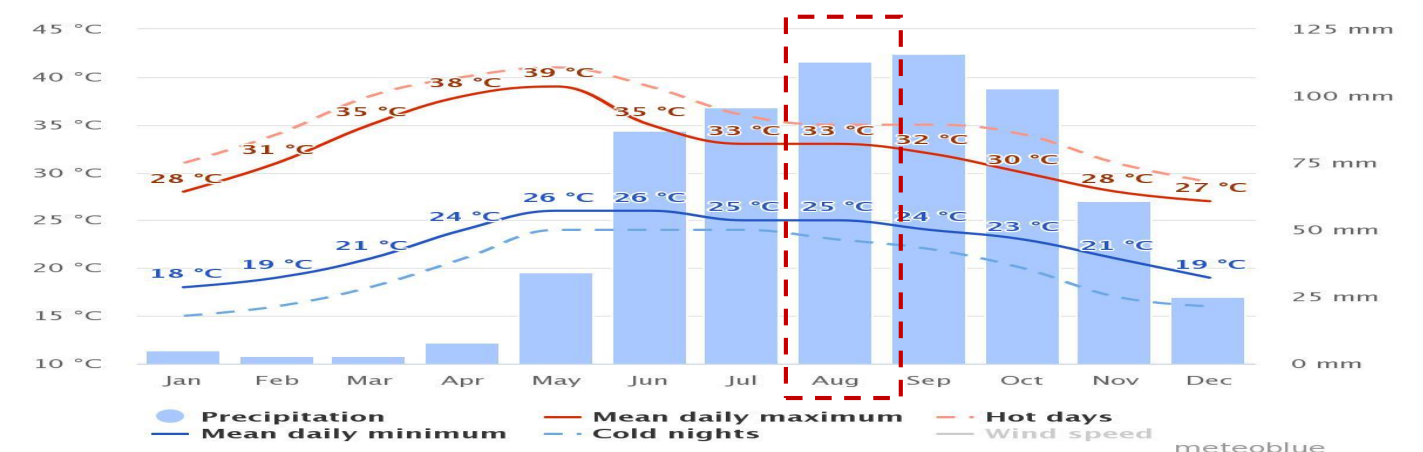
Orientation Of Analysis – WEST



The facing of the building is in east, 12pm in afternoon where the sun hits direct on the building ,the solar radiation will be VERY LOW on the Relevant time on month of JANUARY (WINTER).



The facing of the building is in east, 12pm in afternoon where the sun hits direct on the building ,the solar radiation will be LOW on the Relevant time on month of JANUARY (WINTER).



DAYLIGHTING ANALYSIS

sp41

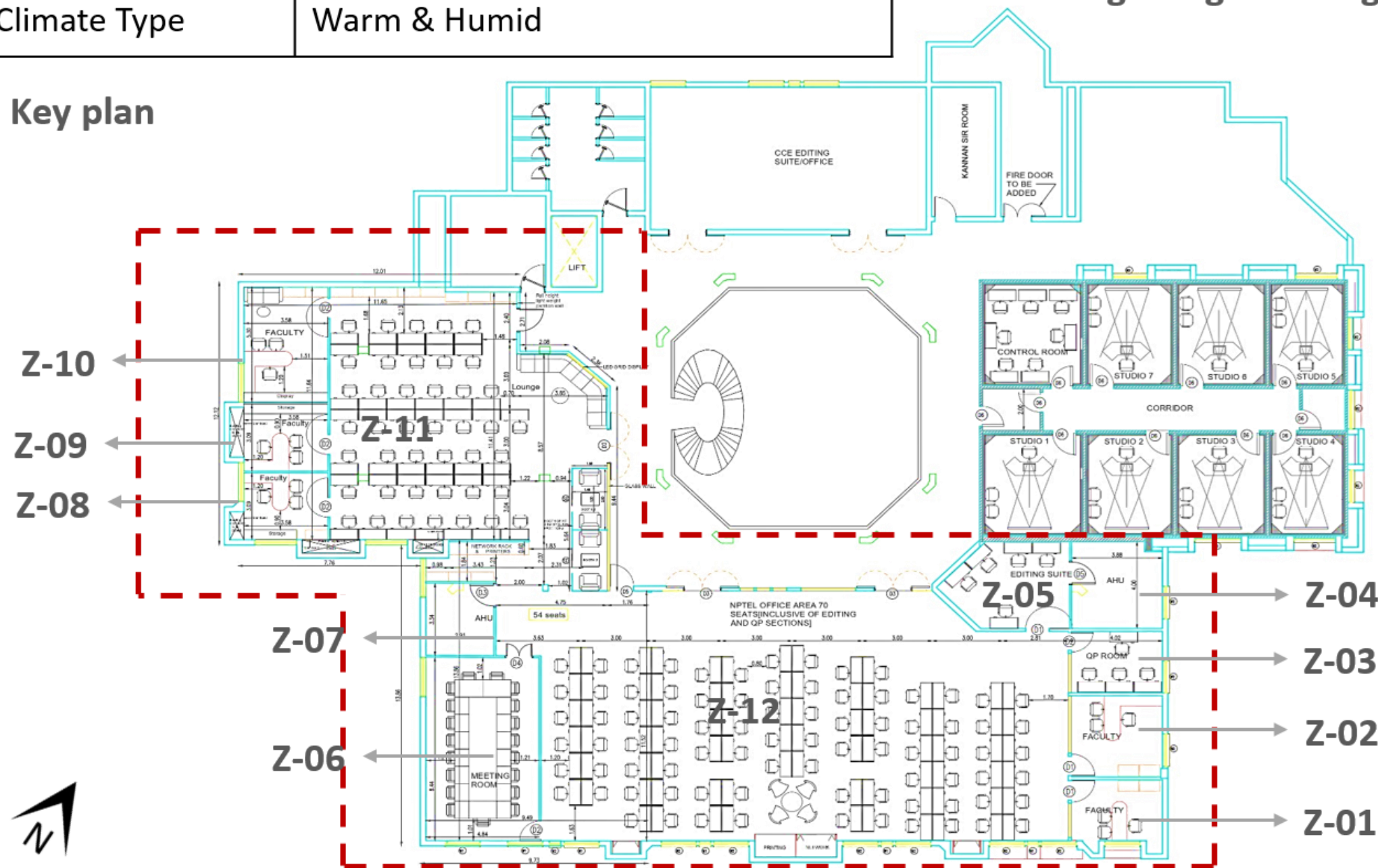
Location	IIT Madras, Chennai Tamil Nadu India.
Latitude	13.0827°N
Longitude	80.2707° E
Building Type	Commercial
Climate Type	Warm & Humid

VLT of glazing – 76% - 0.76 (Default - values are not provided)

Window glazing – Clear glass - 76% VLT
 Interior partition- Frosted glass - 45% VLT
 Ventilator glazing – Clear glass- 76% VLT

Sl. No.	LOCATION	DAYLIGHT FACTOR, PERCENT
i) Dwellings		
	Kitchen	2.5
	Living room	0.625
	Study room	1.9
	Circulation	0.313
ii) Schools		
	Class room desk top, black board	1.9-3.8
	Library	2.5-3.8
iii) Offices		
	General	1.9
	Drawing, typing	3.75
	Enquiry	0.625-1.9
iv) Hospitals		
	General wards	1.25
	Pathological laboratory	2.5-3.75
v) Libraries		
	Stack room	0.9-1.9
	Reading room	1.9-3.75
	Counter area	2.5-3.75
	Catalogue room	1.9-2.5

Key plan



Daylight Factor Analysis

Sky Condition - Overcast Sky (annual)

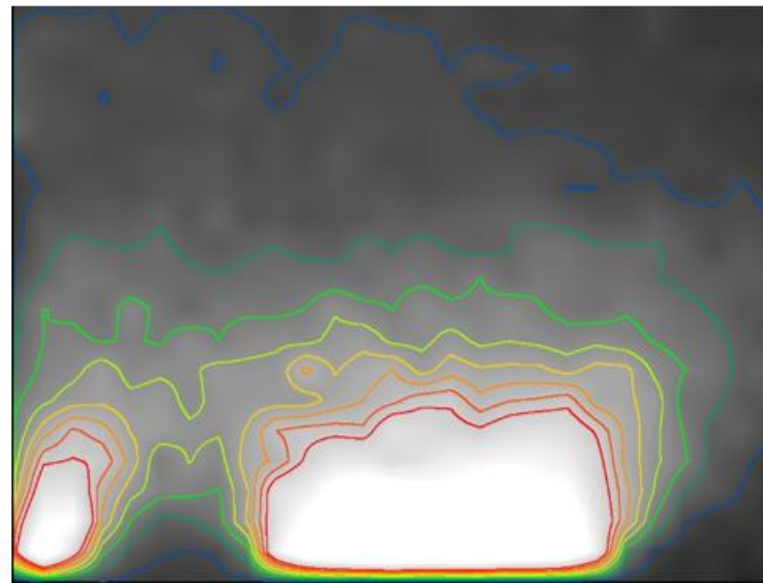
Overcast sky conditions on the work plane @ 0.75m height from the finished floor level

Time - 12 Noon

Without Blinds

DAYLIGHTING ANALYSIS

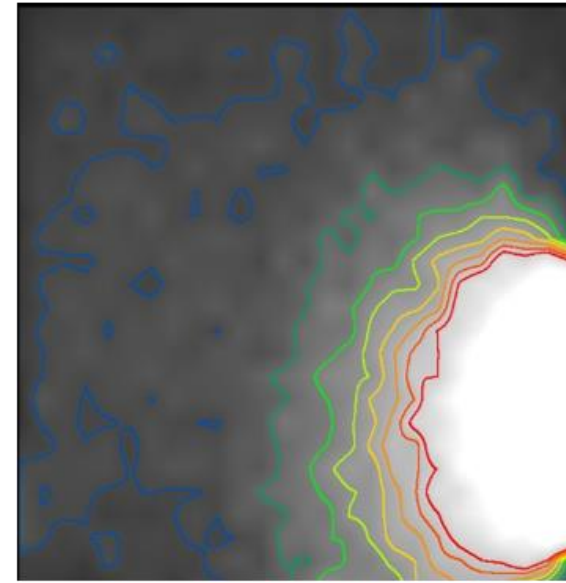
Zone - 1



Default

Average	$D_{average}$	1.69 DF[%]
Median	D_{median}	0.84 DF[%]
Minimum	D_{min}	0.14 DF[%]
Maximum	D_{max}	9.84 DF[%]
Uniformity 1	$D_{min}/D_{average}$	0.0831
Uniformity 2	D_{min}/D_{max}	0.0142

