

PROFESSIONAL TRAINING REPORT

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

by

Seetha Visalakshi. K (39890015)



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

DEC 2020



SATHYABAMA

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(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 (S89 INT)
DEC 2020

Name of the Student : Seetha Visalakshi. K
Reg No. : 39890015

Semester : III
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 (~~§84~~ INT) is the work of **SEETHA VISALAKSHI. K (39890015)** who had undergone training in **DHANA ARCHITECTS, CHENNAI** and has been monitored by the continuous assessment during **Dec 2020 to Jan 2021.**

DR. DEVYANI GANGOPADHYAY

DEAN,

School of Building and Environment Department of
Architecture

Submitted for Viva voce Examination held on _____

Internal Examiner

External Examiner



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E-mail: archhod@sathyabama.ac.in



DECLARATION

I, **Seetha Visalakshi. K**, hereby declare that the Professional Training Report **December 2020 to January 2021** done by me under the guidance of **Ar.Dhanasekar** is submitted in partial fulfillment of the requirements for the completion of practical training session.

DATE :

PLACE :

A handwritten signature in black ink that reads 'K. Seetha Visalakshi'.

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. Dhanasekar, Principal Architect, Dhana Architects, Chennai** 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.

CONFIRMATION LETTER Annexure –V

CONSOLIDATED CERTIFICATE Annexure –IX



5, II floor, 36, CS Towers
Bazullah Road, TNagar, Chennai 17
O: + 91 637 971 16 18
M: + 91 988 430 68 69
www.dhanarchitects.com

07-12-2020

To
The Dean,
Department of Architecture,
School of Building and Environment,
Sathyabama Institute of Science and Technology,
Chennai – 600119

Dear Madam,
Sub: Confirmation for Internship.

This is to confirm that **Seetha Visalakshi. K (39890015)**, pursuing M. Arch (Sustainable Architecture) in Sathyabama Institute of Science and Technology (Deemed to be University) will be undergoing her Internship with us from 07.12.2020 to 25.01.2021 for a period of 30 working days.

Regards,

T. Dhanasekar M.arch
architect



5, II floor, 36, CS Towers
Bazullah Road, TNagar, Chennai 17
O: + 91 637 971 16 18
M: + 91 988 430 68 69
www.dhanarchitects.com

27.01.2021

To
The Dean,
Department of Architecture,
School of Building and Environment,
Sathyabama Institute of Science and Technology,
Chennai - 600119

Dear Madam,
Sub: Completion of one month Professional Training

This is to certify that **Seetha Visalakshi. K (39890015)**, pursuing M.Arch (Sustainable Architecture) - 3rd Semester in Sathyabama Institute of Science and Technology (Deemed to be University) have successfully completed one month Professional Training with us for the period from **07.12.2020 to 27.01.2021**.

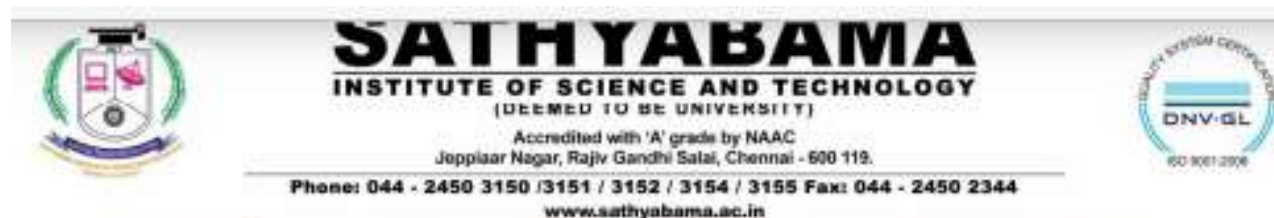
Her contribution of work during the period was appreciable and was very helpful to our organization

Regards,

T. Dhanasekar M.Arch
Architect

WEEKLY REPORT

(Annexure –VII)



DEPARTMENT OF ARCHITECTURE M. Arch (Sustainable Architecture)

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)

1. Name of the office / organization : Dhana Architects
2. Address & Contact Number : No.5, II floor, CS Towers, Bazullah Road, T Nagar, Chennai – 17. 9884306869
3. Name of the student : Seetha Visalakshi. K
4. Duration : From 09.12.2020 To 12.12.2020
5. Total No. of days : 4 days

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 & techniques					✓
Participation and contribution in project meetings		✓			
Understanding of codes and standards		✓			
Schedule preparation & tracking activities					✓
Preparation / Management of drawings		✓			
Learning / Application of software in Projects		✓			
Preparation of concept for projects					✓
Site Management / Discussion with clients					✓

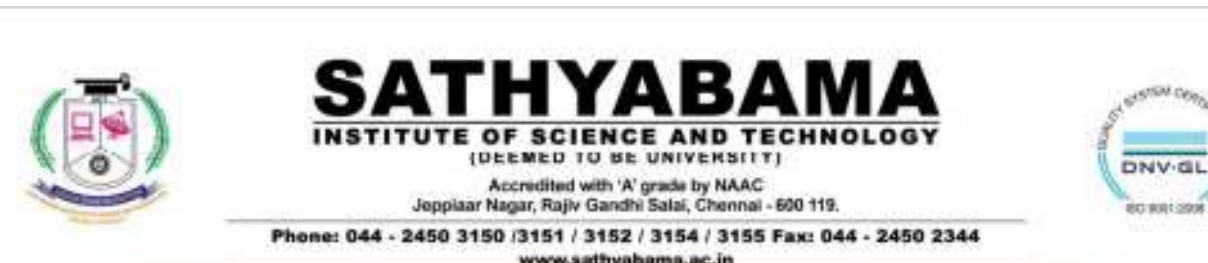
Overall Grading*

7.5

(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 /
Organization (With Seal):



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3. Name of the student : Seetha Visalakshi. K
4. Duration : From 15.12.2020 To 19.12.2020
5. Total No. of days : 5 days

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		✓			
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Presentation Skills developed		✓			
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Participation and contribution in project meetings		✓			
Understanding of codes and standards		✓			
Schedule preparation & tracking activities					✓
Preparation / Management of drawings		✓			
Learning / Application of software in Projects		✓			
Preparation of concept for projects					✓
Site Management / Discussion with clients					✓

Overall Grading*

7.5

(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 /
Organization (With Seal):





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2. Address & Contact Number : No.5, II floor, CS Towers, Bazullah Road, T Nagar, Chennai - 17. 9884306869
3. Name of the student : Seetha Visalakshi. K
4. Duration : From 22.12.2020 To 26.12.2020
5. Total No. of days : 4 days
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 & techniques					✓
Participation and contribution in project meetings		✓			
Understanding of codes and standards		✓			
Schedule preparation & tracking activities					✓
Preparation / Management of drawings		✓			
Learning / Application of software in Projects		✓			
Preparation of concept for projects					✓
Site Management / Discussion with clients					✓

Overall Grading*	7.5
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(A - 8.0, B - 7.0, C - 6.0, D - 5.5, E - 5.0, F - <5)

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2. Address & Contact Number : No.5, II floor, CS Towers, Bazullah Road, T Nagar, Chennai - 17. 9884306869
3. Name of the student : Seetha Visalakshi. K
4. Duration : From 29.12.2020 To 02.01.2021
5. Total No. of days : 4 days
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		✓			
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- Address & Contact Number : No.5, II floor, CS Towers, Bazullah Road, T Nagar, Chennai - 17. 9884306869
- Name of the student : Seetha Visalakshi. K
- Duration : From 05.01.2021 To 09.01.2021
- Total No. of days : 5 days

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		✓			
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Overall Grading*

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- Address & Contact Number : No.5, II floor, CS Towers, Bazullah Road, T Nagar, Chennai - 17. 9884306869
- Name of the student : Seetha Visalakshi. K
- Duration : From 12.01.2021 To 13.01.2021
- Total No. of days : 2 days

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 & techniques					✓
Participation and contribution in project meetings		✓			
Understanding of codes and standards		✓			
Schedule preparation & tracking activities					✓
Preparation / Management of drawings		✓			
Learning / Application of software in Projects		✓			
Preparation of concept for projects					✓
Site Management / Discussion with clients					✓

Overall Grading*

7.5

(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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- Name of the student : Seetha Visalakshi. K
- Duration : From 19.01.2021 To 23.01.2021
- Total No. of days : 5 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 & techniques					√
Participation and contribution in project meetings		√			
Understanding of codes and standards		√			
Schedule preparation & tracking activities					√
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- Name of the student : Seetha Visalakshi. K
- Duration : 27.01.2021
- Total No. of days : 1 day
- 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.

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Understanding of office culture and methodology		√			
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Understanding of codes and standards		√			
Schedule preparation & tracking activities					√
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Learning / Application of software in Projects		√			
Preparation of concept for projects					√
Site Management / Discussion with clients					√

Overall Grading*	7.5
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7. Any other Remarks : _____

8. Signature of the
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WORK DIARY

(Annexure –VIII)

DATE	PROJECT NAME	WORK DONE
09.12.2020 – 12.12.2020	METRO RAIL STATION AT PERUNGUDI	PROJECT INTRODUCTION, CLIMATE ANALYSIS AND SITE ANALYSIS
15.12.2020 – 19.12.2020	METRO RAIL STATION AT PERUNGUDI	CASE STUDY OF TWO METRO STATIONS IN INDIA
22.12.2020 – 26.12.2020	METRO RAIL STATION AT PERUNGUDI	SIMULATION OF THE CASE STUDY PROJECTS AND FINDINGS FROM THE STUDY
29.12.2020 – 02.01.2021	METRO RAIL STATION AT PERUNGUDI	UNDERSTANDING THE OPTIONS GIVEN FOR THE DESIGN. DEVELOPING 3D MODEL FOR THE GIVEN OPTIONS
05.01.2021 – 09.01.2021	METRO RAIL STATION AT PERUNGUDI	SIMULATION OF THE DEVELOPED 3D MODEL
12.01.2021 – 13.01.2021	METRO RAIL STATION AT PERUNGUDI	FINDINGS AND THE RESULT OF THE SIMULATION DEVELOPED
19.01.2021 – 23.01.2021	METRO RAIL STATION AT PERUNGUDI	ANALYSIS AND CONCLUSIONS ON THE OPTIONS WORKED OUT
27.01.2021	METRO RAIL STATION AT PERUNGUDI	FINAL CONSOLIDATED PRESENTATION OF THE PROFESSIONAL TRAINING WORK

Chief Architect Signature:

Office seal:



TABLE OF CONTENTS

CHAPTER NO	TITLE	PAGE NO
1.	GENERAL	
2.	HISTORY OF THE FIRM	
3.	PROJECT 1 DETAILS	
4.	DRAWINGS	
5.	PROJECT 2 DETAILS	
6.	DRAWINGS	
7.	„	
8.	„	
9.	„	
10.	„	
11.	„	
12.	„	
13.	„	
14.	CRITICAL OVERVIEW OF THE FIRM	

FIRM HISTORY

Dhana Architects are an award-winning interdisciplinary practice, operating in fields of architecture, interiors, sustainability and urbanism. The Firm was Established in 2009 under the creative direction of architect T.

Dhanasekar, they believe that architecture and sustainability is about creating a lasting positive impact on our surroundings and our planet. Therefore, they measure their projects on the impact they create both functionally and aesthetically.

They are specialized in Sustainable and Architectural projects. Notable projects are Metro Rail projects, wherein the Energy analysis is done by the team for the CMRL projects.

Chennai is the fourth largest metro system in India. Chennai Metropolis has been growing rapidly and the traffic volumes on the roads have also been increasing enormously.



CHENNAI
13.0827° N, 80.2707° E



AIM

This project aims at providing the people of Chennai with a fast, reliable, convenient, efficient, modern and economical mode of public transport, which is properly integrated with other forms of public and private transport including buses, suburban trains and MRTS.

INTERMODAL SYSTEM

Metro stations in Chennai, including links to a suburban rail, a proposed BRT line, buses, and auto rickshaws as well as parking for cars and 2-wheel transportation.



KOYAMBEDU



THIRUVATTYUR



ALANDUR



AIRPORT

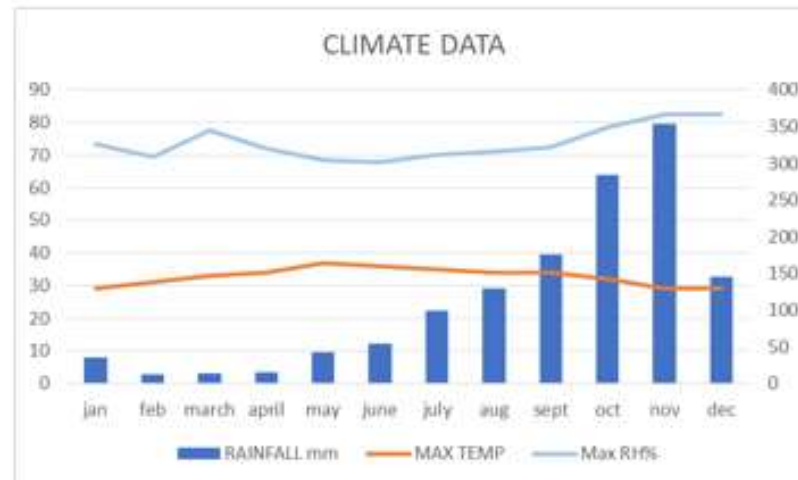


PHASE I

CHENNAI

13.0827° N, 80.2707° E

Chennai features a tropical wet and dry climate. Chennai lies on the thermal equator and is also coastal, which prevents extreme variation in seasonal temperature. For most of the year, the weather is hot and humid. The most prevailing winds in Chennai is the Southwesterly between the end of May to end of September and the Northeasterly during the rest of the year.



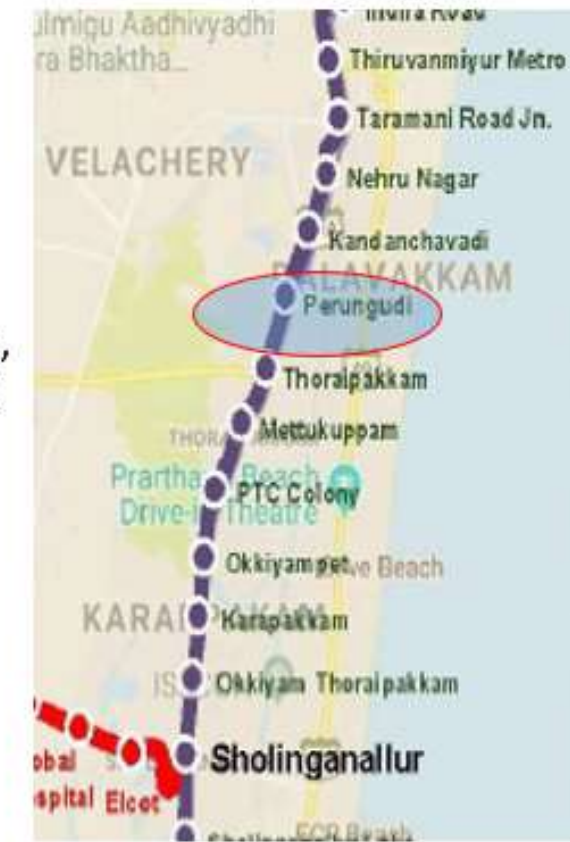
Chennai is categorized under the warm and humid climate.

As we can see that the monsoon falls in the month of sept to nov which is predominantly N-E, with extreme temperature and humidity, comfort is achieved only through good wind movement



The Detailed Project Report for Chennai Metro Rail Phase-II Corridors for 107.55 km covering 3 corridors - C3, C4 and C5 was prepared in March 2017.

Corridor-4 : Lighthouse to Poonamallee Bypass



Corridor-3: Madhavaram to SIPCOT

Thiruvanniyur Metro to Perungudi	Population: 0.27 mn Households: No. of Households - 0.07 mn Income segment: MID, HIG	Institutional/ Residential/ Industrial	Residential: 2-2.5 Institutional: 1.5 Industrial: 1.25	- Located on IT corridor - well developed Physical and Social Infrastructure - Proximity to Employment Hubs	Residential: 545 units Office: 17.6mn.sq.ft.	Residential: 1506 Units Office: 0.5 Mn. Sq.ft.	
Thorapakkam to Sholinganallur	Population: 0.02 mn Households: No. of Households - 0.006 mn. Income segment: MID, HIG	Institutional/ Residential/ Commercial/ Open space/ Light Industrial	Residential: 2-2.5 Institutional: 1.5 Commercial - 2-2.5 Industrial - 1.25 IT Corridor benefits - Additional 1.5 times of the Ordinary FSI Permissible	- Located on IT Corridor - Presence of Budget apartments and Villas - Affordable Office and Retail Rentals - Infrastructural developments	Residential: 2713 units Office: 10.37 mn.sq.ft. Retail: 0.03 mn.sq.ft.	Residential: 4266 Units Office: 1.08 Mn. Sq.ft.	

The project started from the ovr road having the typical plan for metro as this metro line has a similar landuse pattern.

Perungudi is the first station for the design which for pitched.

Transport department has also proposed the a flyover, which is taken into consideration for the metro design.

INTRODUCTION

There are a total of 23 Elevated Stations along the stretch.

It was opened to the public within four years of starting construction, making it the fastest completed metro project in India

ALUVA STATION

The station designs are contemporary but inspired by socio-cultural themes.

Aluva station's theme is Kerala's natural beauty and the station's interiors depict the Periyar and the other major rivers in the state.

SUSTAINABILITY

The system is also involved in sustainable initiatives with the introduction of non-motorized transport corridors in the city, installation of solar panels for power and vertical garden on very sixth metro pillar.



The IIA presented the designs of 14 stations to the KMRL.



SOCIAL INCLUSION



VERTICAL GARDEN



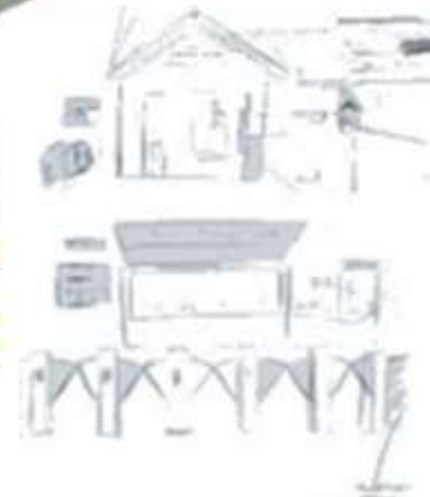
SOLAR ENERGY



PLASTIC BOTTLE RECYCLING

CONCEPT

Every Kochi Metro station is designed on a specific theme around Kerala culture and geography.



Themed Stations

Aluva	ABUNDANT BOUNTY OF NATURE IN KERALA WITH A SPECIAL FOCUS ON WESTERN GHATS, PERIYAR & OTHER RIVERS	There are 44 rivers in Kerala, all but three originating in the Western Ghats. 41 of them flow westward and 3 eastward. The rivers of Kerala are small, in terms of length, breadth and water discharge. The rivers flow faster, owing to the hilly terrain and the short distance between the Western Ghats and the sea. Major rivers: Periyar, Pamba, Bharathapuzha, Chaliyar, Chalakudi, Kadalundi.
Pullinchoodu	Western Ghats – Ecological region, flora & fauna	- Ecoregions – South Western Ghats moist deciduous forests - Ecoregions – South Western Ghats montane rain forests - The sheer number of species of plants (exceeding 4000) in the Western Ghats of Kerala, of which nearly 1500 i.e. more than 30% are endemic to this region.
Companyadi	Western Ghats – Hills & peaks	Wayanad, Silent valley, Anaimalai hills, Cardamom hills, Agastya hills, Nilgiri Hills

CASE STUDY 1 - ALUVA METRO STATION

Plastic Bottle Recycling

KMRL has installed Plastic Bottle Recycling Machines at few stations. The machines have been designed to dispose and recover products effectively for recycling. The highlight of the machine is that customers using the facility will be incentivized by way of discount coupons redeemable at select commercial outlets. Food outlets and supermarkets will be linked with the machine manufacturer for provision of coupons.

