

SUSTAINABLE SCHOOL WITH GLARE FREE DAYLIGHTING

A Thesis

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

by

AKSHAYA C (38890001)



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

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY) Accredited
with Grade "A" by NAAC**

JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600 119

MAY 2021



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BONAFIDE CERTIFICATE

This is to certify that this Report is the bonafide work of **AKSHAYA.C(39890001)** who carried out the Thesis entitled "**SUSTAINABLE SCHOOL WITH GLARE FREE DAYLIGHTING**" under our supervision from January 2021 to May 2021.

Internal guide
(Ar. SHEETAL
AMRAOTKAR)

Internal Panel Member
(Ar. SHEETAL AMRAOTKAR)

External guide
(Ar. BALAMURUGAN)

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

Submitted for Viva voce Examination held on _____

Internal Examiner

External Examiner

DECLARATION

I **AKSHAYA C** hereby declare that the Thesis Report entitled **“SUSTAINABLE SCHOOL WITH GLARE FREE DAYLIGHTING”** done by me under the guidance of **Ar. SHEETAL AMTAKOR**(Internal) and **Ar. P.S. GANESH, Principal Architect – GREENVIRON / Ar. BALAMURUGAN RAJKUMAR, Principal Architect -Proton Ateliers** (External) at Sathyabama Institute of Science and Technology is submitted in partial fulfillment of the requirements for the award of Master of Architecture degree in Sustainable Architecture.

DATE:

PLACE:

SIGNATURE OF THE CANDIDATE

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

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ABSTRACT

The use of daylight and natural ventilation has become an important strategy in schools to create better environmental quality and energy efficiency. These can be achieved by various passive strategies on the basis of various factors such as climatic condition, orientation, daylight, window openings and other features. This study is about the effect of window to wall ratio in absorptance of solar radiation on exterior wall area to that of glazed window to wall and natural ventilation on the thermal performance of the building. Daylight and Ventilation are the minimum basic requirement in any building condition. This paper shall also include some effective case studies. This study mainly includes about how to achieve mandatory daylight by the orientation of the building, the preliminary dissertation work includes about the amount of wwr ratio effective in schools and how they are being achieved, this also includes the literature and case studies about various schools in warm and humid climate and the design strategies used in developing their daylighting factor. The main aim of the project is to achieve better indoor environmental quality under various daylighting techniques. The comparative analysis of daylighting in various orientation and their performance towards the building. To achieve optimum daylighting and less heat through appropriate window wall ratio, mainly the study focuses on the visual comfort in the building through glare free design. The methodology of this design is through various design case studies and by orientating the building and achieving the better energy consumption space and also by having better daylighting strategies in the building surface. The simulations are done on identifying better window wall ratio and the performance of different floor levels.

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION :

The study based on incorporating daylight analysis within the building, and the energy efficient performance of the building.

1.2 AIM:

The main aim of the project is to design a sustainable school that operates completely on daylight in warm and humid climate based on the required daylighting standards.

1.3 OBJECTIVES:

- ☐ The main objective is to achieve better indoor environmental quality under various daylighting techniques.
- ☐ The comparative analysis of achieving the illuminance level at different orientations.
- ☐ The achieve optimum daylighting and less heat through appropriate window wall ratio.
- ☐ To achieve visual comfort through glare free design.
- ☐ The use of simulation and optimization tools to minimize the energy use for heating and lighting , reducing the discomfort and maximizing the useful daylight illuminance.

1.4 SCOPE:

The scope of this project is to develop a glare free school under daylight considerations standards in warm and humid climate, the study covers about 900 students capacity . Moreover, the scope is to achieve better indoor environmental quality and visual comfort within the building space.

1.5 LIMITATIONS:

This research has its limitation focusing mainly on the daylight aspects of the building and the height of the building is Limited upto G+2 floors.

1.6 METHODOLOGY:

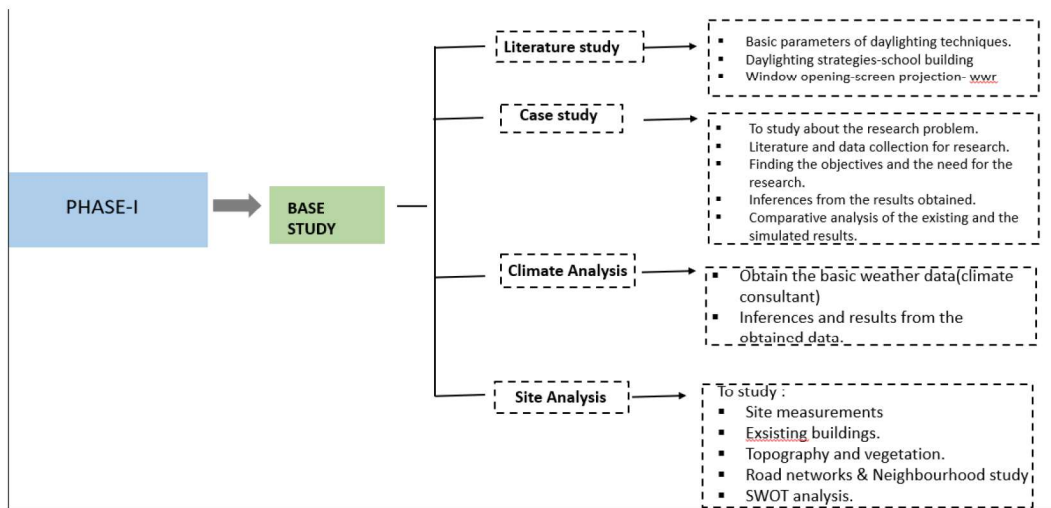


Table1.1 methodology

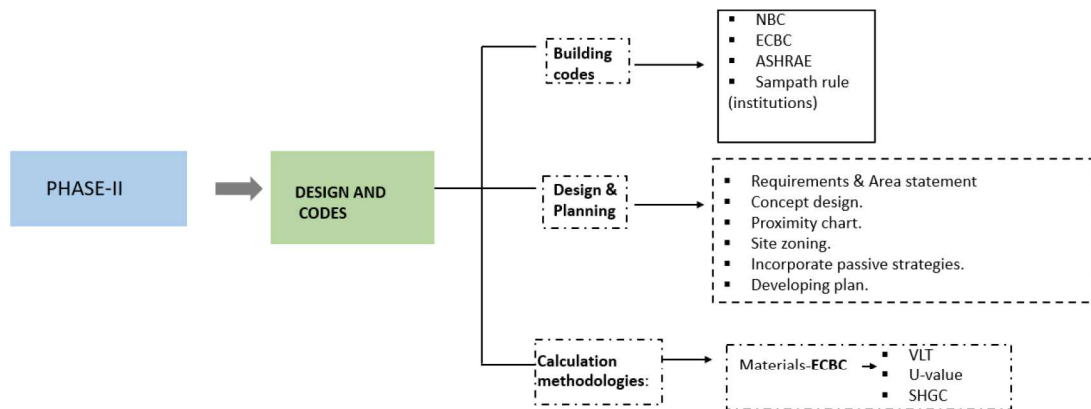


Table1.2 methodology

TIME PLOT- DRY BULB TEMPERATURE:

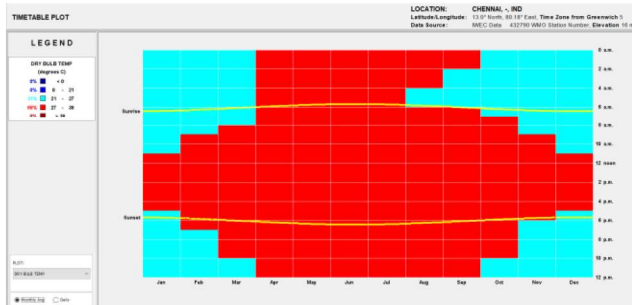


FIG 2.4 dry bulb temperature

TIME PLOT – RELATIVE HUMIDITY:

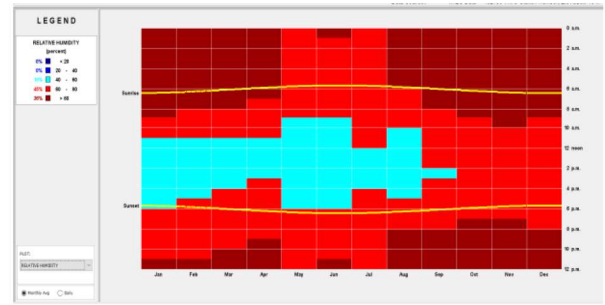
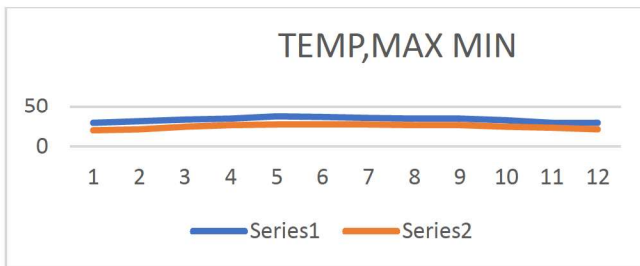


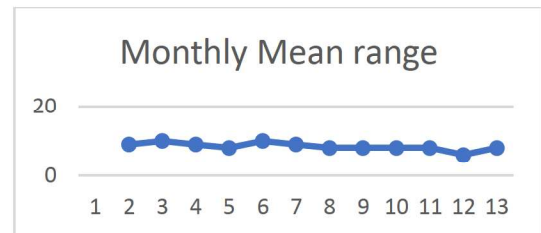
FIG 2.5 plot relative humidity

2.1.1 CLIMATE INFERENCES:

	J	F	M	A	M	J	JU	A	S	O	N	D
Monthly Mean Max	29	31	33	34	37	36	35	34	34	32	29	29
Monthly Mean Min	20	21	24	26	27	27	27	26	26	24	23	21
Monthly Mean range	9	10	9	8	10	9	8	8	8	8	6	8



GRAPH 2.1 temperature chart



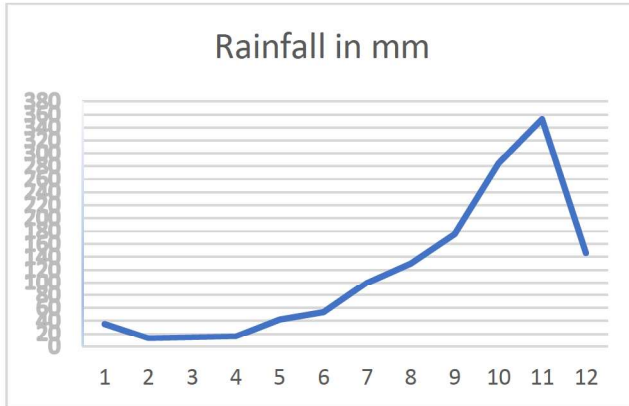
Graph 2.2 monthly mean range

INFERENCE:

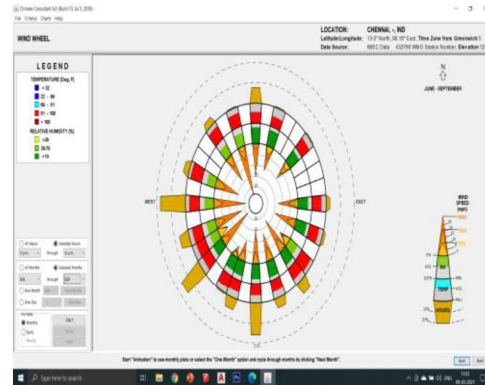
The maximum temperature is in the month of may and June more than 35° C. The min temp is from December and January month were the temp is about 20°C.

RAINFALL:

rainfall mm	35.3	13	14.5	15.9	42.4	53.9	99.6	129.9	175.5	284.6	353	146.3
-------------	------	----	------	------	------	------	------	-------	-------	-------	-----	-------



GRAPH 2.3 rainfall in mm



GRAPH 2.4 Windrose pattern

INFERENCE:

The rainfall is high during October and November (monsoon seasons), there is very least rainfall in the month of feb and march. The predominant wind direction is in the south west to north east direction.

Monthly Mean Max	29	31	33	34	37	36	35	34	34	32	29	29
Day Comfort upper	27	29	27	27	29	29	29	27	27	27	27	27
Lower	22	23	22	22	23	23	23	22	22	22	22	22
Monthly Mean Min	20	21	24	26	27	27	27	26	26	24	23	21
Night comfort upper	21	23	21	21	23	23	23	21	21	21	21	21
lower	17	17	17	17	17	17	17	17	17	17	17	17
Thermal stress day	H	H	H	H	H	H	H	H	H	H	H	H
Night	O	O	H	H	H	H	H	H	H	H	H	O

Table 2.1 mahoney's table

1]Orientation in North and South axis		
2]Open,Spacing for breeze penetration		
3]Rooms, single banked ,Permanent provision for air movement		
4]Large openings 40-80%		
5]Light walls, short time-lag		
6]Light , insulated roofs		
7]In north and south walls at body height on windward side		
8]exclude direct sunlight, protect from rain		
9]Adequate rainwater drainage		

PASSIVE STRATEGIES:

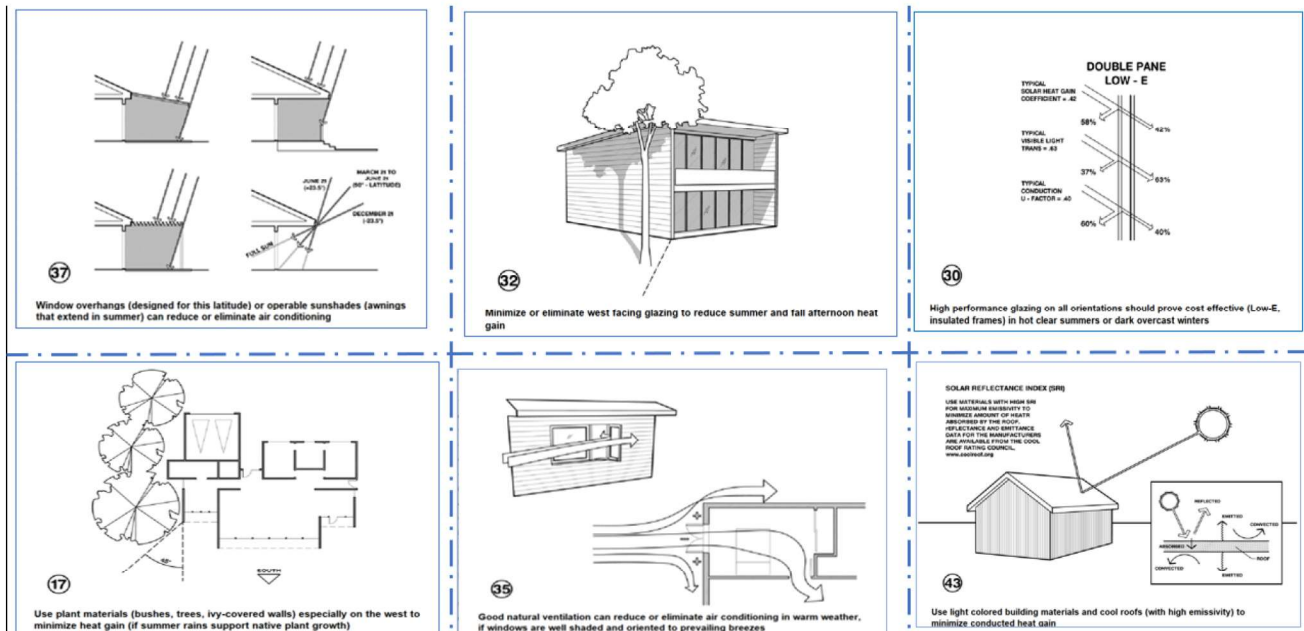


Fig 2.7 passive strategies

2.2 SITE ANALYSIS

SITE INTRODUCTION:



FIG 2.8 site image

The total geographical area of village is 518.17 hectares. Adhanur has a total population of 7,663 peoples. There are about 1,925 houses in Adhanur village. Nandivaram - guduvancheri is nearest town to Adhanur which is approximately 3km away.

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POPULATION OF ADHANUR:

Total Population	Male Population	Female Population
7,663	3,852	3,811

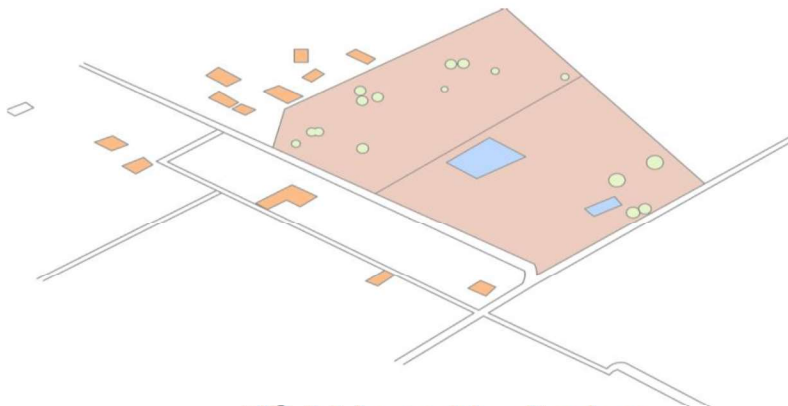


FIG 2.9 isometric site view

SWOT ANALYSIS:

STRENGTH:

- There is already an existing primary school and the site land use is under institution category.
- This school might enhance the institutional space within the particular locality.
- The site has access to all the basic amenities within 3km of distance.

WEAKNESS:

- The site has very less vegetation and is a barren land.
- The site is locality in the interior , which may need vehicular access to the site.

OPPOURTUNITIES:

- This creates a opportunity for higher secondary school in the locality.

THREATS:

- The site has very less vegetation, to reduce the temperature inside the building with maximum of materials available.

2.2.1 SITE INFERENCES:

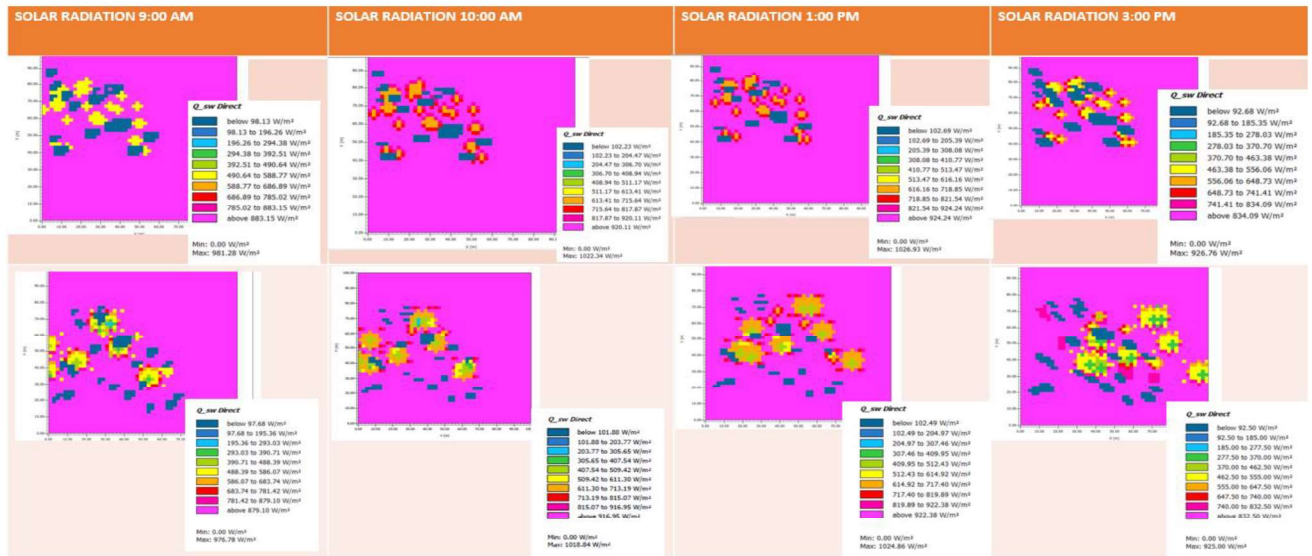


Table 2.2.1 envimet analysis (solar radiation chart)

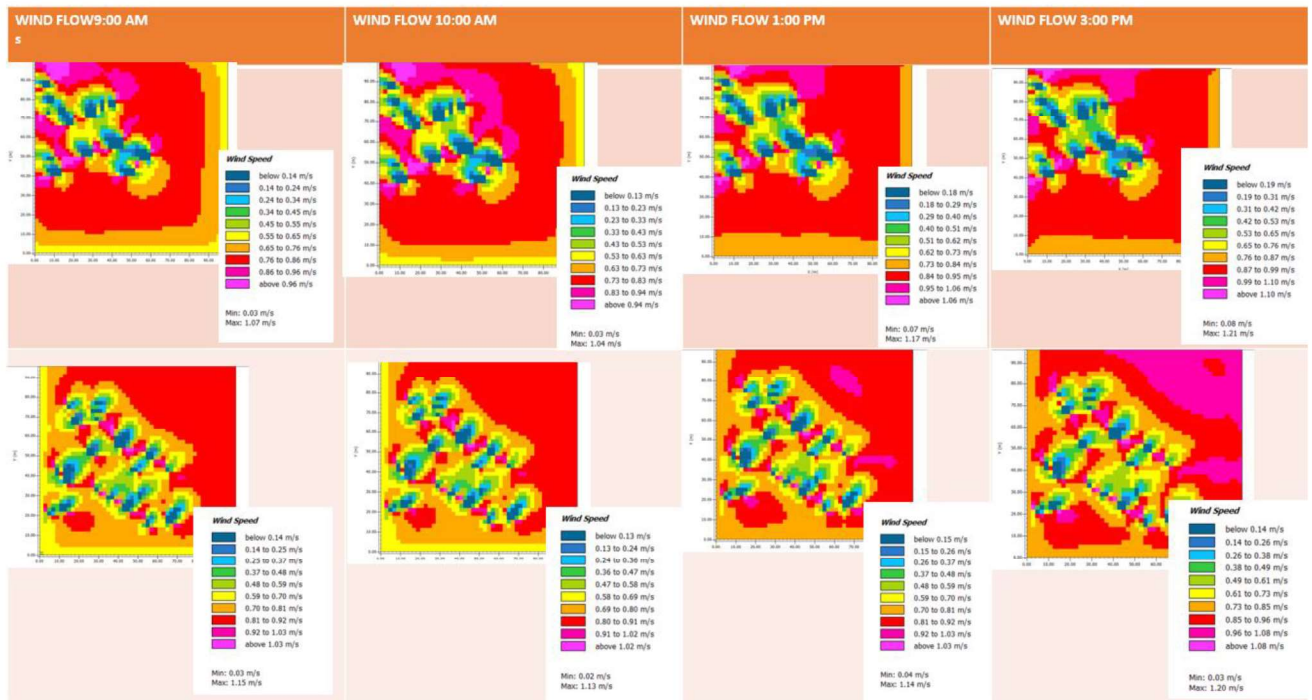


Table 2.2.2 envimet analysis (windflow chart)

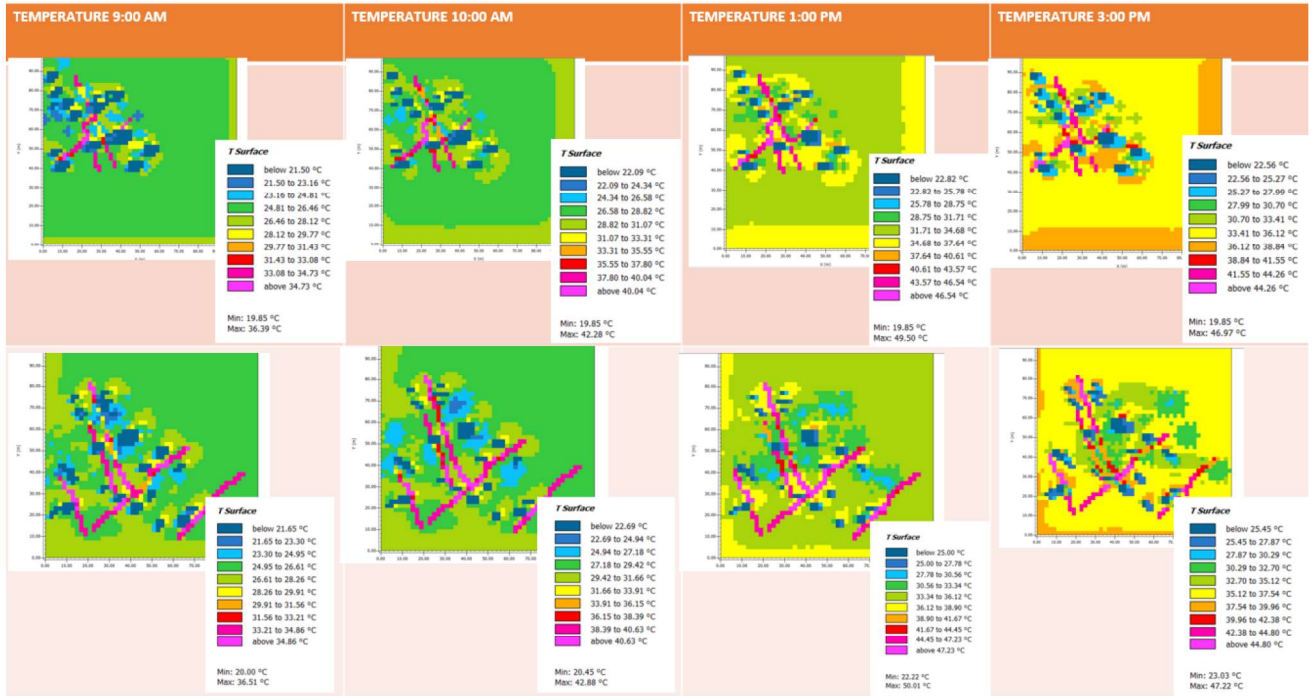


Table 2.2.3 envimet analysis (temperature chart)

CHAPTER -3

CASE STUDY ANALYSIS AND INFERENCES

AIM OF THE STUDY:

The main aim of the study was to bring the efficient benefits in the curriculum of the students with the building structure itself, 1. Design

strategies to improve :

1. Thermal comfort
2. natural ventilation
3. Reduced solar insolation
4. daylight

2. Operations

1. Reduced energy & water consumption
2. Waste management
3. Material efficiency

3. Curriculum

1. LEED LAB

DESIGN REQUIREMENTS:

- Classroom to design for about 25 students.
- Acceptable comfortable range between 40°C and the relative humidity between 40-60%.
- 300 lux in every classroom.

MAIN FOCUS OF THE STUDY:

- Reducing unwanted **solar gains**,

- Promoting **daylight** with minimal internal gain,
- Promoting **natural ventilation**,
- On-site **renewable energy** production.