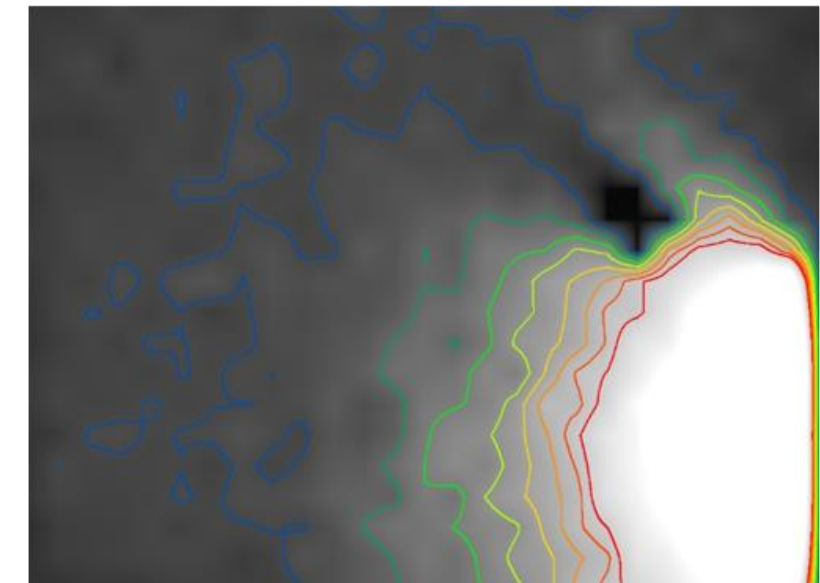
Zone - 2



Default

Average	$D_{average}$	1.75 DF[%]
Median	D_{median}	0.60 DF[%]
Minimum	D_{min}	0.19 DF[%]
Maximum	D_{max}	15.12 DF[%]
Uniformity 1	$D_{min}/D_{average}$	0.1065
Uniformity 2	D_{min}/D_{max}	0.0123

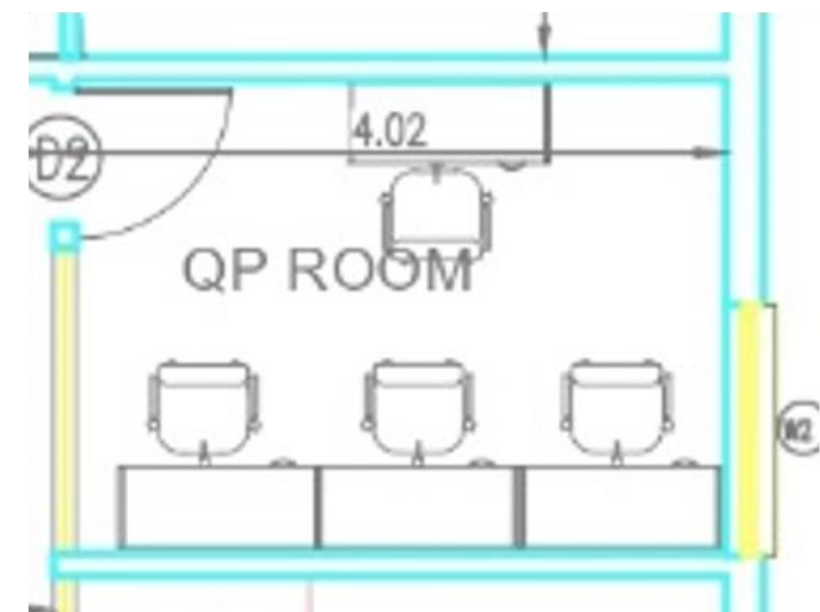
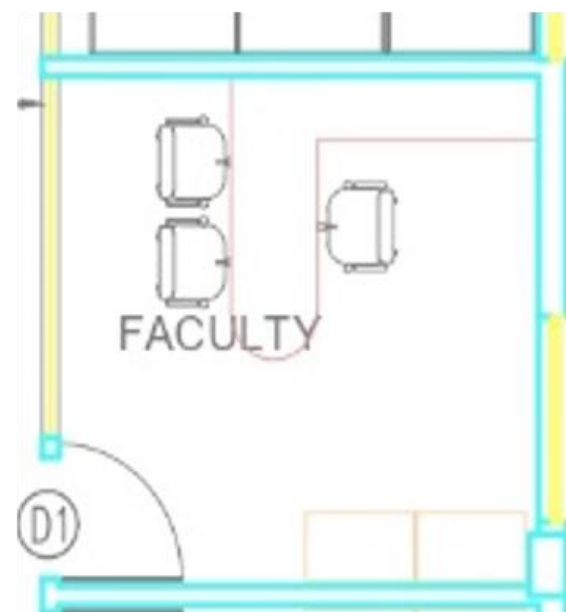
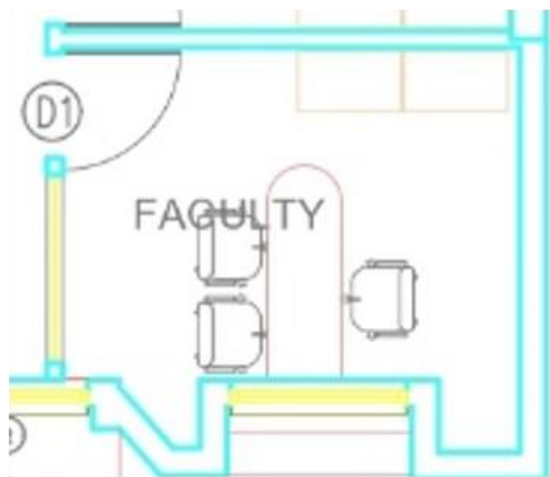
Zone - 3



Default

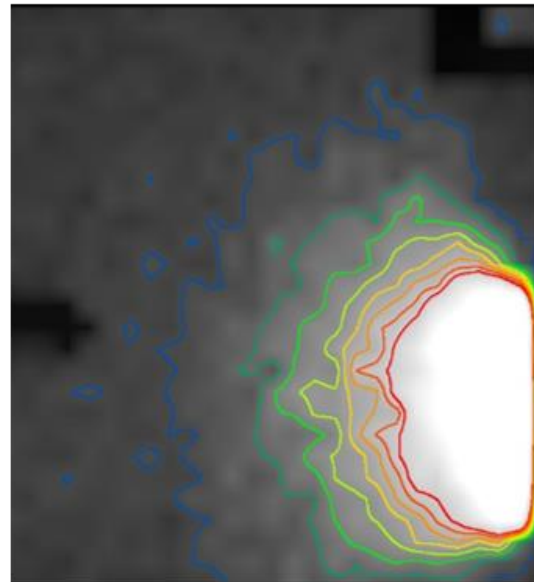
Average	$D_{average}$	1.80 DF[%]
Median	D_{median}	0.54 DF[%]
Minimum	D_{min}	0.01 DF[%]
Maximum	D_{max}	14.31 DF[%]
Uniformity 1	$D_{min}/D_{average}$	0.0040
Uniformity 2	D_{min}/D_{max}	0.0005

About 1.69 % of DF is analysed near the windows and it reduces to 0.50 %. There is sufficient amount of daylight inside the office room.