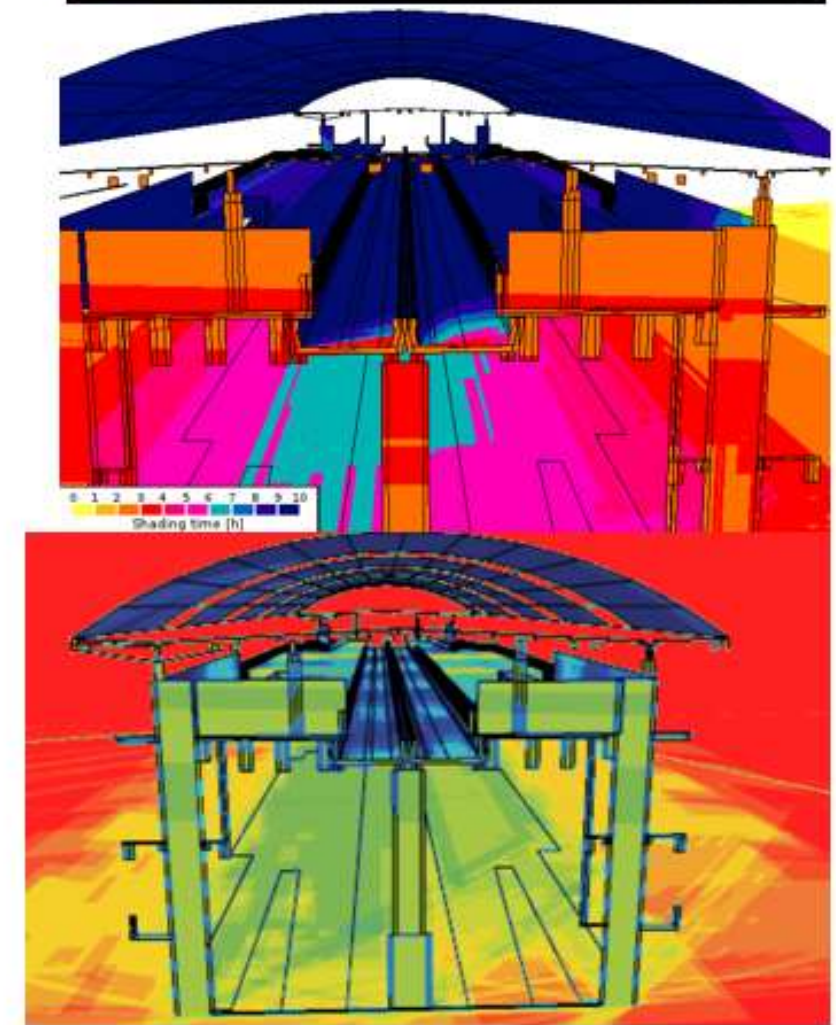
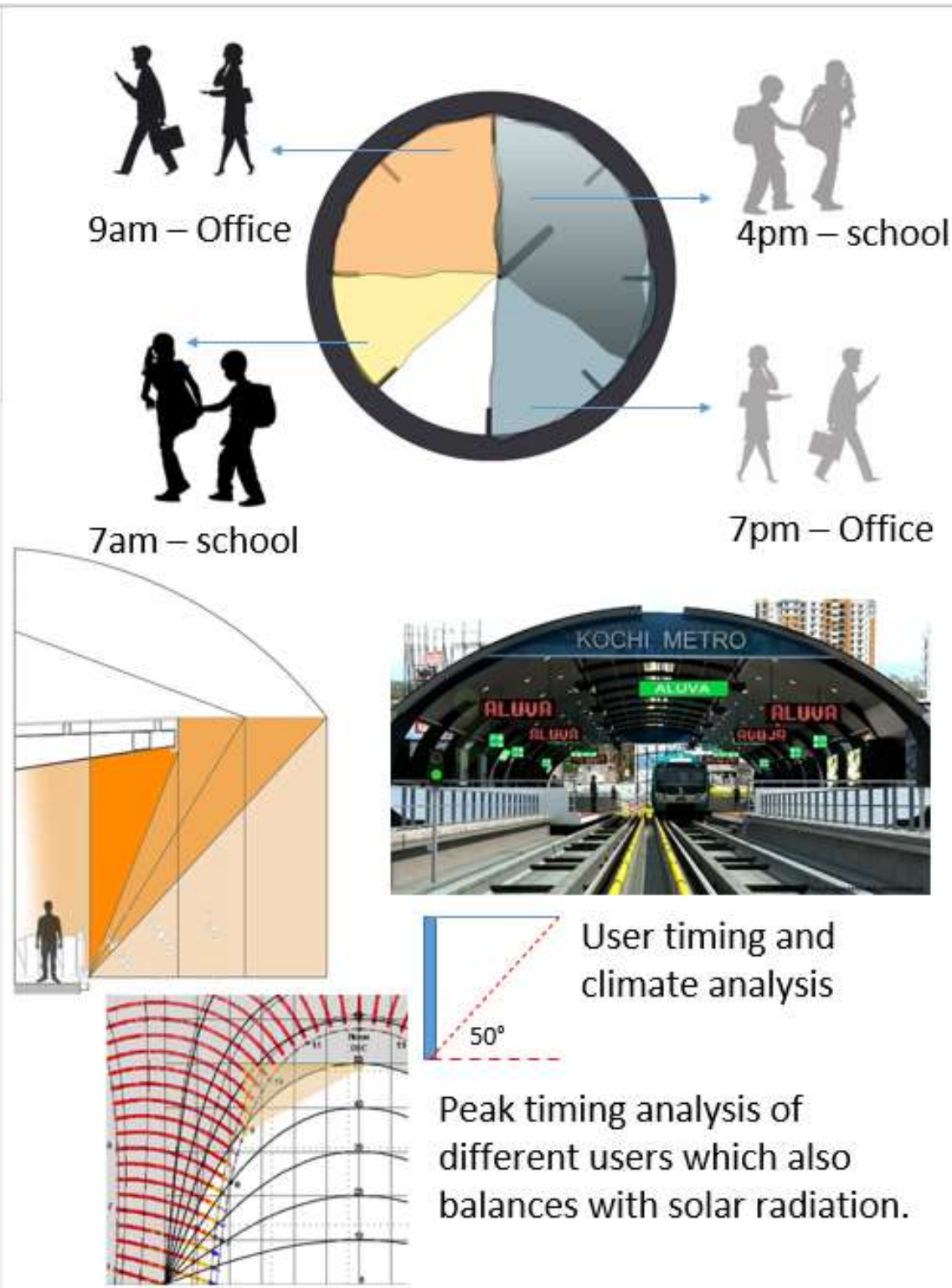
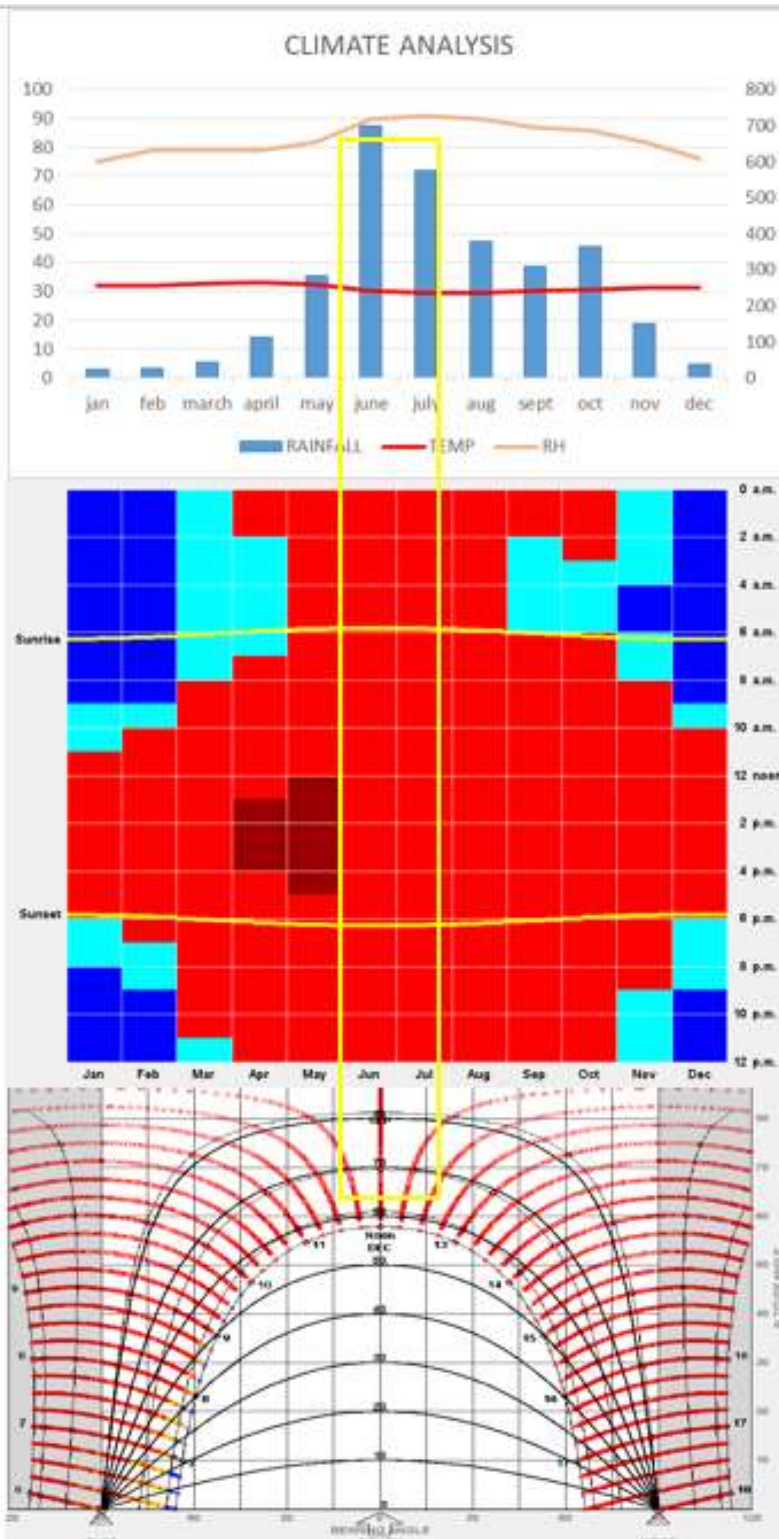
Vertical Gardens

Every sixth pillar of Kochi Metro will have a vertical garden, utilising biodegradable waste from the city instead of soil. The plants contained on the coir beds will be watered using drip irrigation.

Solar Energy

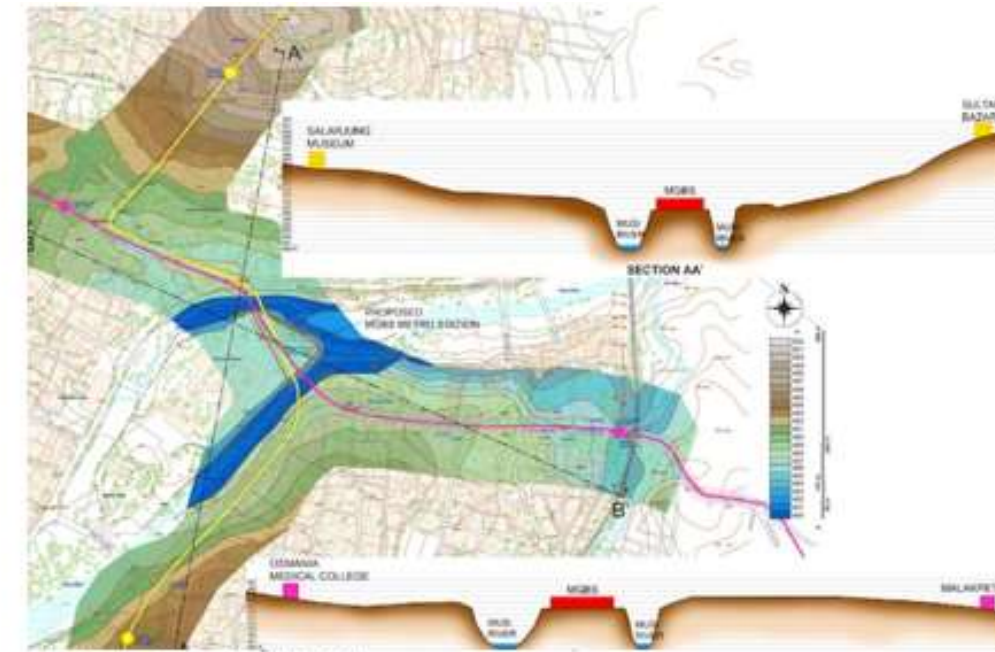
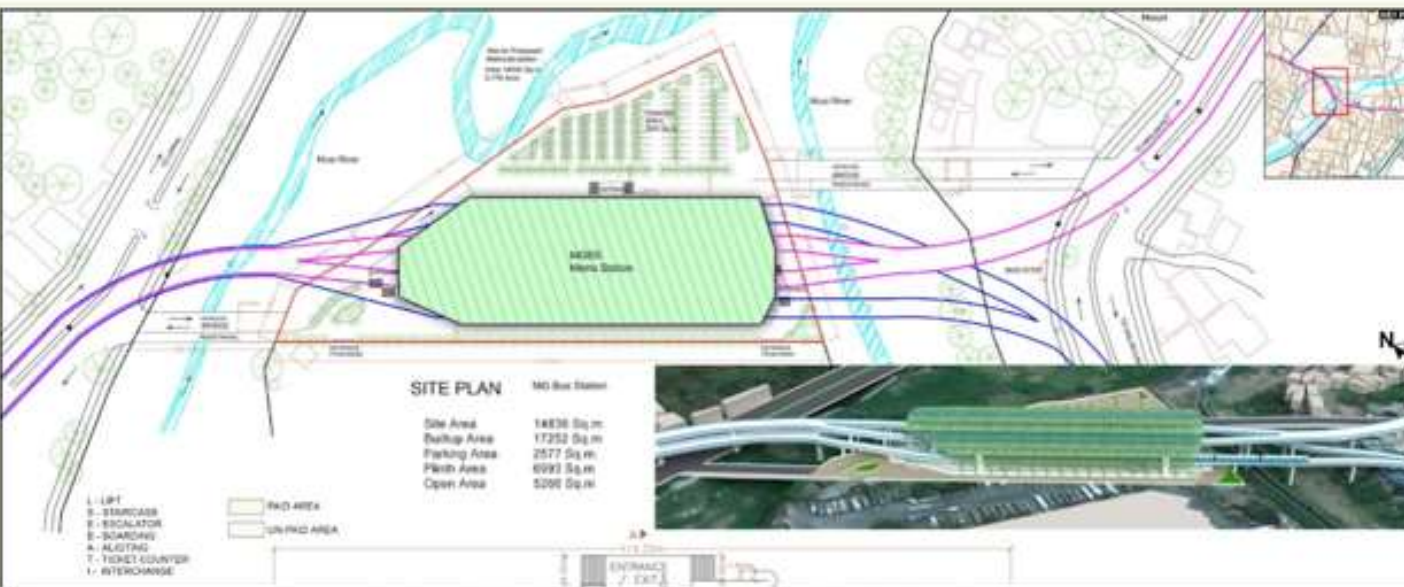
Solar panels on the roofs of metro stations





Hyderabad Metro Rail

Hyderabad Metro Rail Limited is the Government Enterprise, which had initiated the Metro rail project for Hyderabad. The Project was allotted to L&T company in Public Private Partnership (PPP) mode. Metro Rail was approved for 71.16 km., covering three high density traffic corridors of Hyderabad. The Metro Rail System has proved to be the most efficient in terms of energy consumption, space occupancy and numbers transported. Hyderabad Metro Rail project covers three high density traffic corridors of Hyderabad:



Site analysis

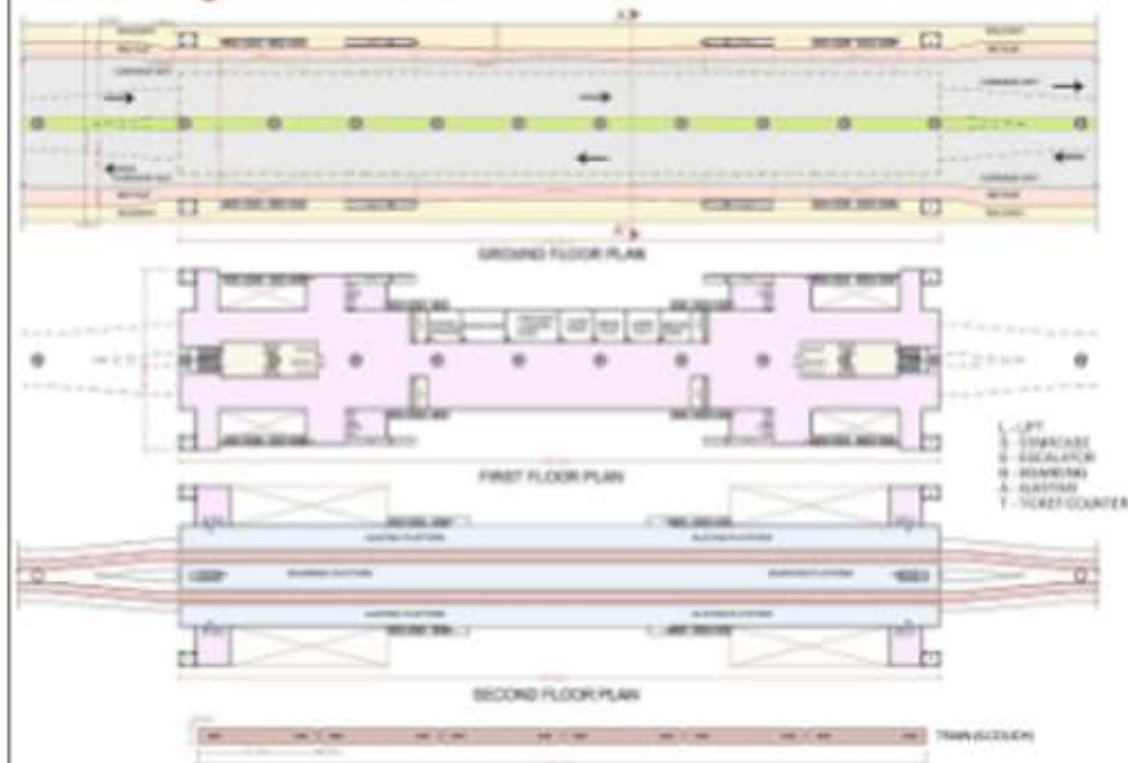
1. The area allotted for proposed MG Bus station site is 3.776 Acre. The site is 5m height from MSL river bed. The land is flat and covered with grass and few trees. Part of the site is used for APORC bus shed and petrol pump. Another part is used as open plot. It is having well connectivity to the MG Bus station.
 2. Suburban area is having very narrow road of only 10m and busy with road shopping. As per the master plan the proposal of widening to 30m by demolishing business complexes and old houses. The people in this area are opposing this proposal as it spoils their livelihood.
 3. Infront of CMAC there are many bus stops, small shops and hawkers. The metro construction may have impact on them.
 4. Salasanki museum area is surrounded with many heritage structures, religious structures, landmarks and old constructions having heritage value.
 5. Market area roads are narrow and with heavy traffic daily. And also there are many religious places and institutions are in this area.
 6. There are 154 buildings to be demolished in the study area in next widening for the construction of metro corridor according to the HMRD proposal.
 7. There are 164 trees to be cut in the study area according to the HMRD metro corridor proposal.
 8. There are possibilities of contamination of Musi river as the piers will be constructed in the river.
- To minimize the impact on the road side buildings, heritage structures and trees because of the metro corridor construction activities, there should be careful alignment and design in these areas.

Environment Impacts of Metro Rail

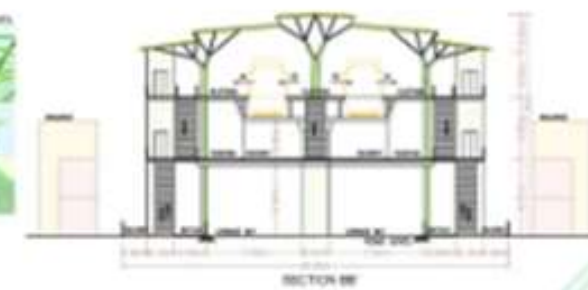
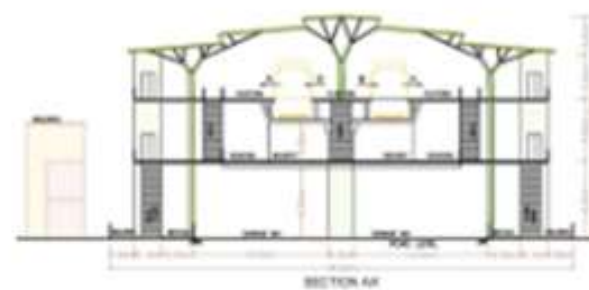
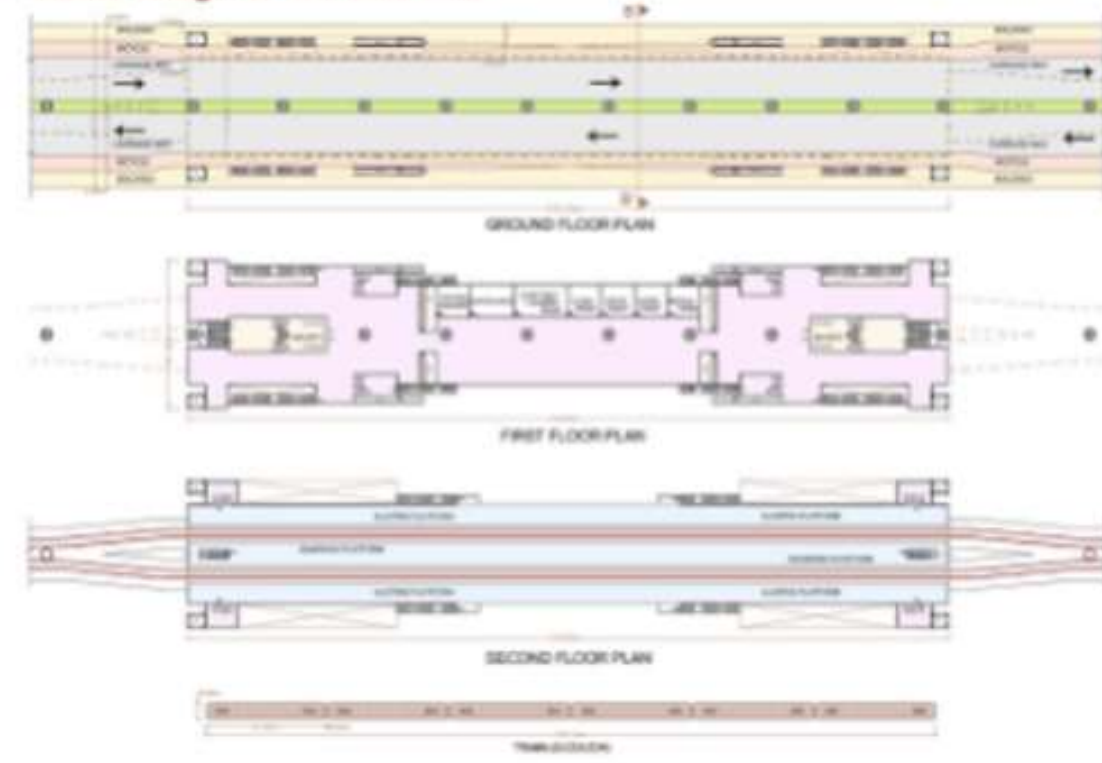
Aspect of Environment	Likely Impacts
A. LAND ENVIRONMENT	
Construction Phase	- Increase in soil erosion due to construction activities - Pollution by construction activities - Use of land for labour facilities - Solid waste from labour facilities
B. WATER QUALITY	
Construction Phase	- Surface runoff from project site - Oil/fuel and waste spills - Sewage Discharge from labor camps and site office.
Operation Phase	- Oil/fuel and waste spills - Discharge of sewage
C. AIR POLLUTION	
Construction Phase	- Dust generation from construction activities - Air pollution due to increased vehicular movement - Fugitive emissions from various construction equipments
Operation Phase	- Increased emission due to vehicle movement and DG set
D. NOISE POLLUTION	
Construction Phase	- Noise due to operation of various equipment - Noise due to construction activities - Noise due to increased vehicular movement
Operation Phase	- Noise from vehicle movement
E. TRAFFIC PATTERN	
Construction Phase	- Traffic congestion on roads due to construction material truck movement - Traffic diversion to other routes due to congestion - Slow movement of vehicles on roads - Improved traffic movement
Operation Phase	- Improved traffic movement
F. SOCIO-ECONOMICS	
Construction Phase	- Increased job opportunity - Increased commercial activities - Displacement of people along the metro routes
Operation Phase	- Increased revenue - Real estate value enhancement and increased commercial activities - Increased job opportunities