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- Average Temperature Range: **25°C in winter to 31°C in summer**. Low variation between summer and winter.
- **March – September can be considered summer and Oct – Feb as winter**
- Peak summer **May and June**, school is closed
- 6°C Diurnal variation in Dry Bulb temperature allows night cooling between 11 PM – 6 AM



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- Annual average **73%**
- Below average is May to July (62 – 69% RH)
- Above average is Oct to Dec (72 – 83 % RH)
- In diurnal variation RH is high during 10 PM – 6 AM (**above 85% RH**)
- RH is low between 10 AM – 4 PM
- Most of the seasonal rainfall happens during the north-east monsoon (October to December)



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d

- Annual average is **2.3 m/s**
- Above average is April – Aug, peaking in late May
- Late afternoons bring high wind everyday
- Predominant wind direction is from **South, South-west and South-east**
- **North and Northeast** also bring in winds in Jan - March

OBJECTIVE 1:

Utilize an **integrated design** process for a high quality and costeffective output.

OBJECTIVE 2:

Discuss various **passive solar measures** to be used in the initial design planning of a new educational campus

OBJECTIVE 3:

Assess various **green technology alternatives** that aim to make the built environment truly sustainable.

OBJECTIVE 4:

Understand how green school enhances the **health and well-being** of the people inside the building

OBJECTIVE 5:

Green in curriculum – understand how **Learning lab** is integrated

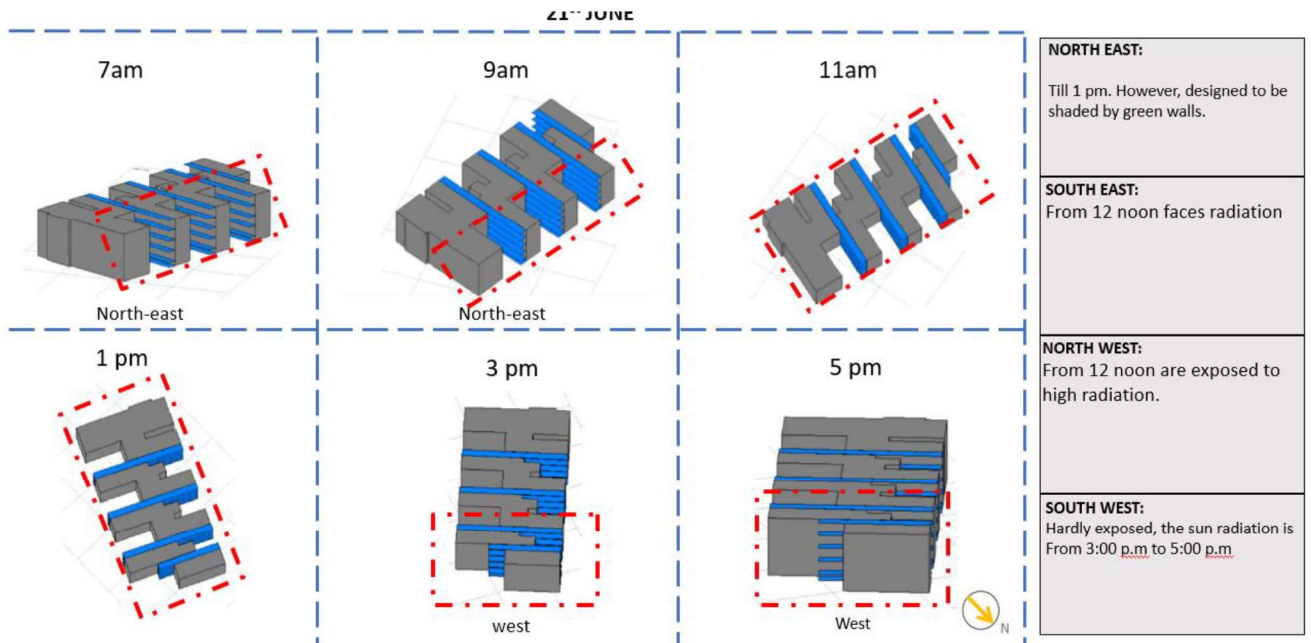


FIG 3.1 solar radiation summer solsitice

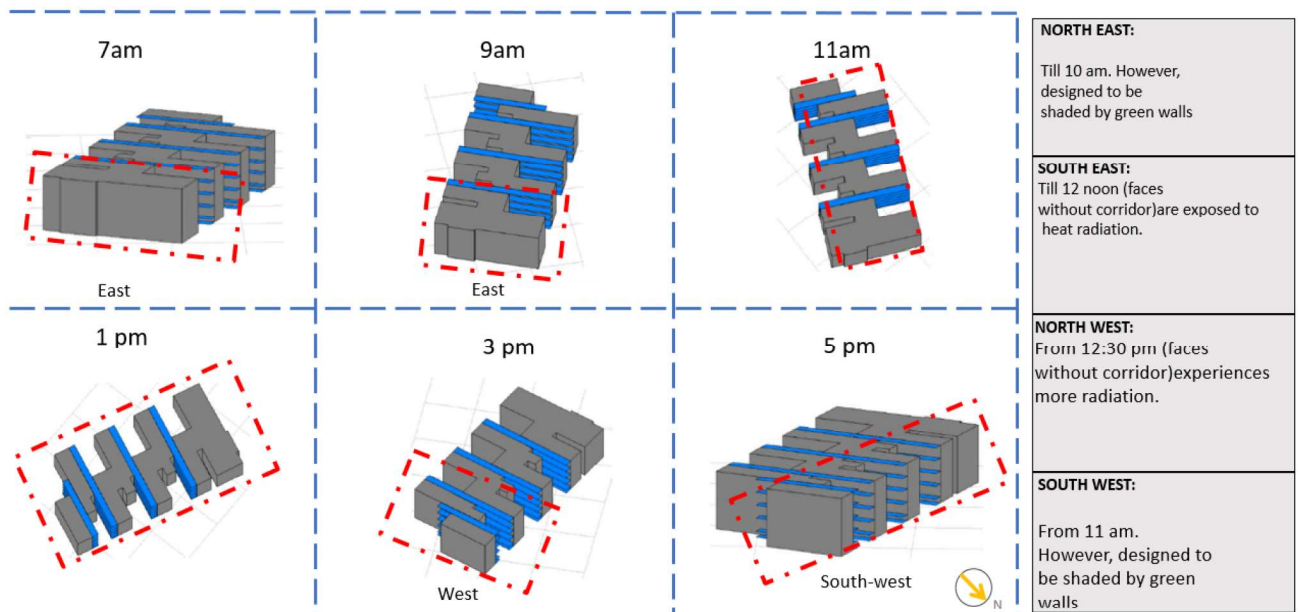


FIG 3.2 solar radiation equinox

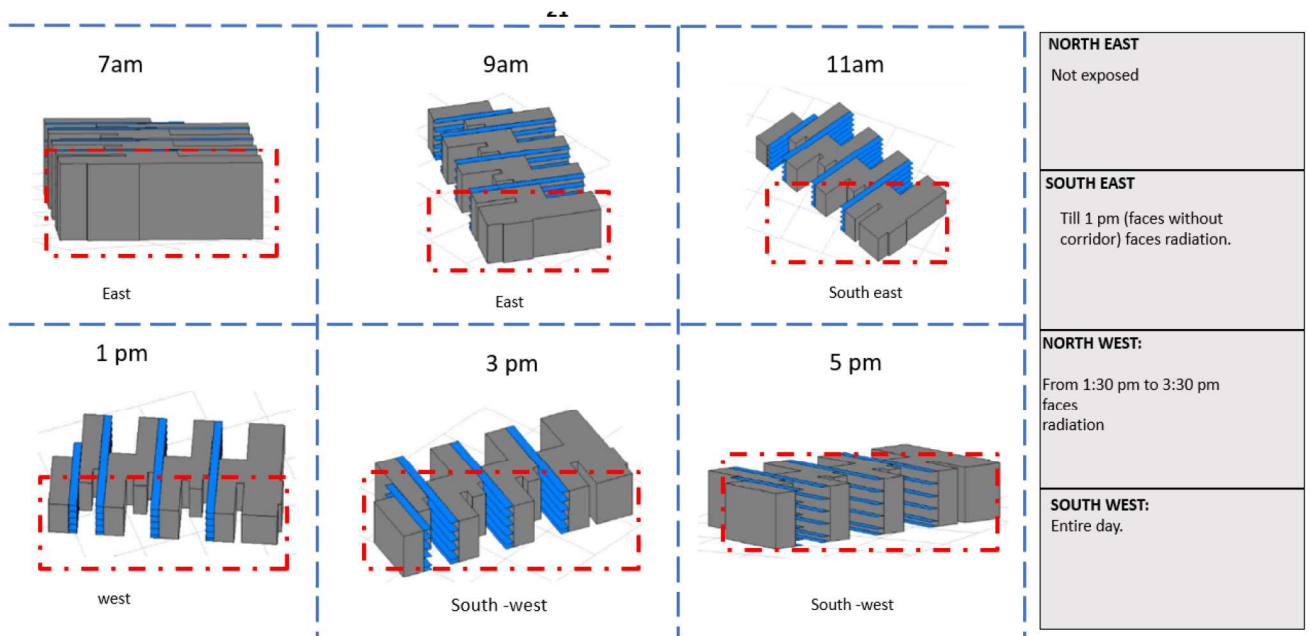
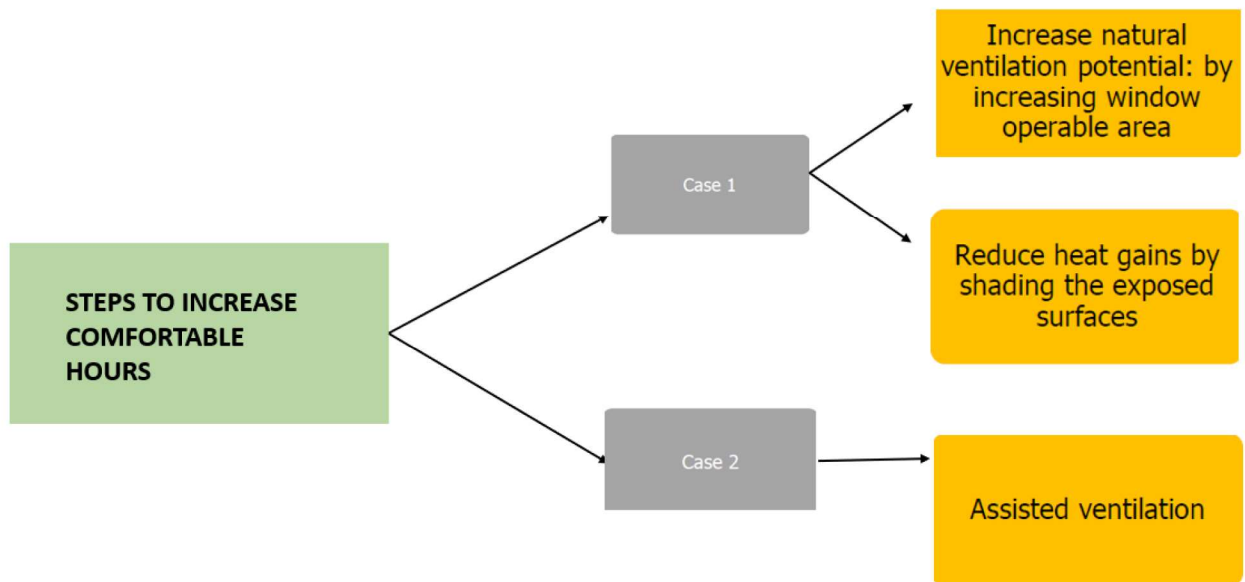


FIG 3.3 solar radiation winter solstice

GREEN ALTERNATIVES:



CASE 1: INCREASING OPERABLE AREA OF THE WINDOW

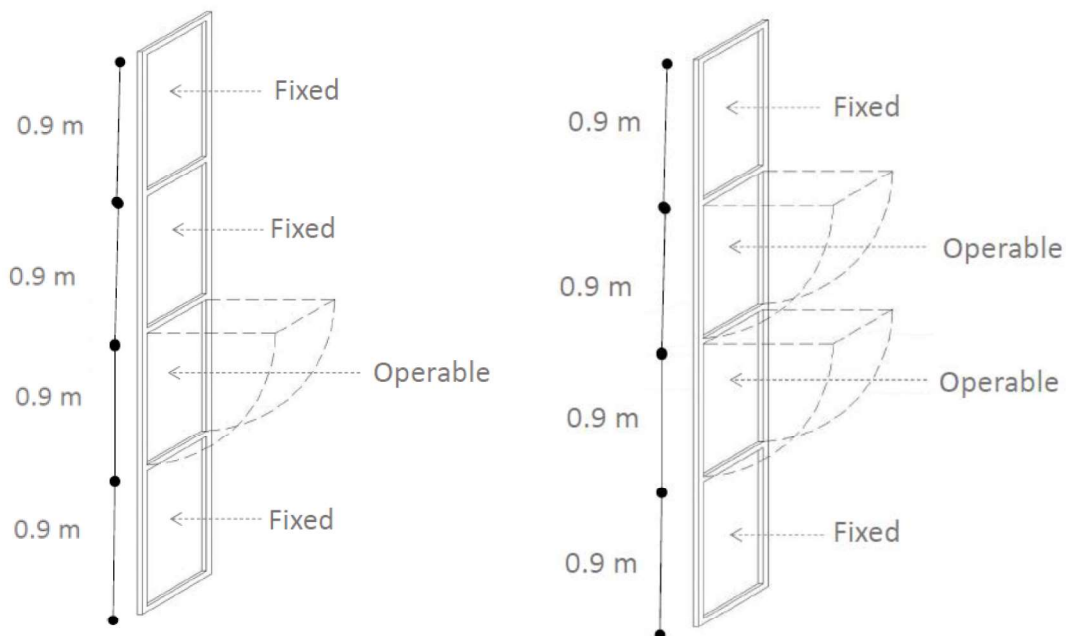


FIG 3.4 WINDOW OPENINGS BASE AND PROPOSED CASE

INITIAL STAGE:

Only second pane was operable

REDUCE HEAT GAINS BY SHADING EXPOSED SURFACES:



WALL:

WALL: Insulated walls are used in South N East and North West to minimize heat gain

Green walls are used in South West and North East to

reduce heat gain



PASSIVE DESIGN STRATEGIES:

BUILDING ENVELOPE

- Wall and roof insulation

VENTILATION

- Shaded roof w/ SRI paint

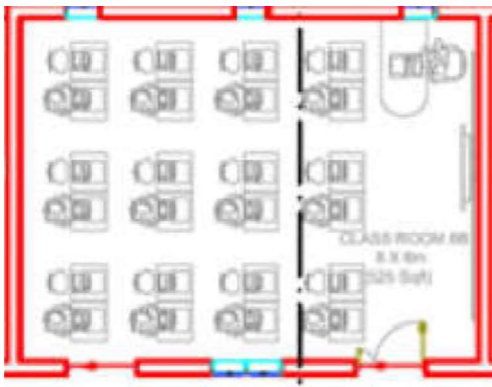
Plume effect and cross Ventilation, Turbo-ventilator for night

flushing to increase thermal lag

THERMAL COMFORT

In winters, turbo ventilator to ventilate during daytime

DAYLIGHT ANALYSIS:



BASE CASE: 3 windows on west wall and 1 door on east wall

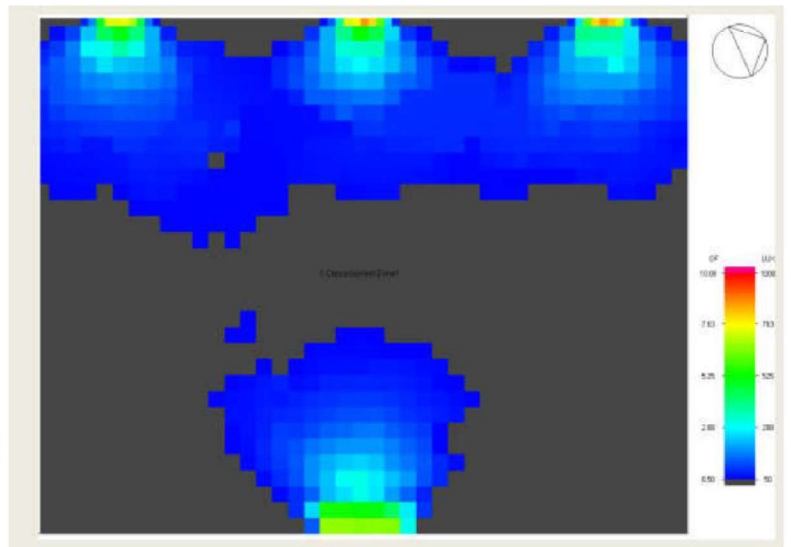


Fig 3.4 Basecase daylight analysis

Proposed case:
3 windows on west wall and

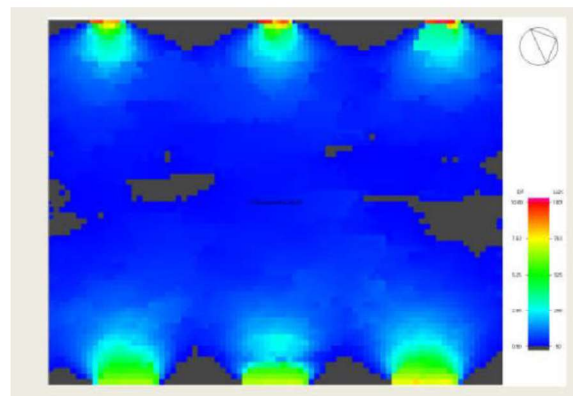
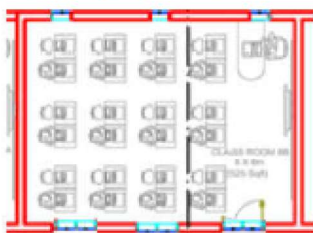


Fig 3.5 proposed case daylight analysis

CHAPTER -4

CONCEPT EVOLUTION AND ORIENTATION

CONCEPT :

The interlinking of buildings together to connect more spaces together, and interconnecting of spaces together. The main design goal is to impart knowledge of the need and importance of sustainability

Principles in students, with the design itself acting as a teaching tool.

Each classroom is provided with an outdoor private green space which allows students to interact with nature and compensate for green area consumed.

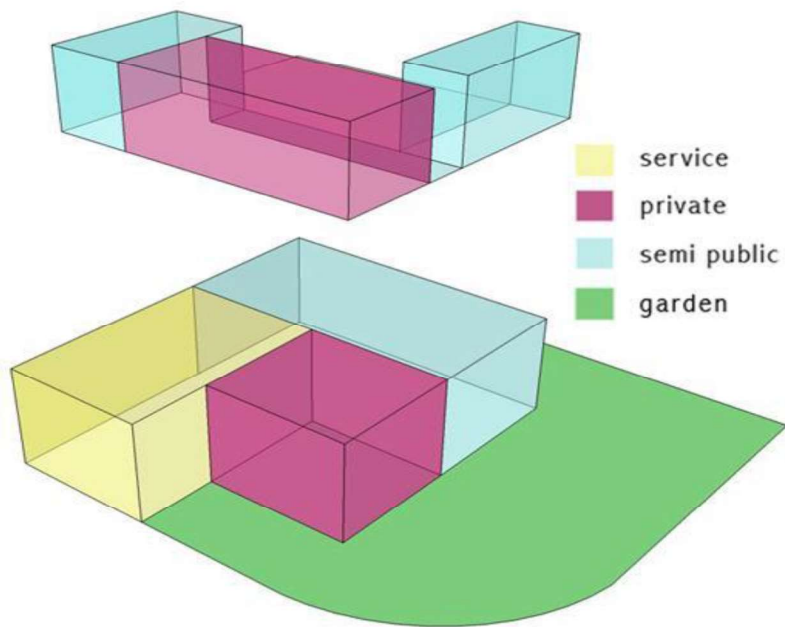


FIG 4.1 concept development

Creation of courtyard space between two classroom area.

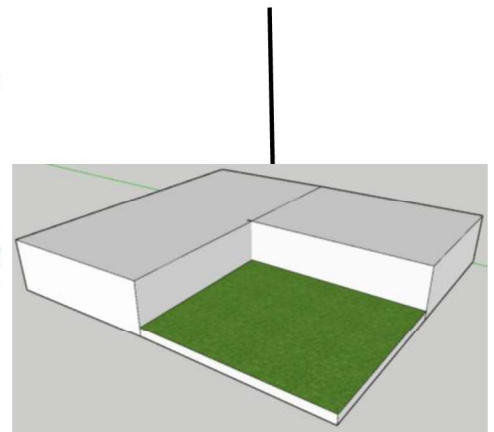
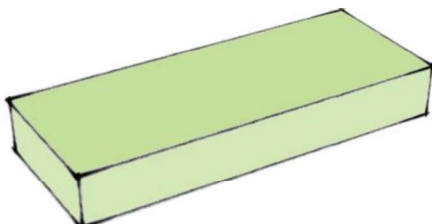


Fig 4.2 concept

Rectangular shape



Classrooms

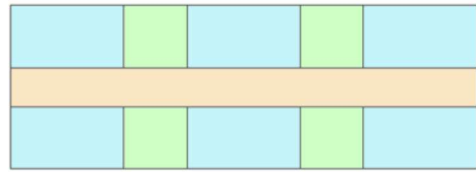


Fig 4.3 rectangular view

Fig 4.4 plan

L- shape Building

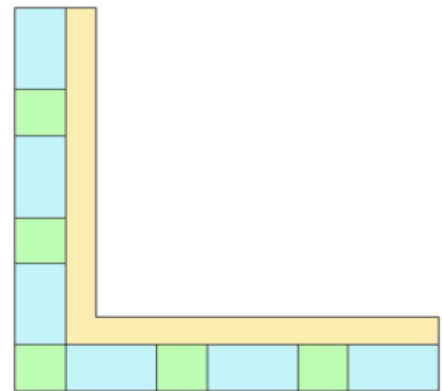
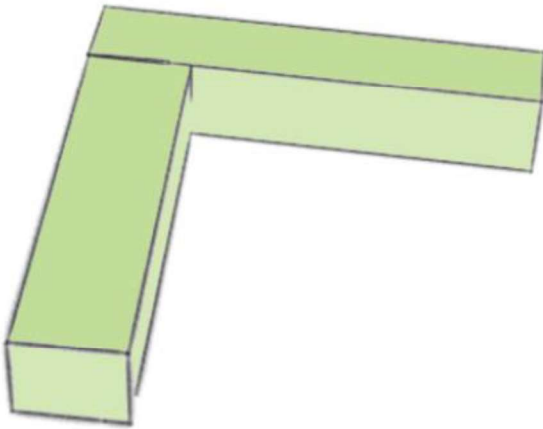
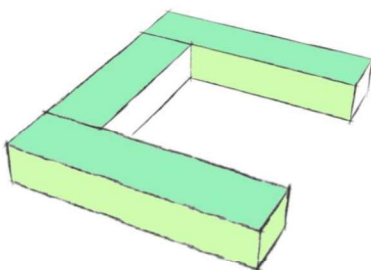


Fig 4.5 L-shape view

Fig 4.6 L-shape plan

C-shape Building



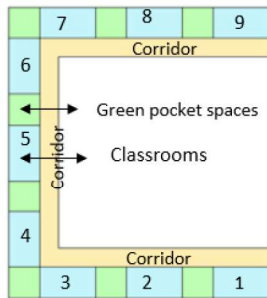


Fig 4.7 c-shape plan

Fig 4.8 plan

4.1 ORIENTATION ANALYSIS

RECTANGULAR FORM

FORM	ORIENTATION	NORTH	EAST	INFERENCE
RECTANGULAR FORM	NORTH			North radiation: 689.19 kWh/m2 East radiation: 1014 kWh/m2
		SOUTH	WEST	
				South radiation: 695.45 kWh/m2 West radiation: 1096 kWh/m2

Table 4.1.1 rectangular form orientation north

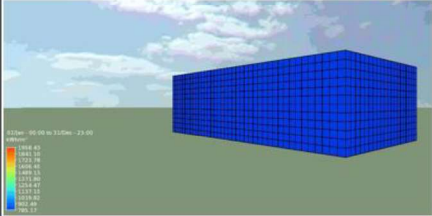
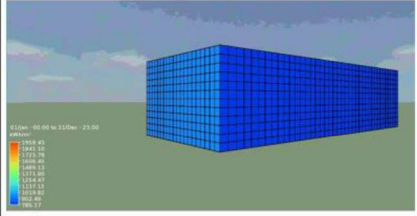
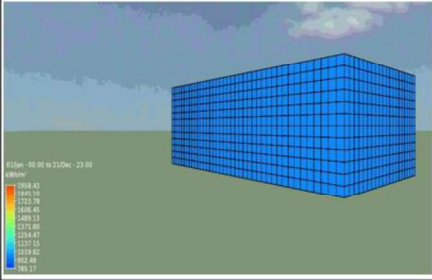
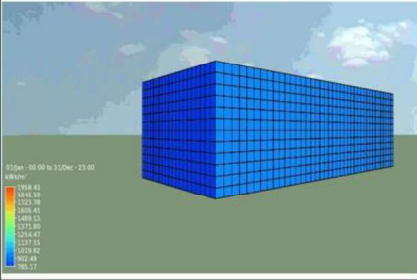
FORM	ORIENTAT ION	NORTH	EAST	INFERENCE
RECTANGU LAR FORM	NORTH EAST, SOUTH WEST			North radiation:787.19 kwh/m2 East radiation:787.19 kwh/m2
		SOUTH	WEST	
				South radiation:1019.17 kwh/m2 West radiation:1137.15 kwh/m2

Table 4.1.2 rectangular form orientation northeast,southwest

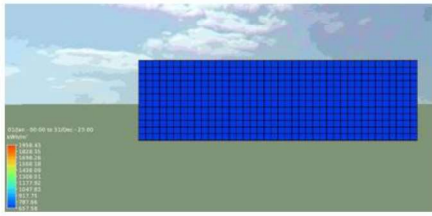
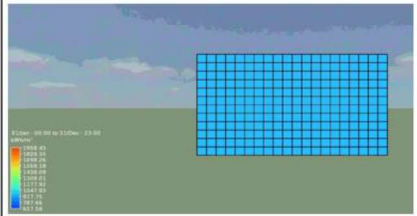
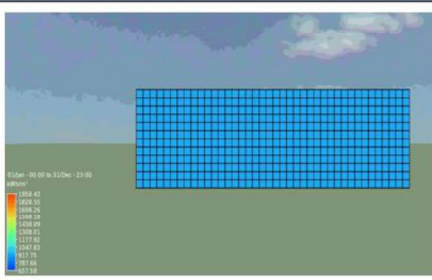
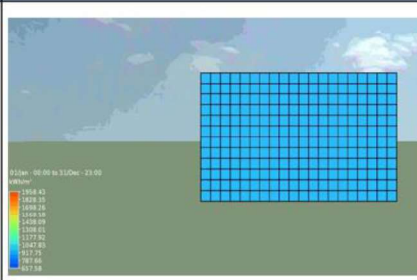
FORM	ORIENTAT ION	NORTH	EAST	INFERENCE
RECTANGU LAR FORM	SOUTH			North radiation:657.58 kwh/m2 East radiation:1043.87 kwh/m2
		SOUTH	WEST	
				South radiation:1047.83 kwh/m2 West radiation:1047.83 kwh/m2