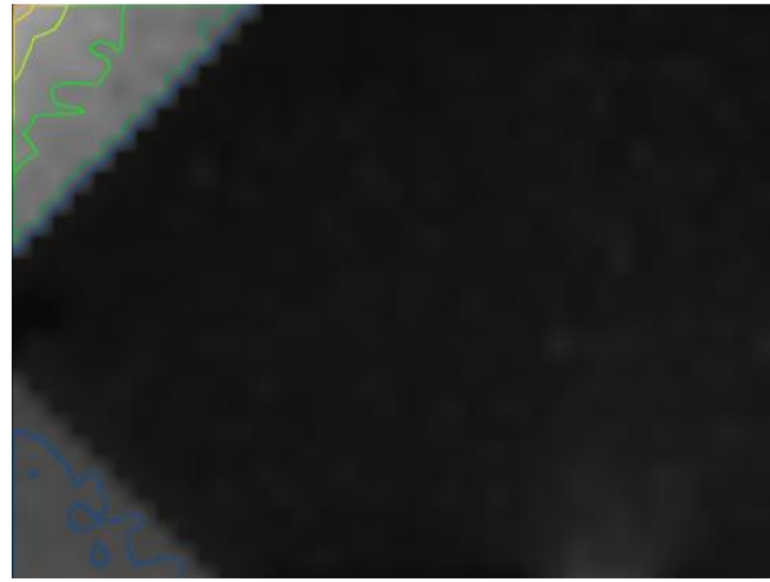


DAYLIGHTING ANALYSIS

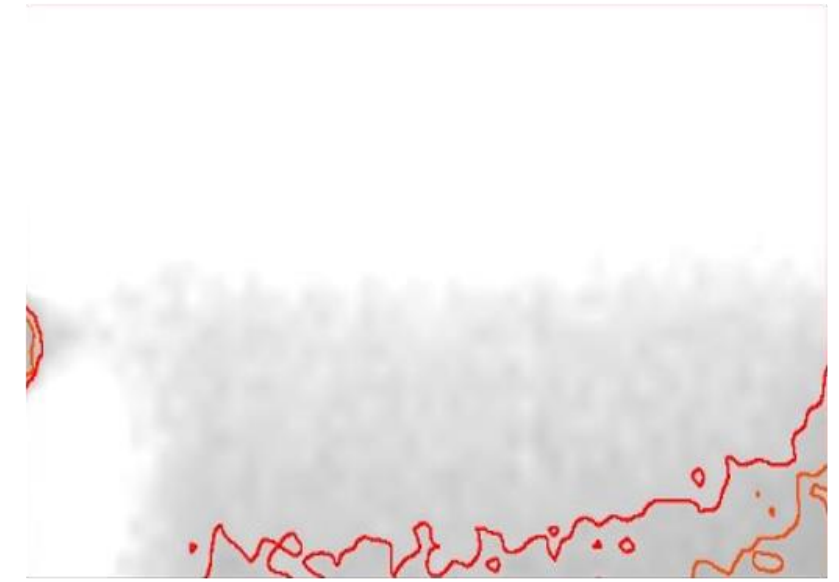
Zone - 4



Zone - 5



Zone - 6



Default

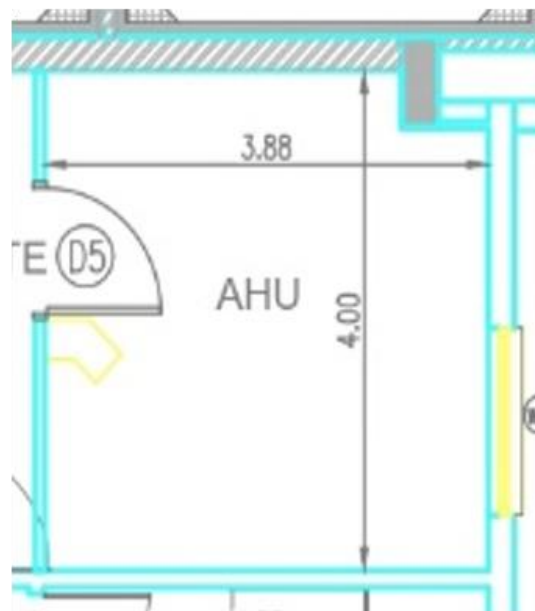
Average	D _{average}	1.33 DF[%]
Median	D _{median}	0.46 DF[%]
Minimum	D _{min}	0.00 DF[%]
Maximum	D _{max}	11.97 DF[%]
Uniformity 1	D _{min} /D _{average}	0.0023
Uniformity 2	D _{min} /D _{max}	0.0003

Default

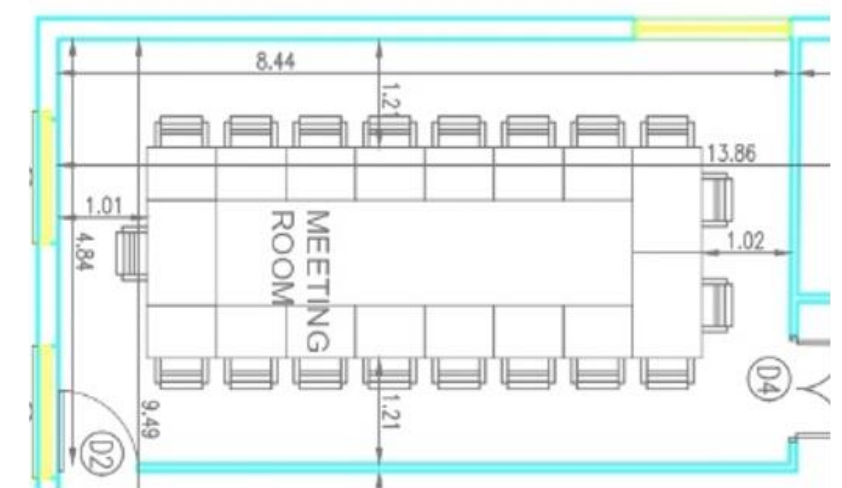
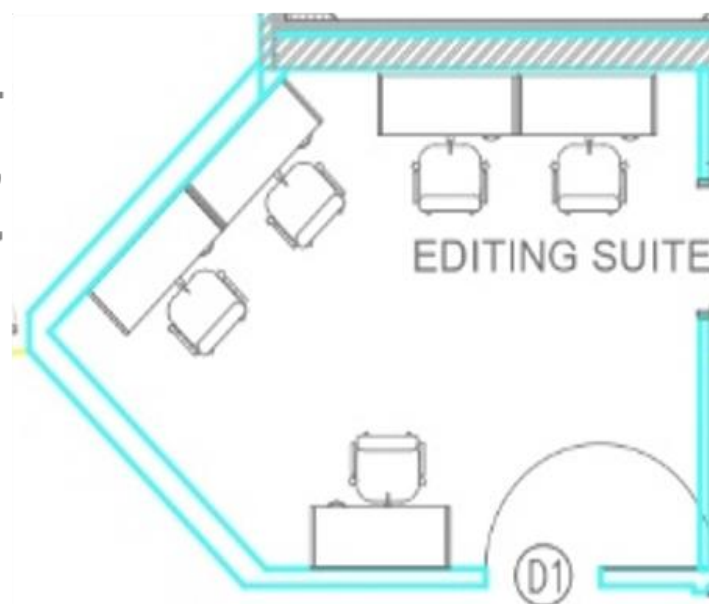
Average	D _{average}	0.18 DF[%]
Median	D _{median}	0.04 DF[%]
Minimum	D _{min}	0.01 DF[%]
Maximum	D _{max}	3.12 DF[%]
Uniformity 1	D _{min} /D _{average}	0.0618
Uniformity 2	D _{min} /D _{max}	0.0035

Default

Average	D _{average}	9.57 DF[%]
Median	D _{median}	6.21 DF[%]
Minimum	D _{min}	2.48 DF[%]
Maximum	D _{max}	33.79 DF[%]
Uniformity 1	D _{min} /D _{average}	0.2598
Uniformity 2	D _{min} /D _{max}	0.0735

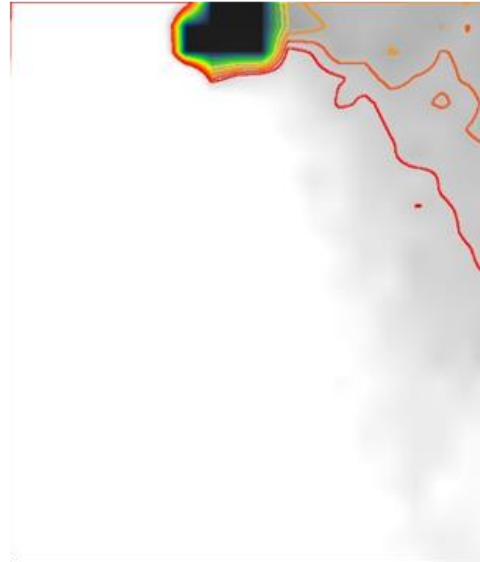
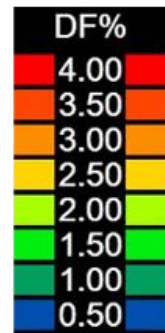


Editing suite –
0.18 % of DF is
analysed near
the windows and
it reduces to 0 %.
No source for DF.

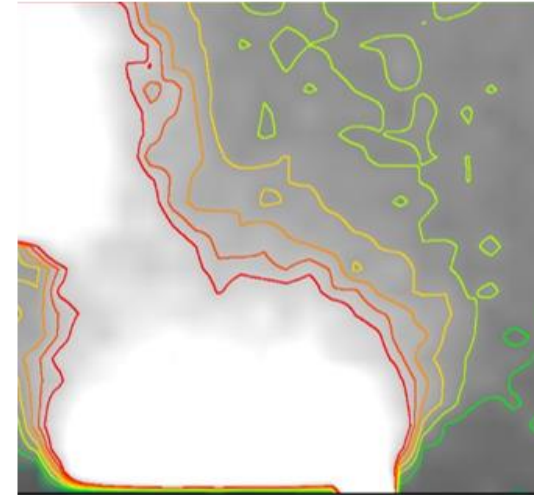
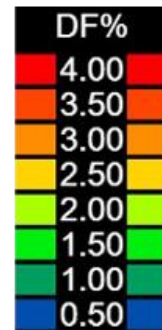


DAYLIGHTING ANALYSIS

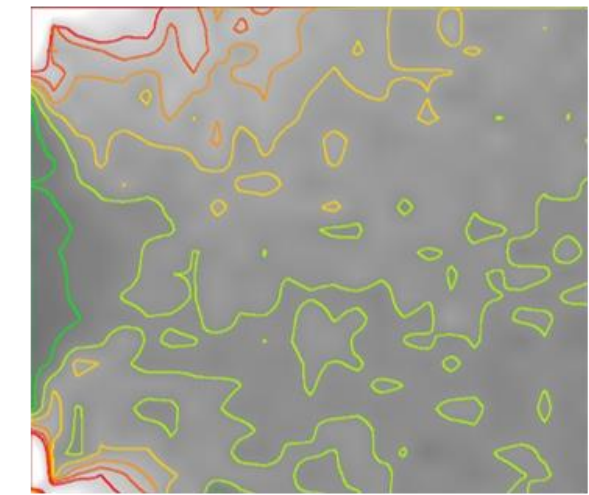
Zone - 7



Zone - 8



Zone - 9



Default

Average	$D_{average}$	9.69 DF[%]
Median	D_{median}	7.65 DF[%]
Minimum	D_{min}	0.07 DF[%]
Maximum	D_{max}	27.08 DF[%]
Uniformity 1	$D_{min}/D_{average}$	0.0068
Uniformity 2	D_{min}/D_{max}	0.0024

