



SATHYABAMA

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

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

www.sathyabama.ac.in

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

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

Name of the Student : Aananya Shree M V

Semester : III

Reg No. : 41890001

Batch : 2021-2023



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DEPARTMENT OF ARCHITECTURE

M. Arch (Sustainable Architecture)

VIVA-VOCE EXAMINATION

This is to certify that the Professional Training Report (S89APT) is the work of **Aananya Shree M V** who had undergone training in **Green Evolution** and has been monitored by the continuous assessment during Jul 2022 to Aug 2022.

A handwritten signature in green ink, reading 'Devyani Gangopadhyay'.

Dr. Devyani Gangopadhyay
HOD AND DEAN

Submitted for Viva voce Examination held on **20.12.2022**

A handwritten signature in blue ink, appearing to read 'V. Jay'.

Internal Examiner

A handwritten signature in black ink, appearing to read 'R. Manj'.

External Examiner

(Annexure III)



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DECLARATION

I **Aananya Shree M V** hereby declare that this Professional Training Report for one month done by me under the guidance of **Ar.Anupama Mohanram** is submitted in partial fulfillment of the requirements for the completion of the practical training session.

DATE : 20 December 2022

PLACE : Chennai



Aananya Shree MV
SIGNATURE OF CANDIDATE

ACKNOWLEDGEMENT

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

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

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

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

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



To,
Aananya Shree MV
DABC Gokulam Phase 2,
Sriram Nagar Main Road
Nolambur, Chennai

June 28th, 2022

Mobile: 9952799056
Email: aananyashree@gmail.com

Dear Aananya,

We are pleased to offer you an internship with Green Evolution on the following terms and conditions:

- 1. Designation:** Architectural Intern
- 2. Internship period:** Through the month of July, 2022
- 3. Documents to be furnished on Joining:**
 - i. Proof of student enrollment

We welcome you to the organization and look forward to a mutually rewarding association.

For Green Evolution Architectural Consultancy

A handwritten signature in blue ink, appearing to read "anupama", written over a faint circular stamp.

Anupama Mohanram M.Arch, LEED AP

Co-Founder and Head of Architecture



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M. Arch (Sustainable Architecture) Batch 2021-2023
Continuous Assessment Report for Professional training

(Continuous progress report of the trainee architect/Project Manager for the period of 15 working days in the office to be submitted to HOD)

1. Name of the office / organization :	Green Evolution
2. Address & Contact Number :	Workflo greeta towers, Perungudi, Chennai, 9940051499
3. Name of the student :	Aananya Shree M V
4. Duration :	From 11 July 2022 To 29 July 2022
5. Total No. of days :	15 days
6. Evaluation of Performance criteria shall be on	

* Note: Kindly grade the student as per his/her overall performance in the office during the assessment month;

Description of works	Excellent	Good	Fair	Poor	NA
Understanding of office culture	*				
Skillsets related to project management					*
Design Management		*			
Understanding the Triple Constraints					*
Observation during Site Visits					*
Understanding of construction details		*			
Understanding of Construction sequences		*			
Site Supervision / Discussion with clients					*
Adherence to Time schedule	*				
Quantitative aptitude		*			
Documentation skills	*				
Coordination with other consultants		*			

Overall Grading*

A

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

7. Any other Remarks : _____

8. Signature of the
Head of the Office /
Organization (With Seal)

:

Green Evolution Architectural Consultancy
No. 43/2, 7th Cross Street,
Besant Nagar, Chennai - 600 090
Landline: 044 - 24411245



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1. Name of the office / organization :	Green Evolution
2. Address & Contact Number :	Workflo greeta towers, Perungudi, Chennai, 9940051499
3. Name of the student :	Aananya Shree M V
4. Duration :	From 1 August 2022 To 19 August 2022
5. Total No. of days :	15 days
6. Evaluation of Performance criteria shall be on	

* Note: Kindly grade the student as per his/her overall performance in the office during the assessment month;

Description of works	Excellent	Good	Fair	Poor	NA
Understanding of office culture	*				
Skillsets related to project management					*
Design Management		*			
Understanding the Triple Constraints					*
Observation during Site Visits					*
Understanding of construction details		*			
Understanding of Construction sequences		*			
Site Supervision / Discussion with clients					*
Adherence to Time schedule	*				
Quantitative aptitude		*			
Documentation skills	*				
Coordination with other consultants		*			

Overall Grading*

A

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

7. Any other Remarks : _____

8. Signature of the
Head of the Office /
Organization (With Seal)

:

Green Evolution Architectural Consultancy
No. 43/2, 7th Cross Street,
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Landline: 044 - 24411245