S. No.	Impacts	Negative Impact		Positive Impact		No Impact
		Short Term	Long Term	Short Term	Long Term	
Project Location						
i.	Displacement of People		•			
ii.	Change of land use		•			
iii.	Loss of trees/vegetation	•				
iv.	Shifting of utilities	•				
v.	Impact on archaeological property					•
Construction Phase						
i.	Pressure on local infrastructure	•				
ii.	Impact on water Quality		•			
iii.	Impact on air quality including dust generation		•			
iv.	Noise pollution		•			
v.	Traffic congestion and loss of access		•			
vi.	Storing and disposal of construction material		•			
vii.	Public health and safety		•			
viii.	Social impact	•				
Operational Phase (Expected)						
i.	Increase in Noise level	•				
ii.	Water Harvesting & Recharge		•			
iii.	Induced Infrastructure development				•	
iv.	Quality of life/ Human use value				•	
v.	Job Opportunities				•	
vi.	Decrease in Air pollution				•	

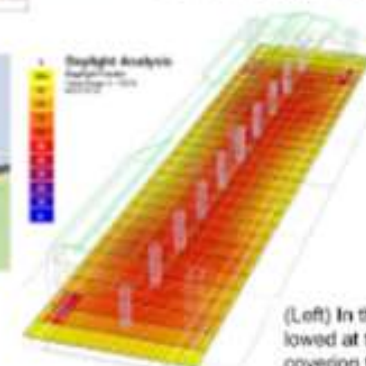
Station Design for 36m wide road



Station Design for 30m wide road



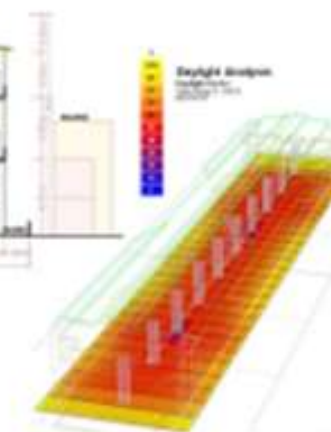
VIEW OF METRO STATION ON 36M WIDE ROAD



Daylight Analysis
Range: 0.00 - 1.00
2022/07/14 10:00

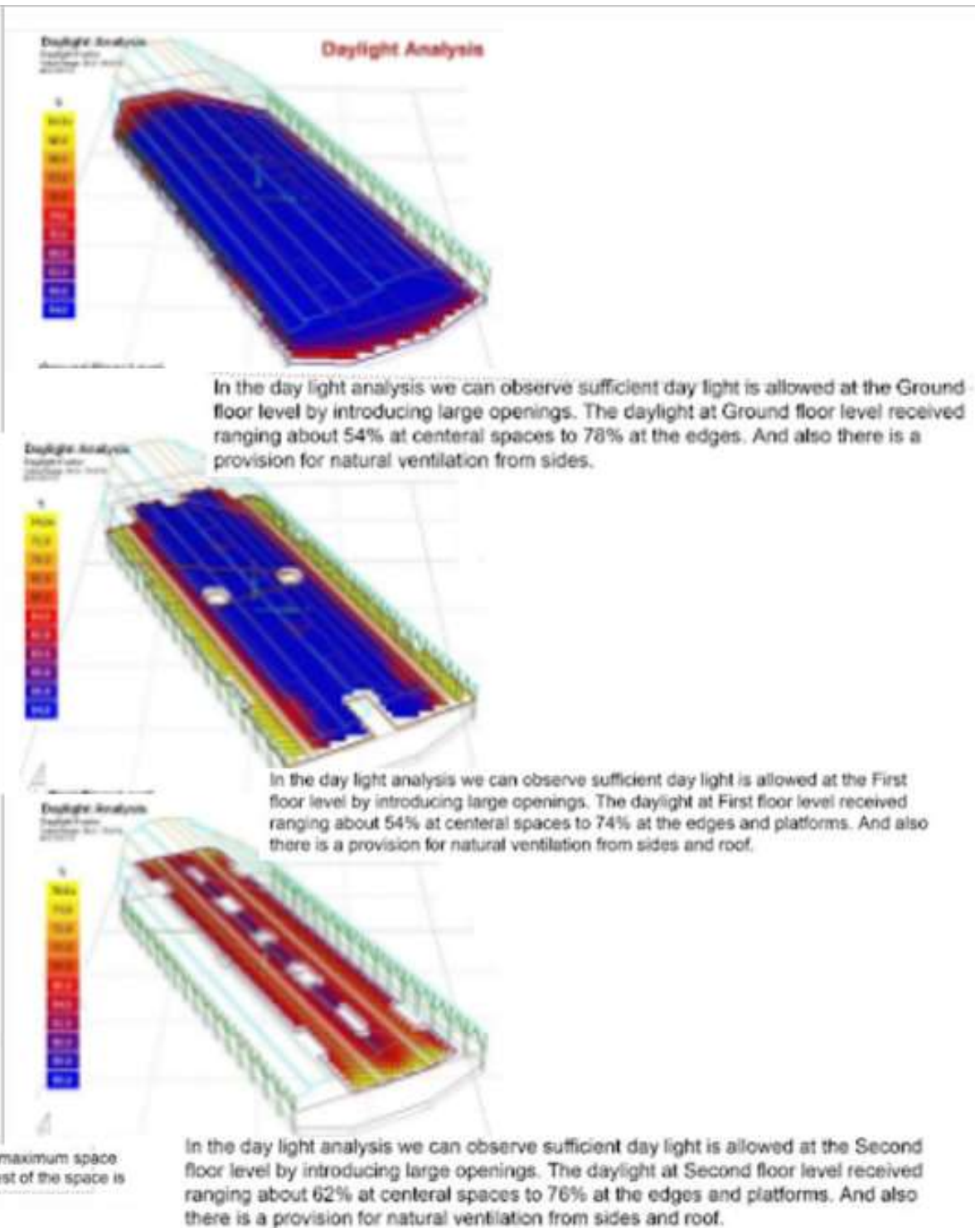
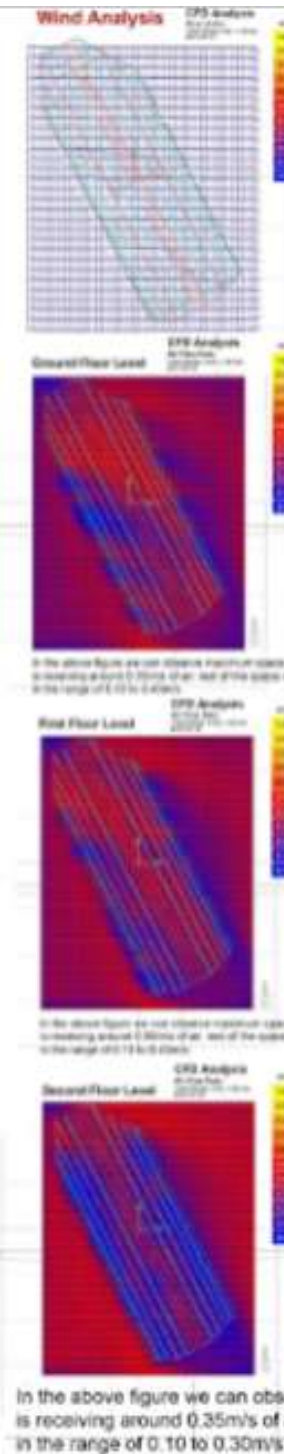
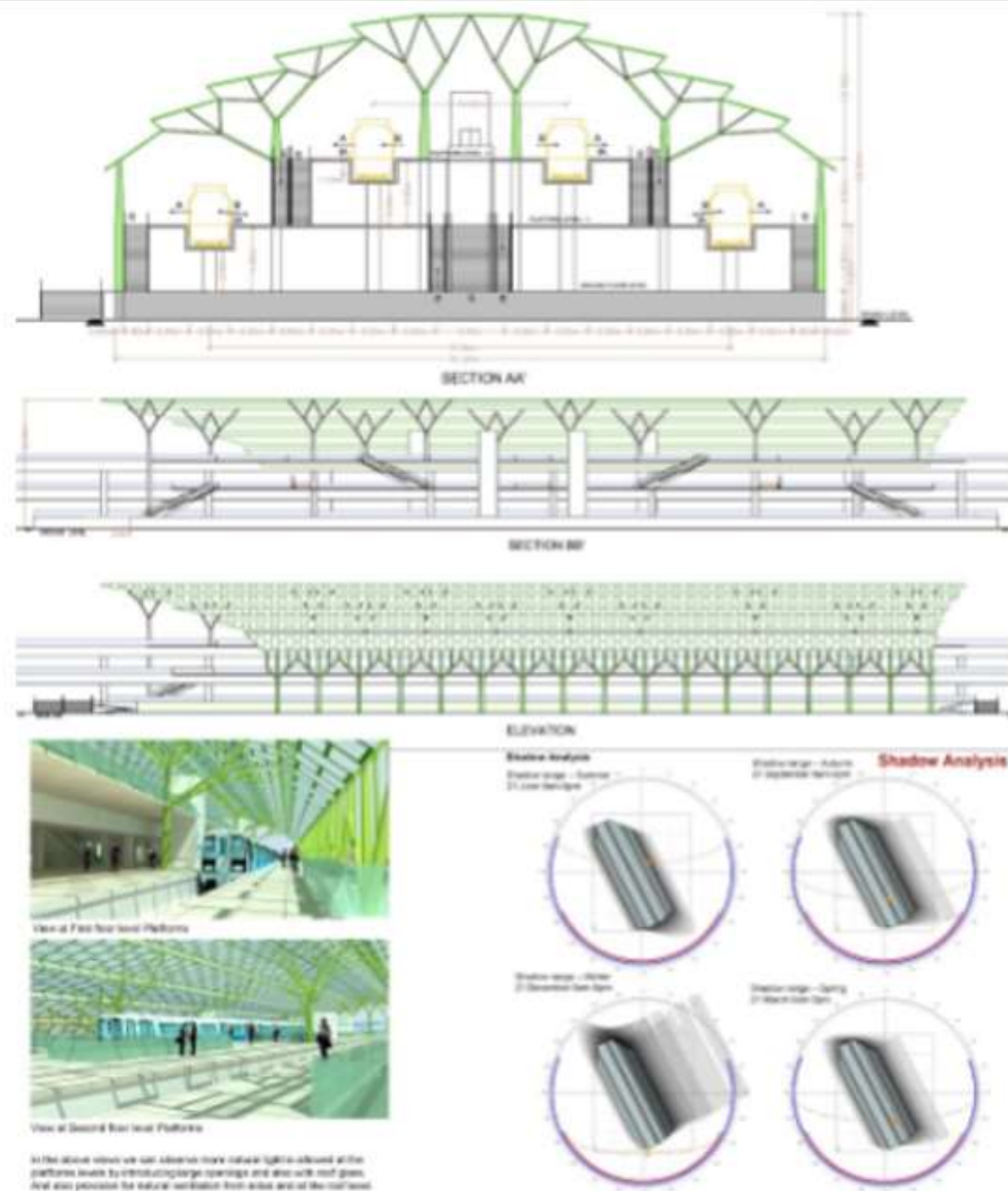


VIEW OF METRO STATION ON 30M WIDE ROAD



Daylight Analysis
Range: 0.00 - 1.00
2022/07/14 10:00

(Left) In the day light analysis we can observe more day light is allowed at the road level by introducing large openings and also not covering full width of the road. The daylight at Road level received ranging about 50% near median to 90% at the edges of the road. And also provision for natural ventilation from sides.

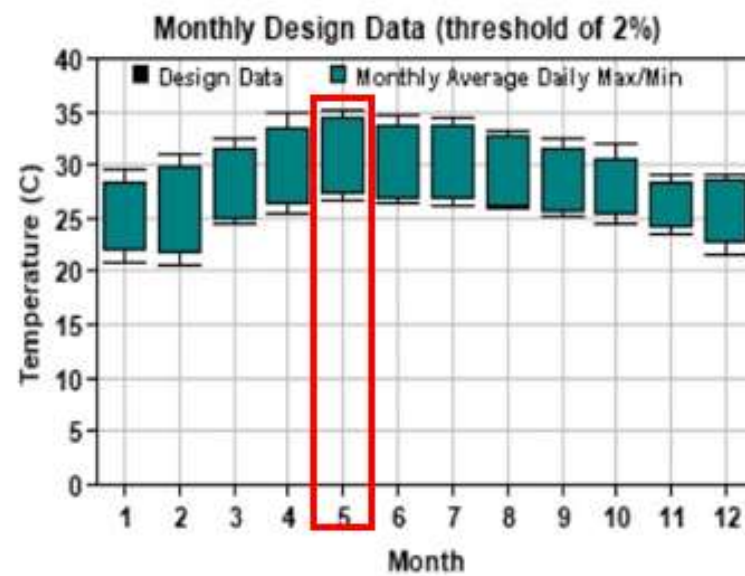


Weather Station: GBS_DGM12_12_165079
 Distance to your project 1.4 mi (2.2 km)
 Latitude = 12.8833, Longitude = 80.2333

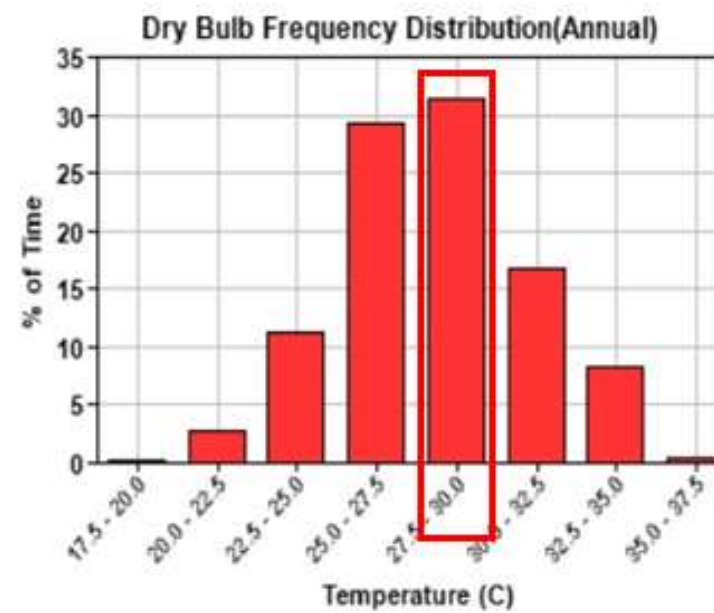
Cooling Degree Day		Heating Degree Day	
Threshold	Value	Threshold	Value
18.3 °C	3624	18.3 °C	0
21.1 °C	2610	15.6 °C	0
23.9 °C	1596	12.8 °C	0
26.7 °C	698	10 °C	0

IP SI

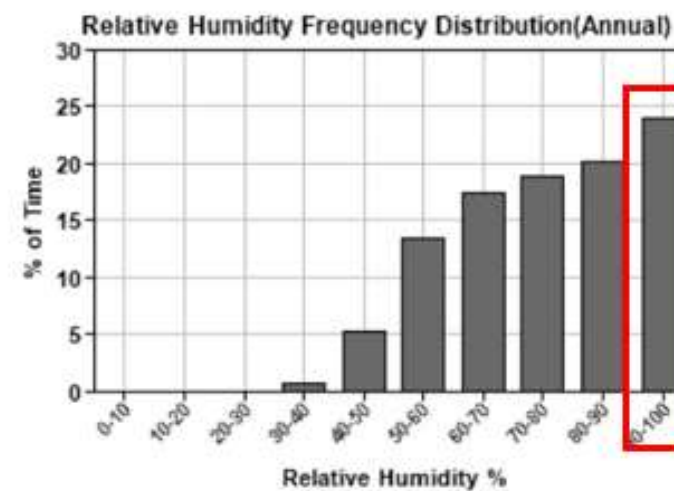
Annual Design Conditions				
Threshold	Cooling		Heating	
	Dry Bulb(°C)	MCWB(°C)	Dry Bulb(°C)	MCWB(°C)
0.1 %	35.5	26.9	19.9	19.9
0.2 %	35.3	26.7	20.5	19.4
0.4 %	35.1	26.4	20.8	19.7
0.5 %	35.0	26.1	21.0	20.0
1 %	34.6	25.9	21.5	20.8
2 %	34.1	25.7	22.1	21.4
2.5 %	33.9	25.7	22.4	21.7
5 %	33.3	25.5	23.1	22.2



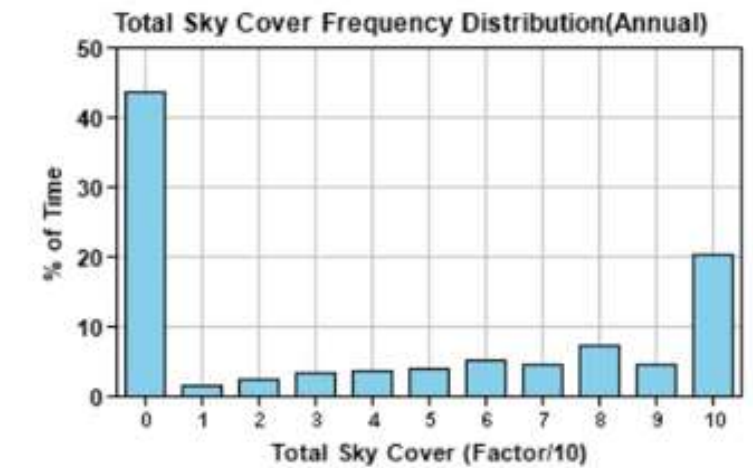
Max temperature for design is experienced in the month of may.



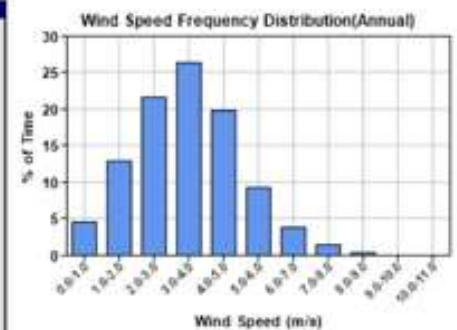
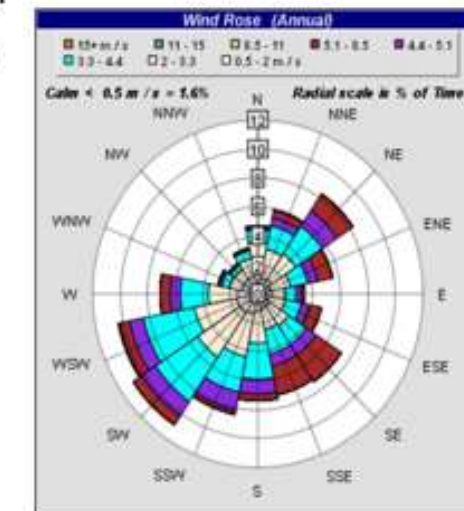
Acc to manual calculation comfortable temperature for chennai is 24.3°C, which is experienced for only 15% of time in a year



The comfortable RH is 50 %, where as chennai experiences more than 50% of RH for 95% of time in a year.



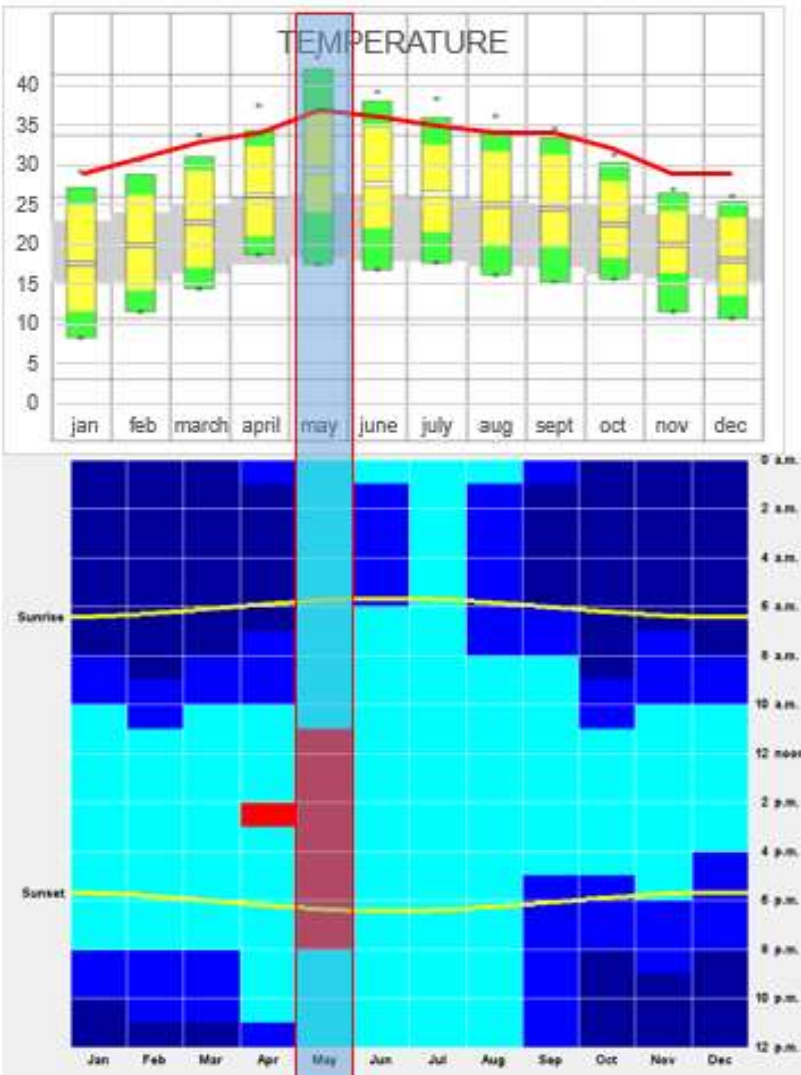
60% of time in a year has sky cover ranging 1 to 10, from this we can conclude that chennai experiences long wave radiation.