Default

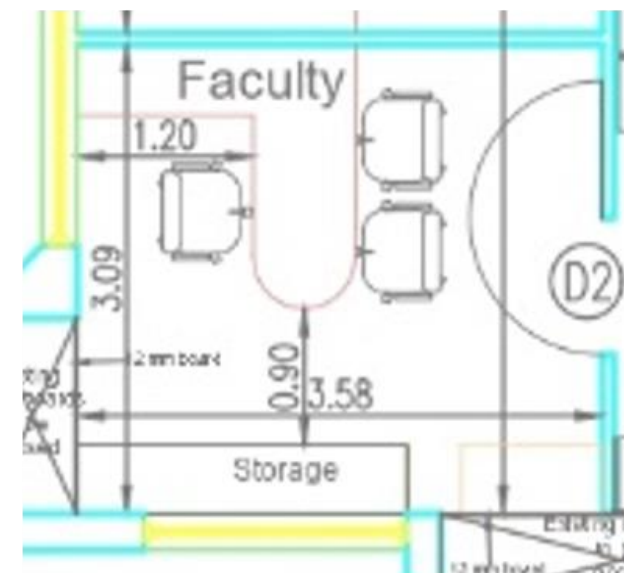
Average	$D_{average}$	4.17 DF[%]
Median	D_{median}	2.74 DF[%]
Minimum	D_{min}	0.69 DF[%]
Maximum	D_{max}	15.87 DF[%]
Uniformity 1	$D_{min}/D_{average}$	0.1660
Uniformity 2	D_{min}/D_{max}	0.0436

Default

Average	$D_{average}$	2.33 DF[%]
Median	D_{median}	2.11 DF[%]
Minimum	D_{min}	0.00 DF[%]
Maximum	D_{max}	11.32 DF[%]
Uniformity 1	$D_{min}/D_{average}$	0.0000
Uniformity 2	D_{min}/D_{max}	0.0000

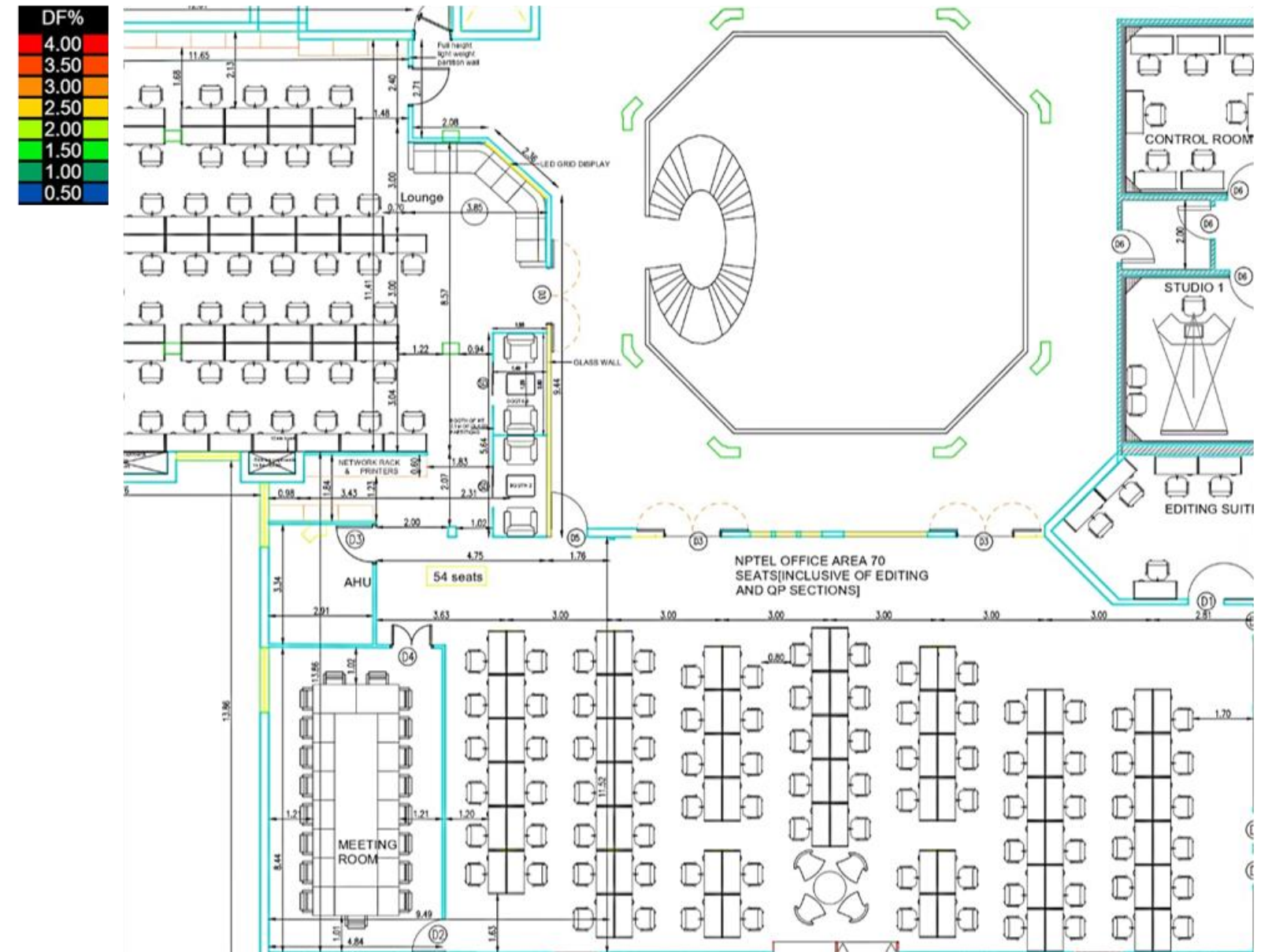
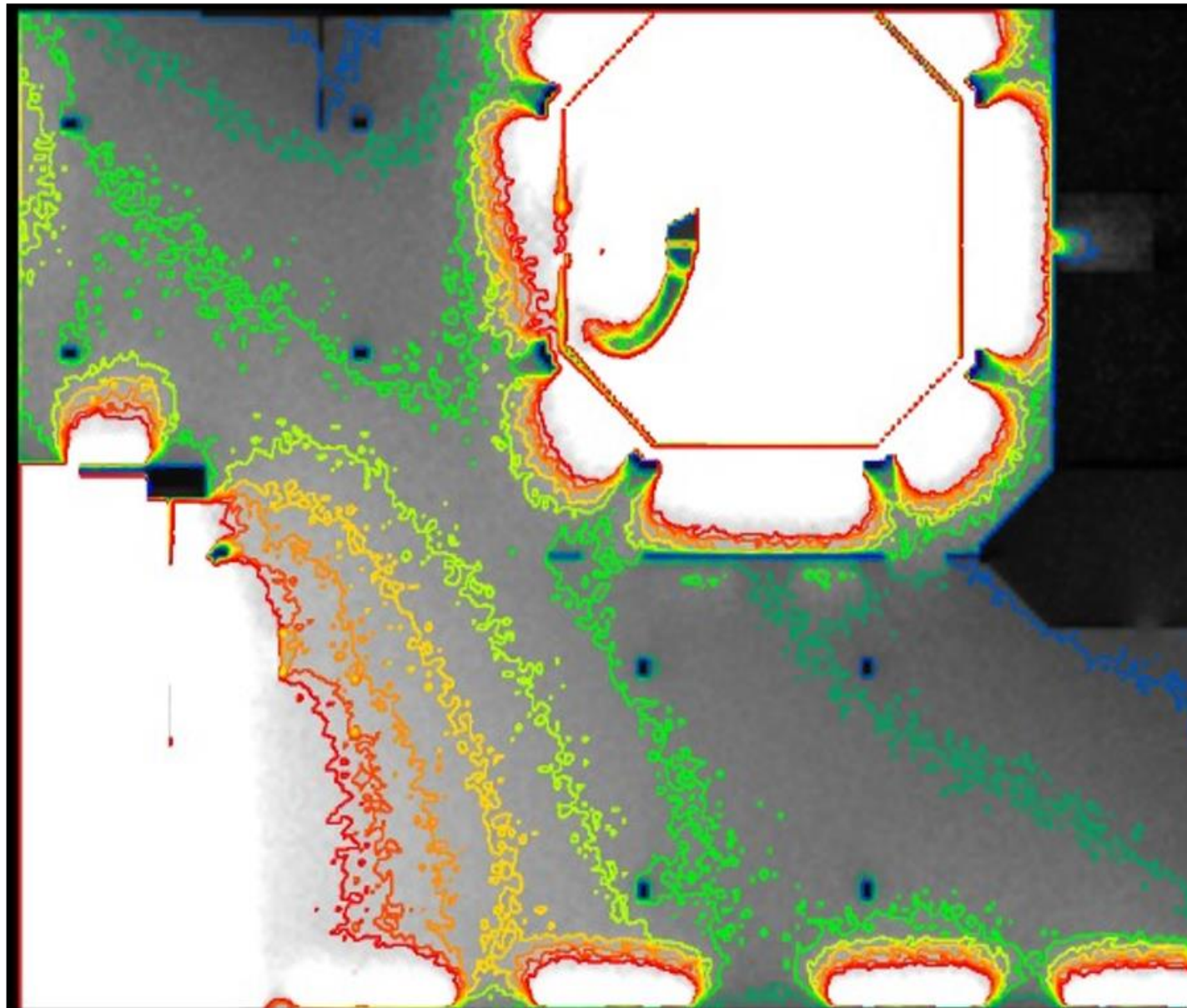


AHU – 9.69 % of DF is analysed near the windows. Its too More than sufficient amount of daylight inside is analysed. (near the west side window it comes around 4% DF, shading devices has to be designed to provide visual comfort)



DAYLIGHTING ANALYSIS

Zone - 11



Default

Average	$D_{average}$	9.08 DF[%]
Median	D_{median}	1.97 DF[%]
Minimum	D_{min}	0.00 DF[%]
Maximum	D_{max}	62.96 DF[%]
Uniformity 1	$D_{min}/D_{average}$	0.0000
Uniformity 2	D_{min}/D_{max}	0.0000

In the office, 500 lux lighting is required, as per the analysis office area receives average amount of 143 lux value, therefore proper shading device (light shelves) can be designed to achieve visual comfort.