Table 4.1.3 rectangular form orientation south

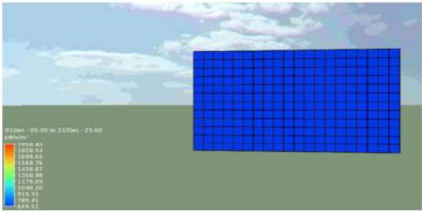
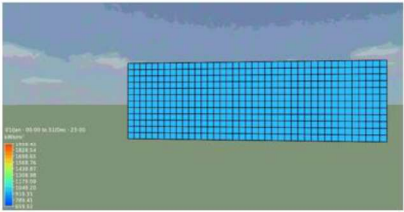
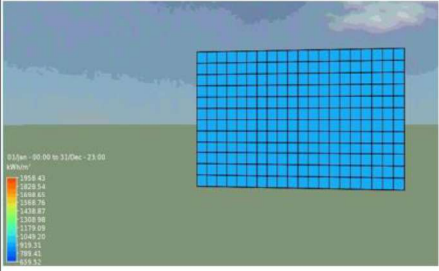
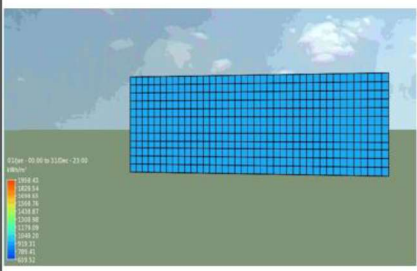
FORM	ORIENTATION	NORTH	EAST	INFERENCE
RECTANGULAR FORM	NORTH WEST, SOUTH EAST			North radiation:659.52 kwh/m2 East radiation:919.31 kwh/m2
		SOUTH	WEST	
				South radiation:919.31 kwh/m2 West radiation:1049.82 kwh/m2

Table 4.1.4 rectangular form orientation northwest, southeast

L-SHAPED BUILDING:

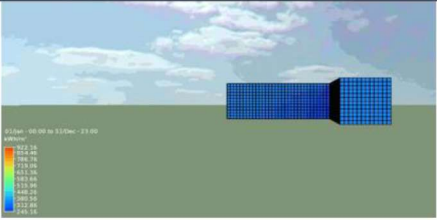
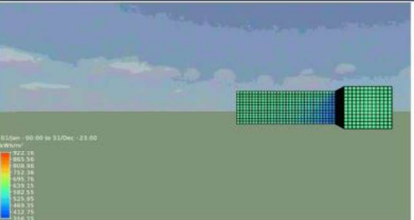
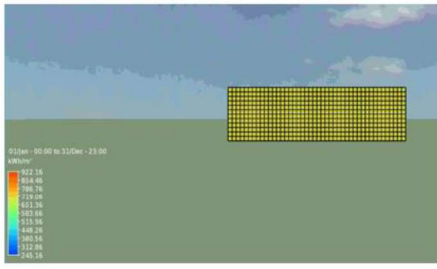
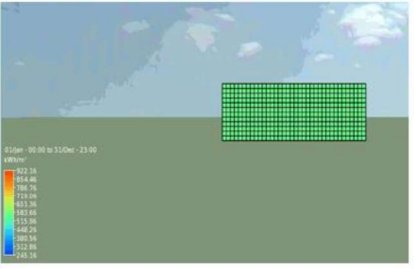
FORM	ORIENTATION	NORTH	EAST	INFERENCE
L-SHAPED-FORM	NORTH			North radiation:312.86kwh/m2 East radiation:639.16 kwh/m2
		SOUTH	WEST	
				South radiation:719.06 kwh/m2 West radiation:583.66 kwh/m2

Table 4.1.4 L-shaped form orientation north

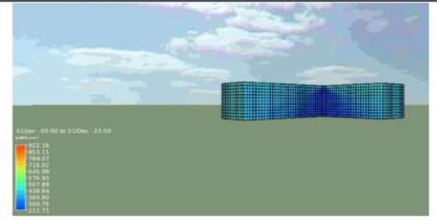
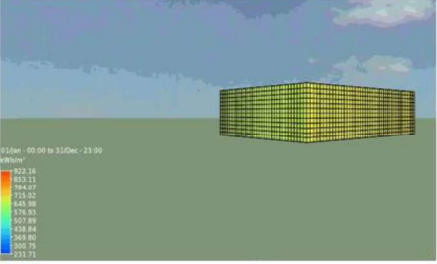
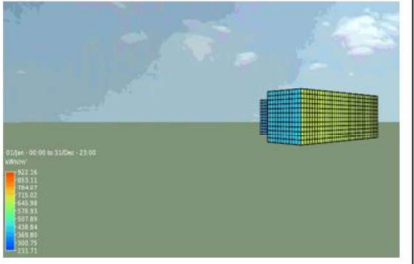
FORM	ORIENTATION	NORTH	EAST	INFERENCE
L-SHAPED-FORM	NORTH EAST, SOUTH WEST			North radiation:369.80 kwh/m2 East radiation:715 kwh/m2
		SOUTH	WEST	
				South radiation:715.02 kwh/m2 West radiation:438 -645 kwh/m2

Table 4.1.5 L-shaped form orientation northeast,southwest

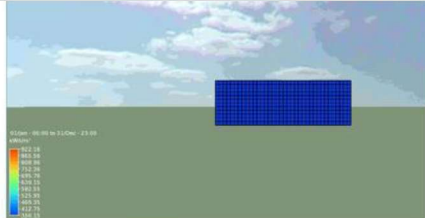
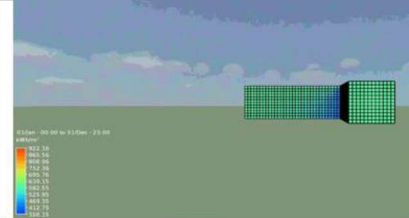
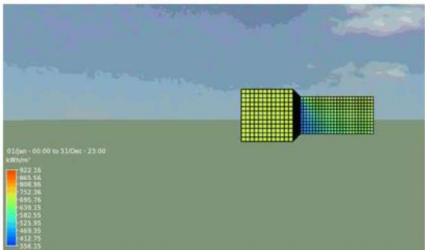
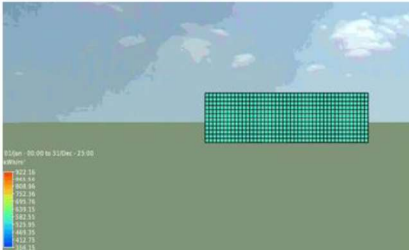
FORM	ORIENTATION	NORTH	EAST	INFERENCE
L-SHAPED-FORM	SOUTH			North radiation:356.15 kwh/m2 East radiation:696.75 kwh/m2
		SOUTH	WEST	
				South radiation:695.76 kwh/m2 West radiation:582.55 kwh/m2

Table 4.1.6 L-shaped form orientation south

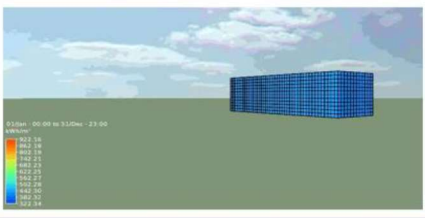
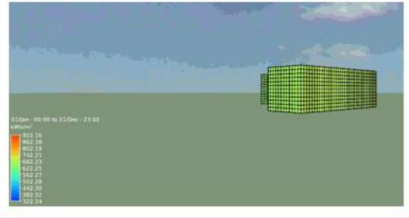
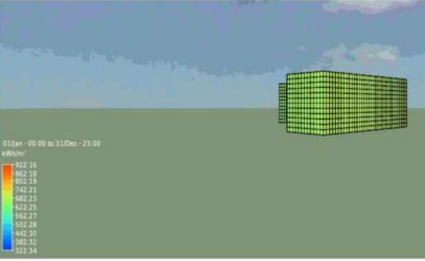
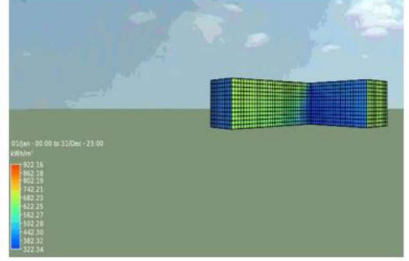
FORM	ORIENTATION	NORTH	EAST	INFERENCE
L-SHAPED-FORM	NORTH WEST, SOUTH EAST			North radiation:382.82 kwh/m2 East radiation:682.23 kwh/m2
		SOUTH	WEST	
				South radiation:622.25 kwh/m2 West radiation: 382.82 – 622.25 kwh/m2

Table 4.1.7 L-shaped form orientation northwest, southeast

C- SHAPED FORM:

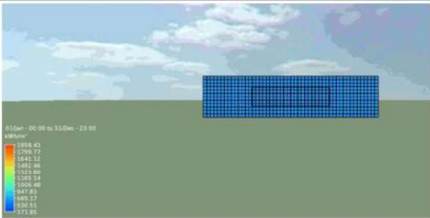
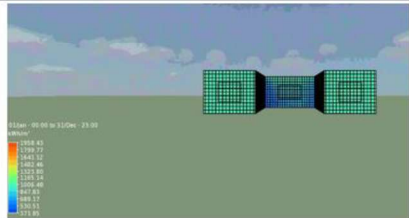
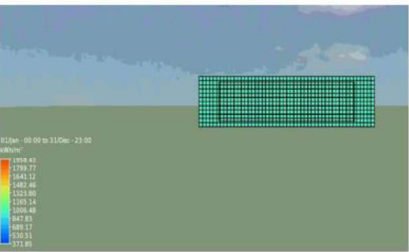
FORM	ORIENTAT ION	NORTH	EAST	INFERENCE
C SHAPED- FORM	NORTH			North radiation: 530.51 kwh/m2 East radiation:1006.48 kwh/m2
		SOUTH	WEST	
				South radiation:1016 kwh/m2 West radiation:1006.48 kwh/m2

Table 4.1.8 C-shaped form orientation north

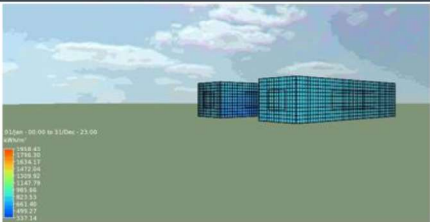
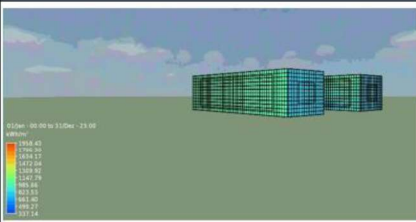
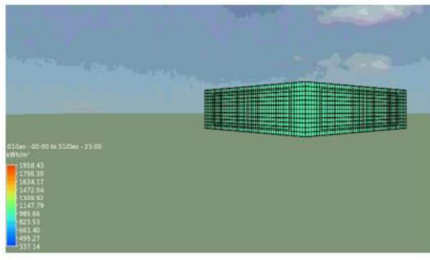
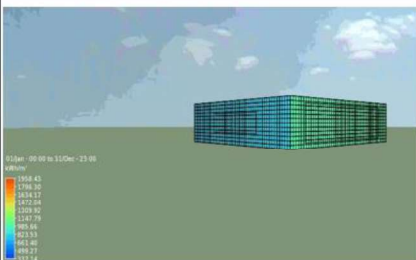
FORM	ORIENTAT ION	NORTH	EAST	INFERENCE
C-SHAPED- FORM	NORTH EAST, SOUTH WEST			North radiaton:661.40 kwh/m2 East radiation: 823-1147 kwh/m2
		SOUTH	WEST	
				South radiation:1147.79 kwh/m2 West radiation:823-1147 kwh/m2

Table 4.1.8 C-shaped form orientation northeast ,southwest

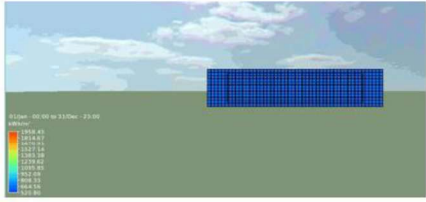
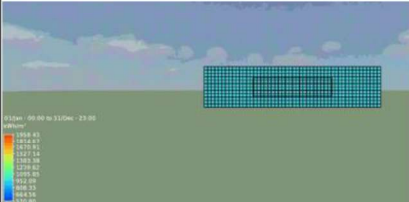
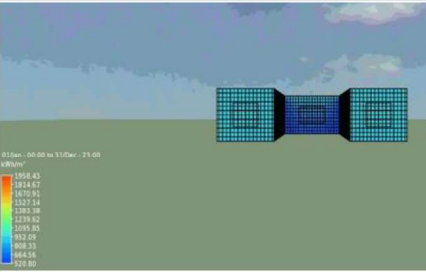
FORM	ORIENTAT ION	NORTH	EAST	INFERENCE
C-SHAPED- FORM	SOUTH			North radiation:520.80 kwh/m2 East radiation:1095.85 kwh/m2
		SOUTH	WEST	
				South radiation:520 kwh/m2 1067.76 kwh/m2 West radiation:952.09 kwh/m2

Table 4.1.9 C-shaped form orientation south

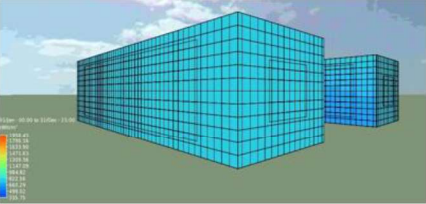
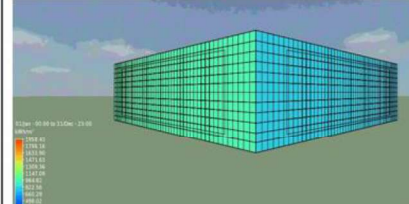
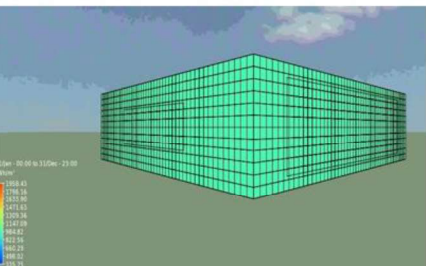
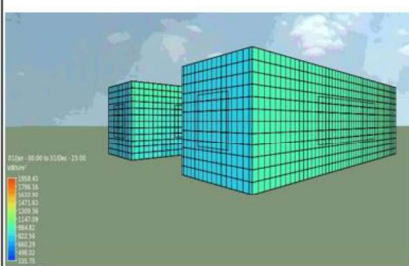
FORM	ORIENTAT ION	NORTH	EAST	INFERENCE
C-SHAPED- FORM	NORTH WEST, SOUTH EAST			North radiation:822.56 kwh/m2 East radiation:822 -1147 kwh/m2
		SOUTH	WEST	
				South radiation:984.82 kwh/m2 West radiation:822 -984 kwh/m2

Table 4.1.10 C-shaped form orientation southeast,northwest

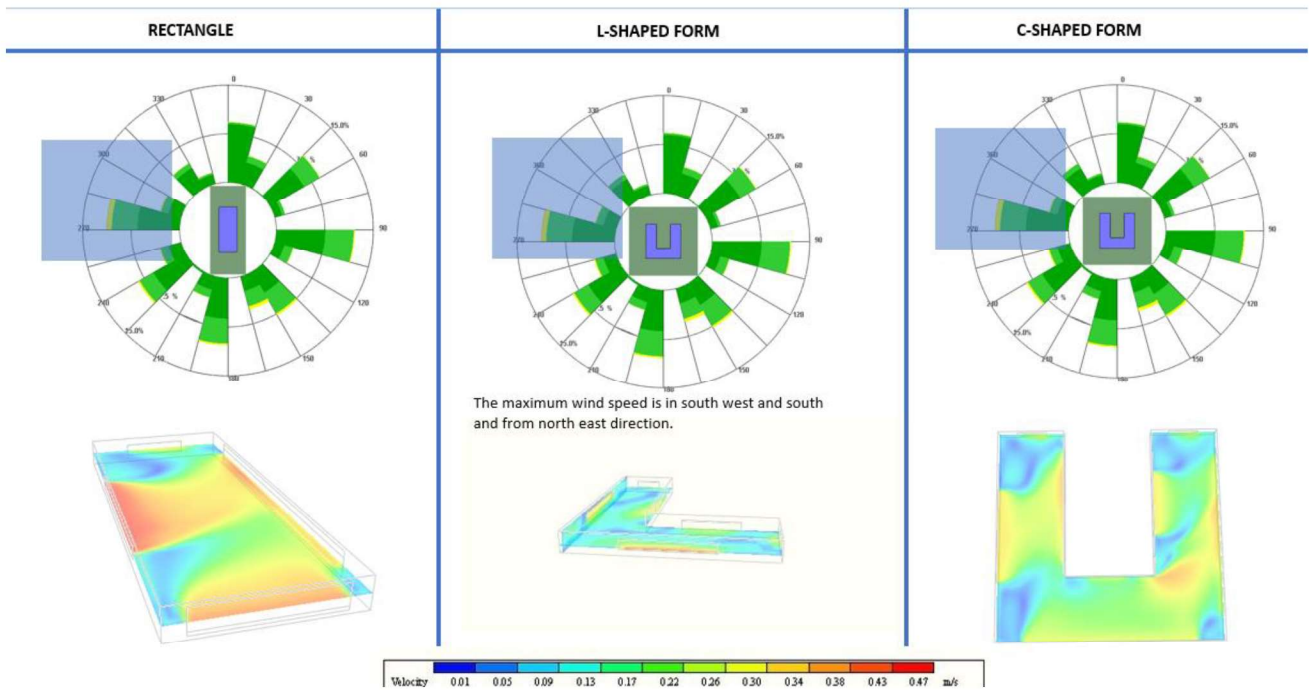


Table 4.1.11 ventilation analysis

RECTANGULAR FORM	NORTH	SOUTH	EAST	WEST
NORTH	689 kwh/m2	1014 kwh/m2	886 kwh/m2	1096 kwh/m2
NORTH EAST	787.19 kwh/m2	1019.17 kwh/m2	787.19 kwh/m2	936.15 kwh/m2
SOUTH	657.58 kwh/m2	1047.83 kwh/m2	1043.87 kwh/m2	1047.83 kwh/m2
NORTH WEST	659.52 kwh/m2	919.31 kwh/m2	919.31 kwh/m2	1049.82 kwh/m2

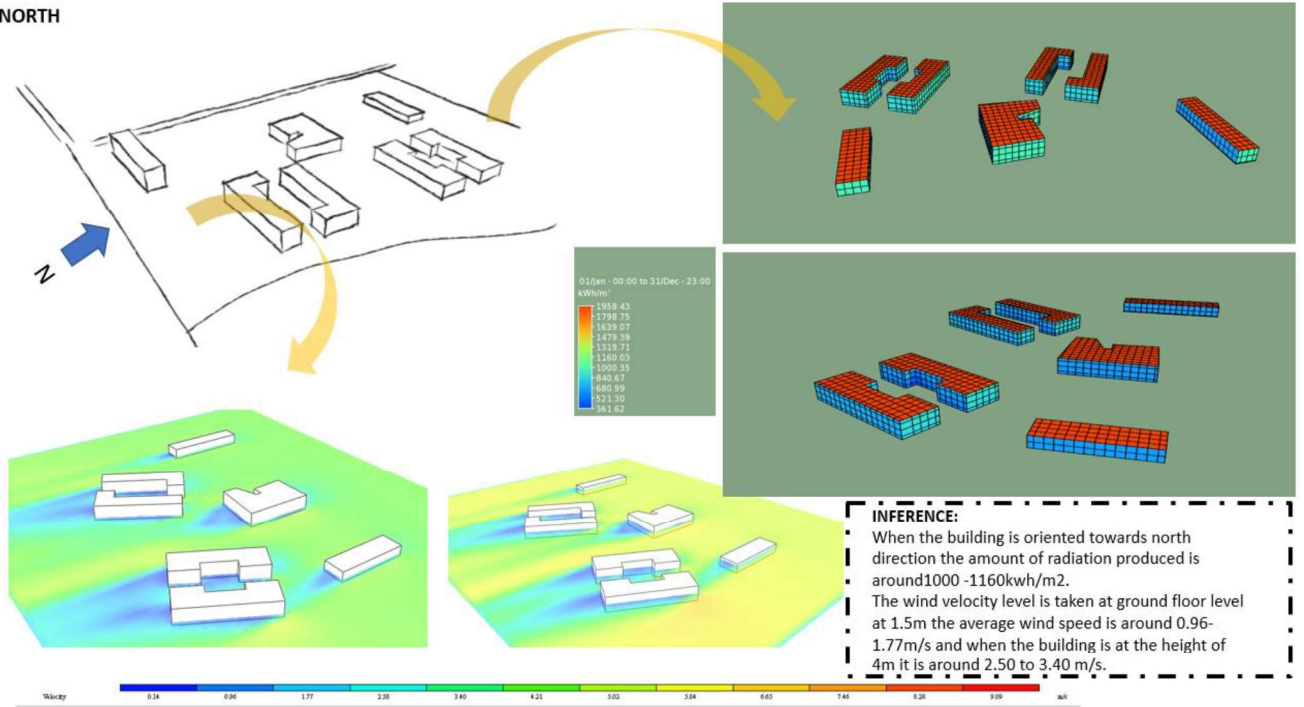
L SHAPED FORM	NORTH	SOUTH	EAST	WEST
NORTH	313 kwh/m2	719.06kwh/m2	715kwh/m2	583.66 kwh/m2
NORTH EAST	369.80 kwh/m2	715.02 kwh/m2	639 kwh/m2	438 -645 kwh/m2
SOUTH	356.15 kwh/m2	695.76 kwh/m2	696.75 kwh/m2	582.55 kwh/m2
NORTH WEST	382.82 kwh/m2	622.25 kwh/m2	682.23 kwh/m2	382.82 – 622.25 kwh/m2

C-SHAPED FORM	NORTH	SOUTH	EAST	WEST
NORTH	530.51 kwh/m2	1016 kwh/m2	1006.48 kwh/m2	1006.48 kwh/m2
NORTH EAST	661.40 kwh/m2	1147.79 kwh/m2	823-1147 kwh/m2	823-1147 kwh/m2
SOUTH	520.80 kwh/m2	520 kwh/m2-1067.76	1095.85 kwh/m2	952.09 kwh/m2
NORTH WEST	822.56 kwh/m2	984.82 kwh/m2	822 -1147 kwh/m2	822 -984 kwh/m2

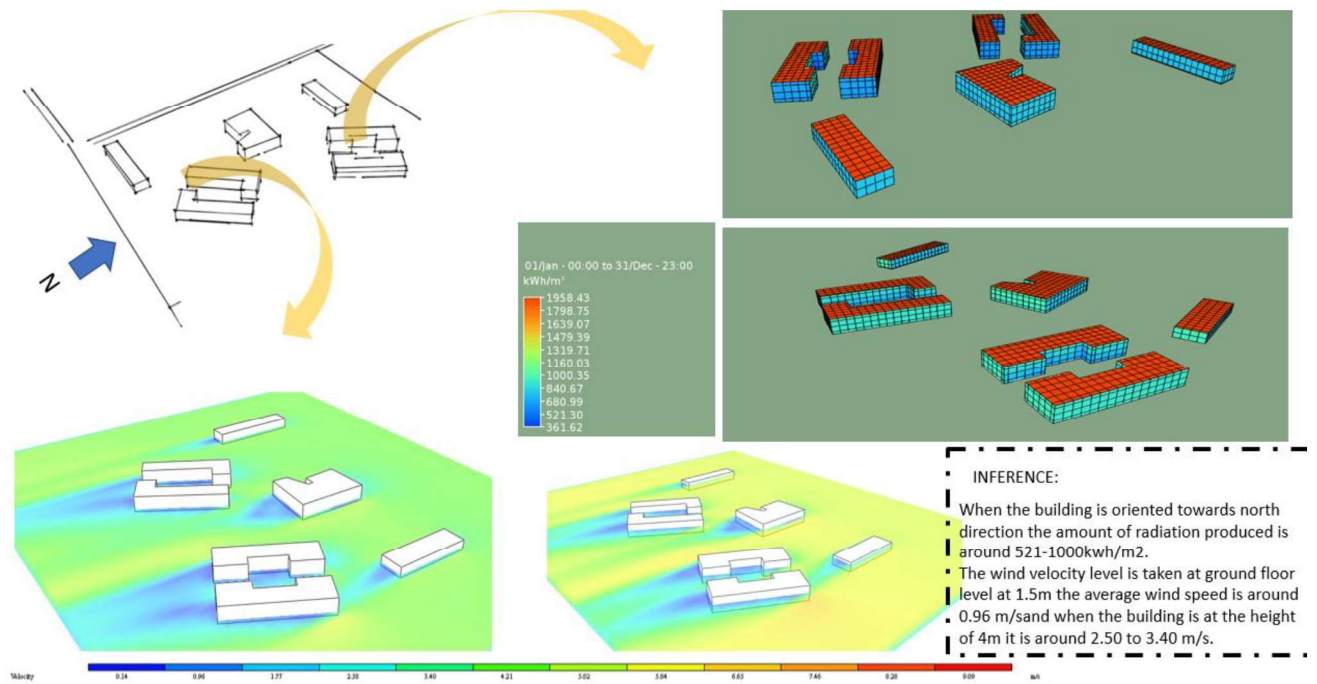
Table 4.1.12 solar radiation inference

NORTH ANALYSIS:

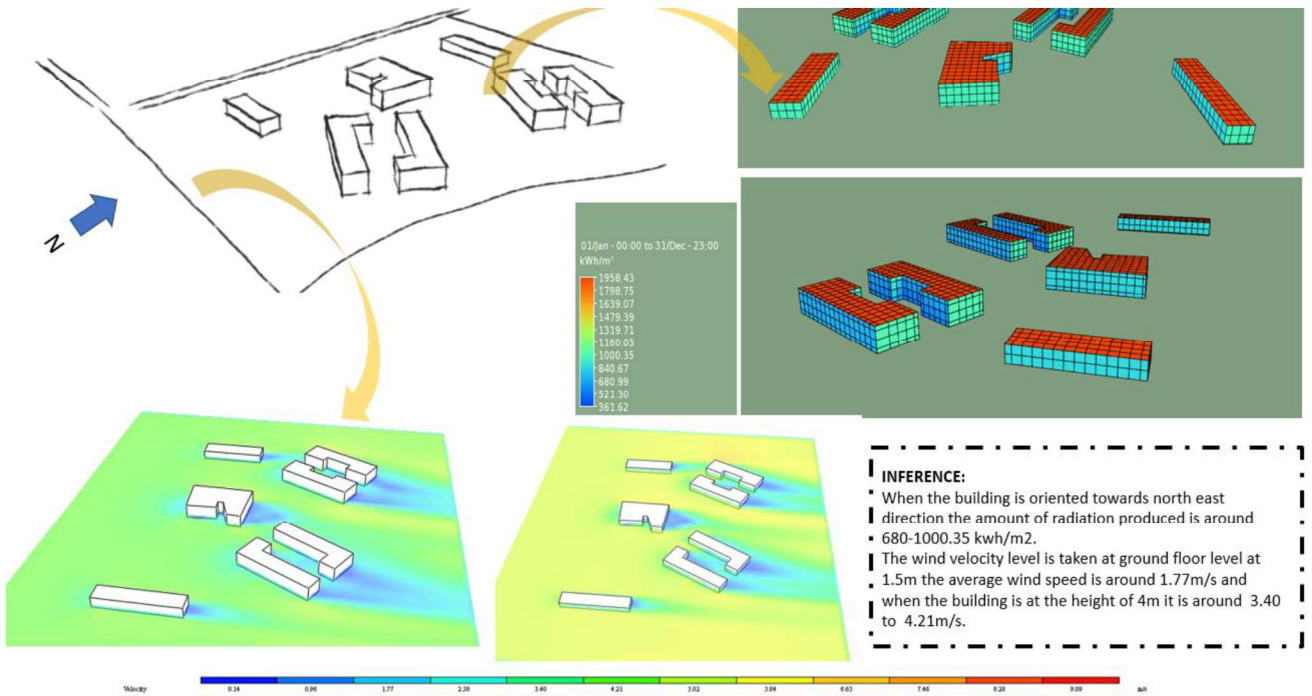
NORTH



NORTH WEST,SOUTH EAST

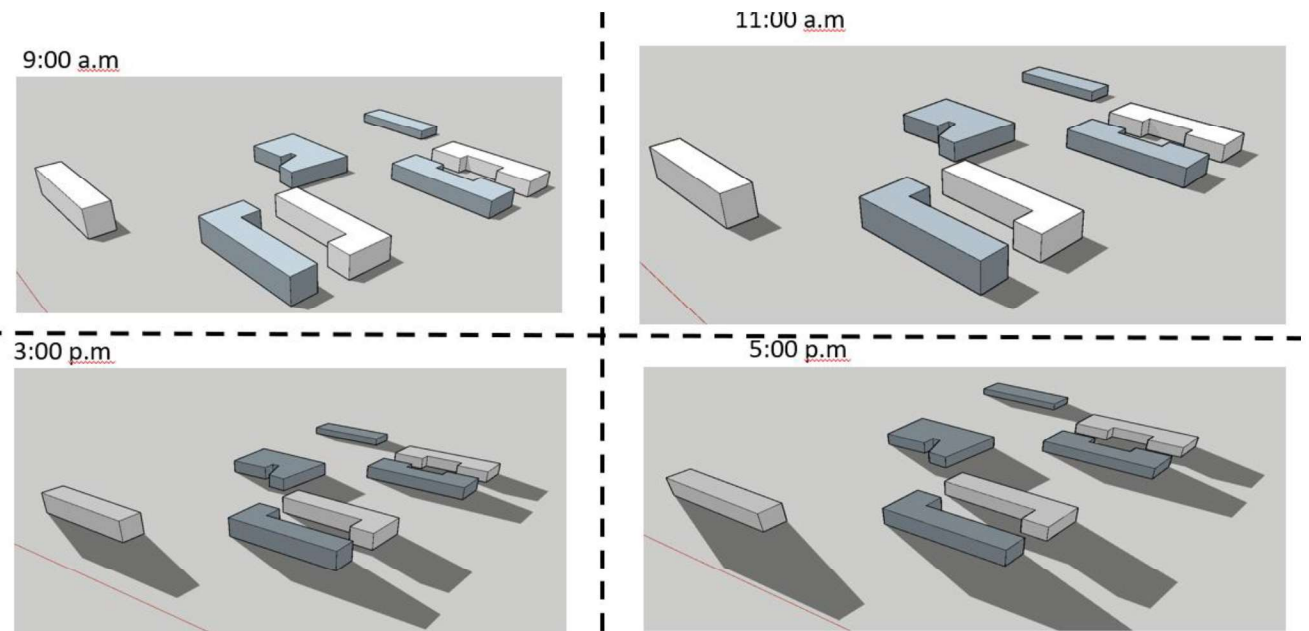


NORTH EAST, SOUTH WEST:



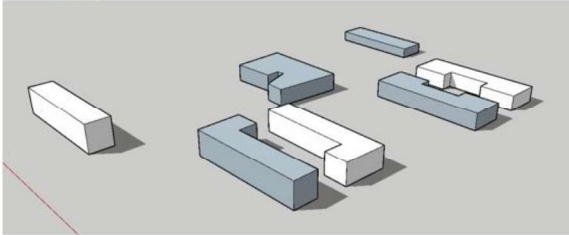
SHADOW ANALYSIS-ORIENTED TOWARDS NORTH:

Summer solstice(21ST JUNE):

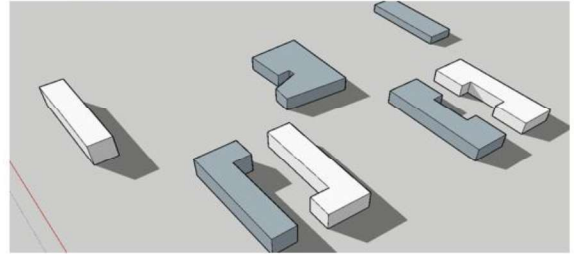


Equinox(21st September):

9:00 a.m

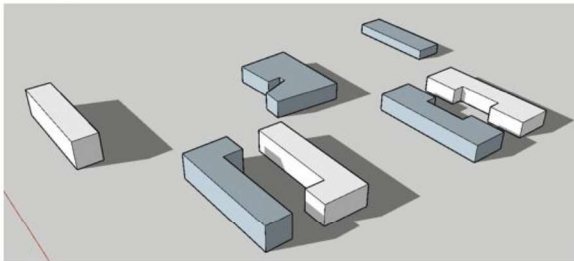


11:00 a.m

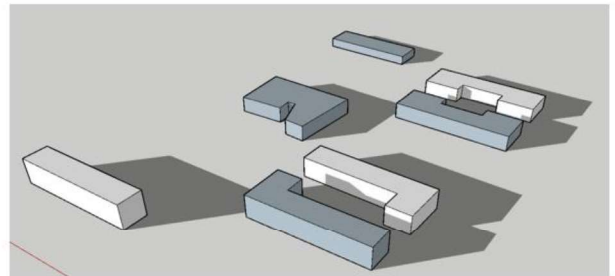


Winter solstice(21st December)

9:00 a.m

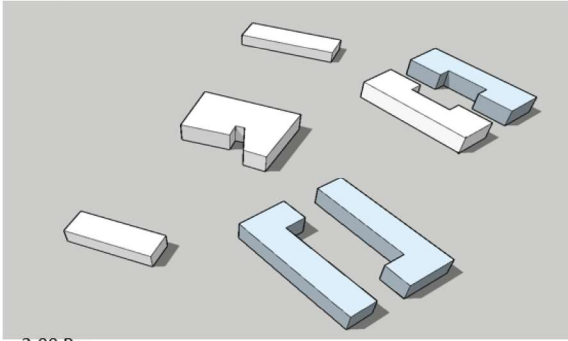


11:00 a.m

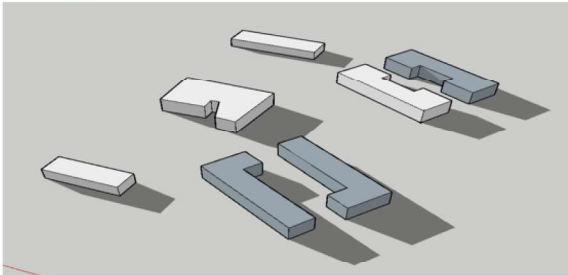


WINTER solstice(21ST DECEMBER):

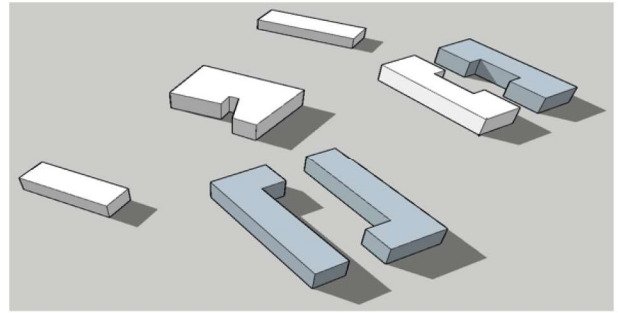
9:00 a.m



3:00 P.m



11:00 a.m



INFERENCE:

There is no mutual shading between the buildings, the impact can be seen if there are any vegetation around the site area, gradually the shadow on the building after 3:00 p.m to around 5:00 p.m

4.2 SITE ORIENTATION AND FLOOR PLANS

SUMMER SOLSITICE- JUNE 21 ST

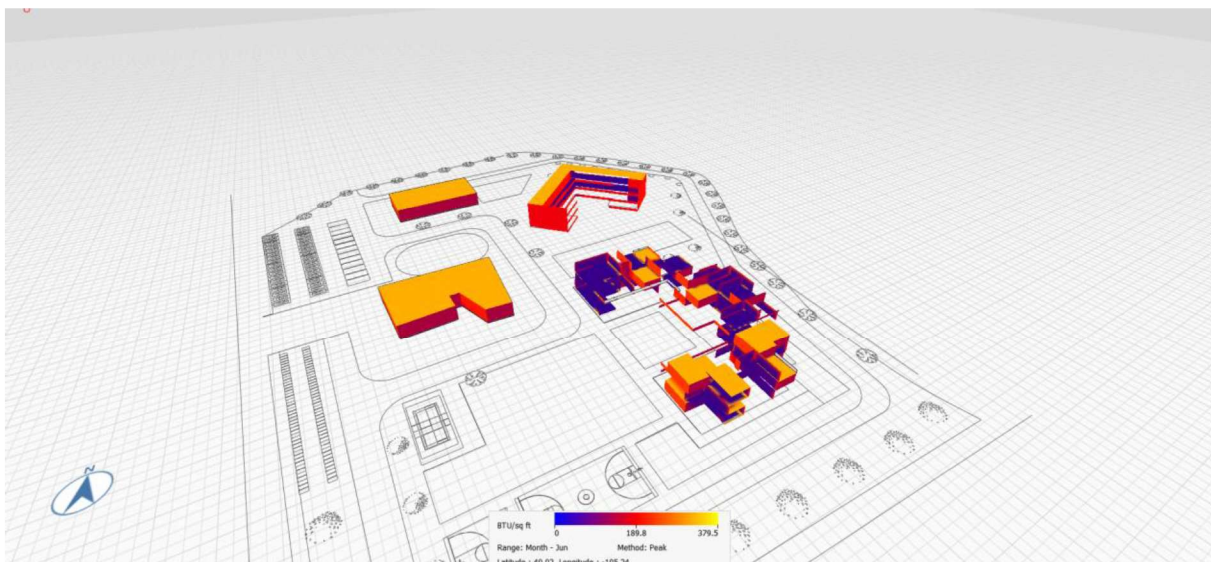


FIG 4.2.1 summer solstice

EQUINOX- SEPTEMBER 21 ST

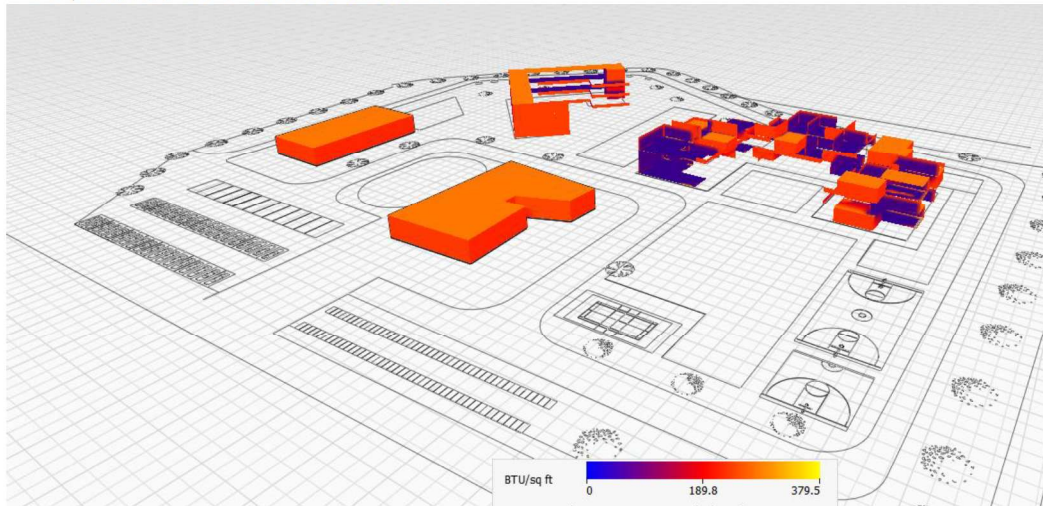


FIG 4.2.2 equinox

WINTER SOLSITICE- DECEMBER 21 ST

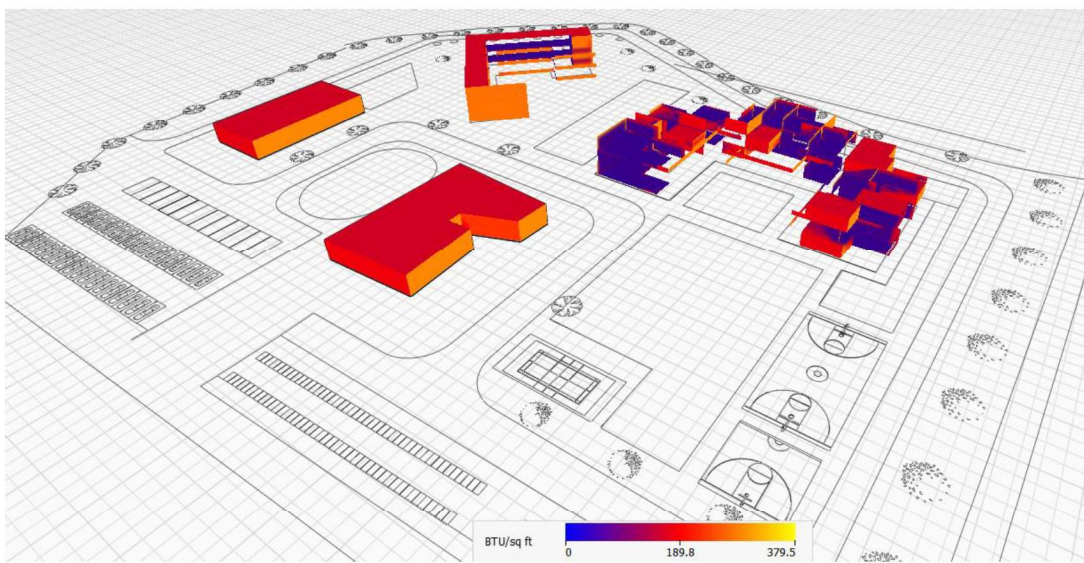


FIG 4.2.3 winter solstice

SUMMER SOLSTICE- JUNE 21 ST

NO.OF BLOCKS	NORTH	SOUTH	EAST	WEST
BLOCK-1	89.27	19.08	111.1	114.2
BLOCK-2	202.6	14.2	114.4	112.1
BLOCK-3	92.77	19.4	220.7	112.1
BLOCK-4	89.27	20.18	220.7	114.2

Table 4.2.1 summer solstice June 21st

EQUINOX- SEPTEMBER 21ST

NO.OF BLOCKS	NORTH	SOUTH	EAST	WEST
BLOCK-1	51.86	217.2	260.1	228.6
BLOCK-2	118.5	262.7	262.1	235.1
BLOCK-3	51.02	215.9	264.8	231.8
BLOCK-4	47.94	217.2	261.3	228.6

Table 4.2.2 equinox September 21st

WINTER SOLSTICE - DECEMBER 21ST

NO.OF BLOCKS	NORTH	SOUTH	EAST	WEST
BLOCK-1	37.54	290.7	200.3	166.9
BLOCK-2	37.54	273.7	284.4	143.2
BLOCK-3	37.3	289.4	215.7	175.5
BLOCK-4	37.54	290.7	37.54	166.9

Table 4.2.3 december 21st

4.2.1 FLOOR PLANS:

ADMIN BLOCK:

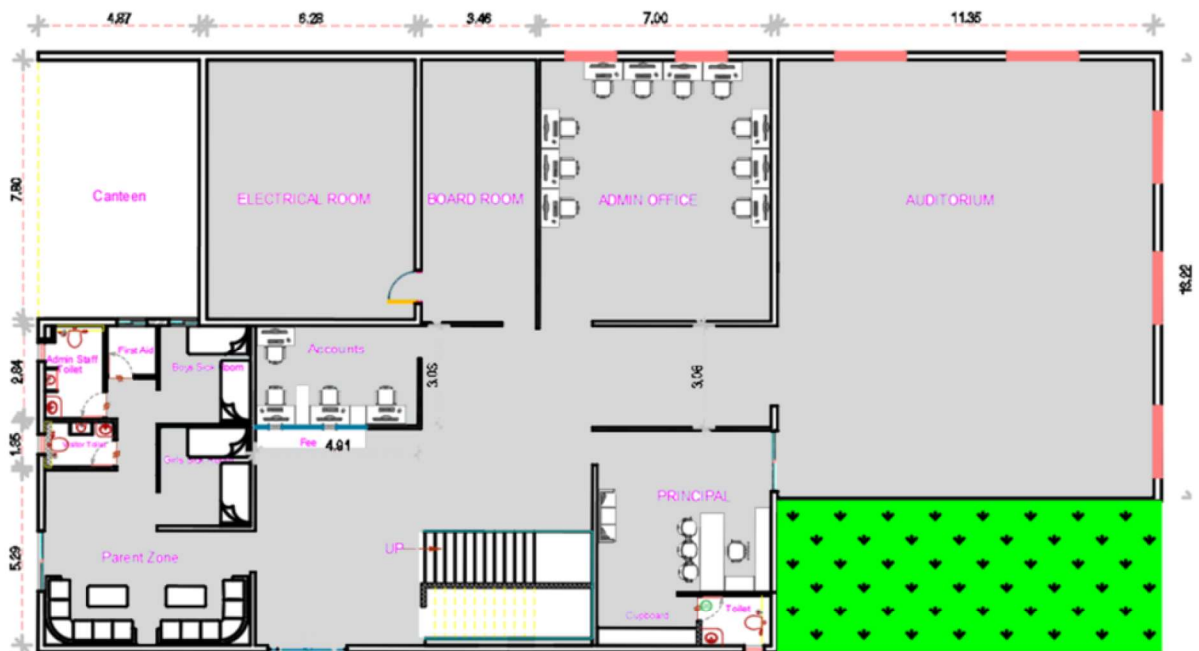


FIG 4.2.1.1 ADMIN BLOCK GROUND FLOOR PLAN

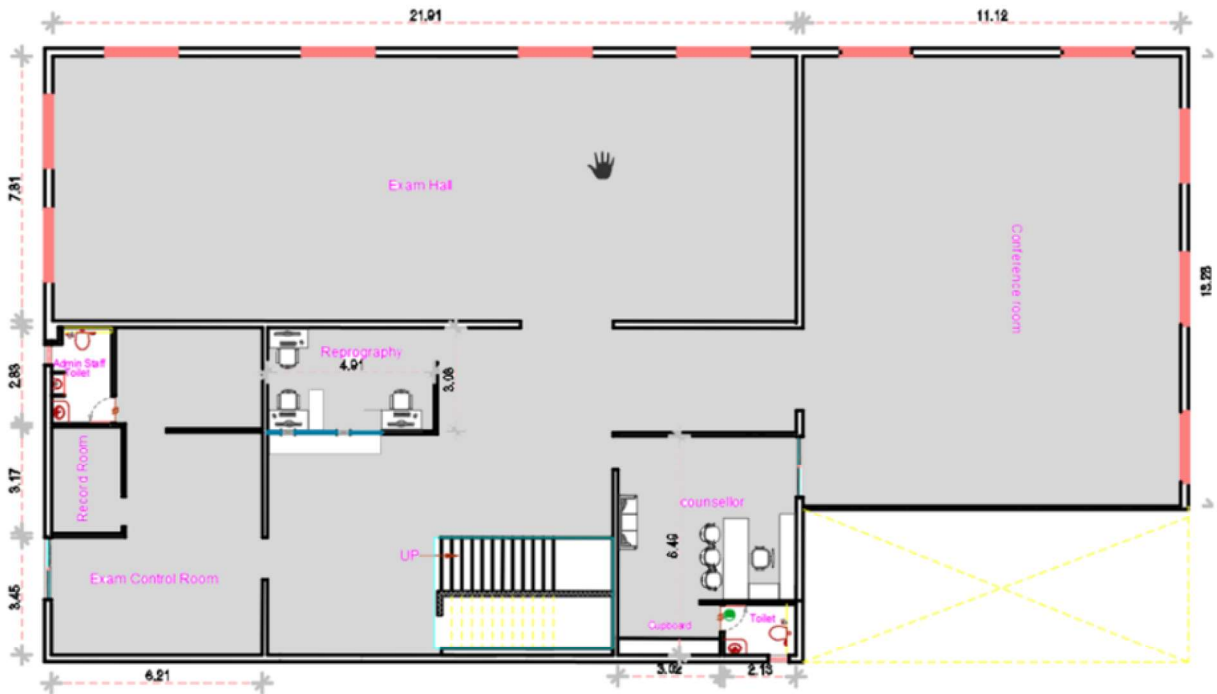
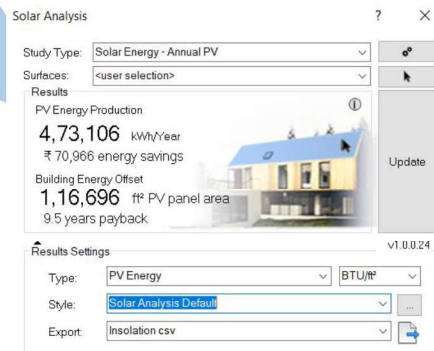
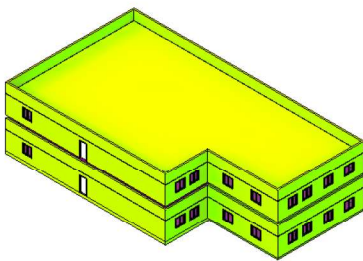


FIG 4.2.1.2 ADMIN BLOCK FIRST FLOOR PLAN

SOLAR RADIATION ANALYSIS:



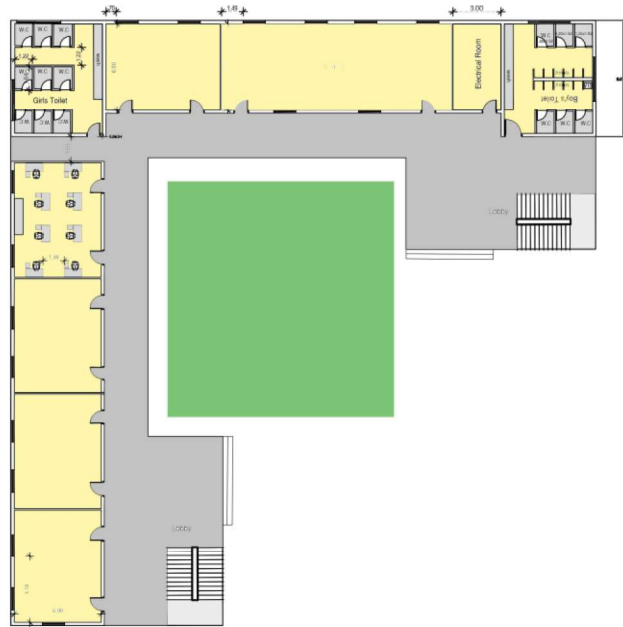


FIG 4.2.1.3 SECONDARY BLOCK GROUND FLOOR PLAN

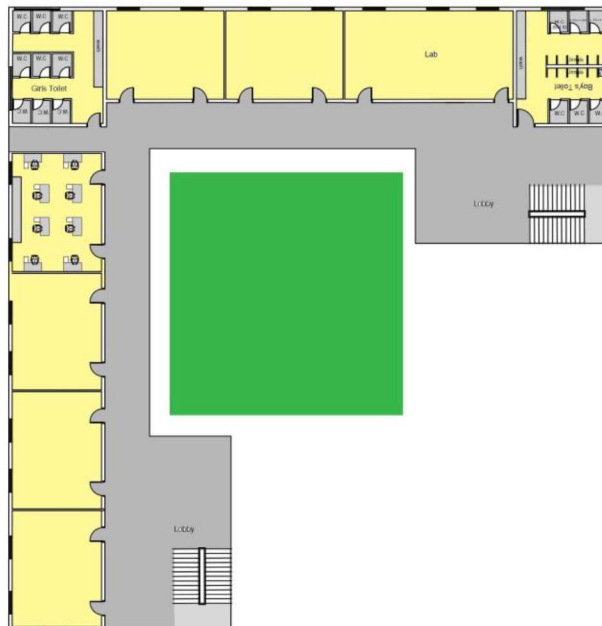


FIG 4.2.1.4 TYPICAL FIRST AND SECOND FLOOR PLAN



FIG 4.2.1.5 HIGHER SECONDARY BLOCK GROUND FLOOR PLAN

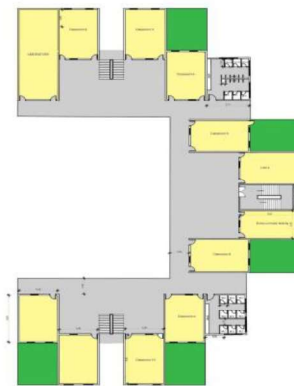


FIG 4.2.1.5 HIGHER SECONDARY BLOCK FIRST FLOOR PLAN



FIG 4.2.1.6 HIGHER SECONDARY BLOCK SECOND FLOOR PLAN

CHAPTER -5

PROPOSALS

5.1 WINDOW WALL RATIO AT DIFFERENT ORIENTATION:

ADMIN BLOCK :

Block	Zone	Floor Area		Average	Minimum	Maximum	Uniformit	Uniformit	Min	Max	
		above	above				y ratio	y ratio			
		Floor Area	Floor Area				Daylight	Daylight			Daylight
		(m2)	(m2)	(%)	Factor (%)	Factor (%)	Factor (%)	Avg)	Max)	e (lux)	e (lux)
Block 1	Zone 3	441.956	203.813	46.116	3.462	0.349	21.367	0.101	0.016	34.9	2138.5
Block 1	Zone 1	49.581	14.594	29.435	2.541	0.263	20.092	0.103	0.013	26.3	2011.1
Block 1	Zone 2	35.14	30.815	87.692	6.492	1.222	20.874	0.188	0.059	122.3	2089.2
Total		526.677	249.222	47.32	4.165	0.263	21.367	0	0	26.3	2138.5