Predominant wind speed is 3-4 m/s annually.

Prevailing winds in Chennai are usually southwesterly between April and October and north-easterly during the rest of the year.

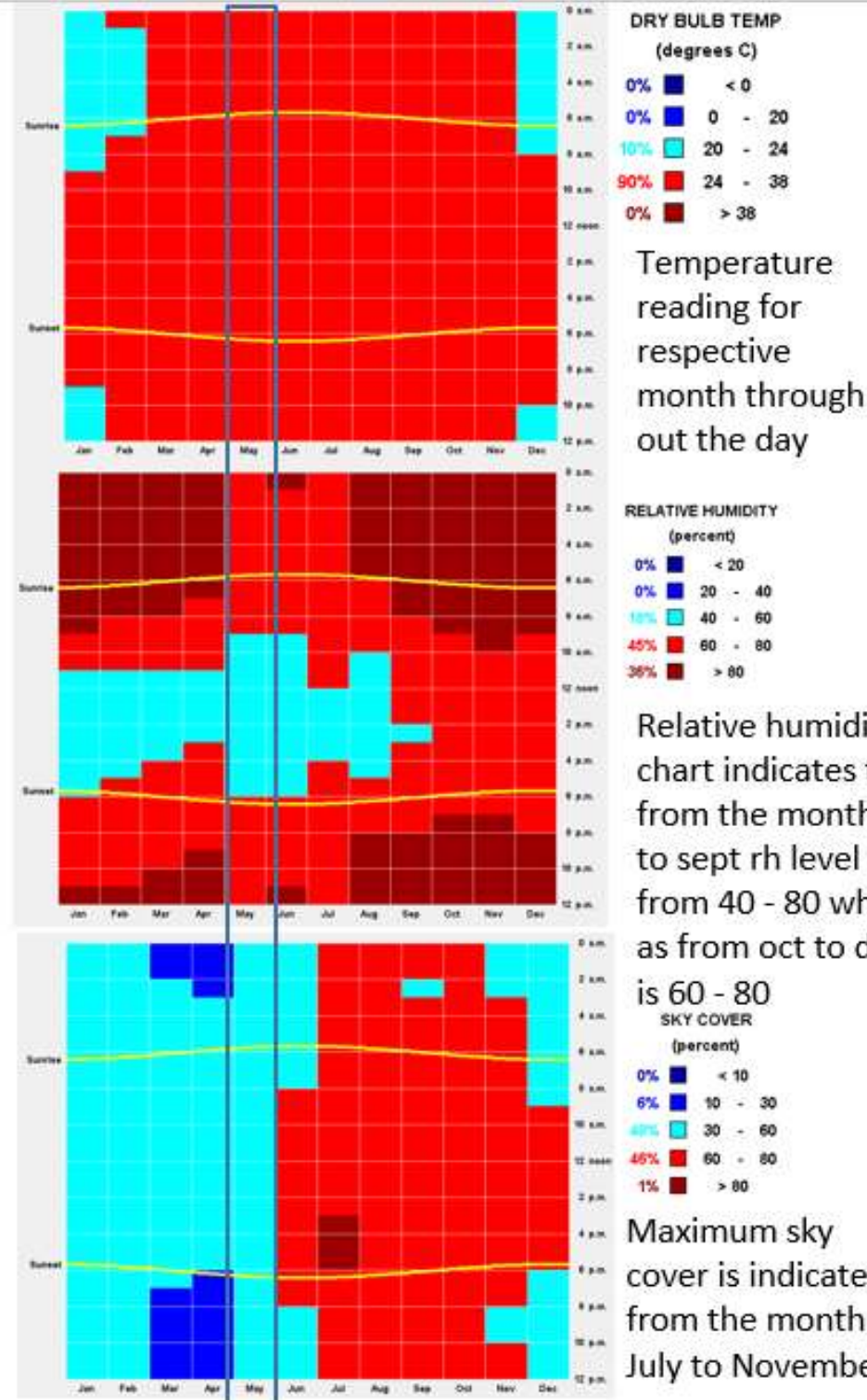
TEMPERATURE



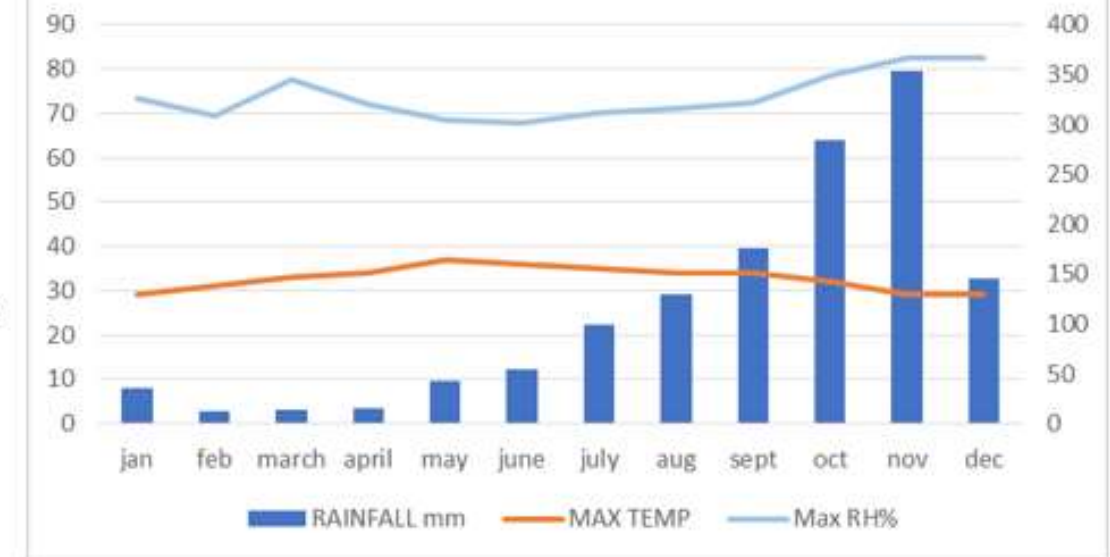
WIND SPEED (m/s)



Correlation of temperature and wind speed indicates that in the month of may there is extreme temperature and also higher wind speed as well. Our design should satisfy these aspects



CLIMATE DATA



Cumulative analysis of rainfall ,temperature and RH

Cumulative analysis for the whole day

Maximum temperature is recorded in the month of may analyzing the same with other parameter we can conclude that relative humidity in that month is 40-60 and also it's a clear sky

Relative humidity is also recorded high from the month of September to December as monsoon is also recorded in this period

Overall design aspects such as ventilation and shading devices should be taken into consideration is what we inferred from this analysis

MAHONEY TABLE GRAPH

Air Temperature

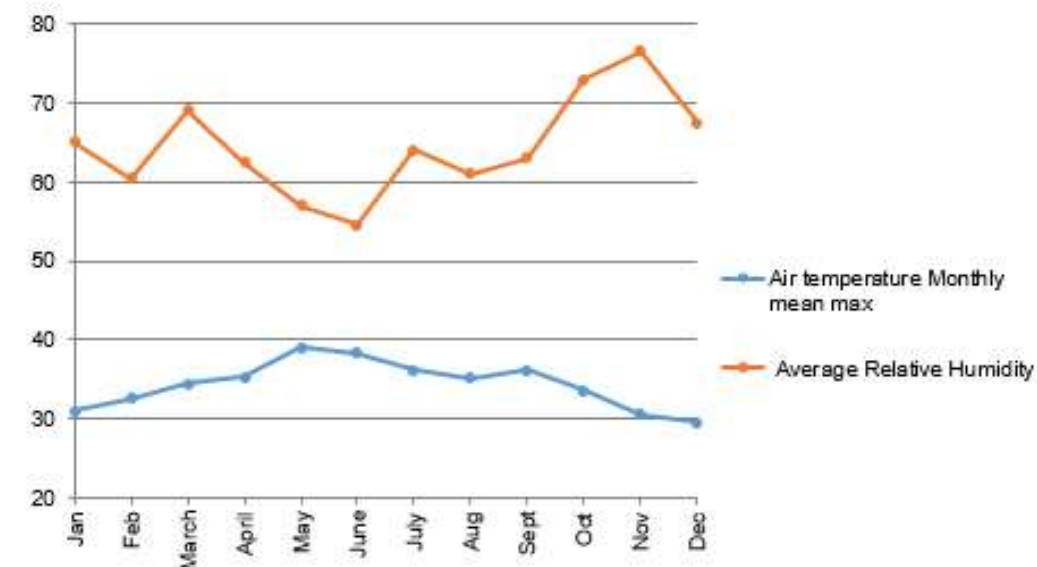
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	high	AMT
Air temperature Monthly mean max	31	32.6	34.5	35.3	39.1	38.3	36	35.2	36.2	33.6	30.6	29.5	37	28.5
monthly mean min.	16.9	18.9	22.3	23.9	24.9	24.4	24	23.4	24.3	23.2	21.8	19.7	20	17
Monthly mean range	14.1	11	12.2	12	14.2	13	12	14	11.9	15	8.8	16	low	AMR

RELATIVE HUMIDITY %

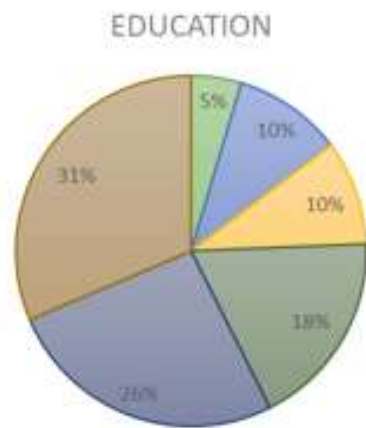
	jan	feb	march	april	may	june	july	aug	sept	oct	nov	dec
Monthly mean max. a.m	72	68	72	64	59	57	68	66	67	76	81	72
monthly mean min. p.m	58	53	66	61	55	52	60	56	59	70	72	63
Average Relative Humidity	65	60.5	69	62.5	57	54.5	64	61	63	73	76.5	67.5
Humidity group	4	3	4	4	3	3	3	4	4	4	4	4

INDICATORS-Table 1

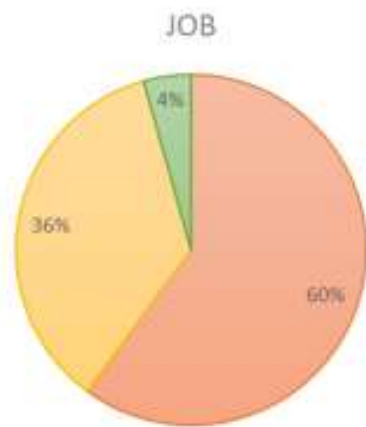
	jan	feb	march	april	may	june	july	aug	sept	oct	nov	dec
	4	3	4	4	3	3	3	4	4	4	4	4
Humid : H1	→	→	→	→				→	→	→	→	→
H2	→		→	→				→	→	→	→	→
H3										→	→	
Arid : A1					→	→	→					
A2												
A3												



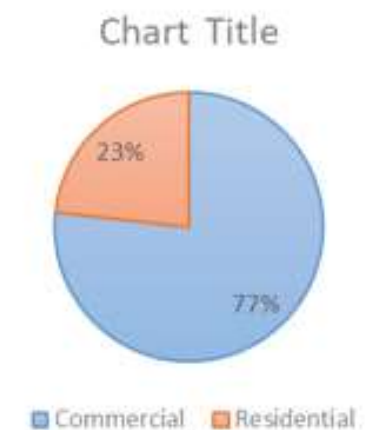
S.No	Design Parameters	Design Recommendation as per MAHONEY table
1	Layout	Orientation North and South, Long axis E-W
2	Spacing	Open spaces for wind penetration
3	Air movement	Rooms single banked, permanent provision for air movement
4	Openings	Minimum opening of 25% – 40%
5	Position of openings	In windward side
6	walls	Heavy walls, over 8 hrs time lag
7	Roofs	Heavy roofs, over 8 hrs time lag
8	Rain protection	Protection necessary for heavy rain
9	External features	Space for outdoor activities



■ Illiterate ■ Primary ■ Upper Primary ■ High School ■ Higher Secondary ■ College



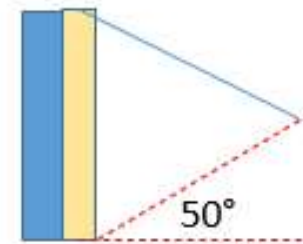
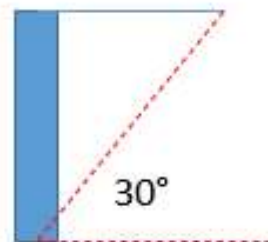
■ Business ■ Service -Private ■ Service Government



■ Commercial ■ Residential



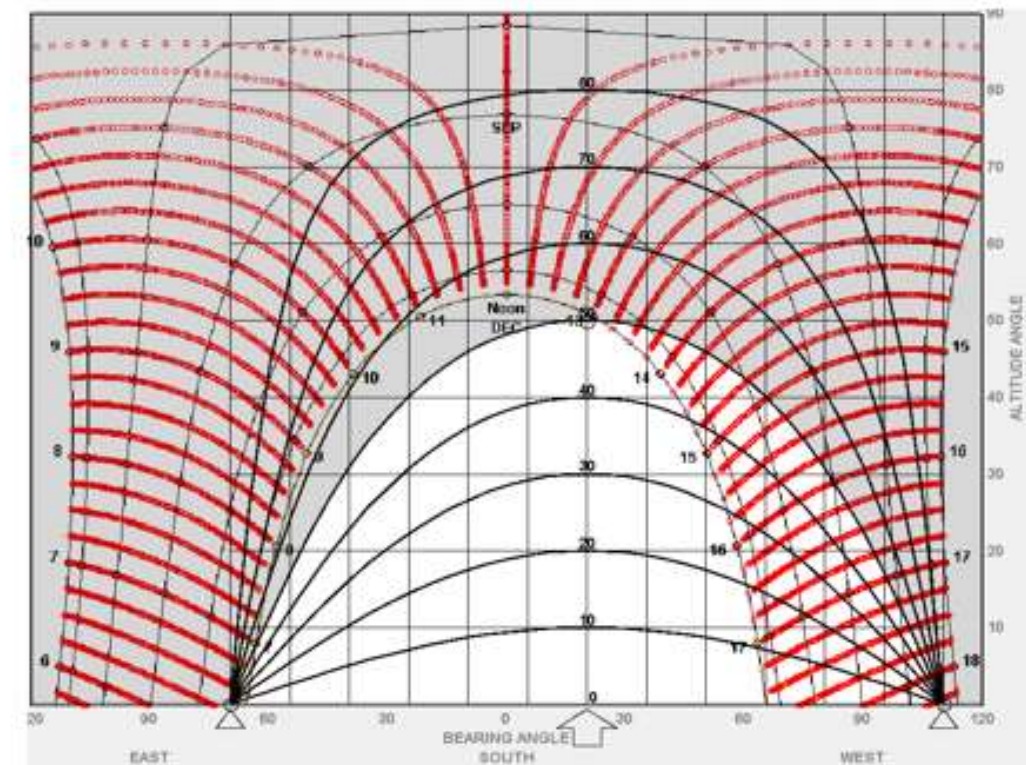
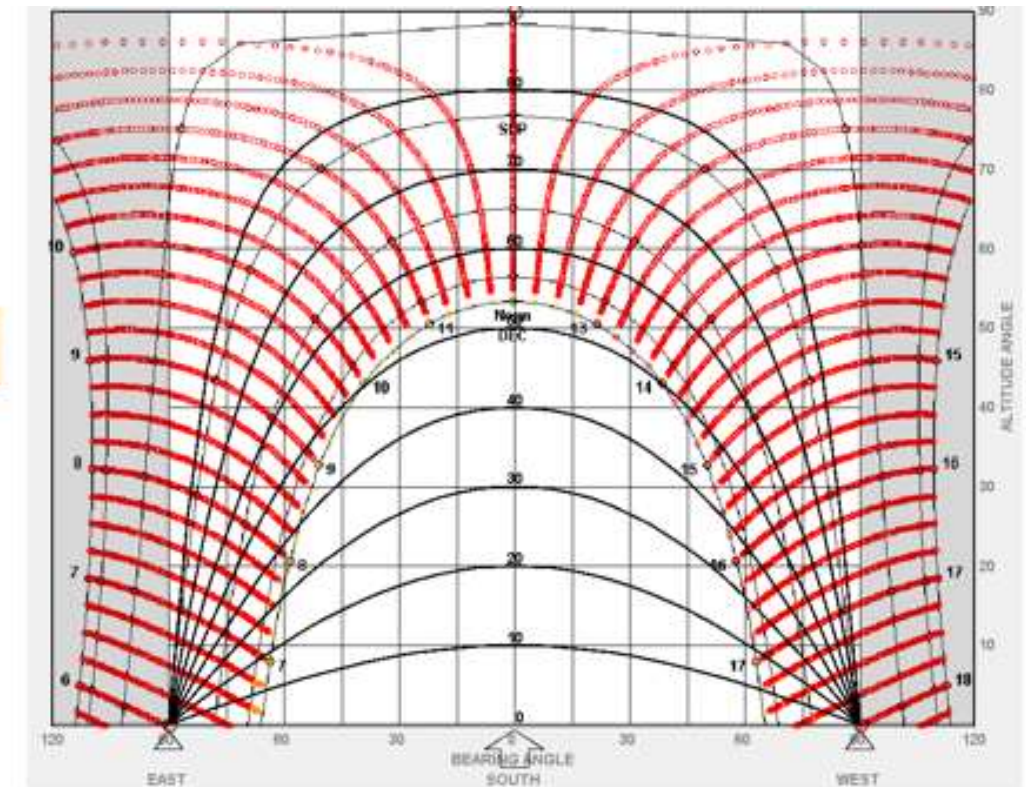
7-9AM



8-9AM

Maximum users in this location are students and working people ,usage of metro by these users are morning from 7am to 9 am and in the evening from 3pm to 7pm.

Taking these peak time into consideration we suggest that providing horizontal shade from the angle of 30° to 50° would help in reducing the solar radiation through the vertical envelope.



	MORNING										AFTERNOON										
	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	MONTHLY			
Jan					3%	8%	29%	68%	17%	15%	17%	20%	27%					Jan	23%		
Feb				3%	3%	15%	38%	70%	15%	13%	15%	17%	22%	32%				Feb	22%		
Mar				3%	8%	24%	49%	67%	15%	13%	14%	16%	19%	26%				Mar	23%		
Apr			5%	5%	17%	33%	60%	62%	16%	14%	15%	17%	19%	24%	31%			Apr	24%		
May		6%	6%	10%	23%	40%	67%	58%	17%	16%	16%	18%	20%	23%	28%	36%		May	26%		
Jun		6%	6%	14%	27%	44%	71%	56%	18%	16%	17%	18%	20%	23%	27%	34%		Jun	26%		
Jul		6%	6%	13%	25%	43%	69%	57%	18%	17%	17%	19%	21%	24%	28%	35%		Jul	27%		
Aug			6%	8%	20%	37%	63%	60%	18%	16%	17%	18%	21%	24%	30%			Aug	26%		
Sep			4%	4%	12%	28%	54%	64%	16%	15%	16%	17%	20%	26%	35%			Sep	24%		
Oct				4%	4%	19%	43%	68%	16%	14%	16%	18%	22%	30%				Oct	23%		
Nov					3%	10%	32%	71%	17%	15%	17%	20%	26%					Nov	23%		
Dec					3%	5%	26%	64%	17%	16%	17%	21%	28%					Dec	22%		
	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	ANNUAL			
	MORNING										AFTERNOON									24%	

The chart signifies that overall throughout the year the sun radiation is higher from 10am to 11am.

In the month of may and june we experience the high temperature.

When we relate the user timing and the solar radiation we can conclude that from 7am to 9am no much of radiation is affecting the environment except the month of may ,june and july which should be addressed in the design

Simulation shows that daylight duration is around 8 hours when shading device is not provided ,where as in the Fig.b we can visualize that daylight is between 2-4 hours with shading device.