DAYLIGHTING ANALYSIS

Location	IIT Madras, Chennai Tamil Nadu India.
Latitude	13.0827°N
Longitude	80.2707° E
Building Type	Commercial
Climate Type	Warm & Humid

VLT of glazing – 76% - 0.76 (Default - values are not provided)

Window glazing – Clear glass - 76% VLT

Interior partition- Frosted glass - 45% VLT

Ventilator glazing – Clear glass- 76% VLT

Illuminance analysis

Cloud cover data

January – 21ST 9am, 12pm, 3pm

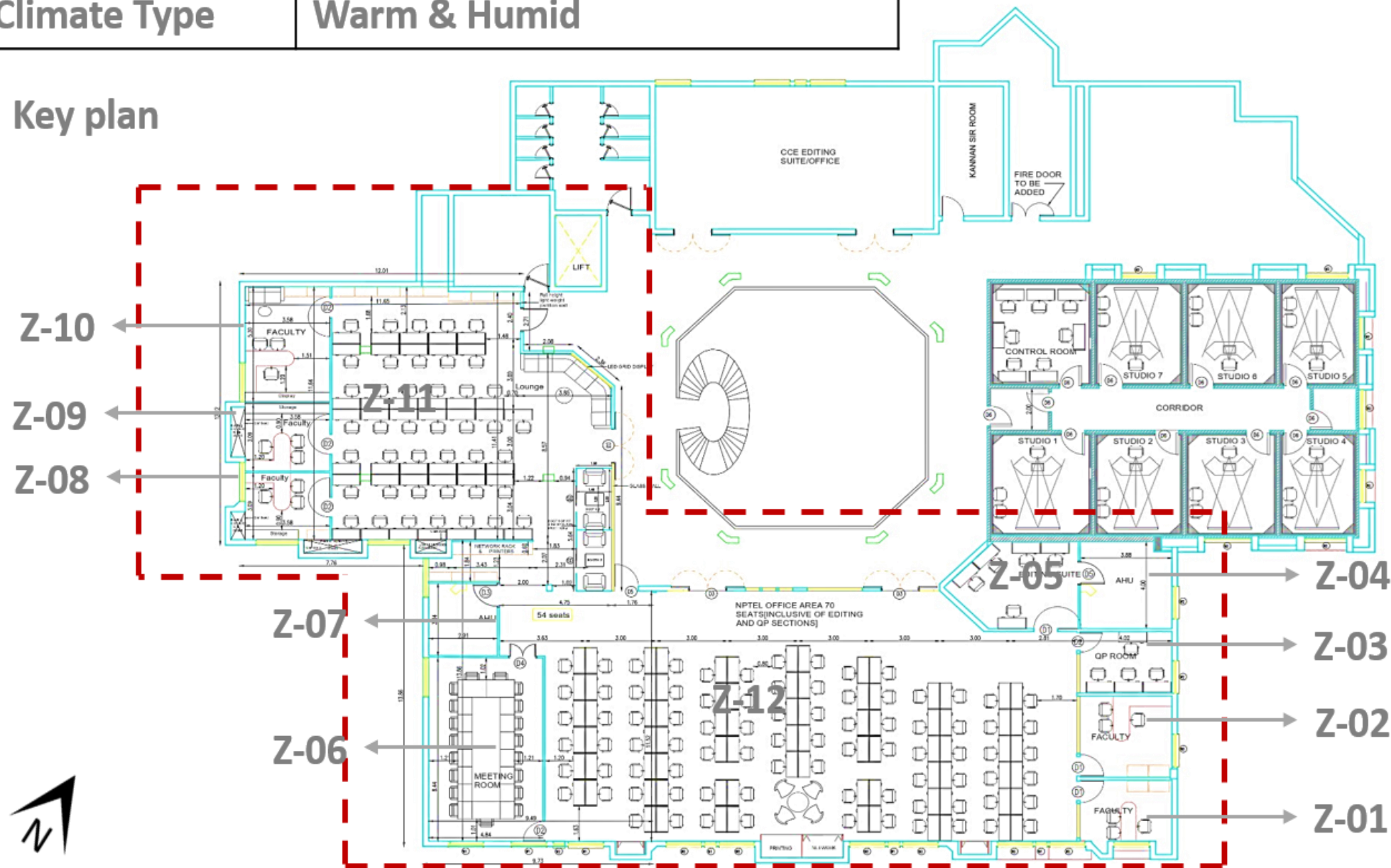
May – 21ST 9am, 12pm, 3pm

August – 21ST 9am, 12pm, 3pm

December – 21ST 9am, 12pm, 3pm

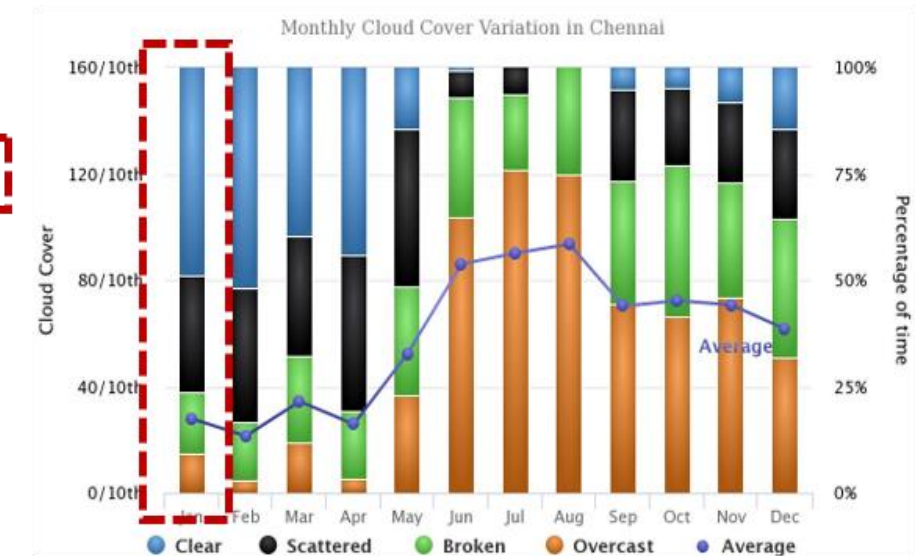
In The Office, 500 Lux Lighting Is Required And 100 Lux Lighting Is Sufficient In The Living Room. In Areas Like Drawing Offices, Textile Mills And Laboratories Require High Light Levels Such As 1.000 Lux.

Key plan

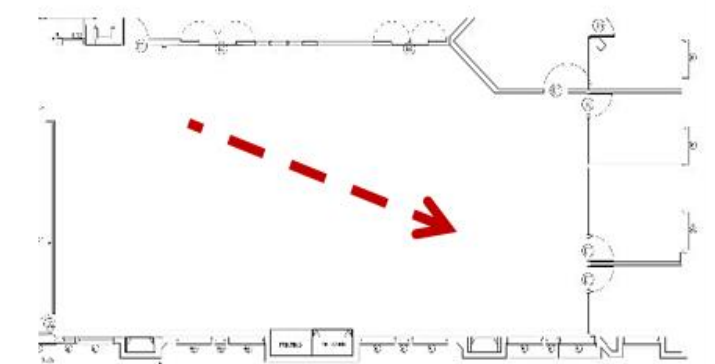
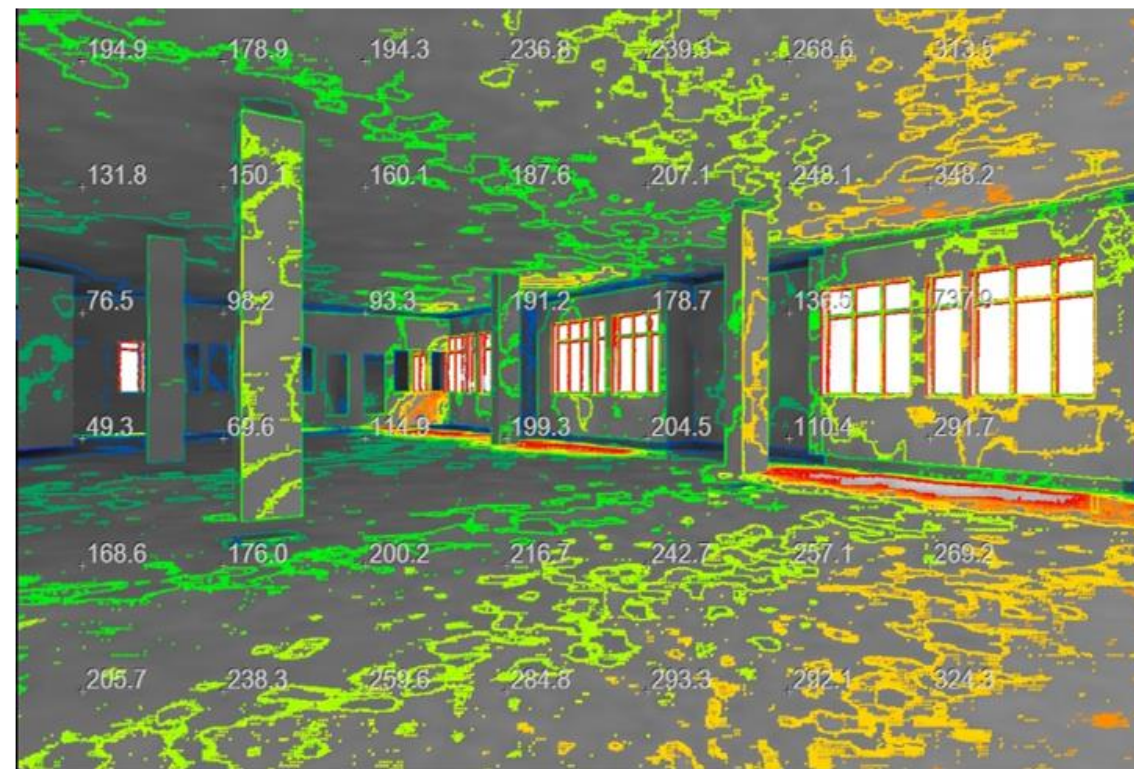
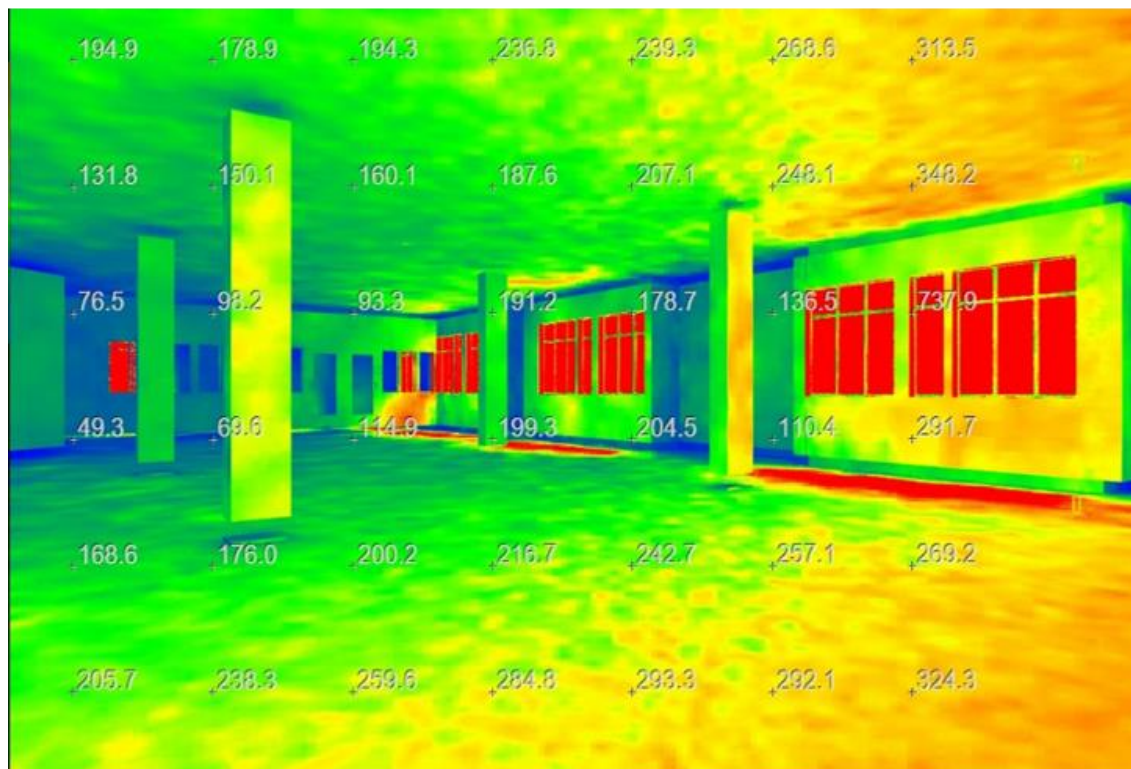