TABLE 5.1.1 WWR 30%

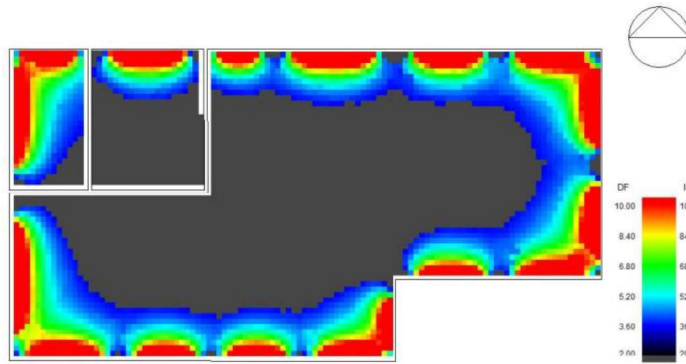


FIG 5.1.1 WWR 30%

Block	Zone	Floor Area			Average Daylight Factor (%)	Minimum Daylight Factor (%)	Maximum Daylight Factor (%)	Uniformity ratio		Min Illuminance (lux)	Max Illuminance (lux)
		Floor Area (m2)	Threshold (m2)	Floor Area above Threshold (%)				(Min / Avg)	(Min / Max)		
Block 1	Zone 3	441.956	254.46	57.576	4.623	0.536	23.228	0.116	0.023	53.6	2324.8
Block 1	Zone 1	49.581	18.46	37.232	3.322	0.357	20.308	0.107	0.018	35.7	2032.4
Block 1	Zone 2	35.14	33.95	96.615	8.324	1.72	22.381	0.207	0.077	172.2	2240.2
Total		526.677	306.87	58.265	5.423	0.357	23.228	0	0	35.7	2324.8

TABLE 5.1.2 WWR 40%

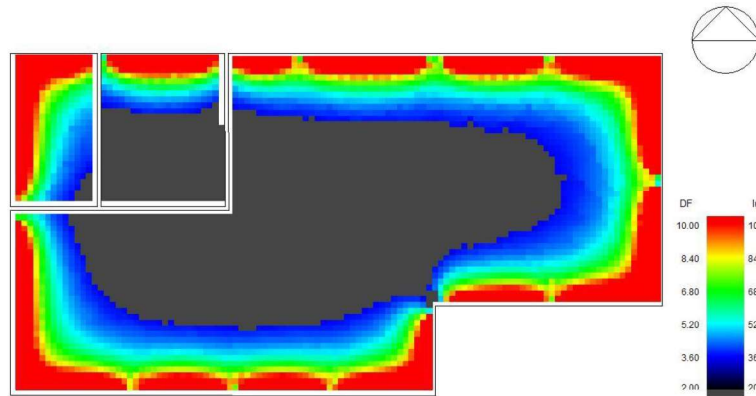


FIG 5.1.2 WWR 40%

Block	Zone	Floor Area			Average Daylight Factor (%)	Minimum Daylight Factor (%)	Maximum Daylight Factor (%)	Uniformity ratio		Min Illuminance (lux)	Max Illuminance (lux)
		Floor Area (m2)	above Threshold (m2)	above Threshold (%)				(Min / Avg)	(Min / Max)		
Block 1	Zone 3	441.956	311.142	70.401	5.949	0.801	28.656	0.135	0.028	80.1	2867.4
Block 1	Zone 1	49.581	22.229	44.834	4.069	0.521	21.462	0.128	0.024	52.2	2148.3
Block 1	Zone 2	35.14	35.14	100	10.231	2.289	28.16	0.224	0.081	229.1	2819
Total		526.677	368.512	69.969	6.75	0.521	28.656	0	0	52.2	2867.4

TABLE 5.1.3 WWR 50%

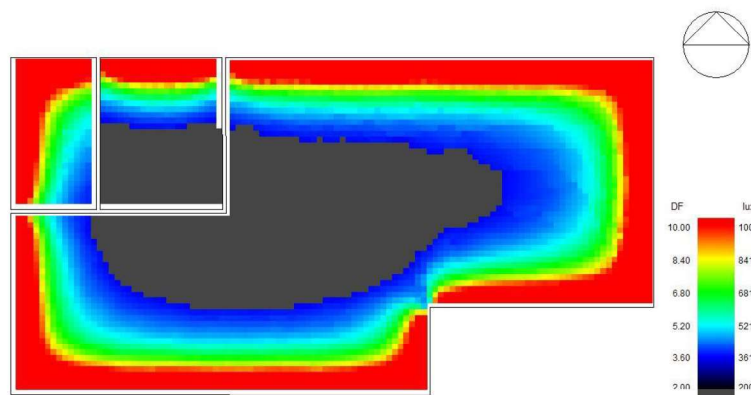


FIG 5.1.3 WWR 50%

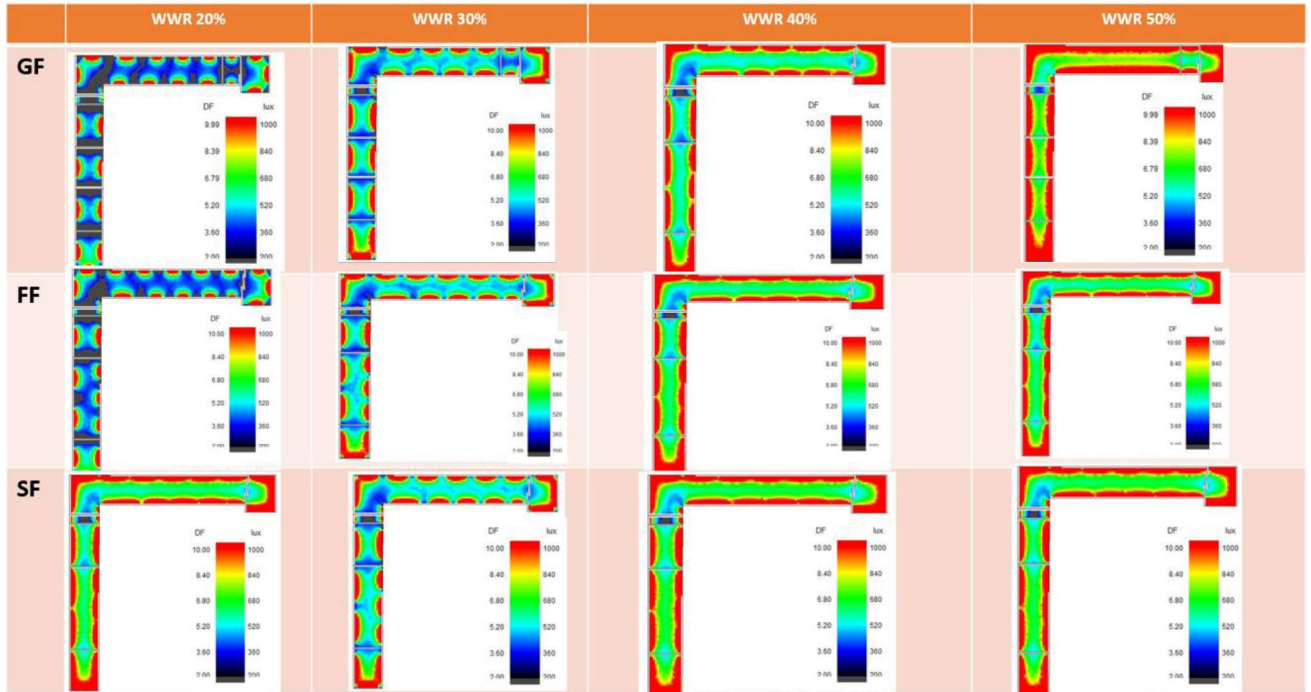
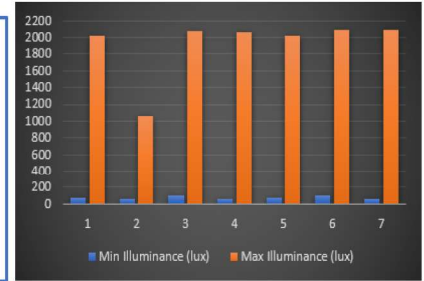


FIG 5.1.4 WWR FOR DIFFERENT FLOOR PLANS

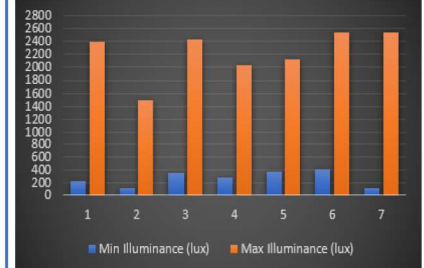
WWR 20%

SECONDARY BLOCK(WINDOW WALL RATIO)

Block	Zone	Floor Area		Average	Minimum	Maximum	Uniformit	Uniformit	Min	Max	
		above	above				y ratio	y ratio			
		Floor Area	Floor Area	Daylight	Daylight	Daylight	(Min /	(Min /	Illuminanc	Illuminanc	
		(m2)	(m2)	Factor (%)	Factor (%)	Factor (%)	Avg)	Max)	e (lux)	e (lux)	
20% SF	Zone 6	201.15	166.31	82.68	4.249	0.721	20.138	0.17	0.036	72.2	2015.2
20% SF	Zone 4	8.361	3.019	36.111	2.307	0.624	10.551	0.27	0.059	62.4	1056
20% SF	Zone 5	39.167	36.694	93.687	6.149	1.021	20.782	0.166	0.049	102.2	2079.8
20% SF	Zone 3	45.269	30.373	67.094	4.515	0.668	20.619	0.148	0.032	66.9	2064.1
20% SF	Zone 2	89.877	74.099	82.444	4.413	0.795	20.161	0.18	0.039	79.6	2018.1
20% SF	Zone 1	42.986	36.513	84.941	6.192	1.081	20.929	0.175	0.052	108.2	2094.7
Total		426.81	347.008	81.303	4.637	0.624	20.929	0	0	62.4	2094.7



Block	Zone	Floor Area				Uniformit				Uniformit	
		above	above	Average	Minimum	Maximum	y ratio	y ratio	Min	Max	
		Floor Area	Threshold	Threshold	Daylight	Daylight	Daylight	(Min /	(Min /	Illuminanc	Illuminanc
		(m2)	(m2)	(%)	Factor (%)	Factor (%)	Factor (%)	Avg)	(Min /	e (lux)	e (lux)
20% FF	Zone 6	201.15	201.15	100	8.252	2.329	23.867	0.282	0.098	233	2388.7
20% FF	Zone 4	8.361	5.574	66.667	4.474	1.319	14.884	0.295	0.089	132.1	1489.8
20% FF	Zone 5	39.167	39.167	100	11.692	3.649	24.289	0.312	0.15	365.2	2430.9
20% FF	Zone 3	45.269	45.269	100	8.203	2.935	20.378	0.358	0.144	293.8	2039.9
20% FF	Zone 2	89.877	89.877	100	8.566	3.676	21.241	0.429	0.173	367.9	2125.6
20% FF	Zone 1	42.986	42.986	100	11.726	4.14	25.424	0.353	0.163	414.3	2544.6
Total		426.81	424.023	99.347	8.819	1.319	25.424	0	0	132.1	2544.6



Block	Zone	Floor Area				Uniformity				Uniformity	
		above	above	Average	Minimum	Maximum	y ratio	y ratio	Min	Max	
		Floor Area	Threshold	Threshold	Daylight	Daylight	Daylight	(Min /	(Min /	Illuminance	Illuminance
		(m2)	(m2)	(%)	Factor (%)	Factor (%)	Factor (%)	Avg)	Max)	e (lux)	e (lux)
20% GF	Zone 6	201.15	201.15	100	9.894	2.863	28.151	0.289	0.102	286.5	2816.9
20% GF	Zone 4	8.361	7.432	88.889	5.103	1.697	14.349	0.333	0.118	169.8	1436
20% GF	Zone 5	39.167	39.167	100	13.792	4.455	30.035	0.323	0.148	445.9	3005.9
20% GF	Zone 3	45.269	45.269	100	9.419	3.822	20.324	0.406	0.188	382.6	2034.3
20% GF	Zone 2	89.877	89.877	100	10.196	4.603	21.649	0.451	0.213	460.6	2166.5
20% GF	Zone 1	42.986	42.986	100	13.878	5.308	30.551	0.382	0.174	531.2	3057.6
Total		426.81	425.881	99.782	10.38	1.697	30.551	0	0	169.8	3057.6

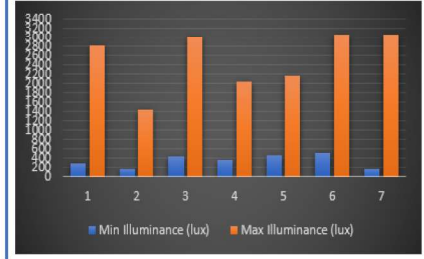
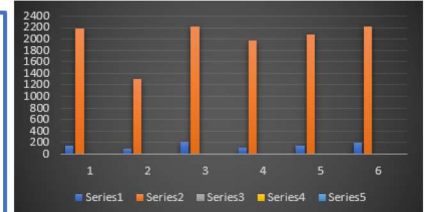


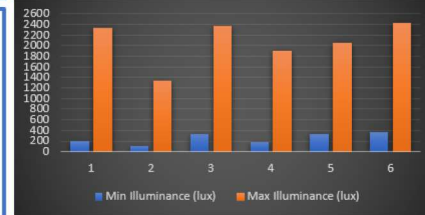
TABLE 5.1.5 WWR 20% FLOOR PLANS

WWR 30%

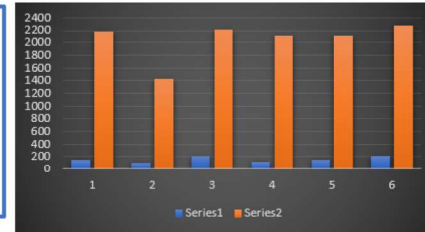
Block	Zone	Floor Area			Unifor			Unifor			Min e (lux)	Max e (lux)
		above	above	Average	Minimum	Maximum	y ratio	y ratio	Min	Max		
		Floor Area (m2)	Floor Area (m2)	Threshold (%)	Daylight Factor (%)	Daylight Factor (%)	Daylight Factor (%)	ratio (Min / Max)	illuminanc e (lux)	illuminanc e (lux)		
30% FF	Zone 6	201.15	201.15	100	7.717	2.006	23.379	0.26	0.086	200.8	2339.5	
30% FF	Zone 4	8.361	5.226	62.5	4.107	1.142	13.376	0.278	0.085	114.3	1338.4	
30% FF	Zone 5	39.167	39.167	100	11.248	3.291	23.63	0.293	0.139	329.4	2364.7	
30% FF	Zone 3	45.269	45.172	99.786	7.578	1.788	19.044	0.236	0.094	178.8	1905.4	
30% FF	Zone 2	89.877	89.877	100	8.025	3.382	20.46	0.421	0.165	338.5	2047.8	
30% FF	Zone 1	42.986	42.986	100	11.256	3.688	24.338	0.328	0.152	369.1	2435.7	



Block	Zone	Floor Area above		Average	Minimum	Maximum	Uniformit	Uniformit	Min	Max	
		Floor Area Threshold (m2)	Floor Area Threshold (m2)	Daylight Factor (%)	Daylight Factor (%)	Daylight Factor (%)	y ratio (Min / Max)	y ratio (Min / Max)	Illuminance (lx)	Illuminance (lx)	
30% GF	Zone 6	201.15	201.15	100	7.717	2.006	23.379	0.26	0.086	200.8	2339.5
30% GF	Zone 4	8.361	5.226	62.5	4.107	1.142	13.376	0.278	0.085	114.3	1338.4
30% GF	Zone 5	39.167	39.167	100	11.248	3.291	23.63	0.293	0.139	329.4	2364.7
30% GF	Zone 3	45.269	45.172	99.786	7.578	1.788	19.044	0.236	0.094	178.8	1905.4
30% GF	Zone 2	89.877	89.877	100	8.025	3.382	20.46	0.421	0.165	338.5	2047.8
30% GF	Zone 1	42.986	42.986	100	11.256	3.688	24.338	0.328	0.152	369.1	2435.7



30% SF	Zone 6	201.15	200.052	99.454	6.517	1.6	21.781	0.246	0.073	160.1	2180
30% SF	Zone 4	8.361	4.877	58.333	3.724	1.123	14.211	0.302	0.079	112.4	1422.3
30% SF	Zone 5	39.167	39.167	100	9.26	2.233	22.165	0.241	0.101	223.5	2218.7
30% SF	Zone 3	45.269	44.011	97.222	6.776	1.163	21.053	0.172	0.055	116.4	2107.2
30% SF	Zone 2	89.877	89.578	99.667	6.73	1.582	21.09	0.235	0.075	158.3	2110.9
30% SF	Zone 1	42.986	42.986	100	9.334	2.202	22.798	0.236	0.097	220.4	2281.5

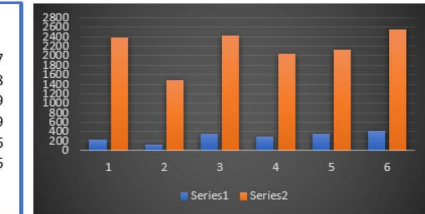


Average of 100%

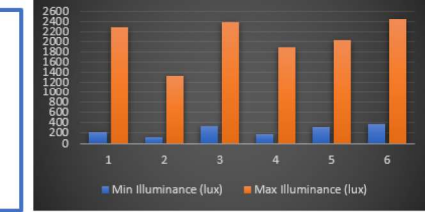
TABLE 5.1.6 WWR 30% FLOOR PLANS

WWR 40%

40% GF	Zone 6	201.15	201.15	100	8.252	2.329	23.867	0.282	0.098	233	2388.7
40% GF	Zone 4	8.361	5.574	66.667	4.474	1.319	14.884	0.295	0.089	132.1	1489.8
40% GF	Zone 5	39.167	39.167	100	11.692	3.649	24.289	0.312	0.15	365.2	2430.9
40% GF	Zone 3	45.269	45.269	100	8.203	2.935	20.378	0.358	0.144	293.8	2039.9
40% GF	Zone 2	89.877	89.877	100	8.566	3.676	21.241	0.429	0.173	367.9	2125.6
40% GF	Zone 1	42.986	42.986	100	11.726	4.14	25.424	0.353	0.163	414.3	2544.6



Block	Zone	Floor Area		Average	Minimum	Maximum	Uniformit	Uniformit	Min	Max	
		above Threshold	above Threshold								
		Floor Area (m2)	Floor Area (m2)	Factor (%)	Daylight Factor (%)	Daylight Factor (%)	y ratio Avg	y ratio (Min/Max)	illuminance (lx)	illuminance (lx)	
40% FF	Zone 6	201.15	201.15	100	7.714	2.125	23.037	0.275	0.092	212.7	2305.4
40% FF	Zone 4	8.361	5.342	63.889	4.111	1.168	13.36	0.284	0.087	116.9	1337.3
40% FF	Zone 5	39.167	39.167	100	11.252	3.389	23.915	0.301	0.142	339.2	2393.2
40% FF	Zone 3	45.269	45.172	99.786	7.574	1.867	18.838	0.247	0.099	186.9	1885.2
40% FF	Zone 2	89.877	89.877	100	8.021	3.135	20.278	0.391	0.155	313.7	2029.4
40% FF	Zone 1	42.986	42.986	100	11.307	3.829	24.628	0.339	0.155	383.2	2464.6



40% SF	Zone 6	201.15	201.15	100	8.677	2.459	23.93	0.283	0.103	246.1	2394.9
40% SF	Zone 4	8.361	6.155	73.611	4.948	1.579	17.004	0.319	0.093	158.1	1701.7
40% SF	Zone 5	39.167	39.167	100	11.945	3.755	24.677	0.314	0.152	375.8	2469.8
40% SF	Zone 3	45.269	45.269	100	8.814	3.536	21.503	0.401	0.164	353.9	2152.1
40% SF	Zone 2	89.877	89.877	100	8.873	3.854	21.756	0.434	0.177	385.8	2177.9
40% SF	Zone 1	42.986	42.986	100	11.908	4.393	25.711	0.369	0.171	439.7	2573.3

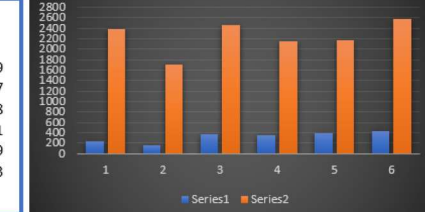
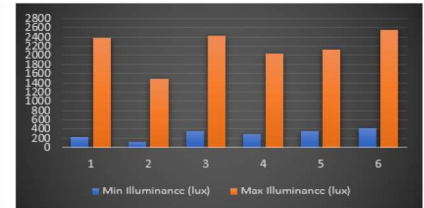


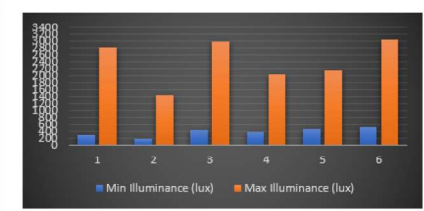
TABLE 5.1.7 WWR 40% FLOOR PLANS

WWR 50%

Block	Zone	Floor Area (m2)	Floor Area above Threshold (m2)	Floor Area above Threshold (%)	Average Daylight Factor (%)	Minimum Daylight Factor (%)	Maximum Daylight Factor (%)	Uniformity ratio (Min / Max)	Uniformity ratio (Min / Max)	Min Illuminance (lux)	Max Illuminance (lux)
50% GF	Zone 6	201.15	201.15	100	8.252	2.329	23.867	0.282	0.098	233	2388.7
50% GF	Zone 4	8.361	5.574	66.667	4.474	1.319	14.884	0.295	0.089	132.1	1489.8
50% GF	Zone 5	39.167	39.167	100	11.692	3.649	24.289	0.312	0.15	365.2	2430.9
50% GF	Zone 3	45.269	45.269	100	8.203	2.935	20.378	0.358	0.144	293.8	2039.9
50% GF	Zone 2	89.877	89.877	100	8.566	3.676	21.241	0.429	0.173	367.9	2125.6
50% GF	Zone 1	42.986	42.986	100	11.726	4.14	25.424	0.353	0.163	414.3	2544.6



Block	Zone	Floor Area (m2)	Floor Area above Threshold (m2)	Floor Area above Threshold (%)	Average Daylight Factor (%)	Minimum Daylight Factor (%)	Maximum Daylight Factor (%)	Uniformity ratio (Min / Max)	Uniformity ratio (Min / Max)	Min Illuminance (lux)	Max Illuminance (lux)
50% FF	Zone 6	201.15	201.15	100	9.894	2.863	28.151	0.289	0.102	286.5	2816.9
50% FF	Zone 4	8.361	7.432	88.889	5.103	1.697	14.349	0.333	0.118	169.8	1436
50% FF	Zone 5	39.167	39.167	100	13.792	4.455	30.035	0.323	0.148	445.9	3005.9
50% FF	Zone 3	45.269	45.269	100	9.419	3.822	20.324	0.406	0.188	382.6	2034.3
50% FF	Zone 2	89.877	89.877	100	10.196	4.603	21.649	0.451	0.213	460.6	2166.5
50% FF	Zone 1	42.986	42.986	100	13.878	5.308	30.551	0.382	0.174	531.2	3057.6



Block	Zone	Floor Area (m2)	Floor Area above Threshold (m2)	Floor Area above Threshold (%)	Average Daylight Factor (%)	Minimum Daylight Factor (%)	Maximum Daylight Factor (%)	Uniformity ratio (Min / Max)	Uniformity ratio (Min / Max)	Min Illuminance (lux)	Max Illuminance (lux)
50% SF	Zone 6	201.15	201.15	100	8.677	2.459	23.93	0.283	0.103	246.1	2394.9
50% SF	Zone 4	8.361	6.155	73.611	4.948	1.579	17.004	0.319	0.093	158.1	1701.7
50% SF	Zone 5	39.167	39.167	100	11.945	3.755	24.677	0.314	0.152	375.8	2469.8
50% SF	Zone 3	45.269	45.269	100	8.814	3.536	21.503	0.401	0.164	353.9	2152.1
50% SF	Zone 2	89.877	89.877	100	8.873	3.854	21.756	0.434	0.177	385.8	2177.9
50% SF	Zone 1	42.986	42.986	100	11.908	4.393	25.711	0.369	0.171	439.7	2573.3

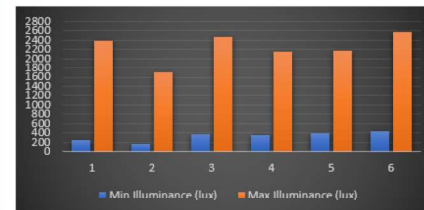


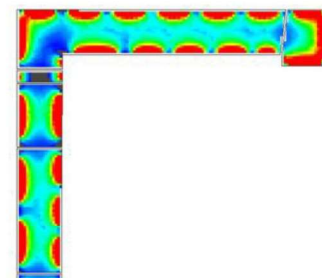
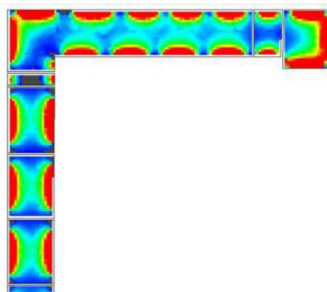
TABLE 5.1.8 WWR 50% FLOOR PLANS

WITHOUT SHADING:

Block	Zone	Floor Area (m2)	Floor Area above ...	Floor Area above ...	Average Daylight ...	Minimum Daylight ...	Maximum Daylight ...	Uniformity ratio (Mi...	Uniformity ratio (Mi...	Min Illuminance (lux)	Max Illuminance (L...
Block 1	Zone 5	241.444	237.871	98.520	6.150	1.374	21.415	0.223	0.064	137.48	2143.42
Block 1	Zone 4	8.361	4.064	48.611	3.100	0.795	11.660	0.256	0.068	79.57	1166.88
Block 1	Zone 3	45.269	39.949	88.248	5.830	0.894	18.404	0.153	0.049	89.51	1841.92
Block 1	Zone 2	89.877	88.579	98.556	6.073	1.193	19.799	0.196	0.060	119.42	1981.81
Block 1	Zone 1	42.986	42.582	99.059	8.683	1.721	22.323	0.198	0.077	172.24	2234.07
Block 2	Zone 5	241.444	239.955	99.383	6.567	1.420	21.794	0.216	0.065	142.10	2181.27
Block 2	Zone 4	8.361	4.645	55.556	3.358	0.915	12.346	0.273	0.074	91.62	1235.77
Block 2	Zone 3	45.269	42.754	94.444	6.344	1.064	19.946	0.168	0.053	106.45	1996.05
Block 2	Zone 2	89.877	89.079	99.111	6.487	1.476	20.734	0.227	0.071	147.67	2075.06
Block 2	Zone 1	42.986	42.986	100.000	9.125	2.046	22.623	0.224	0.090	204.79	2264.44
Block 3	Zone 5	241.444	240.848	99.753	6.854	1.561	21.876	0.228	0.071	156.21	2189.43
Block 3	Zone 4	8.361	4.877	58.333	3.724	1.124	14.161	0.302	0.079	112.46	1417.32
Block 3	Zone 3	45.269	44.011	97.222	6.758	1.207	21.047	0.179	0.057	120.84	2106.68
Block 3	Zone 2	89.877	89.578	99.667	6.711	1.600	21.213	0.238	0.075	160.10	2123.03
Block 3	Zone 1	42.986	42.986	100.000	9.301	2.164	22.686	0.233	0.095	216.55	2270.65
Total		1283.811	1254.765	97.737	6.338	0.795	22.686	0.000	0.000	79.57	2270.65