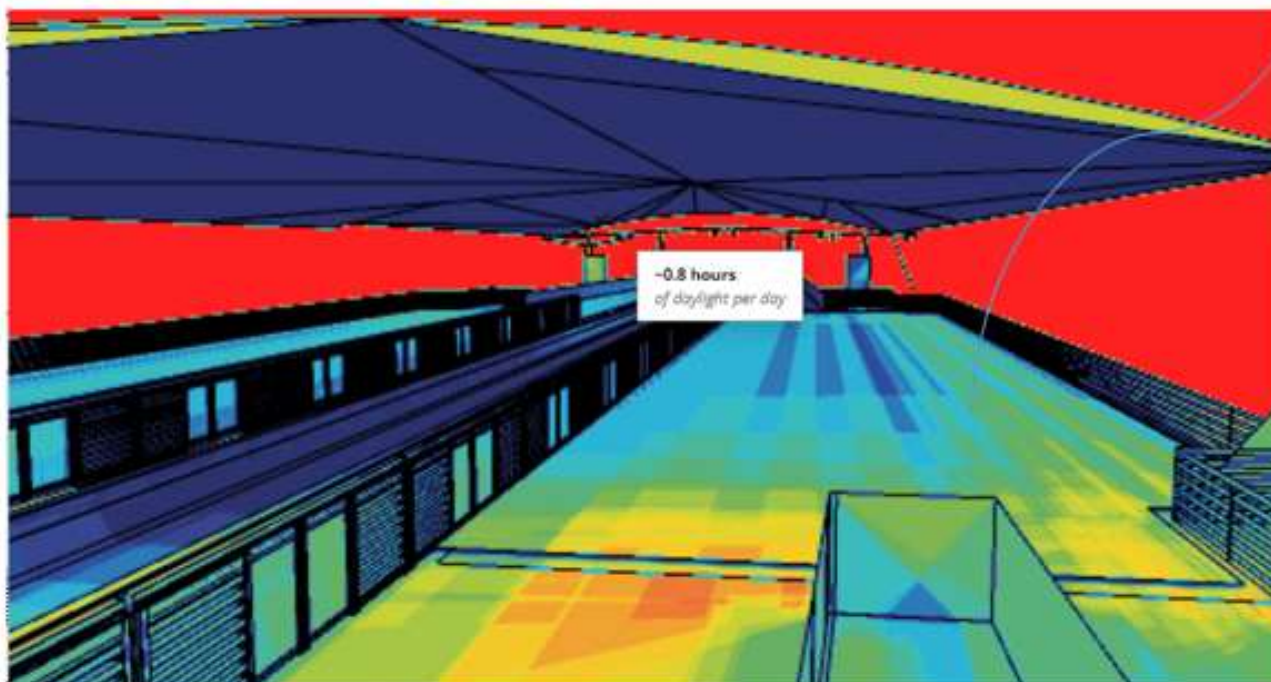


Fig.A

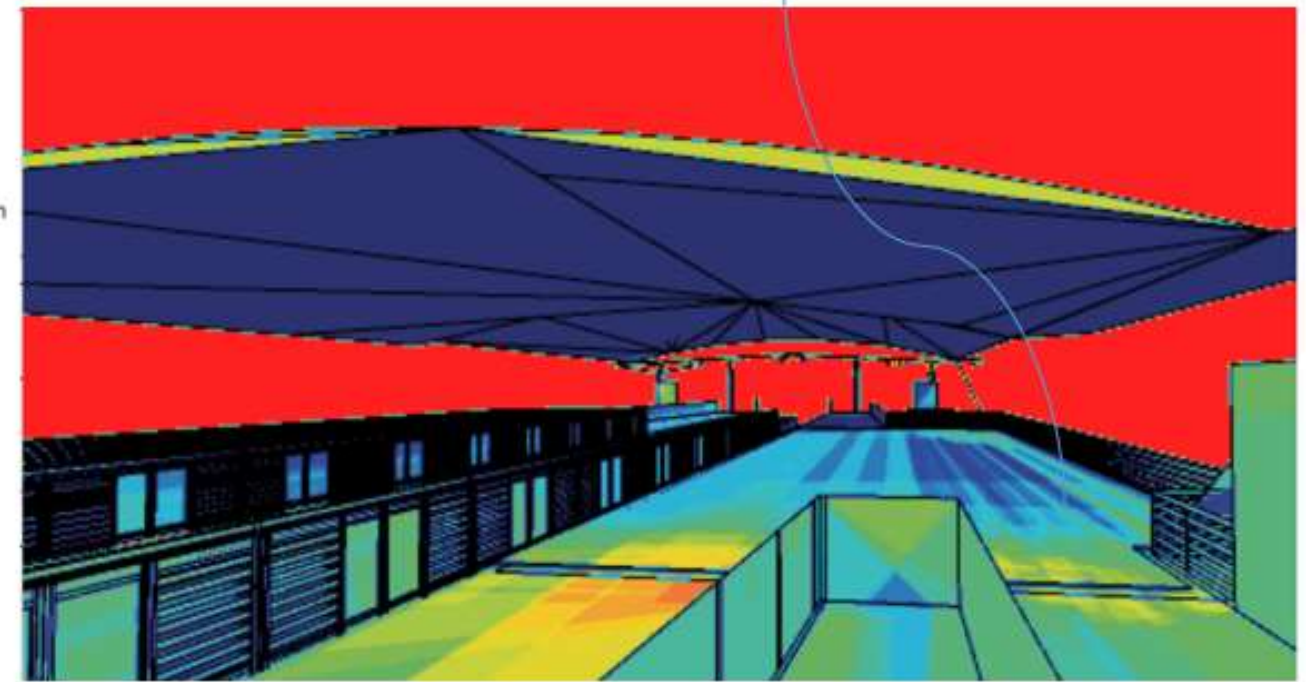
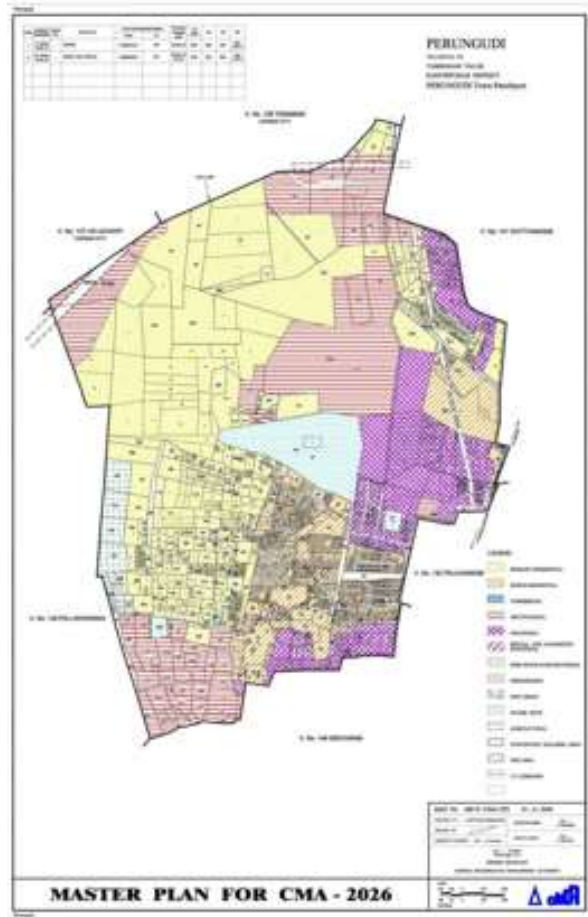


Fig.B



The landuse map of perungudi shows that the major part of land comes under primary residential and industrial.



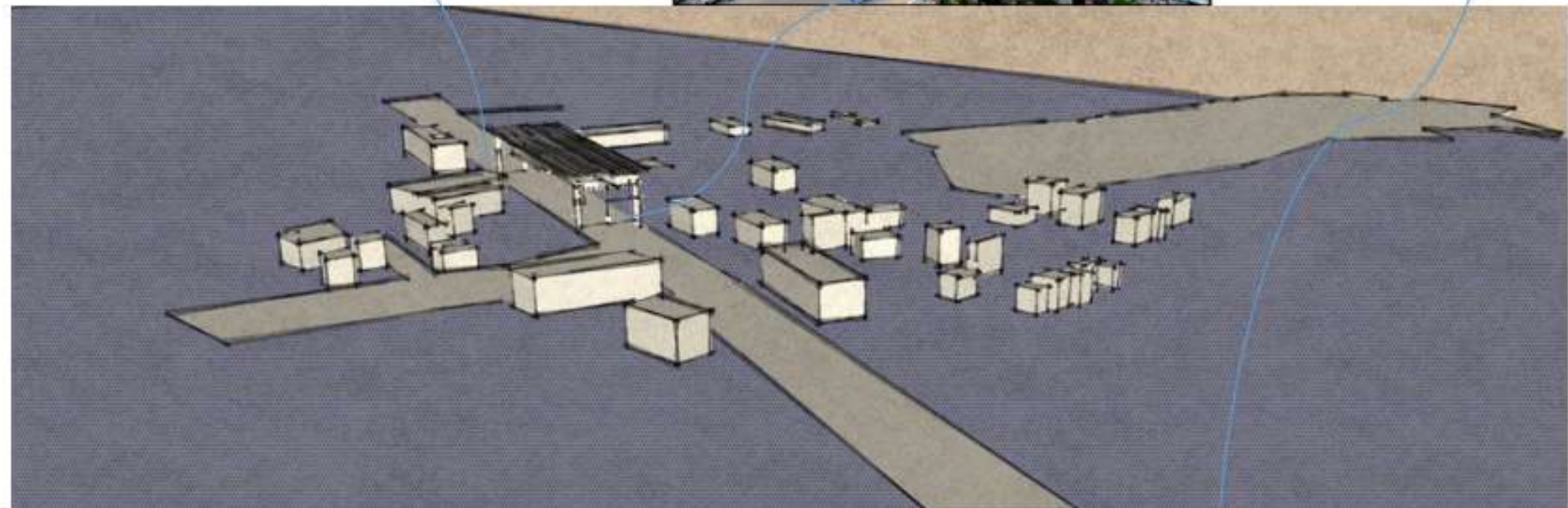
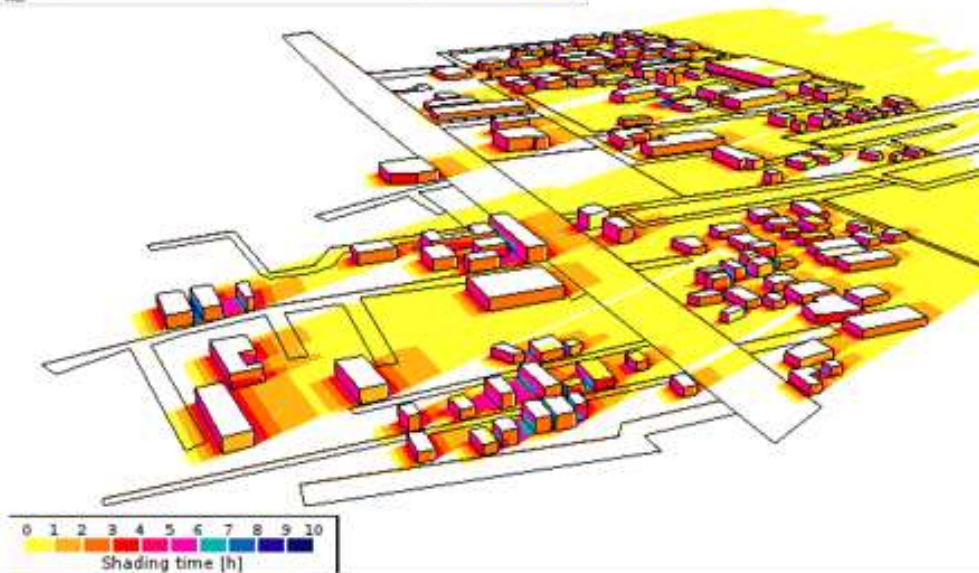
IT building in perungudi near the proposed site for metro



The skyline of perungudi road



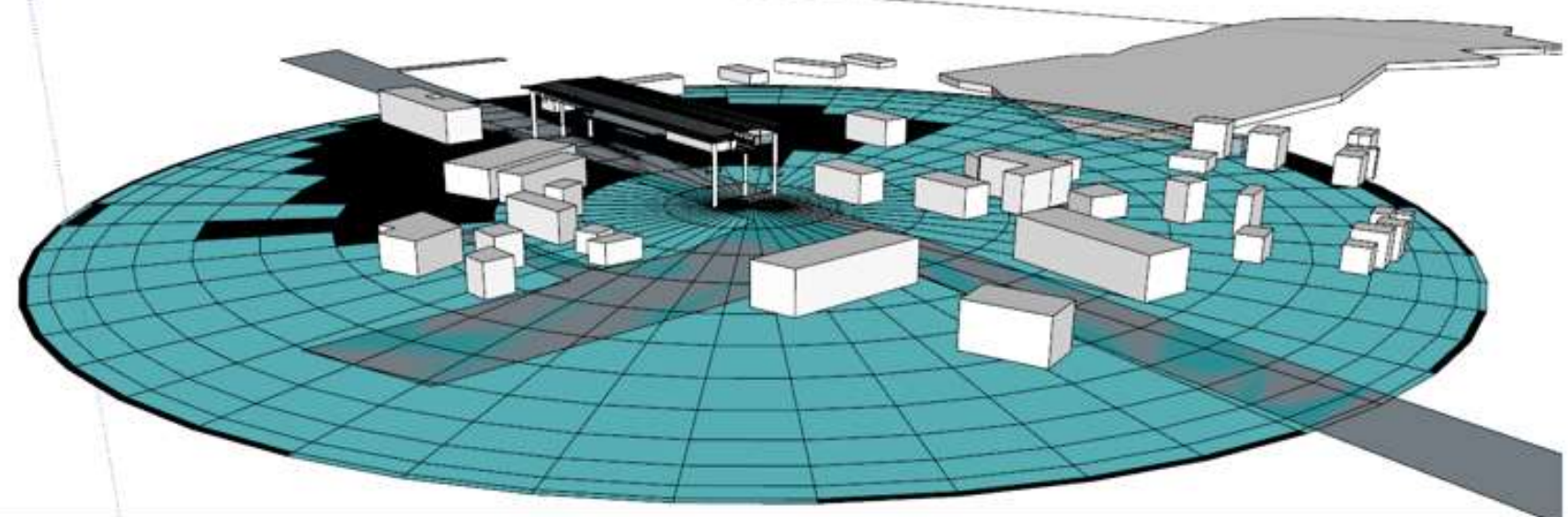
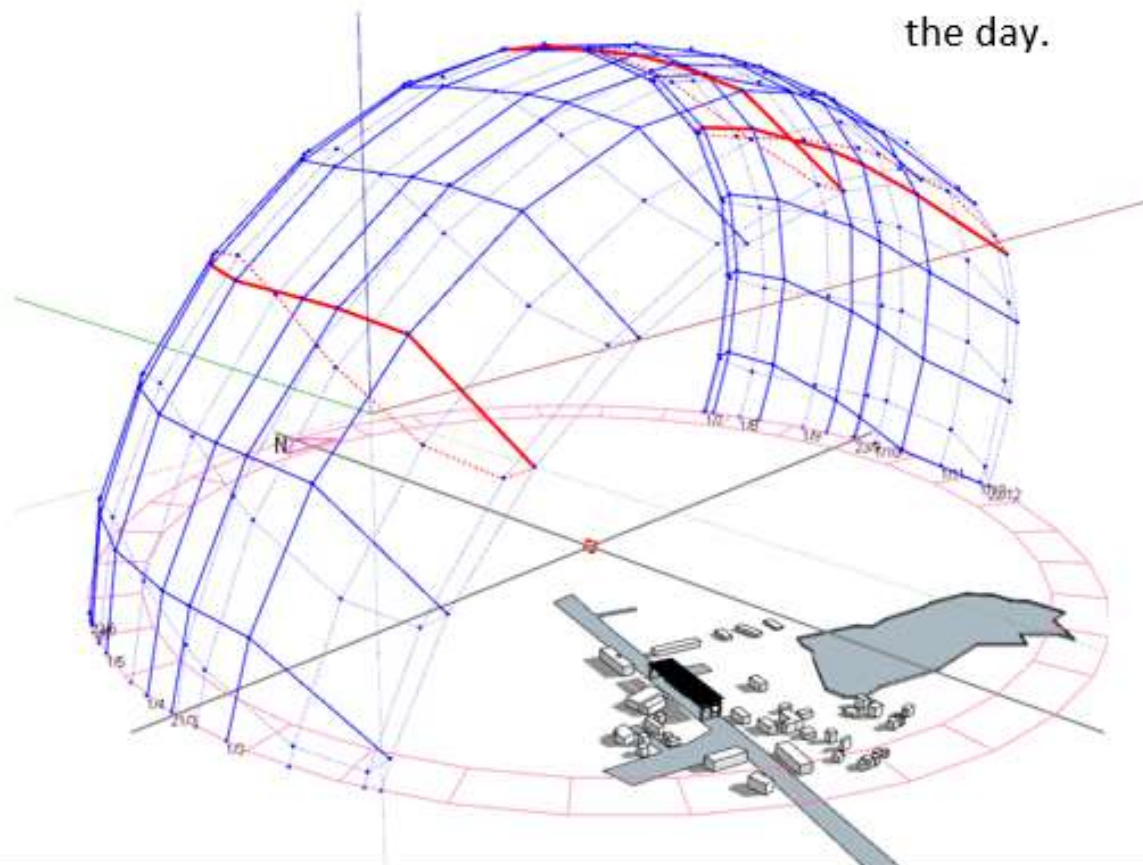
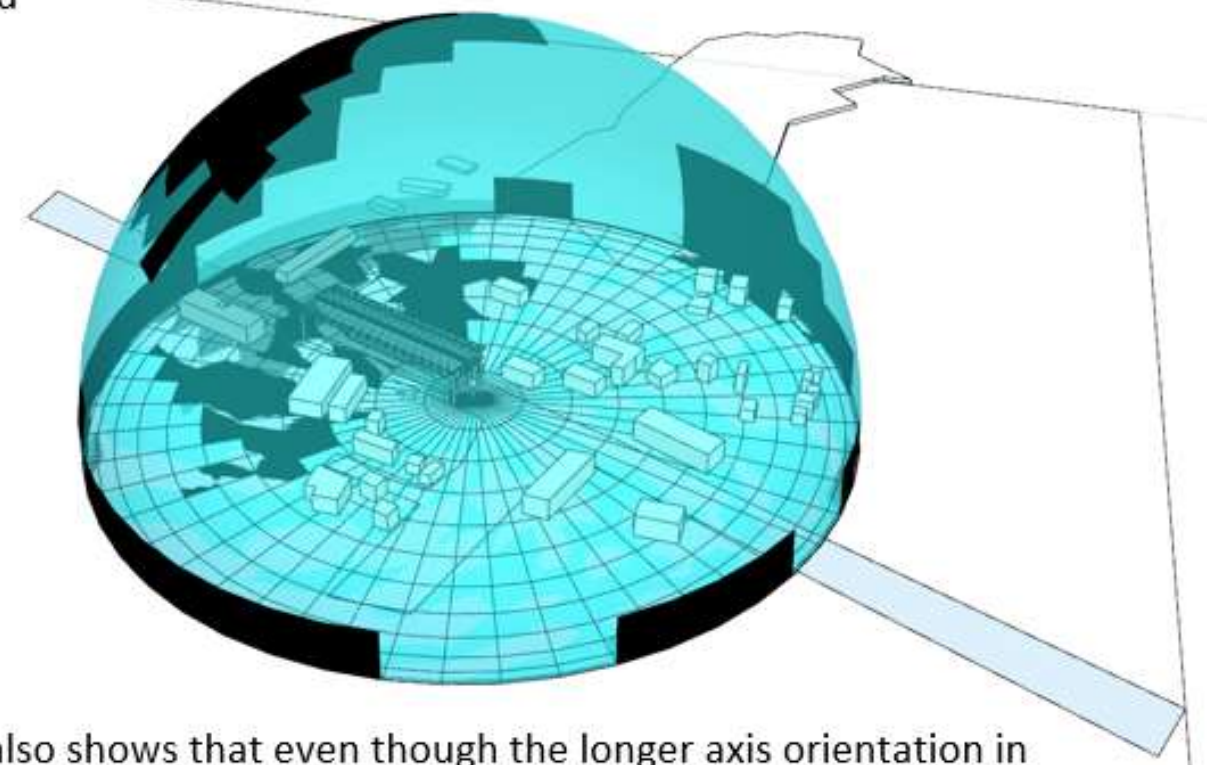
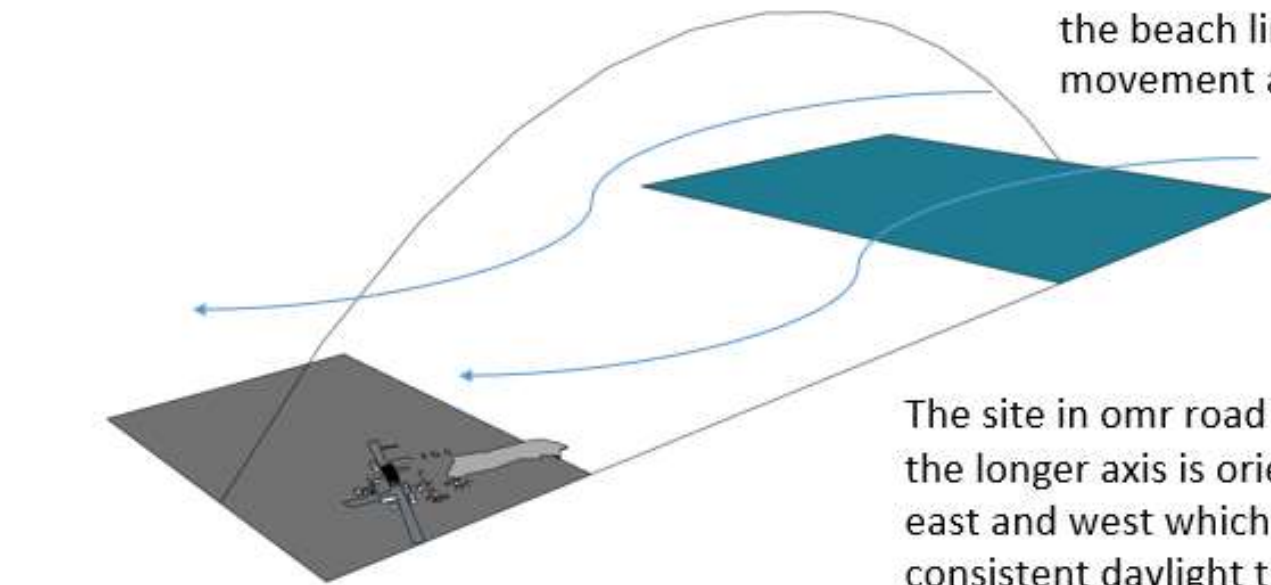
Toll Plaza perungudi