DAYLIGHTING ANALYSIS - ILLUMINANCE

Parameter	Temperature, °C			
	Minimum	Maximum	Average	Standard Deviation
January	5.3	21.6	12.8	± 3.9
February	7.3	26.6	17.2	± 4.6
March	14.5	33.1	23.5	± 4.4
April	19.1	39.3	28.5	± 4.5
May	21.3	42.0	31.7	± 4.5
June	25.9	40.3	32.4	± 3.3
July	24.9	37.4	29.6	± 2.2
August	24.6	33.7	29.0	± 1.8
September	22.7	32.8	27.2	± 2.4
October	15.0	31.5	23.6	± 4.2
November	11.1	27.4	18.8	± 3.8
December	5.2	22.0	13.0	± 4.3



January – 21ST 9am

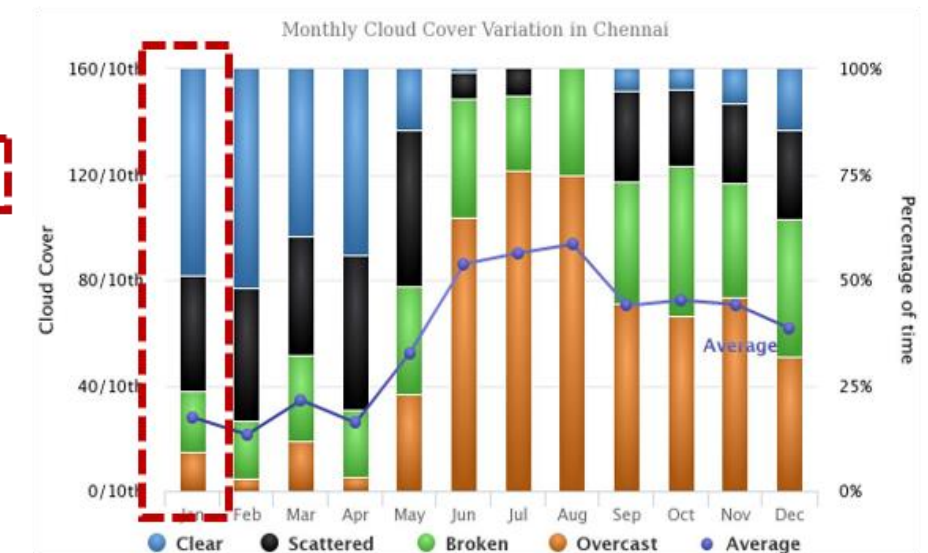


Key plan

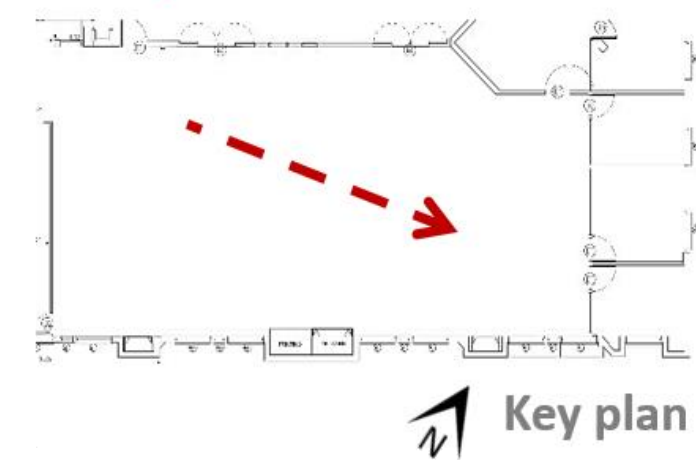
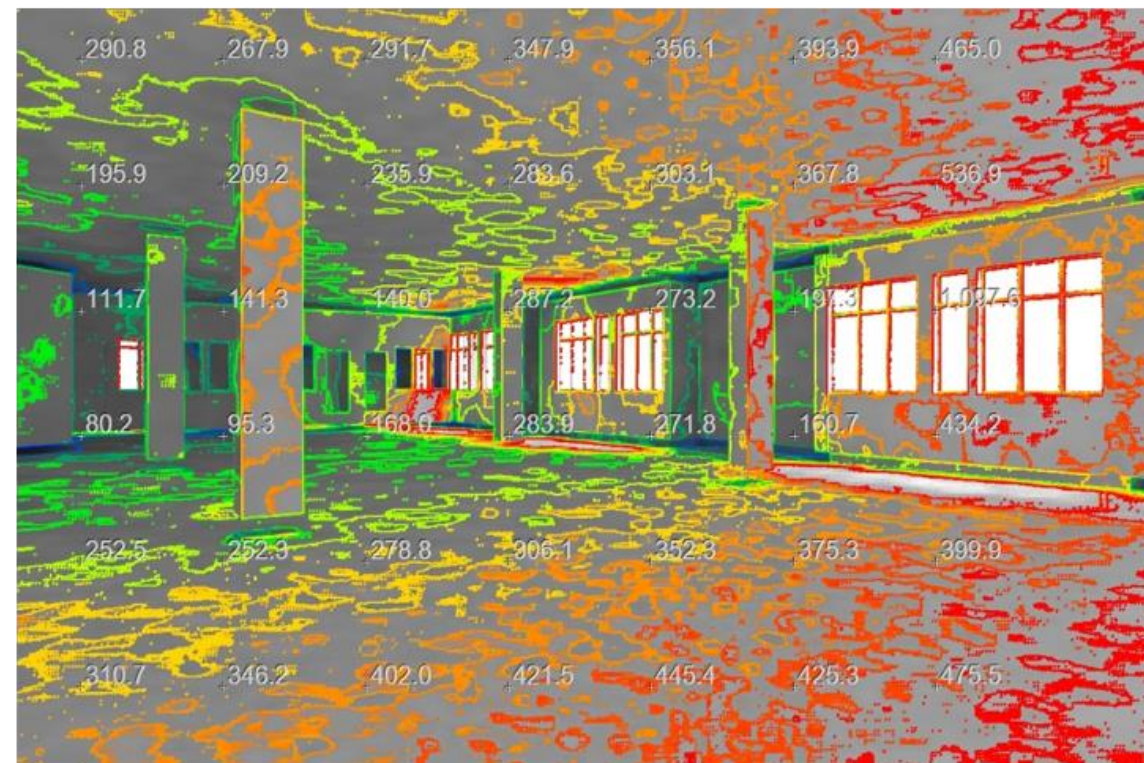
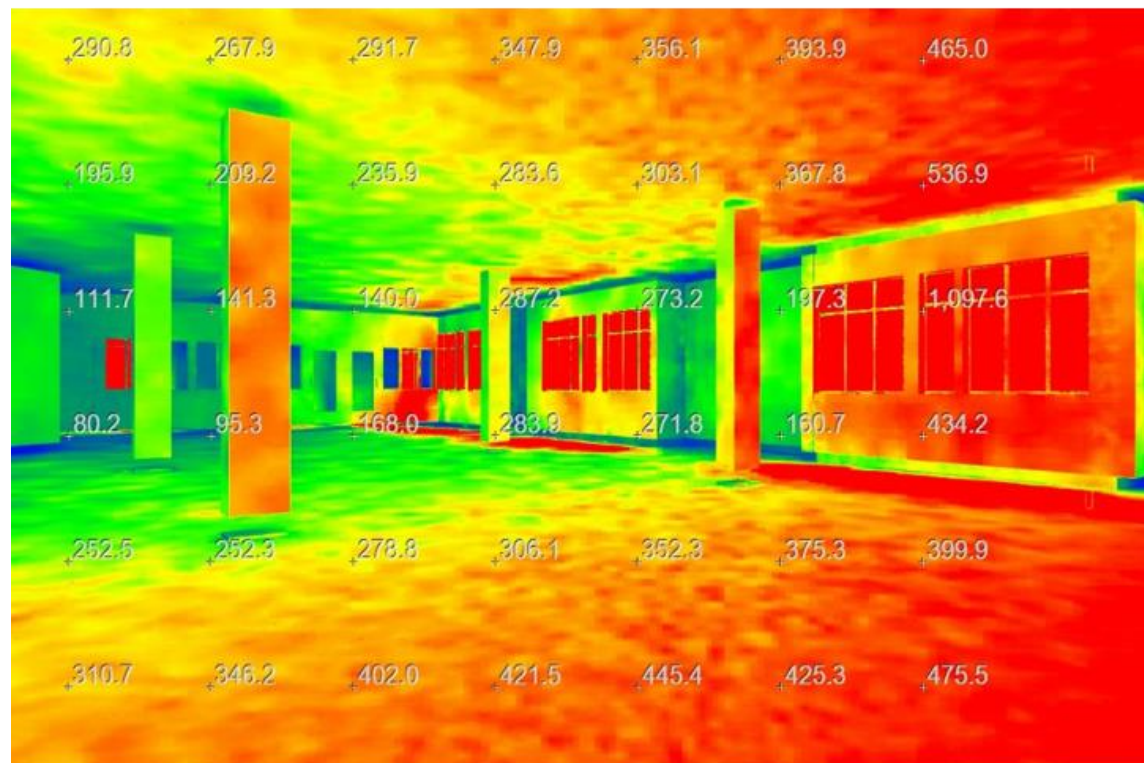
DAYLIGHTING ANALYSIS - ILLUMNANCE