97% of daylighting is achieved

TABLE 5.1.9 WITHOUT SHADING



GROUND FLOOR PLAN

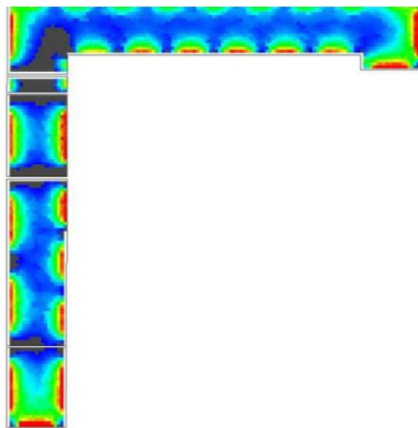
SECOND FLOOR PLAN

FIG 5.1.5 WWR FOR SECONDARY BLOCK FLOOR PLANS

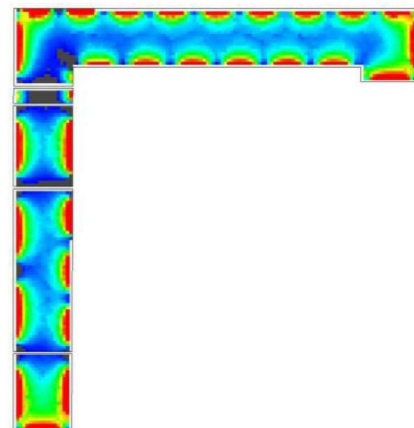
WITH LOUVERS:

Block	Zone	Floor Area (m2)	Floor Area above ...	Floor Area above ...	Average Daylight ...	Minimum Daylight ...	Maximum Daylight...	Uniformity ratio (Mi...	Uniformity ratio (Mi...	Min Illuminance (lux)	Max Illuminance (L...
Block 1	Zone 5	241.444	213.856	88.574	3.796	0.900	12.106	0.237	0.074	90.08	1211.57
Block 1	Zone 4	8.361	2.555	30.556	1.880	0.498	6.350	0.265	0.078	49.84	635.61
Block 1	Zone 3	45.269	31.727	70.085	3.426	0.582	10.011	0.170	0.058	58.27	1001.91
Block 1	Zone 2	89.877	76.496	85.111	3.685	0.782	9.853	0.212	0.079	78.22	985.99
Block 1	Zone 1	42.986	39.446	91.765	5.252	1.142	12.477	0.217	0.091	114.27	1248.88
Block 2	Zone 5	241.444	222.589	92.191	4.016	0.930	11.854	0.231	0.078	93.03	1186.48
Block 2	Zone 4	8.361	2.671	31.944	2.065	0.575	6.903	0.278	0.083	57.52	690.77
Block 2	Zone 3	45.269	33.855	74.786	3.729	0.703	10.466	0.189	0.067	70.36	1047.72
Block 2	Zone 2	89.877	81.689	90.889	3.924	0.890	10.821	0.227	0.082	89.07	1083.18
Block 2	Zone 1	42.986	40.862	95.059	5.484	1.313	12.891	0.239	0.102	131.37	1290.03
Block 3	Zone 5	241.444	227.551	94.246	4.182	1.073	12.400	0.257	0.087	107.44	1241.22
Block 3	Zone 4	8.361	3.251	38.889	2.306	0.734	8.377	0.318	0.088	73.43	838.43
Block 3	Zone 3	45.269	35.693	78.846	4.016	0.756	11.717	0.188	0.065	75.65	1172.74
Block 3	Zone 2	89.877	83.586	93.000	4.038	0.949	11.321	0.235	0.084	95.01	1133.20
Block 3	Zone 1	42.986	40.963	95.294	5.555	1.294	13.360	0.233	0.097	129.53	1337.06
Total		1283.811	1136.788	88.548	3.823	0.498	13.360	0.000	0.000	49.84	1337.06

88% of daylighting is achieved



Ground floor

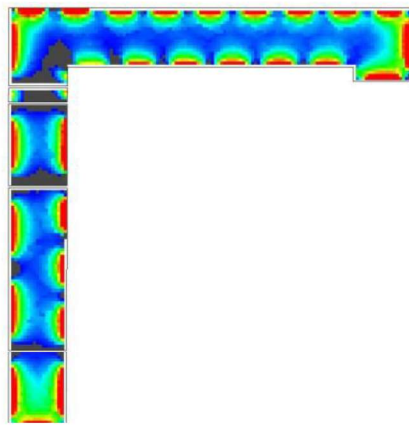


Second floor

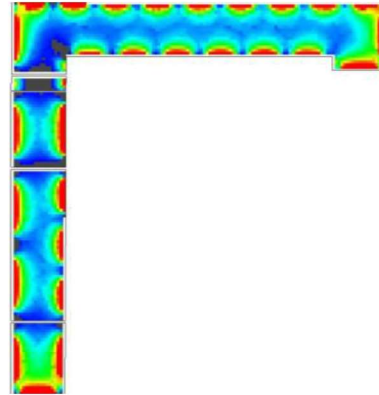
FIG 5.1.6 WWR FOR SECONDARY BLOCK FLOOR PLANS

WITH OVERHANGS:

Block	Zone	Floor Area (m2)	Floor Area above ...	Floor Area above ...	Average Daylight ...	Minimum Daylight ...	Maximum Daylight...	Uniformity ratio (Mi...	Uniformity ratio (Mi...	Min Illuminance (lux)	Max Illuminance (L...
Block 1	Zone 5	241.444	228.344	94.575	4.596	1.014	15.941	0.221	0.064	101.46	1595.27
Block 1	Zone 4	8.361	3.251	38.889	2.290	0.618	8.796	0.270	0.071	61.81	876.31
Block 1	Zone 3	45.269	35.306	77.991	4.221	0.689	13.057	0.163	0.053	68.99	1306.82
Block 1	Zone 2	89.877	84.085	93.556	4.498	0.914	14.295	0.203	0.064	91.41	1430.33
Block 1	Zone 1	42.986	42.076	97.882	6.451	1.353	16.227	0.210	0.083	135.38	1624.20
Block 2	Zone 5	241.444	233.604	96.753	4.911	1.198	16.137	0.244	0.074	119.95	1614.98
Block 2	Zone 4	8.361	3.484	41.667	2.506	0.737	9.538	0.294	0.077	73.73	954.52
Block 2	Zone 3	45.269	38.401	84.829	4.606	0.829	14.049	0.180	0.059	82.97	1406.57
Block 2	Zone 2	89.877	87.680	97.556	4.802	1.098	15.203	0.229	0.072	109.93	1521.75
Block 2	Zone 1	42.986	42.177	98.118	6.761	1.519	16.645	0.225	0.091	152.02	1665.89
Block 3	Zone 5	241.444	236.283	97.863	5.127	1.254	16.266	0.245	0.077	125.50	1628.01
Block 3	Zone 4	8.361	4.064	48.611	2.831	0.934	11.195	0.330	0.083	93.45	1120.47



Ground floor



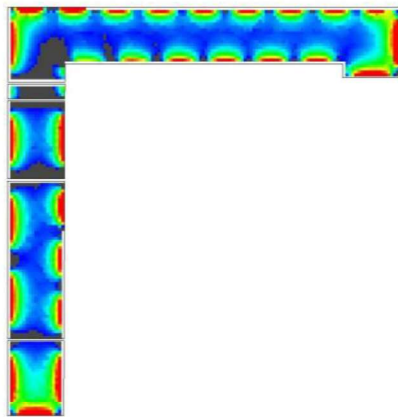
Second floor

FIG 5.1.7 WWR FOR SECONDARY BLOCK FLOOR PLANS

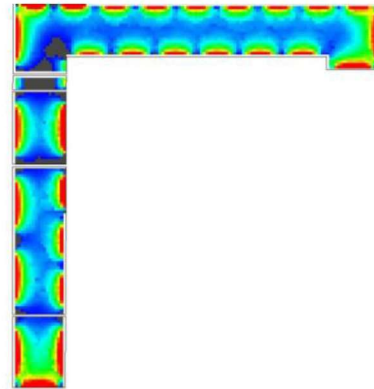
WITH OVERHANGS AND FINS:

Block	Zone	Floor Area (m2)	Floor Area above ...	Floor Area above ...	Average Daylight ...	Minimum Daylight ...	Maximum Daylight...	Uniformity ratio (Mi...	Uniformity ratio (Mi...	Min Illuminance (lux)	Max Illuminance (L...
Block 1	Zone 5	241.444	224.276	92.889	4.263	0.966	14.344	0.227	0.067	96.64	1435.65
Block 1	Zone 4	8.361	2.555	30.556	1.848	0.509	6.509	0.276	0.078	50.98	651.41
Block 1	Zone 3	45.269	34.919	77.137	4.051	0.645	12.079	0.159	0.053	64.58	1208.87
Block 1	Zone 2	89.877	83.187	92.556	4.257	0.881	13.220	0.207	0.067	88.17	1322.92
Block 1	Zone 1	42.986	42.076	97.882	6.117	1.280	14.987	0.209	0.085	128.12	1499.94
Block 2	Zone 5	241.444	229.535	95.068	4.520	1.118	14.521	0.247	0.077	111.91	1453.19
Block 2	Zone 4	8.361	2.787	33.333	2.039	0.626	6.940	0.307	0.090	62.67	694.57
Block 2	Zone 3	45.269	37.917	83.761	4.439	0.829	13.358	0.187	0.062	82.98	1336.95
Block 2	Zone 2	89.877	86.682	96.444	4.553	1.055	13.895	0.232	0.076	105.59	1390.76
Block 2	Zone 1	42.986	42.177	98.118	6.390	1.517	15.233	0.237	0.100	151.86	1524.56
Block 3	Zone 5	241.444	233.406	96.671	4.749	1.222	14.870	0.257	0.082	122.32	1488.16
Block 3	Zone 4	8.361	3.251	38.889	2.290	0.779	7.933	0.340	0.098	77.99	793.92
Block 3	Zone 3	45.269	40.529	89.530	4.761	0.921	14.477	0.194	0.064	92.21	1449.01
Block 3	Zone 2	89.877	87.780	97.667	4.719	1.116	14.187	0.237	0.079	111.72	1419.84
Block 3	Zone 1	42.986	42.278	98.353	6.511	1.573	15.453	0.242	0.102	157.48	1546.74
Total		1283.811	1193.355	92.954	4.367	0.509	15.453	0.000	0.000	50.98	1546.74

92% of daylighting is achieved



Ground floor



Second floor

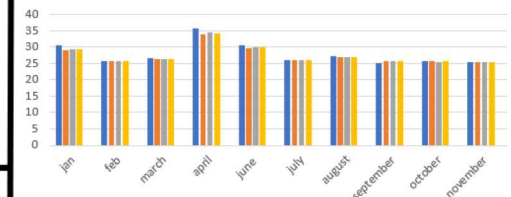
FIG 5.1.7 WWR FOR SECONDARY BLOCK FLOOR PLANS

ANALYSIS:											
WITHOUT SHADING:											
UHV (Electricity) (kWh)	0.00	19.29	19.29	0.00	19.29	19.29	19.29	0.00	19.29	19.29	
Air Temperature (°C)	30.46	25.76	26.54	35.72	25.76	26.11	27.19	30.51	25.74	25.35	
Radiant Temperature (°C)	31.19	29.22	30.42	36.35	29.68	29.05	31.07	30.35	28.85	28.45	
Operative Temperature (°C)	30.83	27.49	28.48	36.03	27.23	27.58	29.42	30.68	27.19	26.90	
Outside Dry-Bulb Temperature (°C)	25.20	26.49	30.78	31.14	28.28	29.68	29.95	28.27	27.78	25.34	
External Infiltration (kWh)	-128.03	15.28	97.57	-108.80	57.65	82.49	63.80	-54.42	47.10	-4.39	
General Lighting (kWh)	0.00	308.11	308.11	0.00	308.11	308.11	308.11	0.00	308.11	308.11	
Computer + Equip (kWh)	19.56	205.40	205.40	19.56	205.40	205.40	205.40	19.56	205.40	205.40	
Occupancy (kWh)	0.00	87.81	87.81	0.00	87.81	87.81	87.81	0.00	87.81	87.81	
Solar Gains Exterior Windows (kWh)	623.14	607.43	605.24	988.70	411.91	413.78	543.61	331.27	499.72	481.58	
WITH LOUVERS:											
UHV (Electricity) (kWh)	0.00	19.29	19.29	0.00	19.29	19.29	19.29	0.00	19.29	19.29	
Air Temperature (°C)	28.86	25.35	26.31	33.38	25.35	25.96	26.77	28.73	25.57	25.29	
Radiant Temperature (°C)	29.40	28.50	29.84	34.40	28.18	28.51	30.57	28.94	28.01	27.58	
Operative Temperature (°C)	29.13	27.02	27.97	34.19	26.90	27.24	28.67	29.84	26.79	26.41	
Outside Dry-Bulb Temperature (°C)	25.20	26.49	30.78	31.14	28.28	29.68	29.95	28.27	27.78	25.34	
External Infiltration (kWh)	-89.65	20.30	103.03	-68.14	61.07	86.04	73.47	-36.09	51.17	1.00	
General Lighting (kWh)	0.00	308.11	308.11	0.00	308.11	308.11	308.11	0.00	308.11	308.11	
Computer + Equip (kWh)	19.56	205.40	205.40	19.56	205.40	205.40	205.40	19.56	205.40	205.40	
Occupancy (kWh)	0.00	87.81	87.81	0.00	87.81	87.81	87.81	0.00	87.81	87.81	
Solar Gains Exterior Windows (kWh)	378.09	409.87	406.98	401.31	274.07	274.66	388.26	218.82	326.34	294.78	
WITH OVERHANGS:											
UHV (Electricity) (kWh)	0.00	19.29	19.29	0.00	19.29	19.29	19.29	0.00	19.29	19.29	
Air Temperature (°C)	29.43	25.58	26.38	34.44	25.66	26.00	26.90	29.92	25.61	25.31	
Radiant Temperature (°C)	30.03	28.60	29.89	34.91	28.32	28.65	30.71	30.16	28.14	27.87	
Operative Temperature (°C)	29.73	27.09	28.14	34.68	26.99	27.32	28.90	30.04	26.87	26.59	
Outside Dry-Bulb Temperature (°C)	25.20	26.49	30.78	31.14	28.28	29.68	29.95	28.27	27.78	25.34	
External Infiltration (kWh)	-103.12	19.56	101.25	-78.82	60.21	85.13	70.48	-40.54	50.29	-1.03	
General Lighting (kWh)	0.00	308.11	308.11	0.00	308.11	308.11	308.11	0.00	308.11	308.11	
Computer + Equip (kWh)	19.56	205.40	205.40	19.56	205.40	205.40	205.40	19.56	205.40	205.40	
Occupancy (kWh)	0.00	87.81	87.81	0.00	87.81	87.81	87.81	0.00	87.81	87.81	
Solar Gains Exterior Windows (kWh)	464.27	446.51	474.60	458.03	313.03	314.93	425.61	251.67	360.55	363.85	
WITH OVERHANGS AND FINS:											
UHV (Electricity) (kWh)	0.00	19.29	19.29	0.00	19.29	19.29	19.29	0.00	19.29	19.29	
Air Temperature (°C)	28.19	25.35	26.37	32.20	25.63	26.87	28.84	29.80	25.57	25.27	
Radiant Temperature (°C)	28.74	28.50	29.82	34.63	28.21	28.55	30.70	30.01	28.03	27.74	
Operative Temperature (°C)	28.45	27.03	28.10	34.42	26.92	27.26	28.80	29.91	26.80	26.50	
Outside Dry-Bulb Temperature (°C)	25.20	26.49	30.78	31.14	28.28	29.68	29.95	28.27	27.78	25.34	
External Infiltration (kWh)	-96.84	20.22	101.66	-73.12	60.89	85.82	71.87	-37.63	51.03	-0.05	
General Lighting (kWh)	0.00	308.11	308.11	0.00	308.11	308.11	308.11	0.00	308.11	308.11	
Computer + Equip (kWh)	19.56	205.40	205.40	19.56	205.40	205.40	205.40	19.56	205.40	205.40	
Occupancy (kWh)	0.00	87.81	87.81	0.00	87.81	87.81	87.81	0.00	87.81	87.81	
Solar Gains Exterior Windows (kWh)	425.10	422.85	458.04	433.04	286.91	289.37	406.22	232.01	331.50	331.98	

INFERENCE:

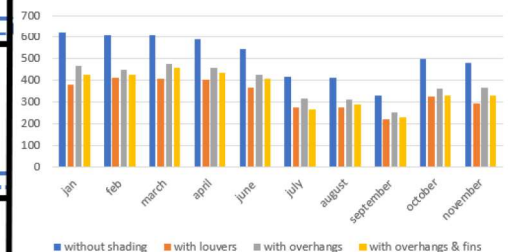
TEMPERATURE CHANGE:

Temperature



RADIATION CHANGE:

Radiation on windows



INFERENCE:

Shading device	Max.illuminance	Min illuminance	Uniformity ratio (min/max)	Uniformity ratio (min/max)	Max.daylight factor	Min.daylight factor	Average daylight factor
Without shading	2270.20	79.57	0.0302	0.057	22.68	0.795	6.3
Horizontal overhang	1665.59	61.81	0.0163	0.0330	16.64	0.647	4.6
Horizontal overhang + fins	1546.74	50.98	0.0187	0.082	15.453	0.509	4.3
With louvers	1337.06	49.84	0.088	0.188	13.360	0.498	3.8

TEMPERATURE:

There is a temperature difference of about 2° temperature difference with louvers and about 1.5° temperature difference in overhangs and overhangs with fins.

RADIATION:

There is about **300 W/M2** difference with louvers and about **100w/m2** with overhang and overhang with fins its around **200 w/2**.

With louvers we can achieve the required daylight and there is much reduction in the radiation, were else overhang and overhang with fins there are considerable amount of reduction in radiation. On the other hand, the overhang enables more light to enter but not to the depth of the classroom, and consequently has a poorer uniformity ratio than louvers. Overall, every shading provide specific daylight quality for the classroom, considering the fact that the difference in energy savings among the shading devices is not considerable and due to the comfort of students, the overhang seems to have most of the comfort condition features.

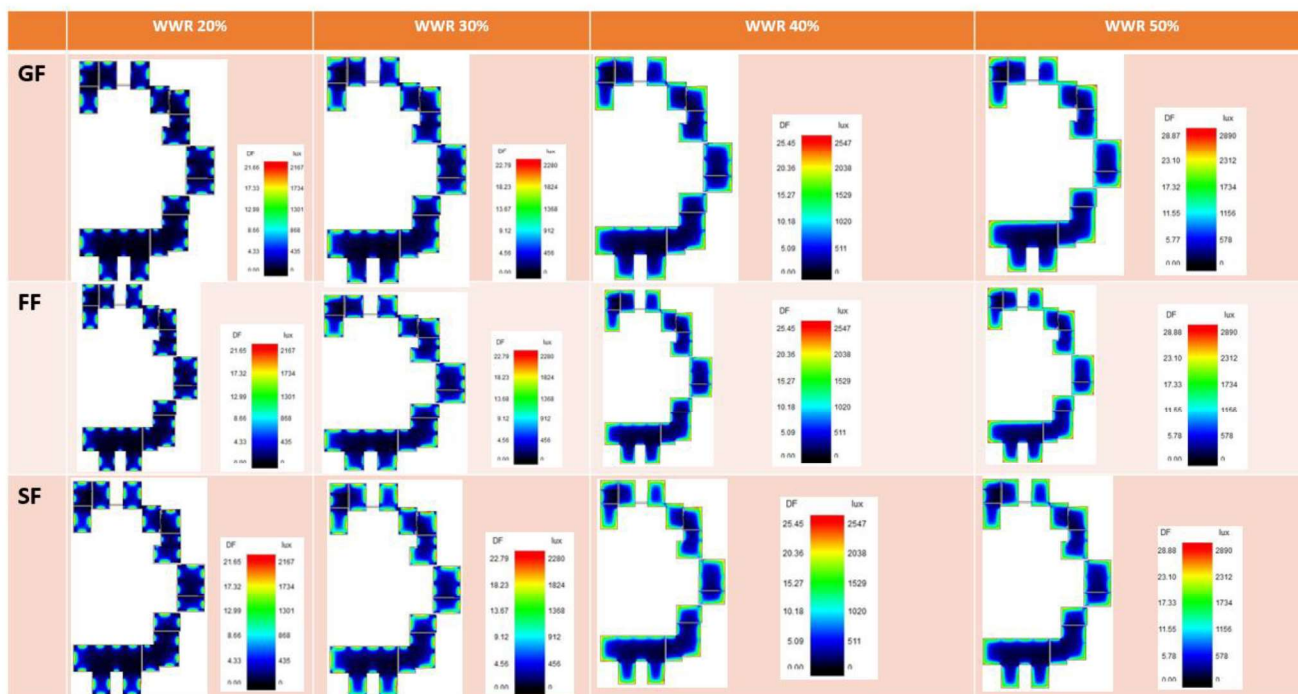
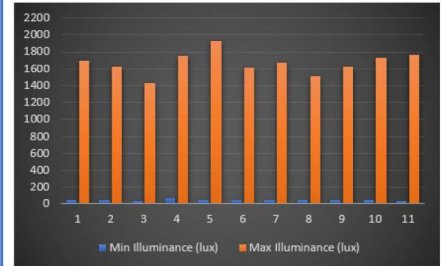


FIG 5.1.8 WWR FOR SECONDARY BLOCK FLOOR PLANS

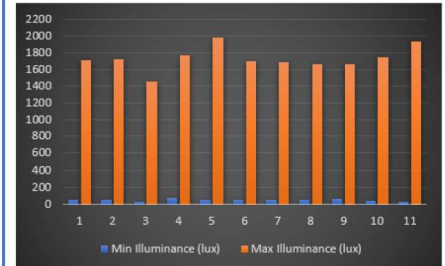
WWR 20%

Block	Zone	Floor Area			Average Daylight Factor (%)	Minimum Daylight Factor (%)	Maximum Daylight Factor (%)	Uniformity ratio (Min / Max)	Uniformity ratio (Min / Max)	Min Illuminance (lux)	Max Illuminance (lux)
		Floor Area (m2)	Threshold (m2)	above (%)							
20 GF	Zone 4	53.505	36.831	68.836	4.068	0.4	16.937	0.098	0.024	40	1694.9
21 GF	Zone 5	164.3	82.298	50.09	3.143	0.356	16.289	0.113	0.022	35.6	1630.2
22 GF	Zone 3	27.847	5.667	20.351	1.631	0.274	14.283	0.168	0.019	27.5	1429.2
23 GF	Zone 2	19.865	15.787	79.474	4.9	0.652	17.554	0.133	0.037	65.3	1757.4
24 GF	Zone 6	52.086	24.04	46.154	3.388	0.408	19.221	0.121	0.021	40.9	1923.6
25 GF	Zone 7	79.134	35.655	45.056	2.91	0.388	16.108	0.133	0.024	38.8	1612
26 GF	Zone 8	102.261	45.25	44.25	2.882	0.403	16.728	0.14	0.024	40.4	1674.3
27 GF	Zone 10	55.55	26.967	48.545	3.161	0.355	15.063	0.112	0.024	35.6	1507.4
28 GF	Zone 1	47.014	29.08	61.853	3.493	0.396	16.26	0.113	0.024	39.7	1627.4
29 GF	Zone 11	138.701	41.086	29.622	2.303	0.356	17.271	0.155	0.021	35.7	1728.7
30 GF	Zone 9	303.165	103.527	34.149	2.423	0.206	17.622	0.085	0.012	20.6	1763.7



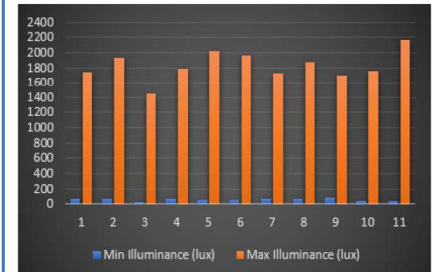
34% daylight

Block	Zone	Floor Area			Average Daylight Factor (%)	Minimum Daylight Factor (%)	Maximum Daylight Factor (%)	Uniformity ratio (Min / Max)	Uniformity ratio (Min / Max)	Min Illuminance (lux)	Max Illuminance (lux)
		Floor Area (m2)	Threshold (m2)	above (%)							
Block 2	Zone 4	53.505	39.153	73.176	4.637	0.553	17.147	0.119	0.032	55.3	1716.3
Block 2	Zone 5	164.3	105.445	64.178	3.639	0.505	17.192	0.139	0.029	50.6	1720.7
Block 2	Zone 3	27.847	5.862	21.053	1.708	0.289	14.43	0.169	0.02	28.9	1444.3
Block 2	Zone 2	19.865	16.31	82.105	5.077	0.739	17.665	0.146	0.042	74	1768.1
Block 2	Zone 6	52.086	25.342	48.654	3.589	0.49	19.767	0.137	0.025	49	1978.8
Block 2	Zone 7	79.134	42.489	53.692	3.343	0.507	17.01	0.152	0.03	50.7	1702.3
Block 2	Zone 8	102.261	49.436	48.343	3.163	0.591	16.946	0.187	0.035	59.1	1696
Block 2	Zone 10	55.55	33.229	59.818	3.712	0.527	16.625	0.142	0.032	52.7	1664.1
Block 2	Zone 1	47.014	31.309	66.595	3.844	0.638	16.677	0.166	0.038	63.8	1669.3
Block 2	Zone 11	138.701	44.68	32.213	2.509	0.438	17.441	0.174	0.025	43.8	1745.4
Block 2	Zone 9	303.165	119.688	39.479	2.738	0.273	19.345	0.1	0.014	27.3	1936.7



39% daylight

Block	Zone	Floor Area			Average Daylight Factor (%)	Minimum Daylight Factor (%)	Maximum Daylight Factor (%)	Uniformity ratio (Min / Max)	Uniformity ratio (Min / Max)	Min Illuminance (lux)	Max Illuminance (lux)
		Floor Area (m2)	Threshold (m2)	above (%)							
20 SF	Zone 4	53.505	41.158	76.923	5.105	0.705	17.414	0.138	0.04	70.6	1743.2
21 SF	Zone 5	164.3	127.998	77.905	4.723	0.708	19.306	0.15	0.037	70.8	1932.4
22 SF	Zone 3	27.847	5.862	21.053	1.73	0.305	14.427	0.176	0.021	30.5	1443.9
23 SF	Zone 2	19.865	16.414	82.632	5.129	0.758	17.834	0.148	0.043	75.9	1784.6
24 SF	Zone 6	52.086	26.143	50.192	3.699	0.493	20.251	0.133	0.024	49.3	2026.8
25 SF	Zone 7	79.134	50.61	63.955	4.047	0.58	19.577	0.143	0.03	58.1	1959.4
26 SF	Zone 8	102.261	54.918	53.704	3.503	0.692	17.25	0.198	0.04	69.3	1726.5
27 SF	Zone 10	55.55	38.279	68.909	4.413	0.634	18.779	0.144	0.034	63.5	1879.4
28 SF	Zone 1	47.014	34.45	73.276	4.336	0.835	16.997	0.193	0.049	83.6	1701.3
29 SF	Zone 11	138.701	49.439	35.644	2.749	0.463	17.603	0.168	0.026	46.4	1761.8
30 SF	Zone 9	303.165	139.462	46.002	3.304	0.392	21.655	0.119	0.018	39.3	2167.6