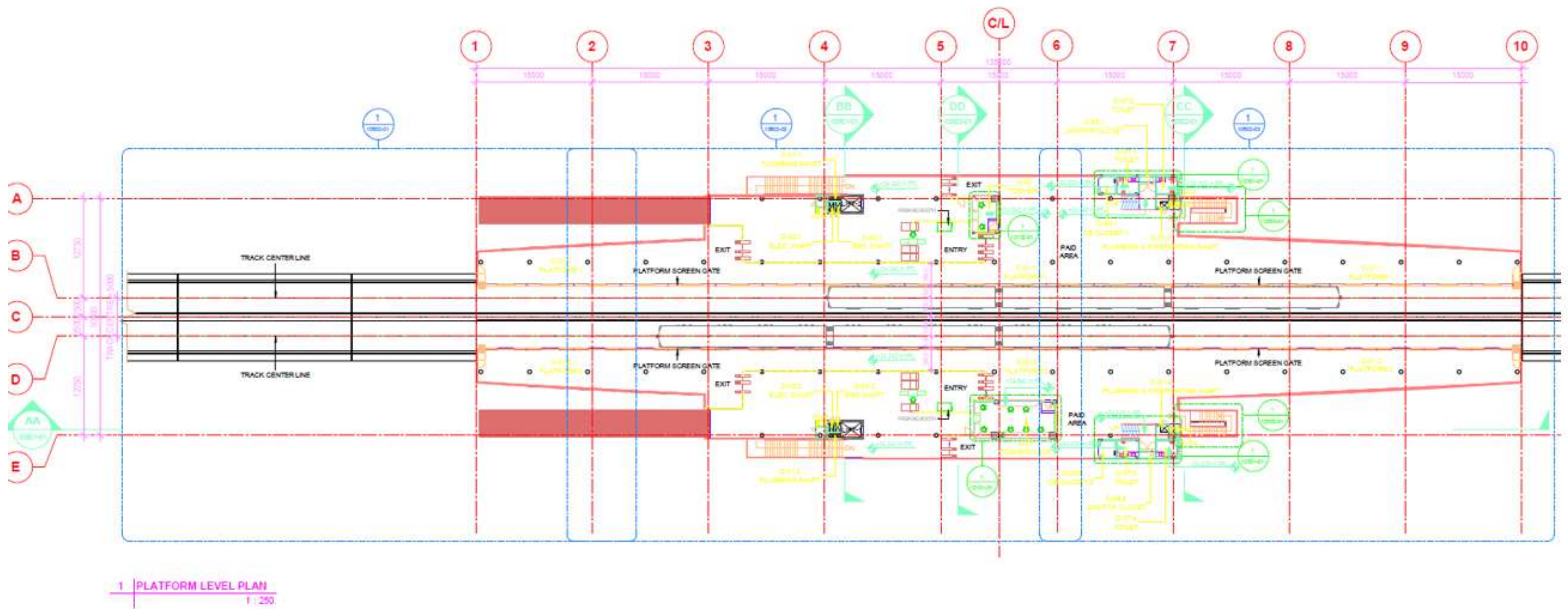


As we can see the omr stretch is parallel to the beach line, which enhance the wind movement as well

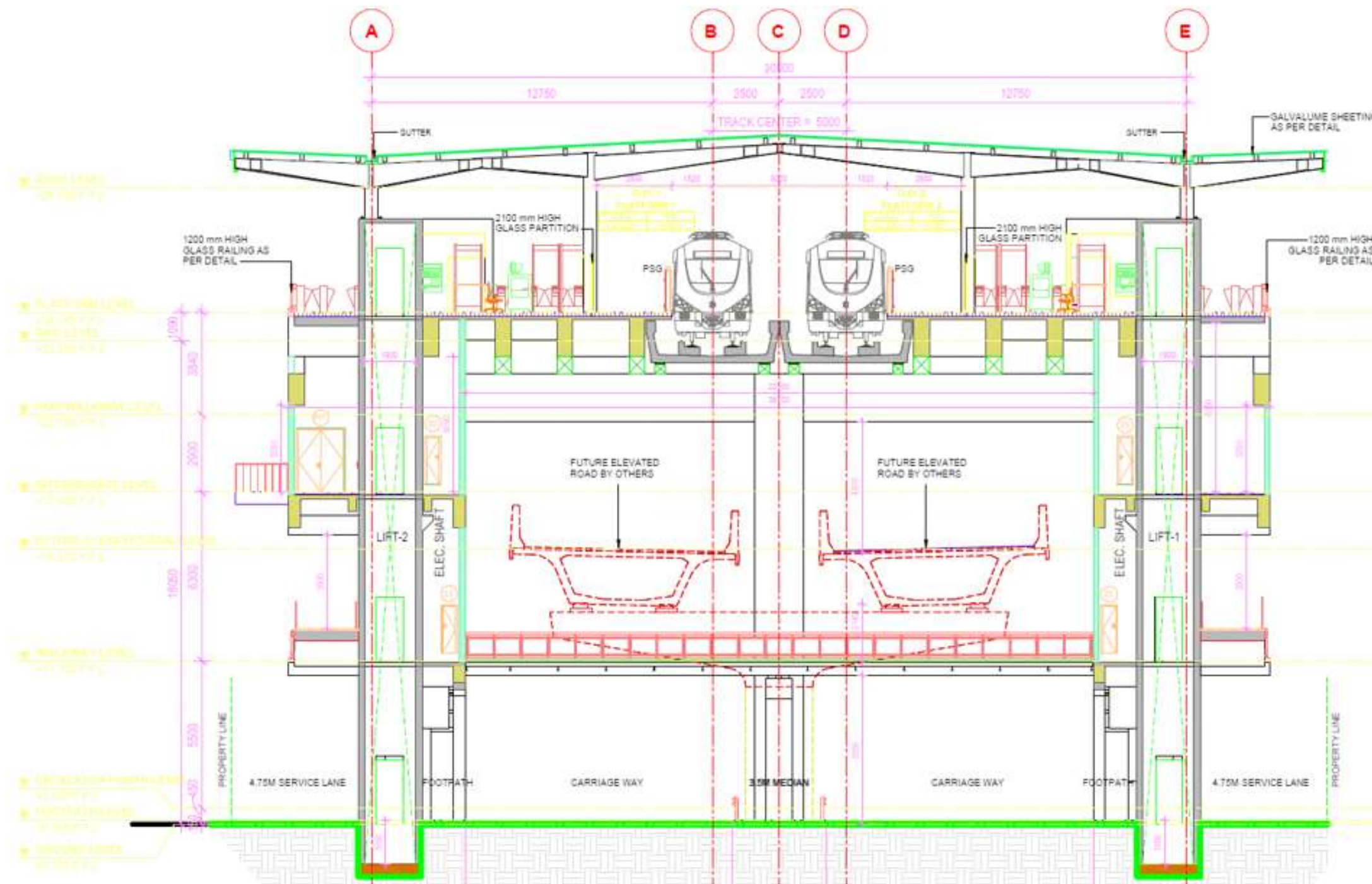
The site in omr road is where the longer axis is oriented in east and west which gives a consistent daylight throughout the day.

The sky view factor also shows that even though the longer axis orientation in east and west, the maximum shadow space falls on the metro site.

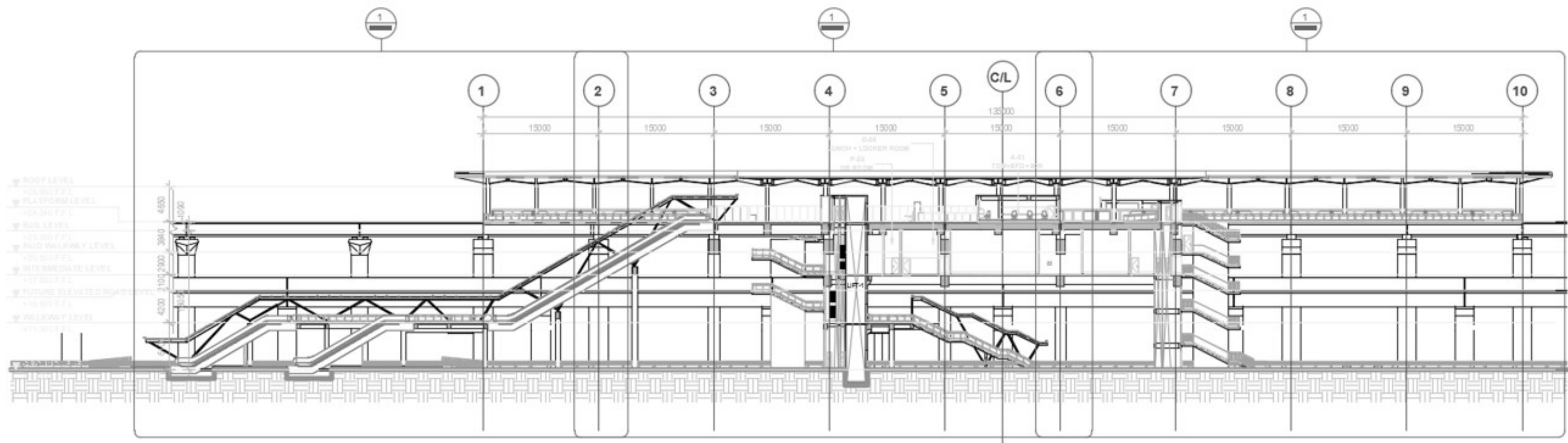




PLATFORM PLAN – PERUNGUDI METRO STATION



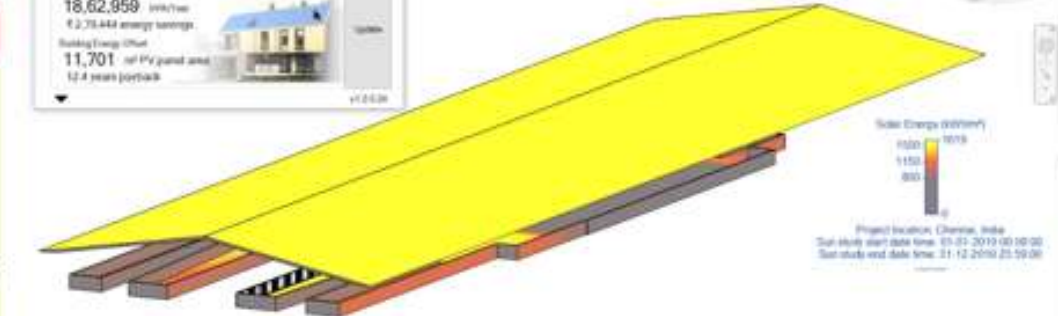
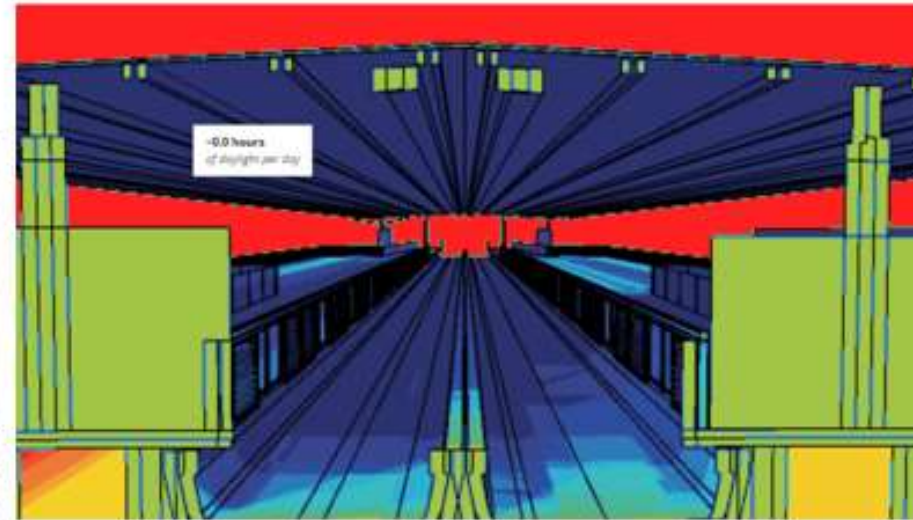
SECTION- PERUNGUDI METRO STATION



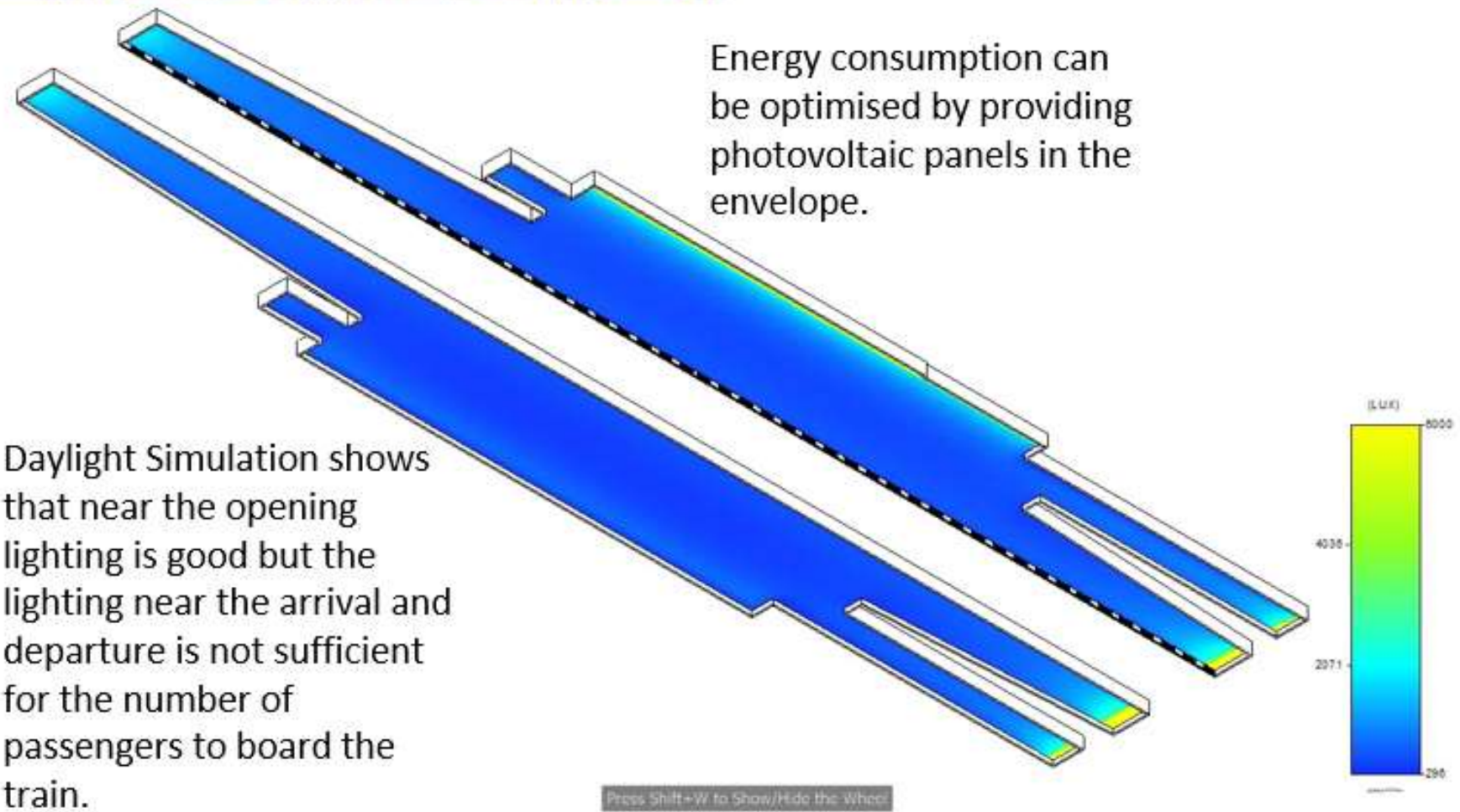
OPTION 1



Option one has been designed in a way where the lighting and wind movement is provided from the longitudinal axis.



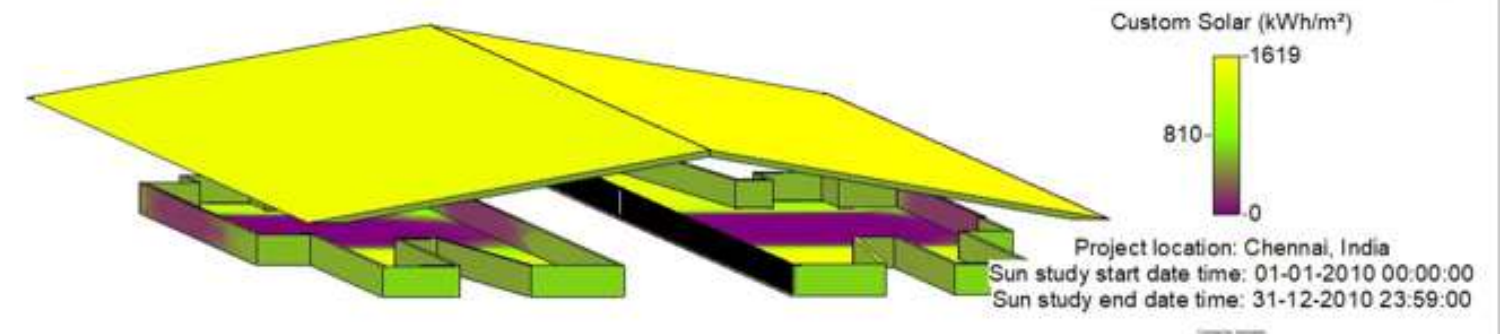
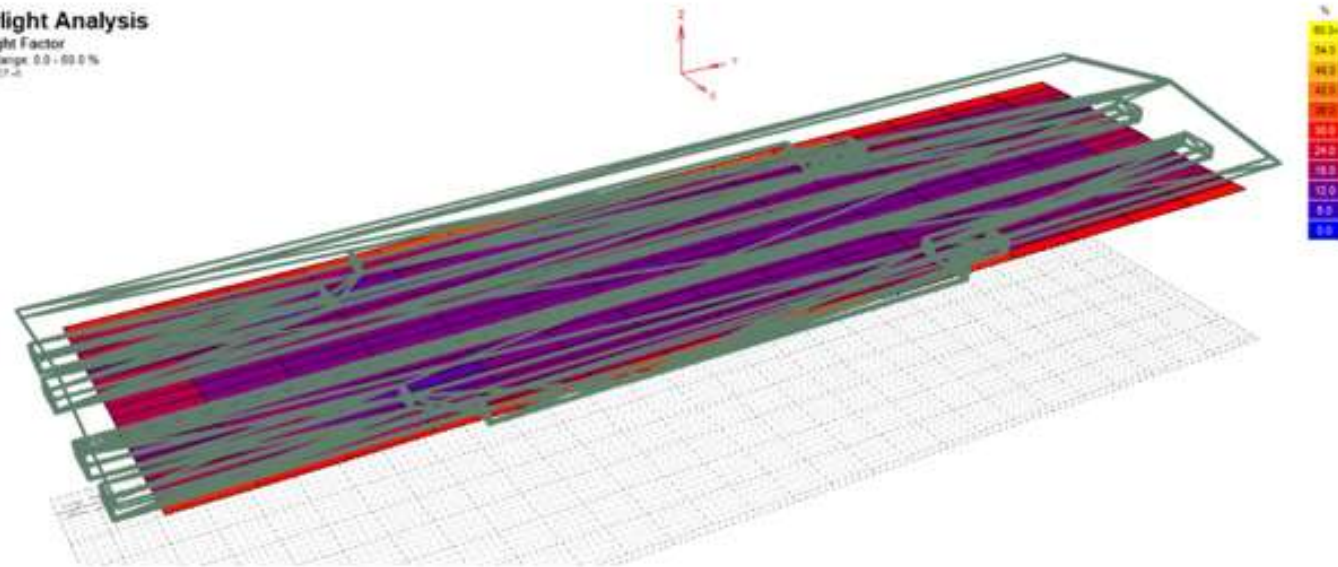
Energy consumption can be optimised by providing photovoltaic panels in the envelope.



Daylight Simulation shows that near the opening lighting is good but the lighting near the arrival and departure is not sufficient for the number of passengers to board the train.