Parameter	Temperature, °C			
	Minimum	Maximum	Average	Standard Deviation
January	5.3	21.6	12.8	± 3.9
February	7.3	26.6	17.2	± 4.6
March	14.5	33.1	23.5	± 4.4
April	19.1	39.3	28.5	± 4.5
May	21.3	42.0	31.7	± 4.5
June	25.9	40.3	32.4	± 3.3
July	24.9	37.4	29.6	± 2.2
August	24.6	33.7	29.0	± 1.8
September	22.7	32.8	27.2	± 2.4
October	15.0	31.5	23.6	± 4.2
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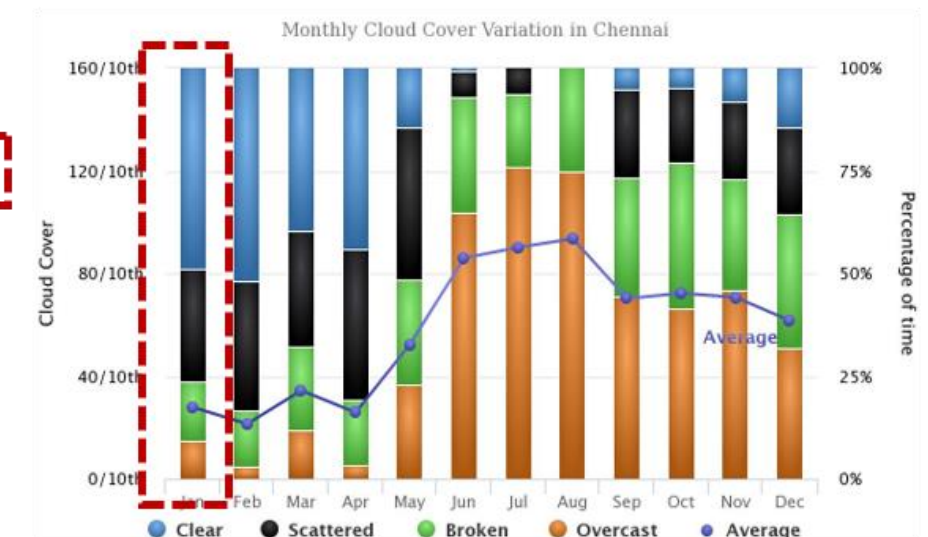
January – 21ST 12pm



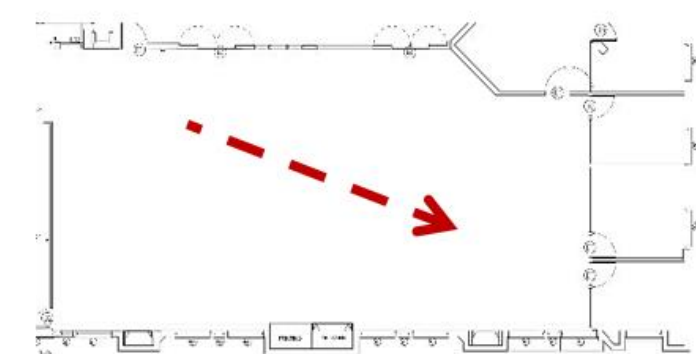
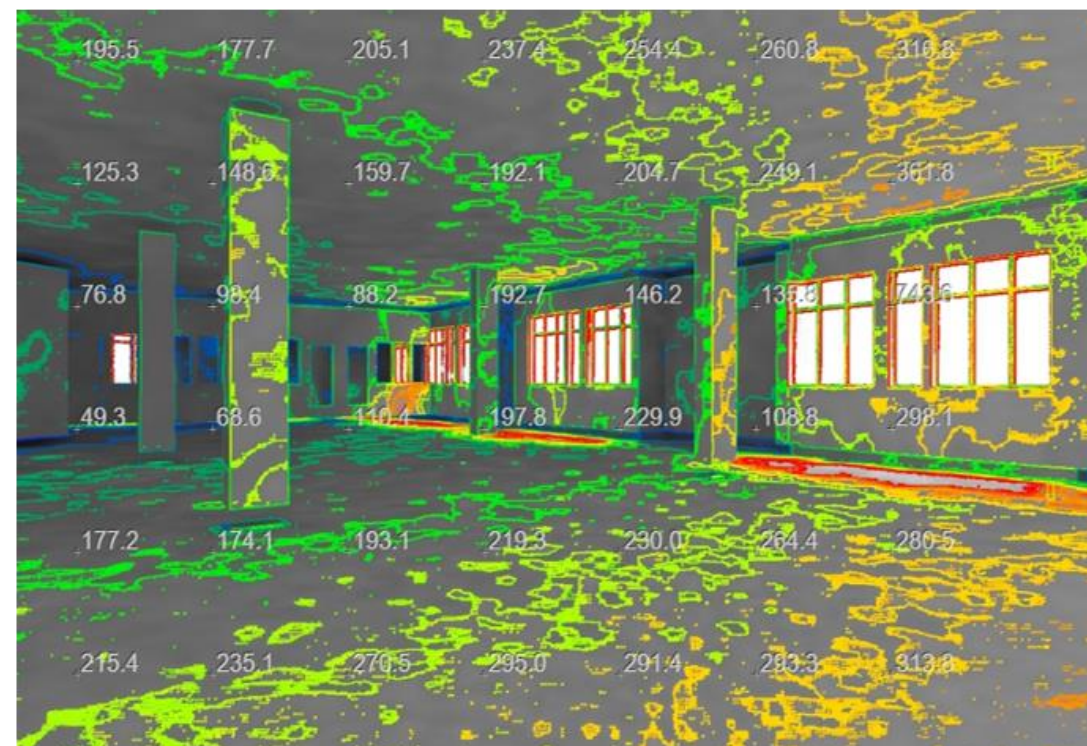
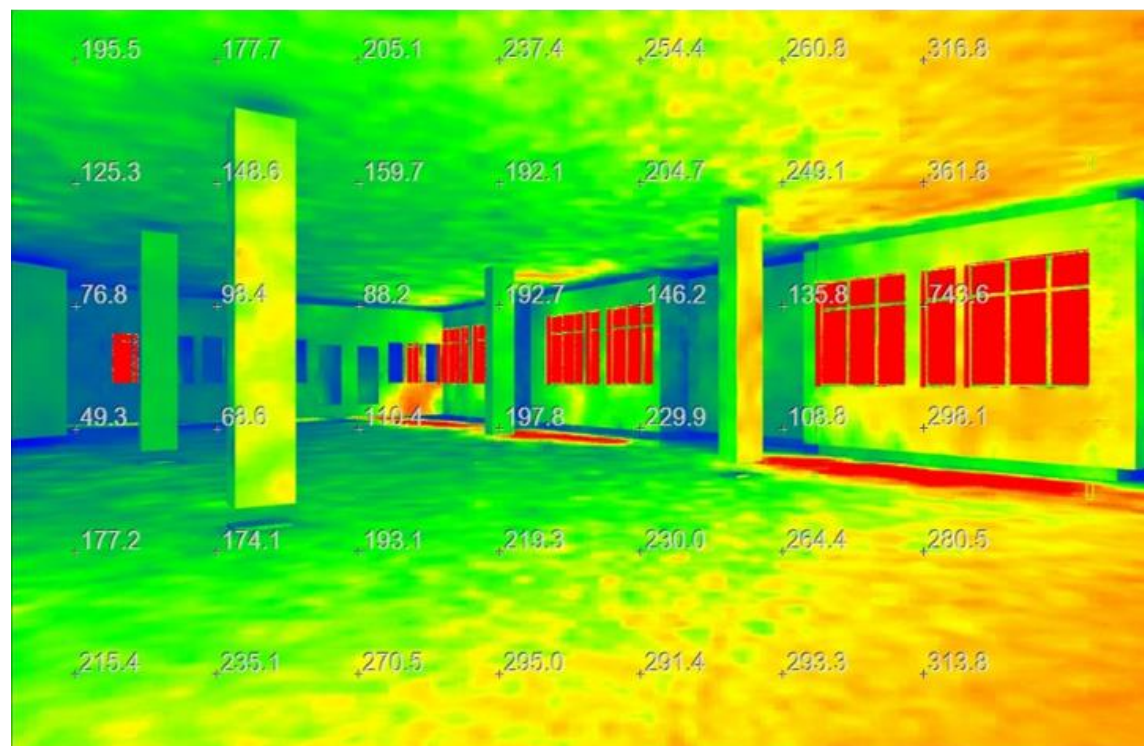
DAYLIGHTING ANALYSIS - ILLUMNANCE