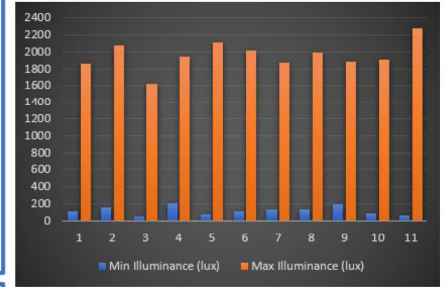


46% daylight

WWR 30%

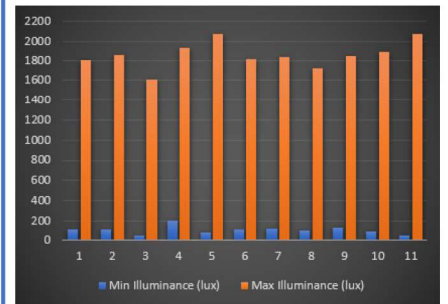
WWR 30%

Block	Zone	Floor Area above		Average Daylight Factor (%)	Minimum Daylight Factor (%)	Maximum Daylight Factor (%)	Uniformity ratio		Min Illuminance (lux)	Max Illuminance (lux)	
		Floor Area Threshold (m2)	Floor Area Threshold (%)				(Min / Avg)	(Min/ Max)			
30 GF	Zone 4	53.505	46.013	85.996	6.113	0.872	17.642	0.143	0.049	87.3	1766.1
31 GF	Zone 5	164.3	131.163	79.831	4.748	0.716	17.727	0.151	0.04	71.6	1774.1
32 GF	Zone 3	27.847	9.868	35.439	2.52	0.426	16.006	0.169	0.027	42.6	1601.8
33 GF	Zone 2	19.865	19.446	97.895	7.403	1.742	18.977	0.235	0.092	174.4	1899.5
34 GF	Zone 6	52.086	34.357	65.962	5.083	0.622	19.911	0.122	0.031	62.3	1993.1
35 GF	Zone 7	79.134	55.662	70.338	4.424	0.675	17.448	0.153	0.039	67.5	1745.9
36 GF	Zone 8	102.261	72.46	70.858	4.398	0.962	17.949	0.219	0.054	96.3	1796.2
37 GF	Zone 10	55.55	41.309	74.364	4.747	0.637	16.203	0.134	0.039	63.7	1621.5
38 GF	Zone 1	47.014	40.935	87.069	5.316	1.073	18.007	0.202	0.06	107.4	1801.8
39 GF	Zone 11	138.701	67.116	48.389	3.541	0.62	18.538	0.175	0.033	62.1	1855.3
40 GF	Zone 9	303.165	162.088	53.465	3.699	0.336	19.332	0.091	0.017	33.6	1934.9



Block	Zone	Floor Area above				Uniformit				Uniformit	Min	Max
		Floor Area	Floor Area	Average	Minimum	Maximum	y ratio	y ratio	Min	Max		
		Threshold (m2)	Threshold (m2)	Daylight Factor (%)	Daylight Factor (%)	Daylight Factor (%)	(Min / Avg)	(Min / Max)	illuminance (lux)	illuminance (lux)		
30 FF	Zone 4	53.505	48.44	90.533	6.869	1.039	18.057	0.151	0.058	104	1807.2	
31 FF	Zone 5	164.3	141.153	85.912	5.448	1.06	18.55	0.194	0.057	106	1856.6	
32 FF	Zone 3	27.847	10.357	37.193	2.628	0.46	16.072	0.175	0.029	46.1	1608.7	
33 FF	Zone 2	19.865	19.865	100	7.68	2.002	19.232	0.261	0.104	200.4	1924.9	
34 FF	Zone 6	52.086	36.36	69.808	5.362	0.722	20.706	0.135	0.035	72.3	2072.4	
35 FF	Zone 7	79.134	64.179	81.101	5.078	0.972	18.075	0.191	0.054	97.2	1808.7	
36 FF	Zone 8	102.261	80.433	78.655	4.808	1.227	18.357	0.255	0.067	122.9	1837.5	
37 FF	Zone 10	55.55	46.662	84	5.552	0.942	17.185	0.17	0.055	94.3	1720.2	
38 FF	Zone 1	47.014	43.975	93.534	5.79	1.276	18.404	0.22	0.069	127.7	1842.2	
39 FF	Zone 11	138.701	74.595	53.782	3.846	0.865	18.815	0.225	0.046	86.6	1883.3	
40 FF	Zone 9	303.165	177.108	58.42	4.148	0.446	20.788	0.108	0.021	44.6	2080.3	

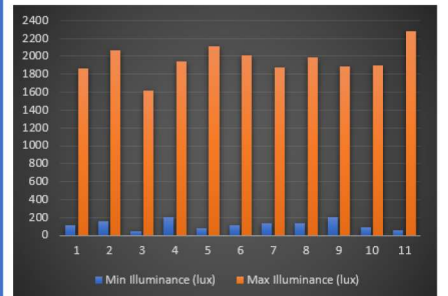
53% of daylight



58% of daylight

WWR 30%

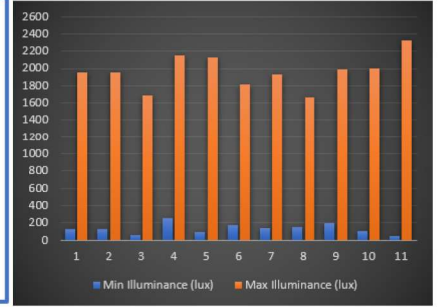
Block	Zone	Floor Area above				Uniformity ratio					Min Illuminance e (lux)	Max Illuminance e (lux)
		Floor Area (m2)	Threshold (m2)	Floor Area (%)	Average Daylight Factor (%)	Minimum Daylight Factor (%)	Maximum Daylight Factor (%)	Uniformity ratio (Min / Avg)	Uniformity ratio (Min / Max)			
30 SF	Zone 4	53.505	49.917	93.294	7.608	1.138	18.62	0.15	0.061	113.9	1863.8	
31 SF	Zone 5	164.3	157.079	95.605	7.084	1.564	20.698	0.221	0.076	156.6	2071.4	
32 SF	Zone 3	27.847	10.455	37.544	2.662	0.464	16.175	0.174	0.029	46.4	1618.7	
33 SF	Zone 2	19.865	19.865	100	7.725	2.021	19.377	0.262	0.104	202.3	1939.6	
34 SF	Zone 6	52.086	37.762	72.5	5.544	0.735	21.123	0.133	0.035	73.6	2114.2	
35 SF	Zone 7	79.134	77.154	97.497	6.093	1.14	20.131	0.187	0.057	114.1	2015.1	
36 SF	Zone 8	102.261	89.503	87.524	5.325	1.383	18.707	0.26	0.074	138.4	1872.2	
37 SF	Zone 10	55.55	52.722	94.909	6.577	1.306	19.906	0.199	0.066	130.7	1992.1	
38 SF	Zone 1	47.014	46.812	99.569	6.459	1.986	18.805	0.307	0.106	198.7	1882.2	
39 SF	Zone 11	138.701	84.017	60.574	4.215	0.888	19.009	0.211	0.047	88.9	1902.6	
40 SF	Zone 9	303.165	195.361	64.44	4.992	0.6	22.788	0.12	0.026	60.1	2280.9	



64% of daylight

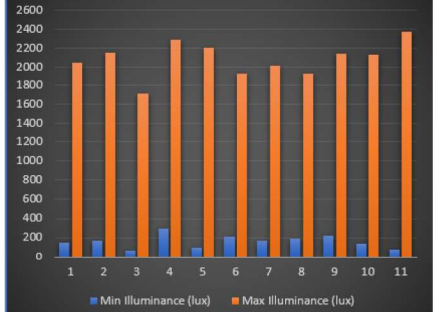
WWR 40%

		Floor Area above			Average	Minimum	Maximum	Uniformity ratio	Uniformity ratio	Min	Max
		Floor Area	Threshold	Threshold	Daylight	Daylight	Daylight	y ratio	y ratio	Illuminance	Illuminance
Block	Zone	(m2)	(m2)	(%)	Factor (%)	Factor (%)	Factor (%)	(Min / Avg)	(Min / Max)	e (lux)	e (lux)
40 GF	Zone 4	53.505	52.028	97.239	7.863	1.255	19.587	0.16	0.064	125.5	1960.1
41 GF	Zone 5	164.3	147.385	89.705	6.222	1.303	19.495	0.209	0.067	130.4	1951.1
42 GF	Zone 3	27.847	11.725	42.105	3.281	0.553	16.883	0.168	0.033	55.3	1689.7
43 GF	Zone 2	19.865	19.865	100	9.487	2.564	21.456	0.27	0.12	256.7	2147.7
44 GF	Zone 6	52.086	40.567	77.885	6.609	0.903	21.261	0.137	0.042	90.4	2127.5
45 GF	Zone 7	79.134	72.499	91.615	5.735	1.697	18.093	0.296	0.094	169.8	1810.6
46 GF	Zone 8	102.261	93.589	91.52	5.816	1.436	19.336	0.247	0.074	143.8	1935.3
47 GF	Zone 10	55.55	49.187	88.545	6.204	1.481	16.63	0.239	0.089	148.2	1664.5
48 GF	Zone 1	47.014	47.014	100	6.888	2.02	19.863	0.293	0.102	202.2	1988.2
49 GF	Zone 11	138.701	91.302	65.826	4.662	1.05	19.972	0.225	0.053	105.1	1999.1
50 GF	Zone 9	303.165	194.315	64.095	4.906	0.457	23.264	0.093	0.02	45.7	2328.5



64% of daylight

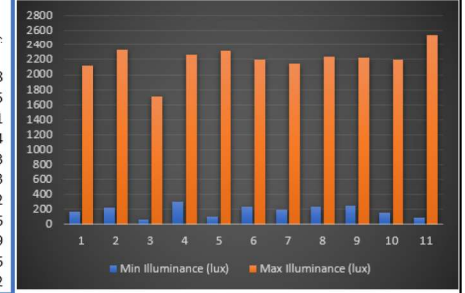
Block	Zone	Floor Area					Uniformit			Uniformit	
		above		Average	Minimum	Maximum	y ratio	y ratio	Min	Max	
		Floor Area (m2)	Threshold (m2)	Daylight Factor (%)	Daylight Factor (%)	Daylight Factor (%)	(Min / Max)	illuminance (lux)	illuminance (lux)		
40 FF	Zone 4	53.505	52.872	98.817	8.814	1.441	20.498	0.164	0.07	144.3	2051.5
41 FF	Zone 5	164.3	157.178	95.665	7.059	1.688	21.533	0.239	0.078	168.9	2154.8
42 FF	Zone 3	27.847	12.409	44.561	3.422	0.596	17.133	0.174	0.035	59.7	1714.7
43 FF	Zone 2	19.865	19.865	100	9.814	2.906	22.899	0.296	0.127	290.8	2291.4
44 FF	Zone 6	52.086	41.969	80.577	6.898	1.003	22.024	0.145	0.046	100.4	2204.6
45 FF	Zone 7	79.134	79.134	100	6.569	2.065	19.289	0.314	0.107	206.6	1930.2
46 FF	Zone 8	102.261	98.473	96.296	6.327	1.692	20.201	0.267	0.084	169.3	2022
47 FF	Zone 10	55.55	54.338	97.818	7.167	1.863	19.294	0.26	0.097	186.5	1931.2
48 FF	Zone 1	47.014	47.014	100	7.459	2.211	21.406	0.296	0.103	221.3	2142.5
49 FF	Zone 11	138.701	106.065	76.471	5.051	1.339	21.325	0.265	0.063	134	2134
50 FF	Zone 9	303.165	211.712	69.834	5.474	0.734	23.798	0.134	0.031	73.5	2381.6



69% of daylight

WWR 40%

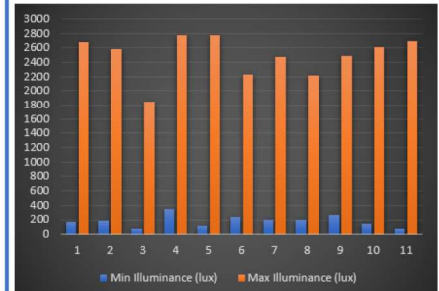
		Floor Area			Uniformit			Uniformit			
		above	above	Average	Minimum	Maximum	y ratio	y ratio	Min	Max	
Block	Zone	Floor Area (m2)	Threshold (m2)	Daylight (%)	Daylight (%)	Daylight (%)	(Min / Max)	(Min / Max)	illuminanc e (lux)	illuminanc e (lux)	
40 SF	Zone 4	53.505	52.978	99.014	9.706	1.634	21.18	0.168	0.077	163.6	2119.8
41 SF	Zone 5	164.3	164.3	100	9.013	2.149	23.247	0.238	0.092	215	2326.5
42 SF	Zone 3	27.847	12.604	45.263	3.476	0.643	17.104	0.185	0.038	64.4	1712.1
43 SF	Zone 2	19.865	19.865	100	9.868	2.931	22.585	0.297	0.13	293.4	2260.4
44 SF	Zone 6	52.086	42.871	82.308	7.108	1.044	23.156	0.147	0.045	104.5	2317.3
45 SF	Zone 7	79.134	79.134	100	7.855	2.276	22.035	0.29	0.103	227.8	2205.3
46 SF	Zone 8	102.261	101.364	99.123	6.985	1.937	21.435	0.277	0.09	193.8	2145.2
47 SF	Zone 10	55.55	55.55	100	8.394	2.304	22.364	0.274	0.103	230.6	2238.6
48 SF	Zone 1	47.014	47.014	100	8.262	2.475	22.196	0.3	0.112	247.8	2221.9
49 SF	Zone 11	138.701	120.538	86.905	5.487	1.543	21.974	0.281	0.07	154.4	2199.6
50 SF	Zone 9	303.165	239.471	78.99	6.515	0.875	25.447	0.134	0.034	87.6	2547.2



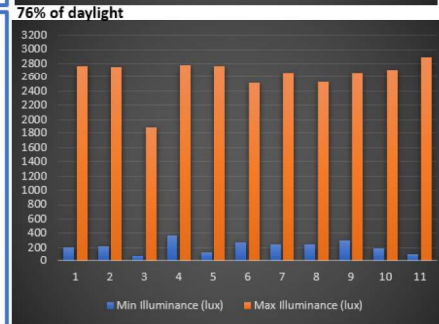
78% of daylight

WWR 50%

Block	Zone	Floor Area				Uniformity					Min		Max	
		above		above		Average	Minimum	Maximum	y ratio	y ratio	Min	Max	Min	Max
		Floor Area	Threshold	Floor Area	Threshold	Daylight	Daylight	Daylight	(Min/	(Min/	illuminanc	illuminanc	e (lux)	e (lux)
		(m2)	(m2)	(m2)	(m2)	Factor (%)	Factor (%)	Factor (%)	Avg)	Max)				
50 GF	Zone 4	53.505	53.189	99.408	9.898	1.753	26.76	0.177	0.066		175.4	2678.5		
51 GF	Zone 5	164.3	162.223	98.736	7.78	1.833	25.803	0.236	0.071		183.4	2582.7		
52 GF	Zone 3	27.847	14.265	51.228	4.141	0.748	18.43	0.181	0.041		74.9	1844.6		
53 GF	Zone 2	19.865	19.865	100	11.65	3.56	27.701	0.306	0.129		356.3	2772.4		
54 GF	Zone 6	52.086	45.976	88.269	8.045	1.224	27.67	0.152	0.044		122.5	2769.6		
55 GF	Zone 7	79.134	79.134	100	7.245	2.422	22.325	0.334	0.108		242.4	2234.3		
56 GF	Zone 8	102.261	102.261	100	7.408	2.065	24.796	0.279	0.083		206.7	2481.9		
57 GF	Zone 10	55.55	55.247	99.455	7.689	1.981	22.1	0.258	0.09		198.3	2211.9		
58 GF	Zone 1	47.014	47.014	100	8.644	2.679	24.862	0.31	0.108		268.2	2488.8		
59 GF	Zone 11	138.701	130.251	93.908	5.977	1.514	26.083	0.253	0.058		151.5	2610.1		
60 GF	Zone 9	303.165	231.676	76.419	6.254	0.816	26.922	0.131	0.03		81.7	2695		

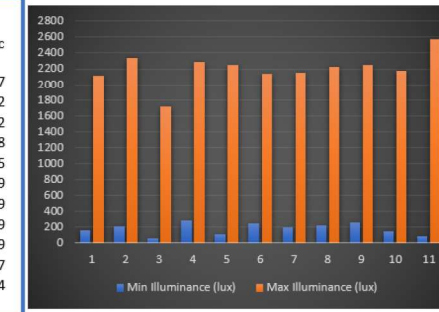


Block	Zone	Floor Area				Uniformit			Uniformit		Min Illuminanc e (lux)	Max Illuminanc e (lux)
		Floor Area	Floor Area	Average	Minimum	Maximum	y ratio	y ratio				
		Threshold	above	Daylight	Daylight	Daylight	(Min /	(Min /				
		(m2)	Threshold	Threshold	Factor (%)	Factor (%)	Factor (%)	Avg)	Max)			
50 FF	Zone 4	53.505	53.505	100	11.171	2.069	27.646	0.185	0.075	207.1	2767.2	
51 FF	Zone 5	164.3	164.3	100	8.909	2.244	27.467	0.252	0.082	224.5	2749	
52 FF	Zone 3	27.847	14.949	53.684	4.332	0.848	18.742	0.196	0.045	84.9	1875.9	
53 FF	Zone 2	19.865	19.865	100	12.105	3.762	27.74	0.311	0.136	376.6	2776.7	
54 FF	Zone 6	52.086	47.578	91.346	8.486	1.366	27.632	0.161	0.049	136.8	2765.5	
55 FF	Zone 7	79.134	79.134	100	8.343	2.746	25.124	0.329	0.109	274.8	2514.4	
56 FF	Zone 8	102.261	102.261	100	8.128	2.424	26.698	0.298	0.091	242.6	2672.2	
57 FF	Zone 10	55.55	55.55	100	8.929	2.508	25.296	0.281	0.099	251	2531.5	
58 FF	Zone 1	47.014	47.014	100	9.425	3.054	26.661	0.324	0.115	305.6	2668.3	
59 FF	Zone 11	138.701	137.924	99.44	6.471	1.935	27.034	0.299	0.072	193.7	2705.7	
60 FF	Zone 9	303.165	264.283	87.175	7.054	1.017	28.879	0.144	0.035	101.7	2890.2	



WWR 50%

Block	Zone	Floor Area		Average	Minimum	Maximum	Uniformit	Uniformit	Min	Max	
		above	above				y ratio	y ratio			
		Threshold	Threshold				(Min /	(Min /			
		Floor Area	Floor Area	Daylight	Daylight	Daylight	Max)	Max)	illuminanc	illuminanc	
		(m2)	(m2)	(%)	Factor (%)	Factor (%)	Factor (%) Avg)		e (lux)	e (lux)	
50 SF	Zone 4	53.505	52.872	98.817	9.646	1.611	21.108	0.167	0.076	161.3	2112.7
51 SF	Zone 5	164.3	164.3	100	8.978	2.049	23.405	0.228	0.088	205.1	2342.2
52 SF	Zone 3	27.847	12.507	44.912	3.467	0.62	17.126	0.179	0.036	62.1	1714.2
53 SF	Zone 2	19.865	19.865	100	9.884	2.879	22.86	0.291	0.126	288.2	2288.2
54 SF	Zone 6	52.086	42.971	82.5	7.087	1.041	22.463	0.147	0.046	104.2	2248.5
55 SF	Zone 7	79.134	79.134	100	7.843	2.423	21.353	0.309	0.113	242.5	2136.9
56 SF	Zone 8	102.261	101.563	99.318	6.963	1.937	21.43	0.278	0.09	193.9	2144.9
57 SF	Zone 10	55.55	55.55	100	8.377	2.263	22.178	0.27	0.102	226.5	2219.9
58 SF	Zone 1	47.014	47.014	100	8.257	2.525	22.531	0.306	0.112	252.7	2254.9
59 SF	Zone 11	138.701	120.149	86.625	5.502	1.45	21.691	0.264	0.067	145.1	2170.7
60 SF	Zone 9	303.165	240.517	79.335	6.51	0.888	25.663	0.136	0.035	88.9	2568.4

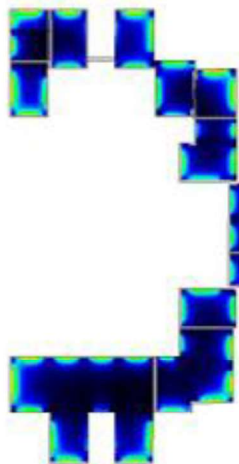


79% of daylight

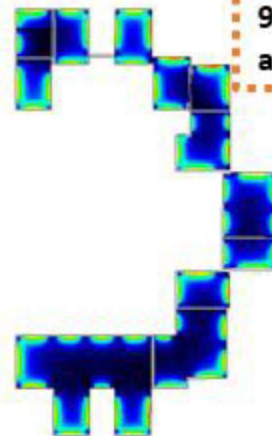
Window shading	Scenario 1: DGU (more exposure area) and SGU (less exposure area)	Scenario 2: horizontal overhang (0.5m)	Scenario 3: overhang + sidefins (0.5m)	Scenario 4: louvers (0.1m from window), 0.18m spacing blades (8 blades)	Scenario 5: lightshelves
North	SGU	X	X	X	O
South	DGU	O	O	O	O
East	DGU	O	O	O	X
west	DGU	O	O	O	X

WITHOUT SHADING:

Block	Zone	Floor Area (m2)	Floor Area ab..	Floor Area ab..	Average Dayl.	Minimum Dayl.	Maximum D.s.	Uniformity rat.	Uniformity rat.	Min Illuminan..	Max Illuminan..
Block 1	Zone 5	164.300	162.223	98.736	7.790	1.833	25.803	0.236	0.071	183.43	2582.75
Block 1	Zone 3	27.847	14.265	51.228	4.141	0.748	18.430	0.181	0.041	74.87	1844.57
Block 1	Zone 2	19.865	19.865	100.000	11.650	3.560	27.701	0.306	0.129	356.29	2772.35
Block 1	Zone 6	52.086	45.976	98.269	8.045	1.224	27.670	0.152	0.044	122.52	2769.63
Block 1	Zone 7	79.134	79.134	100.000	7.245	2.422	22.325	0.334	0.108	242.39	2234.25
Block 1	Zone 8	102.261	102.261	100.000	7.408	2.065	24.796	0.279	0.083	206.67	2481.85
Block 1	Zone 10	55.550	55.247	99.455	7.689	1.981	22.100	0.258	0.090	198.32	2211.95
Block 1	Zone 1	47.014	47.014	100.000	8.644	2.679	24.862	0.310	0.108	268.20	2488.75
Block 1	Zone 11	138.701	130.251	93.908	5.977	1.514	26.083	0.253	0.058	151.47	2610.07
Block 1	Zone 9	303.165	231.676	76.419	6.254	0.816	26.922	0.131	0.030	81.73	2695.03
Block 2	Zone 4	53.505	53.505	100.000	11.171	2.069	27.646	0.185	0.075	207.13	2767.16
Block 2	Zone 5	164.300	164.300	100.000	8.909	2.244	27.467	0.252	0.082	224.55	2749.04
Block 2	Zone 3	27.847	14.949	53.684	4.332	0.848	18.742	0.196	0.045	84.90	1875.90
Block 2	Zone 2	19.865	19.865	100.000	12.105	3.762	27.740	0.311	0.136	376.58	2776.67
Block 2	Zone 6	52.086	47.578	91.346	8.486	1.366	27.632	0.161	0.049	136.76	2765.54
Block 2	Zone 7	79.134	79.134	100.000	8.343	2.746	25.124	0.329	0.109	274.80	2514.37
Block 2	Zone 8	102.261	102.261	100.000	8.128	2.424	26.698	0.298	0.091	242.60	2672.15
Block 2	Zone 10	55.550	55.550	100.000	8.929	2.598	25.296	0.281	0.099	251.03	2531.55
Block 2	Zone 1	47.014	47.014	100.000	9.425	3.054	26.661	0.324	0.115	305.61	2668.27
Block 2	Zone 11	138.701	137.924	99.440	6.471	1.935	27.034	0.299	0.072	193.70	2706.73
Block 2	Zone 9	303.165	264.283	87.175	7.054	1.017	28.879	0.144	0.035	101.73	2890.20
Block 3	Zone 4	53.505	52.872	98.817	9.646	1.611	21.108	0.167	0.076	161.27	2112.74
Block 3	Zone 5	164.300	164.300	100.000	8.978	2.049	23.405	0.228	0.088	205.05	2342.16
Block 3	Zone 3	27.847	12.507	44.912	3.467	0.620	17.126	0.179	0.036	62.05	1714.25
Block 3	Zone 2	19.865	19.865	100.000	9.884	2.879	22.860	0.291	0.126	288.17	2288.03
Block 3	Zone 6	52.086	42.971	82.500	7.087	1.041	22.463	0.147	0.046	104.17	2248.47
Block 3	Zone 7	79.134	79.134	100.000	7.843	2.423	21.353	0.309	0.113	242.51	2136.88
Block 3	Zone 8	102.261	101.563	99.318	6.963	1.937	21.430	0.278	0.090	193.88	2144.91
Block 3	Zone 10	55.550	55.550	100.000	8.377	2.263	22.178	0.270	0.102	226.49	2219.88
Block 3	Zone 1	47.014	47.014	100.000	8.257	2.525	22.531	0.306	0.112	252.67	2254.93
Block 3	Zone 11	138.701	120.149	86.625	5.502	1.450	21.691	0.264	0.067	145.08	2170.71
Block 3	Zone 9	303.165	240.517	79.335	6.510	0.888	25.663	0.136	0.035	88.92	2568.35
Total		3130.283	2863.905	91.490	7.897	0.620	28.879	0.000	0.000	62.05	2890.20