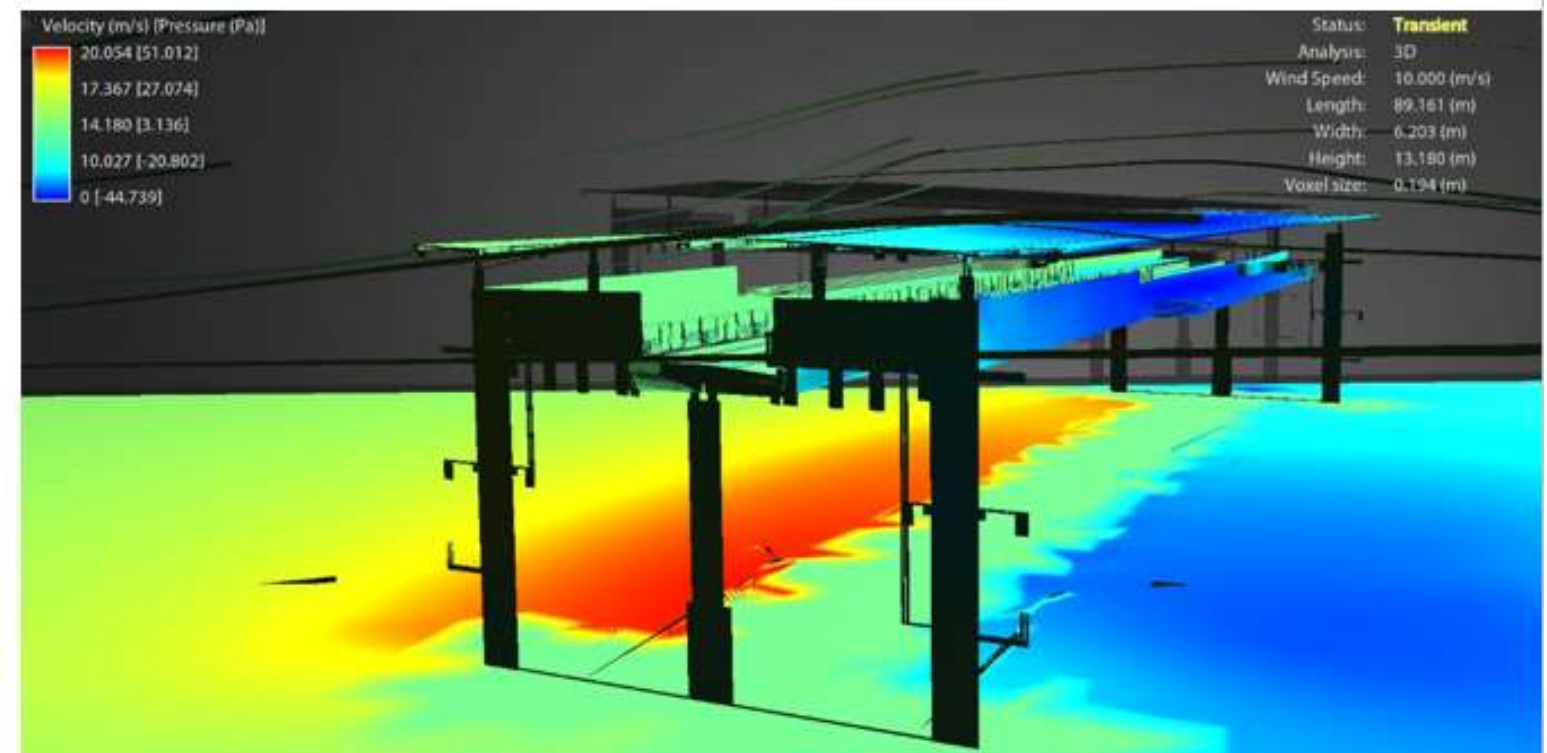
OPTION 1

Daylight Analysis
Daylight Factor
Value Range: 0.0 - 89.0 %
4/20/2027 -6



Shading device is used extensively for cutting down the direct radiation to a greater extent, Material selection for the envelope shall be considered with respect to solar radiation.

Metro station is situated in 20 m high from the ground level which allows unobstructed wind movement also creates positive pressure on the surface.



OPTION 1

Summer solstice.



Summer solstice solar radiation analysis shows that the max area of platform falls under the range of 0 – 475 wh/sq.m.

Equinox.

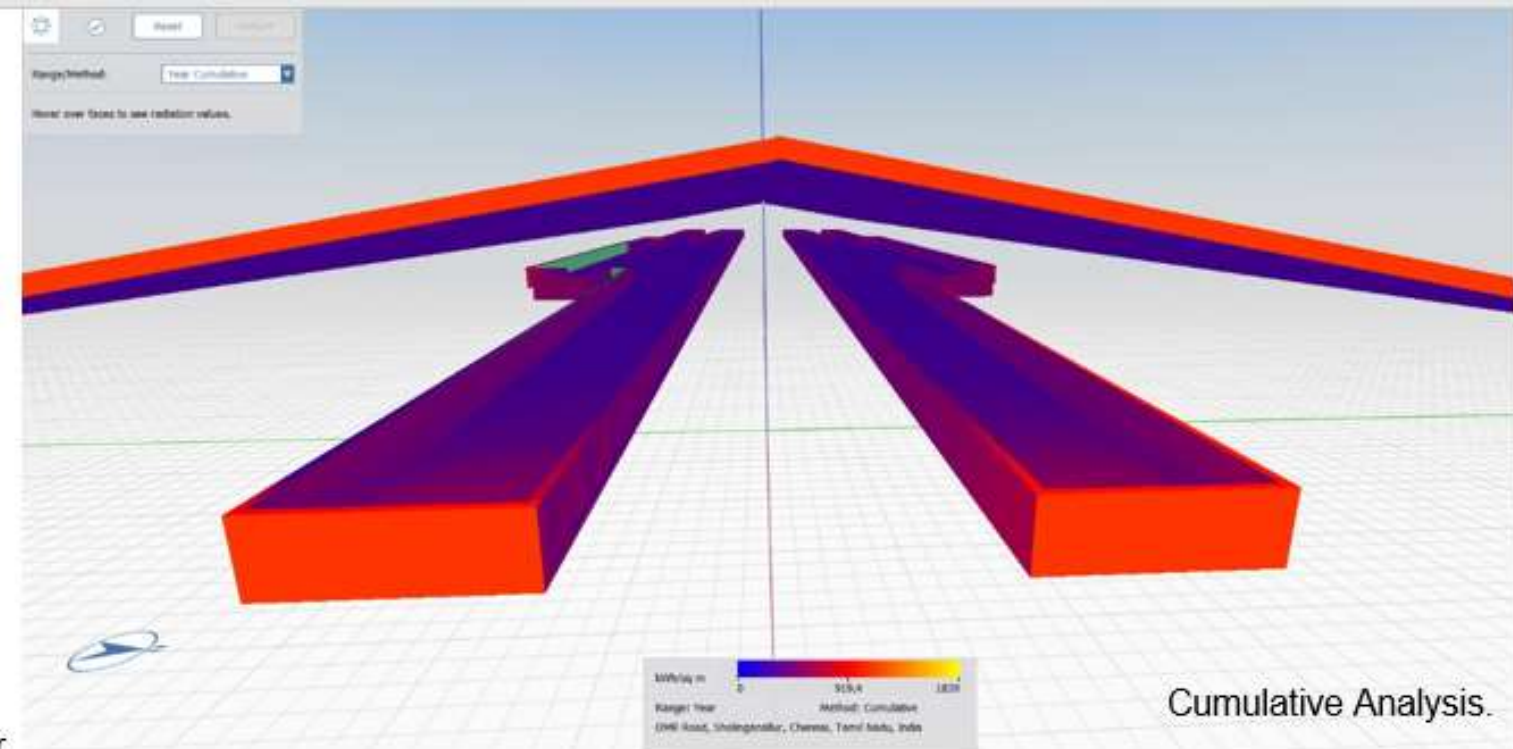


Equinox solar radiation analysis also shows that the max area of platform falls under the range of 0 – 475 wh/sq.m.

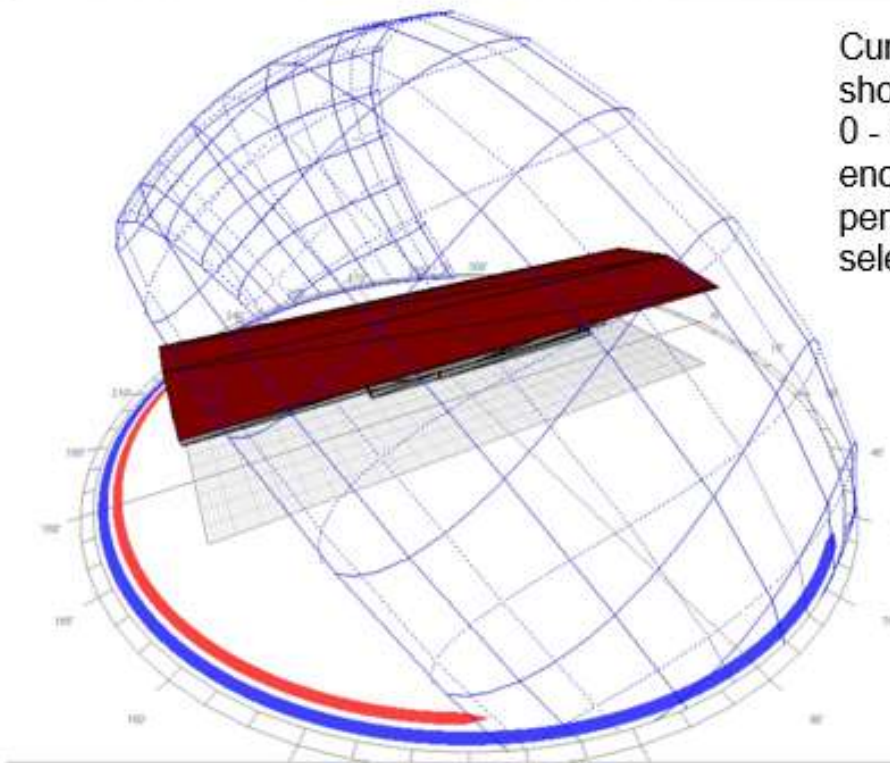
Winter solstice.



Winter solstice solar radiation analysis shows that the max area of platform falls under the range of 0 – 250 wh/sq.m. radiation is little higher on the eastern façade.



Cumulative Analysis.

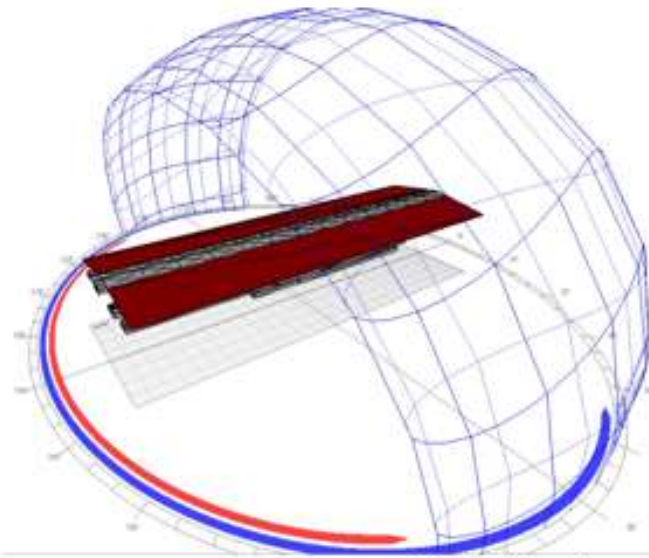


Cumulative analysis of solar analysis shows that over all radiation falls under 0 - 300 wh/sq.m. , which would not be enough for typology. To enhance the performance the envelope material selection also plays a major role.

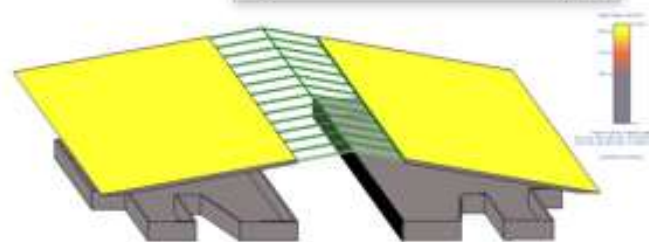
OPTION 2



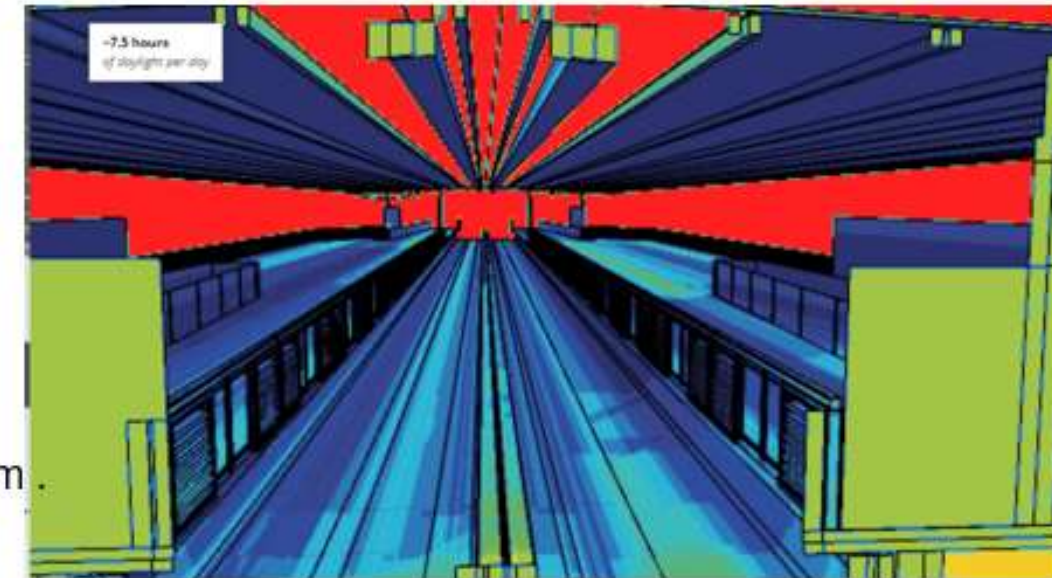
Visuals of interior of platform .



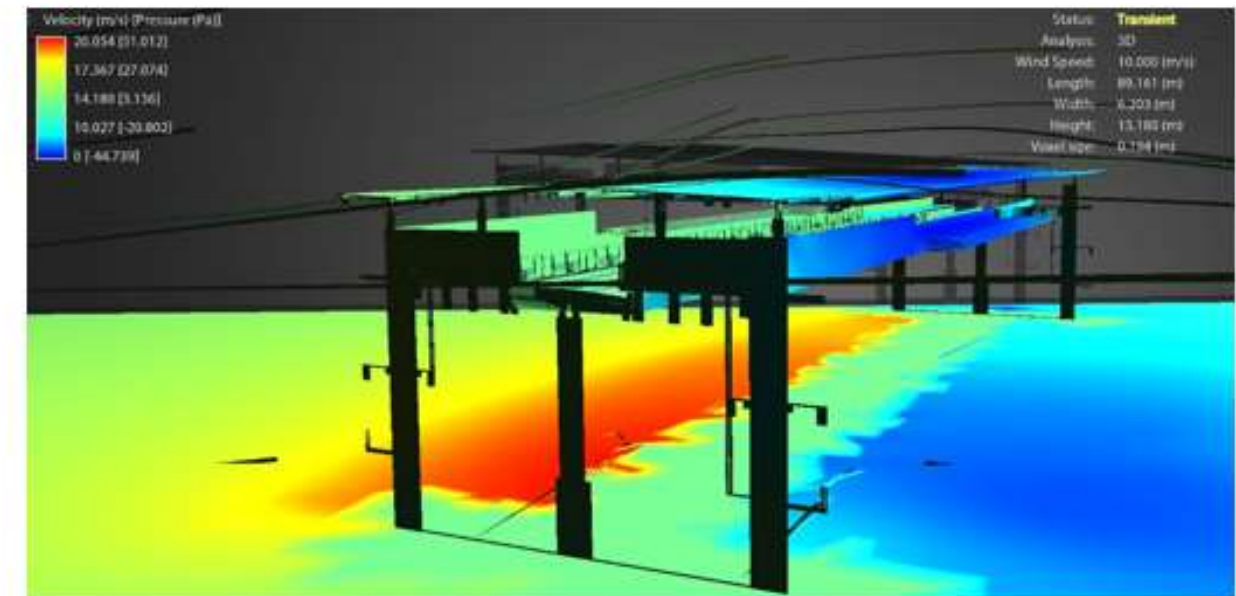
Model in the sun path diagram

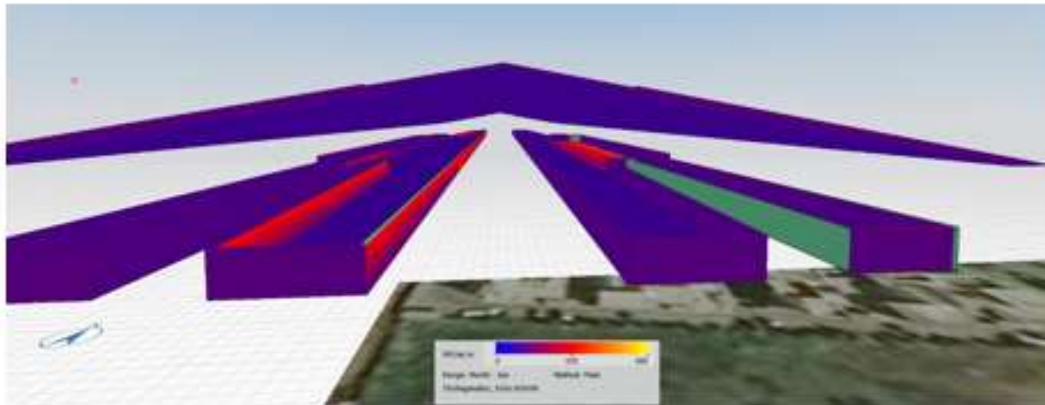


The station is oriented longitudinally on east and west side which also enhances the wind movement



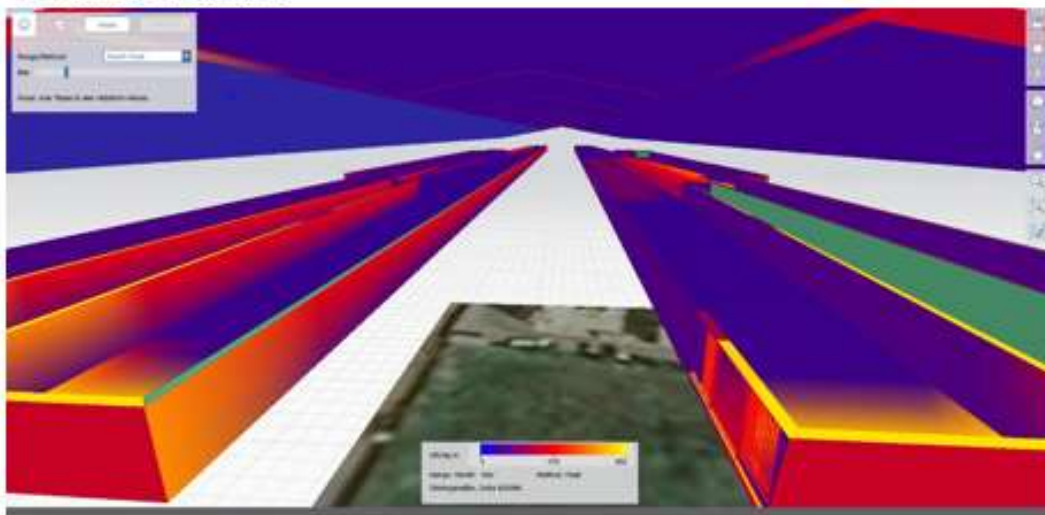
As we can see through the day lighting simulation option two with opening in the middle helps in creating a better daylight to the users.





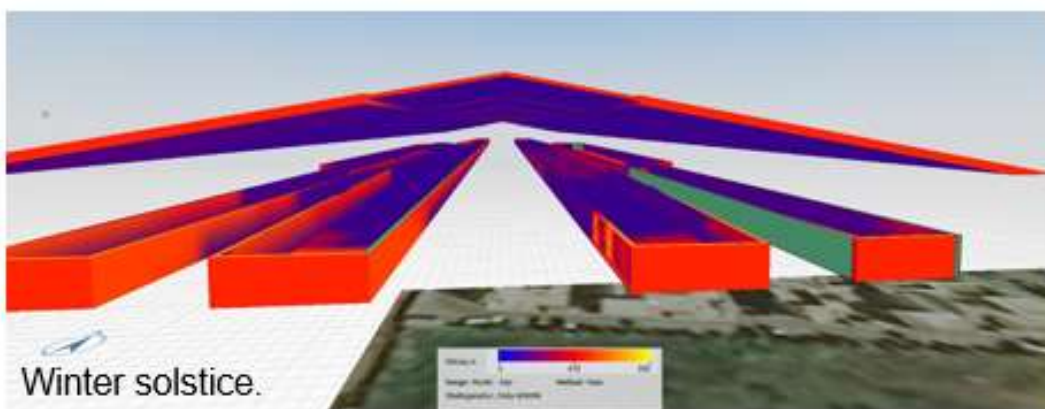
Summer solstice.

Summer solstice even though the overall required lighting is not achieved the above glazing helps enhance the visibility naturally



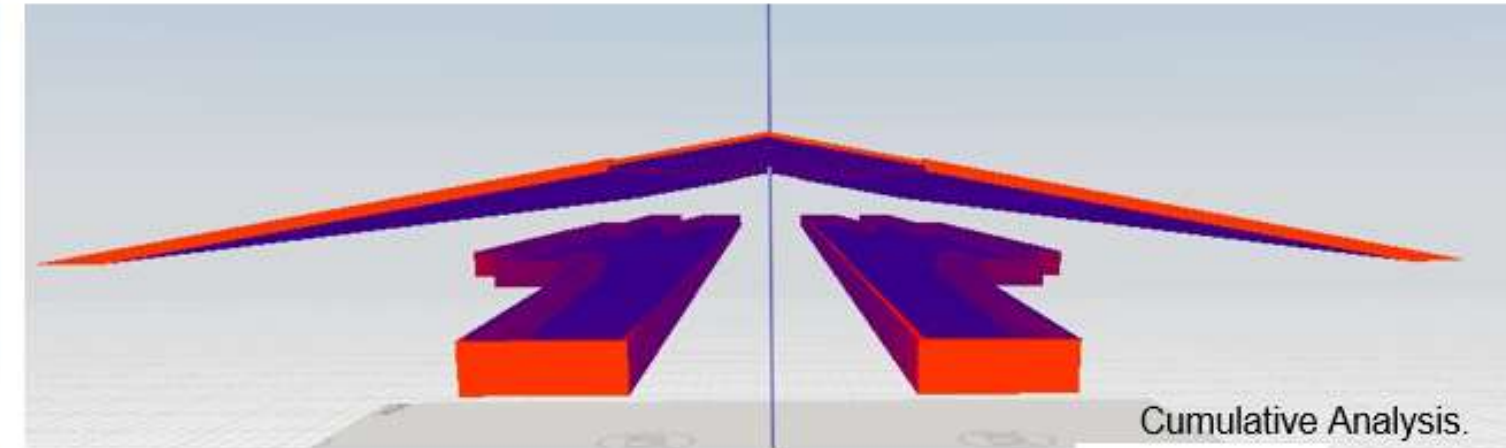
Equinox.

In equinox we can experience good radiation due to the above glazing.



Winter solstice.