Parameter	Temperature, °C			
	Minimum	Maximum	Average	Standard Deviation
January	5.3	21.6	12.8	± 3.9
February	7.3	26.6	17.2	± 4.6
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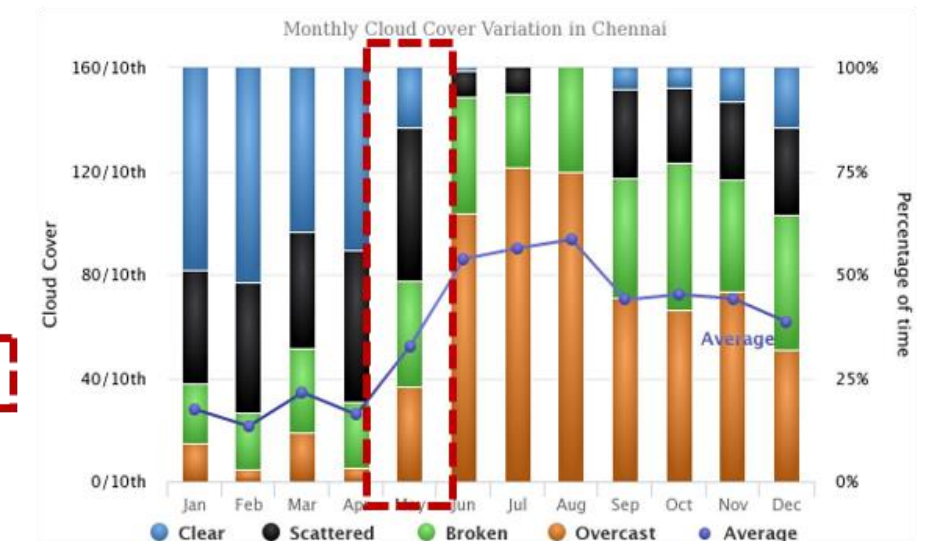
January – 21ST 3pm



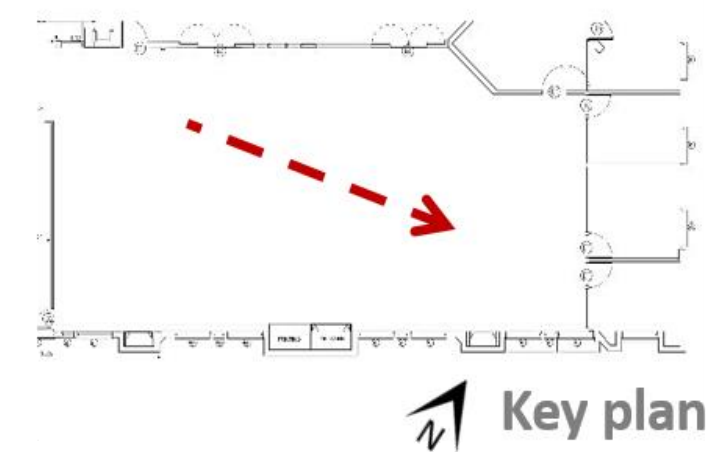
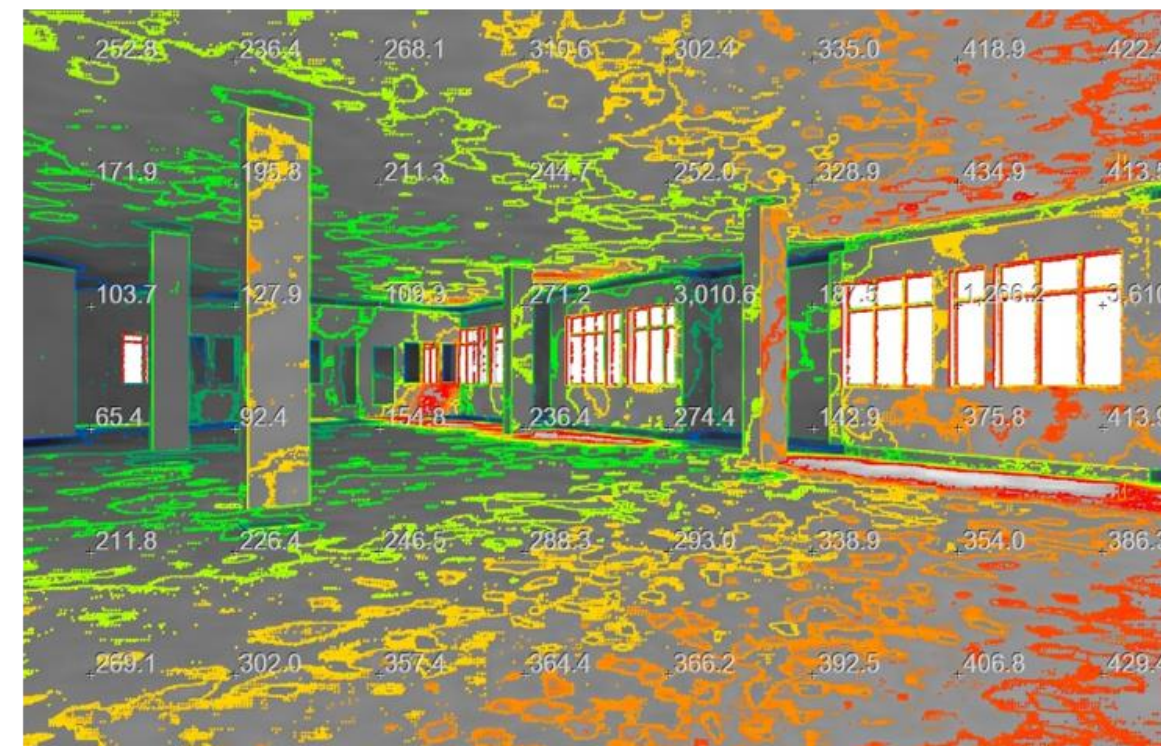
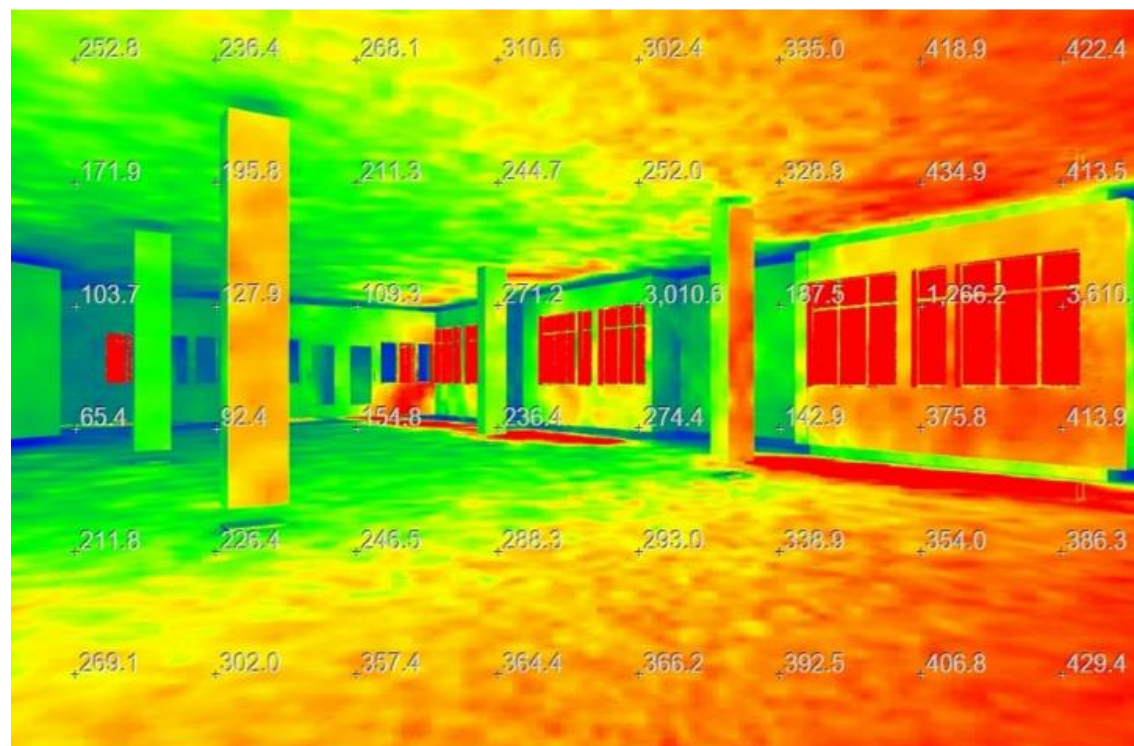
Key plan

DAYLIGHTING ANALYSIS - ILLUMNANCE

Parameter	Temperature, °C			
	Minimum	Maximum	Average	Standard Deviation
January	5.3	21.6	12.8	± 3.9
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September	22.7	32.8	27.2	± 2.4
October	15.0	31.5	23.6	± 4.2
November	11.1	27.4	18.8	± 3.8
December	5.2	22.0	13.0	± 4.3



May – 21ST 9am



Key plan

Thank You!