Ground floor

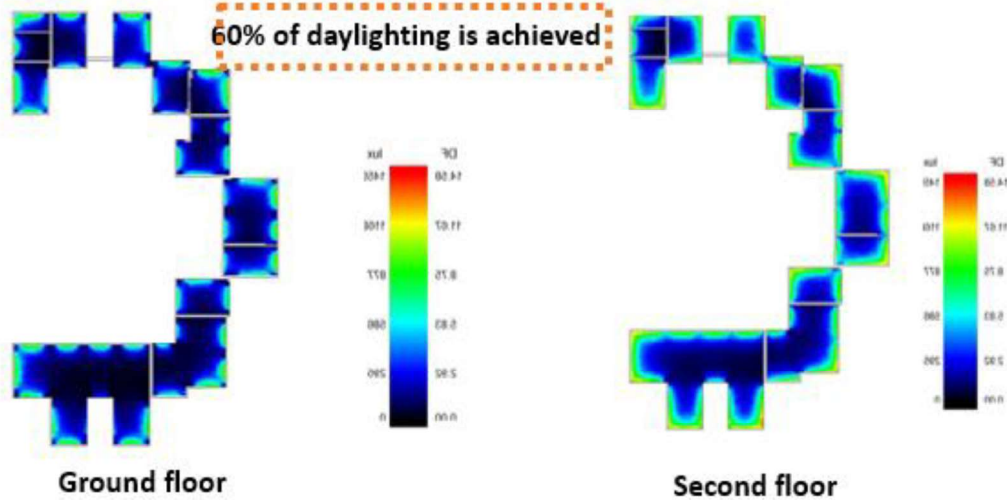


Second floor

91% of daylighting is achieved

WITH LOUVERS:

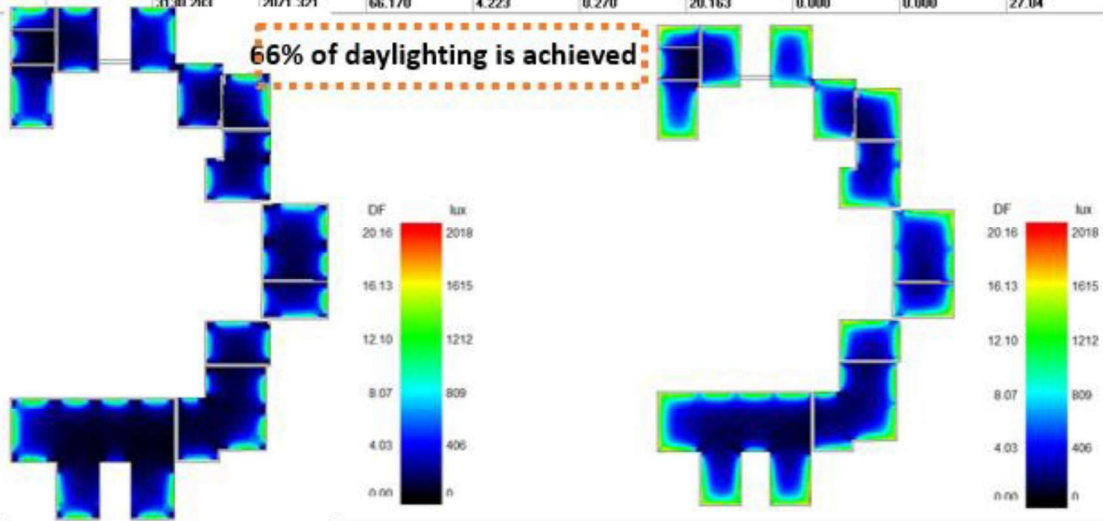
Block	Zone	Floor Area (m2)	Floor Area above	Floor Area above	Average Daylight	Minimum Daylight	Maximum Daylight	Uniformity ratio (M)	Uniformity ratio (M)	Min Illuminance (lux)	Max Illuminance (l)
Block 1	Zone 4	53.505	39.575	73.964	3.612	0.604	9.516	0.167	0.063	60.45	952.42
Block 1	Zone 5	164.300	97.136	59.121	2.840	0.505	9.849	0.178	0.051	50.51	985.67
Block 1	Zone 3	27.847	6.644	23.860	1.575	0.273	9.052	0.173	0.030	27.33	905.93
Block 1	Zone 2	19.865	16.728	84.211	4.563	1.120	10.379	0.245	0.108	112.07	1038.61
Block 1	Zone 6	52.086	26.944	51.731	3.093	0.423	10.437	0.137	0.041	42.34	1044.82
Block 1	Zone 7	79.134	38.329	48.436	2.954	0.471	9.301	0.186	0.051	47.19	930.98
Block 1	Zone 8	102.261	50.134	49.025	2.663	0.670	9.626	0.252	0.070	67.02	963.31
Block 1	Zone 10	95.950	29.795	53.636	2.745	0.430	8.417	0.157	0.051	43.08	842.49
Block 1	Zone 1	47.014	31.512	67.026	3.199	0.748	9.713	0.234	0.077	74.85	972.14
Block 1	Zone 11	138.701	45.845	33.053	2.131	0.467	10.067	0.219	0.046	46.78	1007.72
Block 1	Zone 9	303.165	117.882	38.884	2.223	0.204	10.118	0.092	0.020	20.44	1012.53
Block 2	Zone 4	53.505	42.530	79.487	4.063	0.622	9.877	0.153	0.063	62.28	980.53
Block 2	Zone 5	164.300	111.973	68.152	3.261	0.691	10.283	0.212	0.067	69.13	1029.25
Block 2	Zone 3	27.847	6.742	24.211	1.620	0.301	9.016	0.186	0.033	30.08	902.45
Block 2	Zone 2	19.865	17.565	88.421	4.702	1.277	10.643	0.272	0.120	127.79	1065.28
Block 2	Zone 6	52.086	27.946	53.854	3.220	0.421	10.240	0.131	0.041	42.14	1024.99
Block 2	Zone 7	79.134	44.074	55.695	2.924	0.563	9.614	0.193	0.059	56.38	962.21
Block 2	Zone 8	102.261	54.419	53.216	2.904	0.754	10.107	0.259	0.075	75.42	1011.59
Block 2	Zone 10	95.950	34.744	62.545	3.190	0.578	9.025	0.181	0.064	57.87	903.17
Block 2	Zone 1	47.014	34.045	72.414	3.470	0.851	10.002	0.245	0.085	85.15	1001.10
Block 2	Zone 11	138.701	49.439	35.644	2.296	0.506	10.168	0.220	0.050	50.63	1017.65
Block 2	Zone 9	303.165	130.431	43.023	2.479	0.293	10.647	0.118	0.027	29.28	1065.61
Block 3	Zone 4	53.505	50.973	95.266	5.770	0.991	12.239	0.172	0.081	99.20	1224.88
Block 3	Zone 5	164.300	145.396	89.103	5.188	1.366	12.820	0.263	0.107	136.73	1282.82
Block 3	Zone 3	27.847	9.478	34.035	2.114	0.410	9.299	0.194	0.044	41.00	930.61
Block 3	Zone 2	19.865	19.760	99.474	5.982	1.979	12.954	0.331	0.153	198.09	1296.50
Block 3	Zone 6	52.086	35.158	67.500	4.195	0.616	12.433	0.147	0.050	61.60	1244.22
Block 3	Zone 7	79.134	69.329	87.610	4.524	1.560	11.317	0.345	0.138	156.10	1132.63
Block 3	Zone 8	102.261	82.028	80.214	4.158	1.266	12.347	0.304	0.103	126.68	1235.74
Block 3	Zone 10	95.950	49.995	90.000	4.860	1.444	12.424	0.297	0.116	144.50	1243.52
Block 3	Zone 1	47.014	43.265	92.026	4.897	1.607	11.974	0.328	0.134	160.81	1198.51
Block 3	Zone 11	138.701	74.984	54.062	3.231	0.967	12.273	0.299	0.079	96.75	1228.36
Block 3	Zone 9	303.165	187.945	61.994	3.750	0.503	14.582	0.134	0.035	50.36	1459.43
Total		3130.283	1823.741	58.261	3.454	0.204	14.582	0.000	0.000	20.44	1459.43



WITH OVERHANGS:

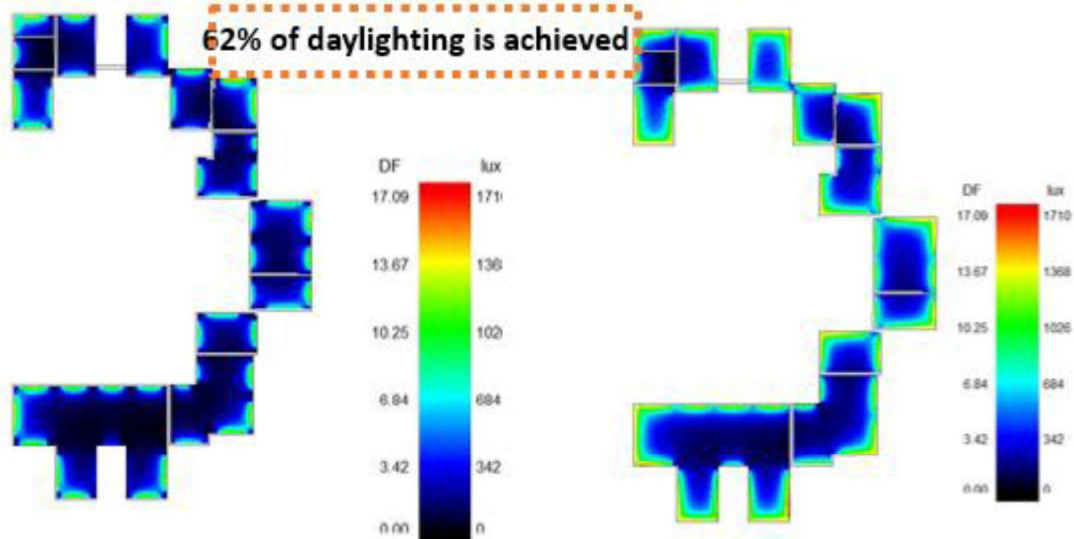
Block	Zone	Floor Area (m ²)	Floor Area above...	Floor Area above...	Average Daylight...	Minimum Daylight...	Maximum Daylight...	Uniformity ratio (M...	Uniformity ratio (M...	Min Illuminance (lux)	Max Illuminance (l...
Block 1	Zone 4	53.505	42.530	79.487	4.339	0.664	12.197	0.153	0.054	66.45	1221.06
Block 1	Zone 5	164.300	112.666	68.573	3.427	0.578	12.407	0.169	0.047	57.81	1241.58
Block 1	Zone 3	27.847	7.523	27.018	1.891	0.377	11.410	0.199	0.033	37.75	1141.97
Block 1	Zone 2	19.865	18.505	93.158	5.553	1.230	13.596	0.221	0.090	123.11	1361.04
Block 1	Zone 6	52.086	29.849	57.308	3.772	0.542	14.122	0.144	0.038	54.20	1413.41
Block 1	Zone 7	79.134	45.064	56.946	3.137	0.578	12.682	0.184	0.046	57.85	1269.51
Block 1	Zone 8	102.261	59.403	58.090	3.259	0.766	12.631	0.235	0.061	76.69	1264.20
Block 1	Zone 10	55.550	34.138	61.455	3.327	0.544	11.355	0.163	0.048	54.41	1136.22
Block 1	Zone 1	47.014	36.071	76.724	3.893	0.836	12.639	0.215	0.066	83.64	1264.86
Block 1	Zone 11	138.701	54.004	38.936	2.616	0.499	12.920	0.191	0.039	49.91	1293.35
Block 1	Zone 9	303.165	134.233	44.277	2.719	0.270	14.418	0.099	0.019	27.04	1443.07
Block 2	Zone 4	53.505	44.852	83.826	4.972	0.833	12.761	0.168	0.065	83.41	1277.34
Block 2	Zone 5	164.300	125.722	76.520	3.846	0.734	12.942	0.191	0.057	73.48	1295.49
Block 2	Zone 3	27.847	8.305	29.825	1.988	0.410	11.606	0.206	0.035	41.07	1161.64
Block 2	Zone 2	19.865	18.715	94.211	5.693	1.381	13.588	0.243	0.102	138.25	1360.02
Block 2	Zone 6	52.086	31.852	61.154	3.991	0.621	14.746	0.156	0.042	62.19	1475.84
Block 2	Zone 7	79.134	51.997	65.707	3.605	0.704	13.020	0.195	0.054	70.48	1303.15
Block 2	Zone 8	102.261	67.177	65.692	3.544	0.916	12.874	0.258	0.071	91.70	1288.54
Block 2	Zone 10	55.550	40.299	72.545	3.931	0.736	12.248	0.187	0.060	73.70	1225.67
Block 2	Zone 1	47.014	38.908	82.759	4.225	1.016	13.075	0.240	0.078	101.68	1308.81
Block 2	Zone 11	138.701	59.152	42.647	2.840	0.635	13.168	0.224	0.048	63.60	1318.03
Block 2	Zone 9	303.165	149.919	49.451	2.993	0.360	15.345	0.120	0.023	36.05	1535.80
Block 3	Zone 4	53.505	52.345	97.830	7.080	1.372	15.093	0.194	0.091	137.26	1510.50
Block 3	Zone 5	164.300	158.365	96.388	6.240	1.720	16.160	0.276	0.106	172.19	1617.63
Block 3	Zone 3	27.847	10.943	39.298	2.588	0.529	11.801	0.205	0.045	52.98	1180.98
Block 3	Zone 2	19.865	19.865	100.000	7.322	2.434	16.121	0.332	0.151	243.56	1613.33
Block 3	Zone 6	52.086	39.665	76.154	5.208	0.878	16.710	0.169	0.053	87.88	1672.48
Block 3	Zone 7	79.134	78.738	99.439	5.580	1.948	14.711	0.349	0.132	195.05	1472.70
Block 3	Zone 8	102.261	96.580	94.444	5.133	1.646	14.959	0.321	0.110	164.69	1497.03
Block 3	Zone 10	55.550	54.540	98.182	6.006	1.895	15.468	0.316	0.123	189.71	1548.27
Block 3	Zone 1	47.014	47.014	100.000	5.990	2.095	15.379	0.350	0.136	209.69	1539.13
Block 3	Zone 11	138.701	92.866	66.947	4.005	1.226	15.488	0.306	0.079	122.73	1550.05
Block 3	Zone 9	303.165	209.525	69.113	4.638	0.683	20.163	0.147	0.034	68.34	2018.08
Total		3130.203	2071.321	66.170	4.223	0.270	20.163	0.000	0.000	27.04	2018.08

66% of daylighting is achieved



WITH OVERHANGS AND FINS:

Block	Zone	Floor Area (m2)	Floor Area above ...	Floor Area above ...	Average Daylight	Minimum Daylight	Maximum Daylight	Uniformity ratio (M)	Uniformity ratio (M)	Min Illuminance (lux)	Max Illuminance (lux)
Block 1	Zone 4	53 505	41 475	77 515	4.170	0.671	11 745	0.161	0.057	67.14	1175.49
Block 1	Zone 5	164 300	102 180	62 191	3.191	0.555	11 620	0.174	0.046	55.55	1162.92
Block 1	Zone 3	27 847	6 937	24 912	1.746	0.357	10 068	0.205	0.035	35.77	1007.67
Block 1	Zone 2	19 865	17 963	90 526	5.115	1.158	12 531	0.226	0.092	115.92	1254.18
Block 1	Zone 6	52 086	29 048	55 769	3.602	0.541	13 965	0.150	0.039	54.19	1397.70
Block 1	Zone 7	79 134	41 895	52 941	2.958	0.514	11 667	0.174	0.044	51.42	1167.54
Block 1	Zone 8	102 261	57 210	55 945	3.087	0.741	11 827	0.240	0.063	74.17	1183.65
Block 1	Zone 10	55 950	33 027	55 455	3.175	0.527	10 345	0.166	0.051	52.79	1035.35
Block 1	Zone 1	47 014	35 261	75 000	3.688	0.802	11 504	0.218	0.070	80.30	1151.26
Block 1	Zone 11	136 701	50 313	36 275	2.445	0.477	12 186	0.195	0.039	47.72	1219.51
Block 1	Zone 9	303 165	129 765	42 803	2.571	0.268	12 800	0.104	0.021	26.81	1280.98
Block 2	Zone 4	53 505	44 852	83 826	4.770	0.847	12 280	0.178	0.069	84.79	1228.97
Block 2	Zone 5	164 300	119 590	72 787	3.592	0.717	11 870	0.200	0.060	71.73	1188.07
Block 2	Zone 3	27 847	7 523	27 018	1.822	0.389	10 203	0.213	0.038	38.89	1021.12
Block 2	Zone 2	19 865	18 505	93 158	5.274	1.286	12 686	0.244	0.102	128.75	1267.60
Block 2	Zone 6	52 086	30 951	59 423	3.801	0.598	13 919	0.157	0.043	59.88	1392.96
Block 2	Zone 7	79 134	49 818	62 954	3.412	0.626	11 861	0.184	0.053	62.69	1187.06
Block 2	Zone 8	102 261	64 187	62 768	3.367	0.793	11 951	0.236	0.066	79.39	1195.96
Block 2	Zone 10	55 950	35 633	71 495	3.752	0.721	11 285	0.192	0.064	72.16	1129.55
Block 2	Zone 1	47 014	37 287	79 310	3.996	0.991	11 850	0.248	0.084	99.20	1185.78
Block 2	Zone 11	136 701	55 695	40 126	2.648	0.592	12 503	0.224	0.047	59.23	1251.21
Block 2	Zone 9	303 165	144 120	47 538	2.842	0.360	13 886	0.127	0.026	36.01	1389.76
Block 3	Zone 4	53 505	52 239	97 633	6.868	1.323	13 976	0.193	0.095	132.42	1398.78
Block 3	Zone 5	164 300	155 892	94 883	5.985	1.594	14 995	0.266	0.106	159.55	1501.03
Block 3	Zone 3	27 847	10 162	36 491	2.443	0.523	11 254	0.214	0.047	52.39	1126.31
Block 3	Zone 2	19 865	19 865	100 000	6.879	2.312	15 582	0.336	0.148	231.45	1559.76
Block 3	Zone 6	52 086	38 764	74 423	5.016	0.863	15 354	0.172	0.056	86.36	1536.67
Block 3	Zone 7	79 134	77 649	98 123	5.297	1.772	13 925	0.335	0.127	177.38	1393.74
Block 3	Zone 8	102 261	93 290	91 228	4.956	1.580	13 895	0.319	0.114	158.12	1386.89
Block 3	Zone 10	55 950	54 540	98 182	5.836	1.909	14 108	0.327	0.135	191.08	1411.79
Block 3	Zone 1	47 014	47 014	100 000	5.787	2.094	14 491	0.362	0.145	209.60	1493.40
Block 3	Zone 11	136 701	86 251	62 185	3.766	1.057	13 974	0.281	0.076	105.83	1398.66
Block 3	Zone 9	303 165	206 388	68 078	4.472	0.697	17 088	0.156	0.041	69.78	1710.37
Total		3138 283	1999 329	63 871	4.010	0.268	17 088	0.080	0.000	26.81	1710.37



ANALYSIS:

WITHOUT SHADING:

Room Electricity (kWh)	47.70	500.83	500.83	47.70	500.83	500.83	500.83	47.70	500.83	500.83
Lighting (kWh)	0.00	751.27	751.27	0.00	751.27	751.27	751.27	0.00	751.27	751.27
Cooling (Electricity) (kWh)	0.00	2682.72	3519.12	0.00	2564.46	2752.40	3475.21	0.00	2808.97	2263.34
DHW (Electricity) (kWh)	0.00	47.04	47.04	0.00	47.04	47.04	47.04	0.00	47.04	47.04
Air Temperature (°C)	30.73	25.80	26.60	36.70	25.75	26.13	27.30	30.72	25.75	25.42
Radiant Temperature (°C)	31.47	29.46	30.72	37.42	28.72	29.13	32.04	31.07	28.74	28.34
Operative Temperature (°C)	31.10	27.63	28.66	37.06	27.23	27.63	29.67	30.90	27.24	28.88
Outside Dry-Bulb Temperature (°C)	25.20	26.49	30.78	31.14	28.28	29.68	29.95	28.27	27.78	25.34
External Infiltration (kWh)	-327.69	34.63	234.01	-321.25	141.37	200.29	148.11	-144.68	114.32	-9.09
General Lighting (kWh)	0.00	751.27	751.27	0.00	751.27	751.27	751.27	0.00	751.27	751.27
Computer + Equip (kWh)	47.70	500.83	500.83	47.70	500.83	500.83	500.83	47.70	500.83	500.83
Occupancy (kWh)	0.00	214.10	214.10	0.00	214.10	214.10	214.10	0.00	214.10	214.10
Solar Gains Exterior Windows (kWh)	1757.76	1814.71	1819.43	1759.04	1177.32	1181.44	1629.02	946.32	1439.02	1347.75
Zone Sensible Heating (kWh)	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00
Zone Sensible Cooling (kWh)	0.00	-3348.49	-4037.46	0.00	-2873.95	-3019.61	-4520.86	0.00	-2896.25	-2650.50
Mech Vent + Nat Vent + Infiltration (ac/h)	0.71	1.16	1.15	0.71	1.16	1.15	1.15	0.71	1.15	1.16

WITH LOUVERS:

Lighting (kWh)	0.00	TOTAL	TOTAL	0.00	TOTAL	TOTAL	TOTAL	0.00	TOTAL	TOTAL
Cooling (Electricity) (kWh)	0.00	2224.75	3005.03	0.00	2275.22	2443.20	2853.72	0.00	2439.77	1882.73
DHW (Electricity) (kWh)	0.00	47.04	47.04	0.00	47.04	47.04	47.04	0.00	47.04	47.04
Air Temperature (°C)	28.38	25.46	26.20	33.38	25.53	25.86	26.62	29.36	25.48	25.15
Radiant Temperature (°C)	28.84	28.20	29.30	33.70	27.88	28.19	30.14	29.49	27.71	27.30
Operative Temperature (°C)	28.61	26.83	27.75	33.54	26.70	27.03	28.38	29.43	26.60	26.23
Outside Dry-Bulb Temperature (°C)	25.20	26.49	30.78	31.14	28.28	29.68	29.95	28.27	27.78	25.34
External Infiltration (kWh)	-190.59	54.87	257.22	-131.46	154.32	215.43	187.99	-66.68	129.78	7.17
General Lighting (kWh)	0.00	751.27	751.27	0.00	751.27	751.27	751.27	0.00	751.27	751.27
Computer + Equip (kWh)	47.70	500.83	500.83	47.70	500.83	500.83	500.83	47.70	500.83	500.83
Occupancy (kWh)	0.00	214.10	214.10	0.00	214.10	214.10	214.10	0.00	214.10	214.10
Solar Gains Exterior Windows (kWh)	777.87	884.04	881.08	861.05	564.39	564.97	793.43	450.96	678.08	598.07
Zone Sensible Heating (kWh)	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.00
Zone Sensible Cooling (kWh)	0.00	-2572.66	-3166.81	0.00	-2394.93	-2510.91	-3455.58	0.00	-2299.59	-2053.23

WITH OVERHANGS:

Room Electricity (kWh)	47.70	500.83	500.83	47.70	500.83	500.83	500.83	47.70	500.83	500.83
Lighting (kWh)	0.00	751.27	751.27	0.00	751.27	751.27	751.27	0.00	751.27	751.27
Cooling (Electricity) (kWh)	0.00	2251.09	3075.64	0.00	2307.02	2476.51	2939.92	0.00	2470.60	1969.90
DHW (Electricity) (kWh)	0.00	47.04	47.04	0.00	47.04	47.04	47.04	0.00	47.04	47.04
Air Temperature (°C)	28.81	25.49	26.27	33.74	25.55	25.89	26.71	29.51	25.51	25.21
Radiant Temperature (°C)	29.33	28.28	29.51	34.12	27.98	28.29	30.41	29.66	27.81	27.51
Operative Temperature (°C)	29.07	26.88	27.89	33.93	26.76	27.09	28.56	29.59	26.66	26.36
Outside Dry-Bulb Temperature (°C)	25.20	26.49	30.78	31.14	28.28	29.68	29.95	28.27	27.78	25.34
External Infiltration (kWh)	-215.55	53.18	253.48	-152.42	152.79	213.68	182.28	-74.85	128.16	3.47
General Lighting (kWh)	0.00	751.27	751.27	0.00	751.27	751.27	751.27	0.00	751.27	751.27
Computer + Equip (kWh)	47.70	500.83	500.83	47.70	500.83	500.83	500.83	47.70	500.83	500.83
Occupancy (kWh)	0.00	214.10	214.10	0.00	214.10	214.10	214.10	0.00	214.10	214.10
Solar Gains Exterior Windows (kWh)	936.84	946.75	1010.00	970.28	633.83	636.23	903.07	508.90	737.09	725.85
Zone Sensible Heating (kWh)	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.00
Zone Sensible Cooling (kWh)	0.00	-2615.27	-3285.49	0.00	-2448.58	-2564.95	-3602.62	0.00	-2347.82	-2170.45

WITH OVERHANGS AND FINS:

Room Electricity (kWh)	47.70	500.83	500.83	47.70	500.83	500.83	500.83	47.70	500.83	500.83
Lighting (kWh)	0.00	751.27	751.27	0.00	751.27	751.27	751.27	0.00	751.27	751.27
Cooling (Electricity) (kWh)	0.00	2243.68	3070.35	0.00	2300.29	2469.81	2930.79	0.00	2462.61	1960.94
DHW (Electricity) (kWh)	0.00	47.04	47.04	0.00	47.04	47.04	47.04	0.00	47.04	47.04
Air Temperature (°C)	28.75	25.48	26.26	33.69	25.55	25.89	26.70	29.48	25.50	25.20
Radiant Temperature (°C)	29.27	28.26	29.50	34.06	27.95	28.27	30.38	29.63	27.78	27.49
Operative Temperature (°C)	29.01	26.87	27.88	33.88	26.75	27.08	28.54	29.56	26.64	26.34
Outside Dry-Bulb Temperature (°C)	25.20	26.49	30.78	31.14	28.28	29.68	29.95	28.27	27.78	25.34
External Infiltration (kWh)	-212.25	53.57	253.73	-149.55	153.13	214.04	182.95	-73.30	128.54	3.95
General Lighting (kWh)	0.00	751.27	751.27	0.00	751.27	751.27	751.27	0.00	751.27	751.27
Computer + Equip (kWh)	47.70	500.83	500.83	47.70	500.83	500.83	500.83	47.70	500.83	500.83
Occupancy (kWh)	0.00	214.10	214.10	0.00	214.10	214.10	214.10	0.00	214.10	214.10
Solar Gains Exterior Windows (kWh)	915.15	932.36	1000.11	956.65	619.69	622.61	892.48	498.19	721.51	709.04
Zone Sensible Heating (kWh)	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.00
Zone Sensible Cooling (kWh)	0.00	-2602.92	-3276.64	0.00	-2437.49	-2553.95	-3586.30	0.00	-2335.02	-2156.08
Mech Vent + Nat Vent + Infiltration (ac/h)	0.71	1.16	1.15	0.71	1.16	1.15	1.15	0.70	1.15	1.16

CONCLUSION:

The different window wall ratio and their impact on the buildings accordingly is given and also the different proposals for those buildings is also given at different floor levels. The proposals made on different floor levels and proposals given in such basis.