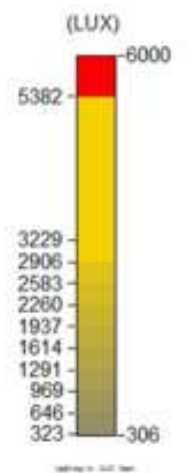
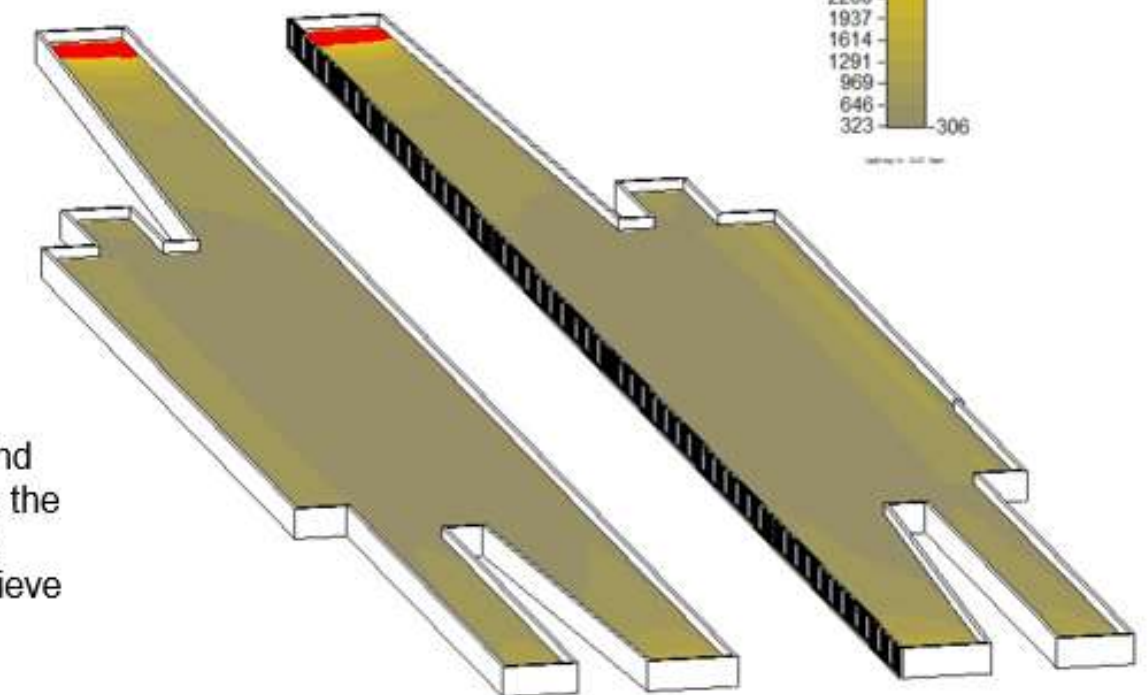
Winter solstice is also getting good amount of radiation with the help of above glazing.



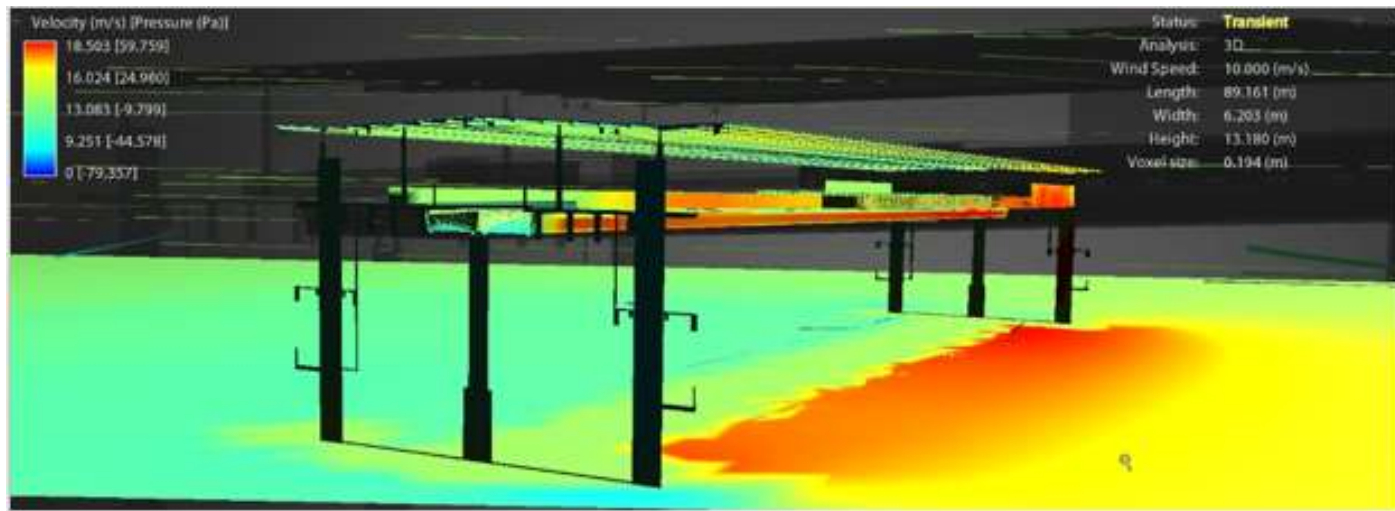
Cumulative Analysis.

The over all radiation analysis conveys that the radiation reduced to a greater extent.

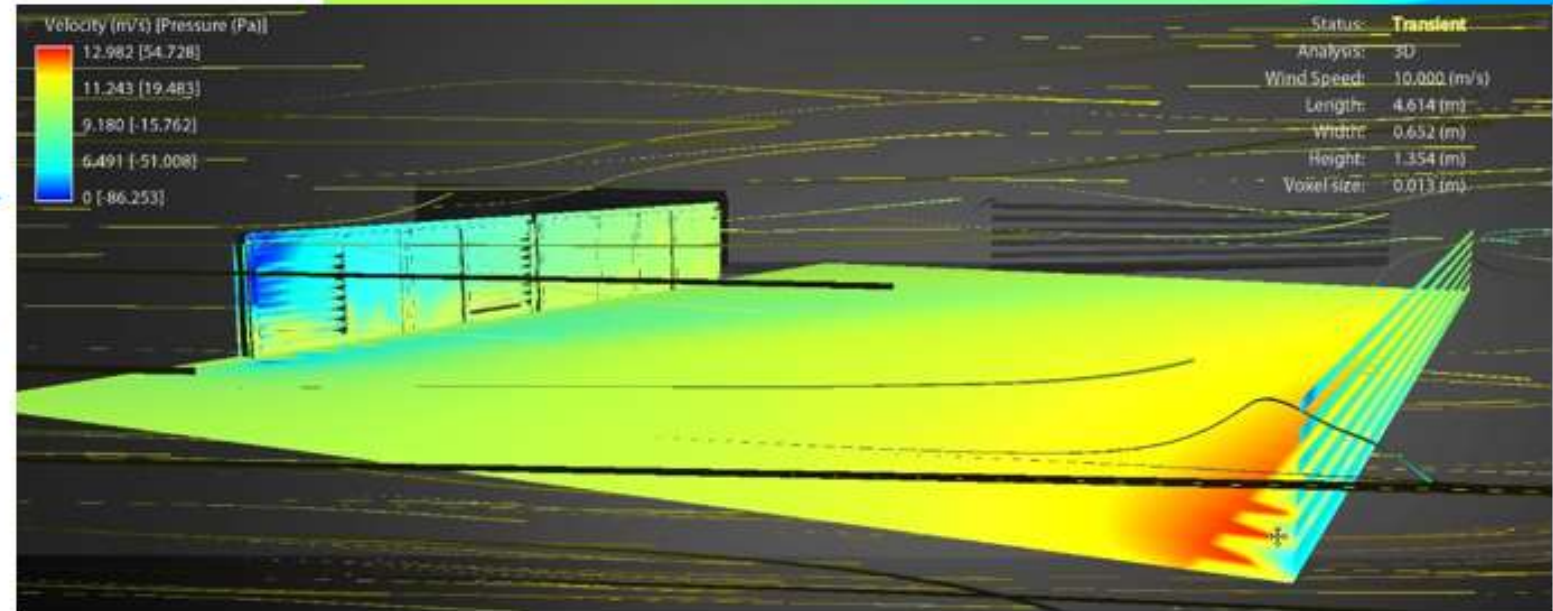
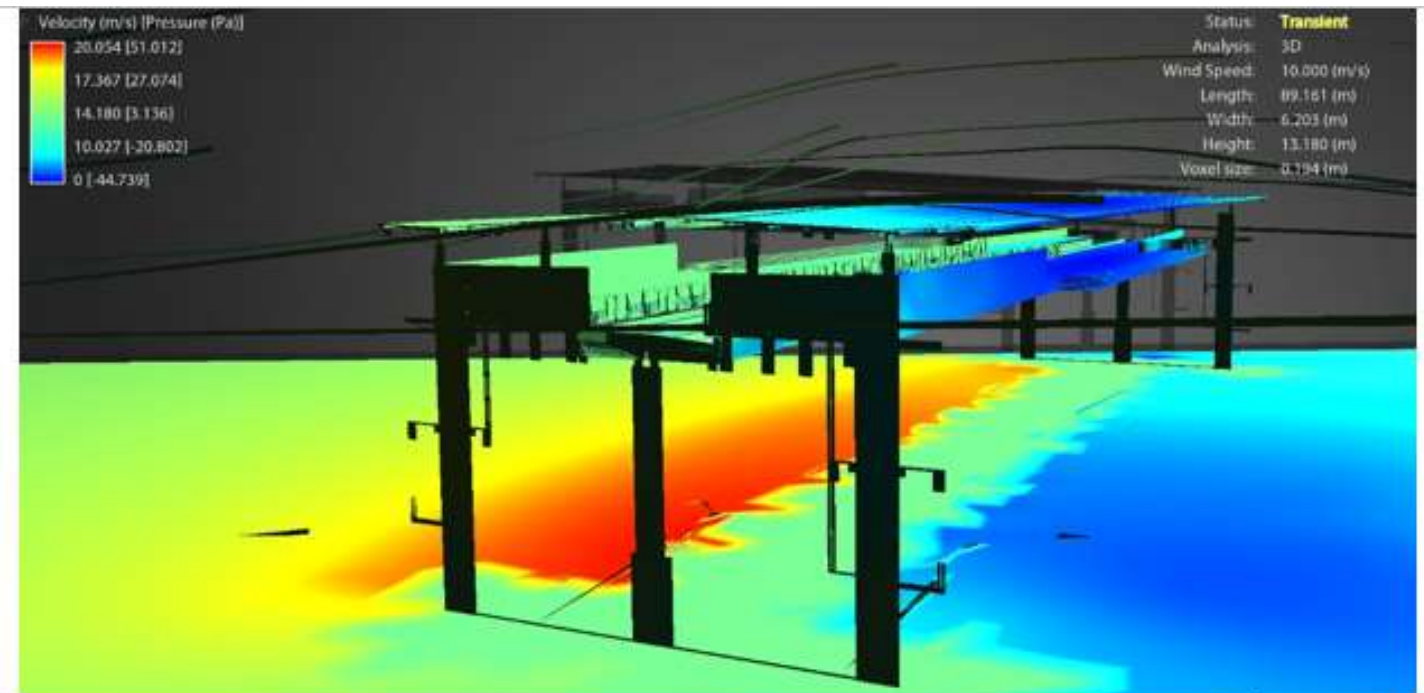
The daylight analysis proves that natural daylight could be achieved with the presence of skylight in the roof



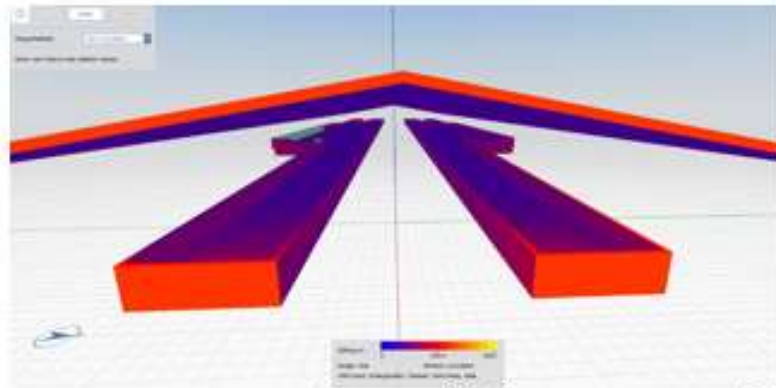
Max lux level achieved in the platform is around 323 – 646 lux. In the periphery of the station they achieve till 2260lux



Unobstructed wind movement is seen in all options, but the presence of grill helps in wind crossing the platform.

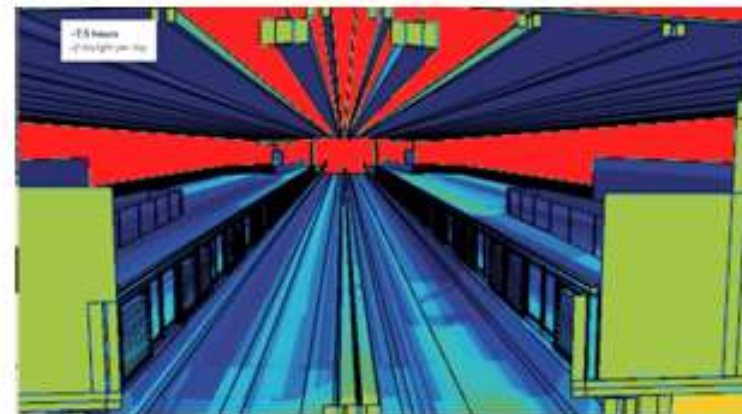
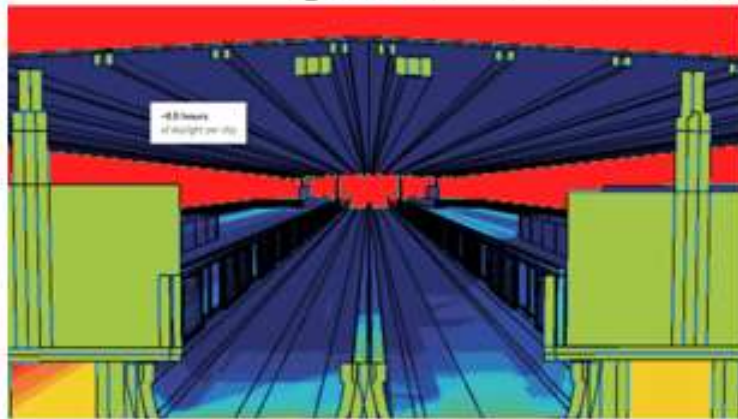
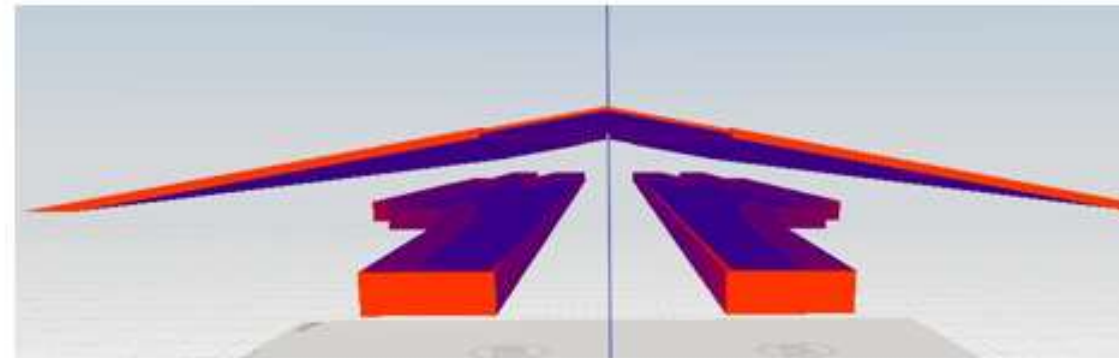


OPTION 1

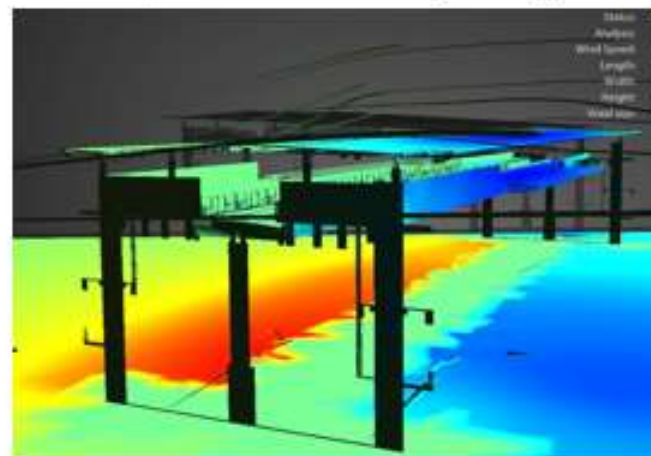
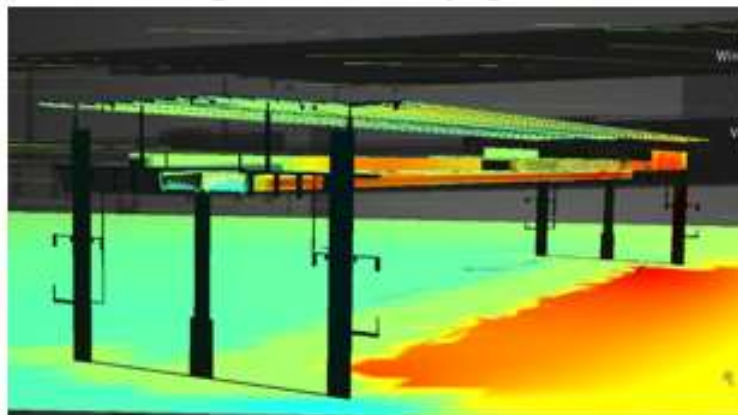


Even with the presence of skylight in the envelope the radiation is reduced to a greater extent due to shading device.

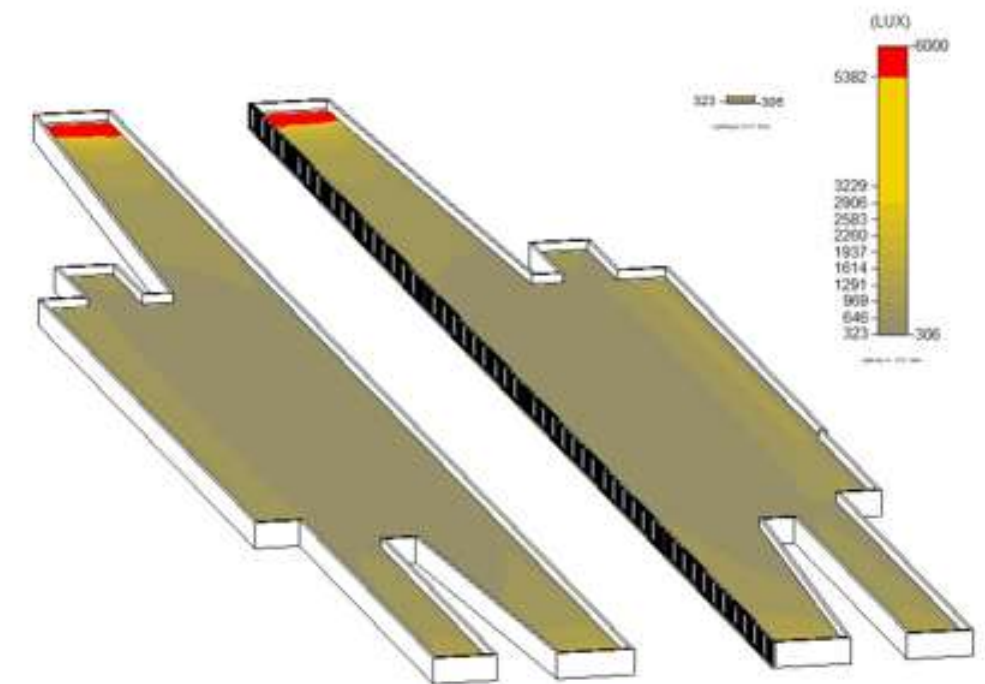
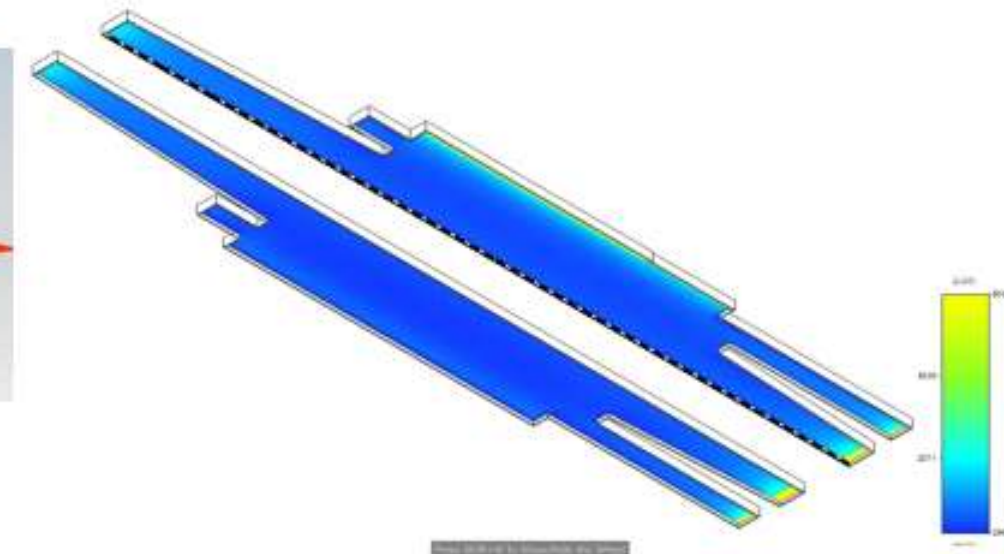
OPTION 2



As we can see through the day lighting simulation option two with opening in the middle helps in creating a better daylight to the users.



There is a better wind movement in option 2 and also there is only positive pressure which enhances the wind movement



Option 2 works better in receiving the natural day lighting with presence of skylight in the envelope.