DAY	PROJECT NAME	WORK DONE	DAY	PROJECT NAME	WORK DONE
01	The school (Staff quarters)	Introduction, Site visit and meeting	16	GE Office	Water Calculation as per IGBC
02	The school (Staff quarters)	Site visit at Thalambur	17	GE Office and Residence	Water Calculation as per IGBC
03	GE Office	Lighting Simulation – Light Stanza –PIT	18	GE Residence	Team meeting and Discussion, Electrical layout
04	GE Office	Lighting Simulation – Light Stanza – Annual metrics	19	GE Residence	Electrical layout
05	GE Office	Team Meeting and discussion , Presentation of lighting simulations	20	GE Residence	Team meeting and Discussion, Electrical layout corrections
06	GE Office	Presentation of lighting simulations	21	GE Office and Residence	Energy Manual Calculation
07	GE Office	Water Calculation as per NBC	22	GE Residence	Electrical layout corrections
08	GE Office	Roof Rain water Calculation and Opaque Simulation	23	GE Office and Residence	LPD Calculation
09	GE Office	Presentation of lighting simulations	24	GE Residence	Team meeting and Discussion, Drafting of Floor Plan
10	GE Office	Team meeting, Discussion and review, Sketch Up model for lighting simulation	25	GE Residence	Drafting of Floor Plan
11	GE Office	Sketch Up model with different types of openings for lighting simulations	26	GE Residence	Drafting of Floor Plan
12	GE Office	Lighting Simulations – Light Stanza	27	GE Office	Solar Insolation Analysis with Griha cube
13	GE Office	Team Meeting and Discussion , Lighting Simulations – Light Stanza	28	GE Residence	Solar Insolation Analysis with Griha cube
14	GE Office	Presentation of lighting simulations	29	GE Office and Residence	Energy Manual Calculation corrections
15	GE Office	Team meeting, Discussion, Presentation of lighting simulations	30	GE Office and Residence	Team meeting and Discussion

Chief Architect Signature:

Office seal

Green Evolution Architectural Consultancy
 No:43/2, 7th Cross Street,
 Besant Nagar , Chennai - 600 090
 Landline: 044 - 24411245



To:
The Head of the Department
Department of Architecture,
School of Building & Environment
Sathyabama Institute of Science and Technology
(Deemed to be University)
Rajiv Gandhi Salai, Jeppiaar Nagar.
Chennai-600 119, Tamil Nadu

Date: August 20, 2022

Dear Sir/Madam,

This letter is to verify that Aananya Shree M.V, Second year M.Arch (Sustainable Design) student of Department of Architecture, School of Building & Environment Sathyabama Institute of Science and Technology, has successfully completed her internship in our firm from July 11, 2022 until July 29, 2022 and from August 01, 2022 until August 19, 2022.

For Green Evolution Architectural Consultancy

Green Evolution Architectural Consultancy
No:43/2, 7th Cross Street,
Besant Nagar, Chennai - 600 090
Landline: 044 - 24411245

Anupama Mohanram
Proprietor
COA reg No.: CA/2006/38052

CHAPTER NO.	TITLE	PAGE NO.
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2	Project : GE Office and Residence	2
3	GE Office - Day Lighting Simulation and Analysis	3
4	GE Office - Day Lighting Simulation with different Iterations	9
5	GE Office and Residence - Solar Insolation Analysis with Griha cube	27
6	GE Office and Residence - Material Iterations	28
7	GE Office and Residence - Water calculations	29
8	GE Office and Residence - LPD Calculations	30
9	GE Office and Residence - Energy Calculations	31
10	GE Residence – Drafting of Floor plan	32
11	GE Residence – Electrical Layout	33

The firm specializes in designing beautiful, energy efficient and earth friendly spaces that demonstrate the human ability to adapt and live in harmony with nature.

Design Philosophy

Customized: a design that embodies the institution's philosophy and supports its vision and mission

Sustainability: a campus / building that is energy, water and resource efficient; and built with eco-friendly materials

Ergonomics: spaces and facilities that are designed to ensure ease of use and well-being of occupants

In touch with nature: spaces which weave indoors and outdoors to foster close contact with nature

Safety: carefully designed facilities that provide a safe environment for occupants

Accessibility: thoughtfully designed facilities that allow access to occupants of various abilities

Aesthetics: that will pique the students' interest and inculcate an appreciation for art

Contextual relevance: designs that are relevant to pertinent geographic, climatic & cultural factors

Green Highlights

- Founded by professionals with global architectural experience
- Felicited in 2015 by the Indian Green Building Council for our contribution to the green building movement
- Provided advisory services for 45 Lakh square feet of green projects thus far
- Designed 10 Lakh square feet of green spaces thus far
- Team with extensive green building accreditation (LEED / GRIHA / IGBC)



SEARCH begins here....
Sustainable Excellence through Architecture



Education

Master of Architecture (M.Arch)

Kansas State University, Manhattan, Kansas, USA

Bachelor of Architecture (B.Arch)

School of Architecture and Planning, Anna University, Chennai, India

Professional Experience

Founder and Head, 2008-present

Green Evolution Architectural Consultancy, Chennai

Firm profile: Provides architecture and green building consulting services.

Project Architect 1997-2007

Cordogan Clark and Associates, Chicago, USA

Firm profile: Provides architecture, landscaping and interior design services for multiple project types in the United States and China

Anupama Mohanram
Co-founder and Head of Architecture

Areas of Speaking Expertise

- Environmentally sustainable architecture and green building design
- Passive solar and climate responsive design
- Vernacular influences in sustainable architecture
- Green building materials

Certifications

LEED® Accredited Professional

Certified by the United States Green Building Council (USGBC)

Certified GRIHA Evaluator and Trainer

Anupama Mohanram is an architect with a passion for environmental sustainability. During her 10-year practice in the USA, Anupama was involved in the design of multiple design projects including schools, offices, residences and banks. Her interest in nature and green technologies spurred her to obtain a LEED AP accreditation before moving back to India to start her own architecture firm in 2008. Anupama leverages her rich international experience in environmentally sustainable architecture to design and construct green buildings in the Indian context.

LOCATION : Semmancheri

TPOLOGY : Office space

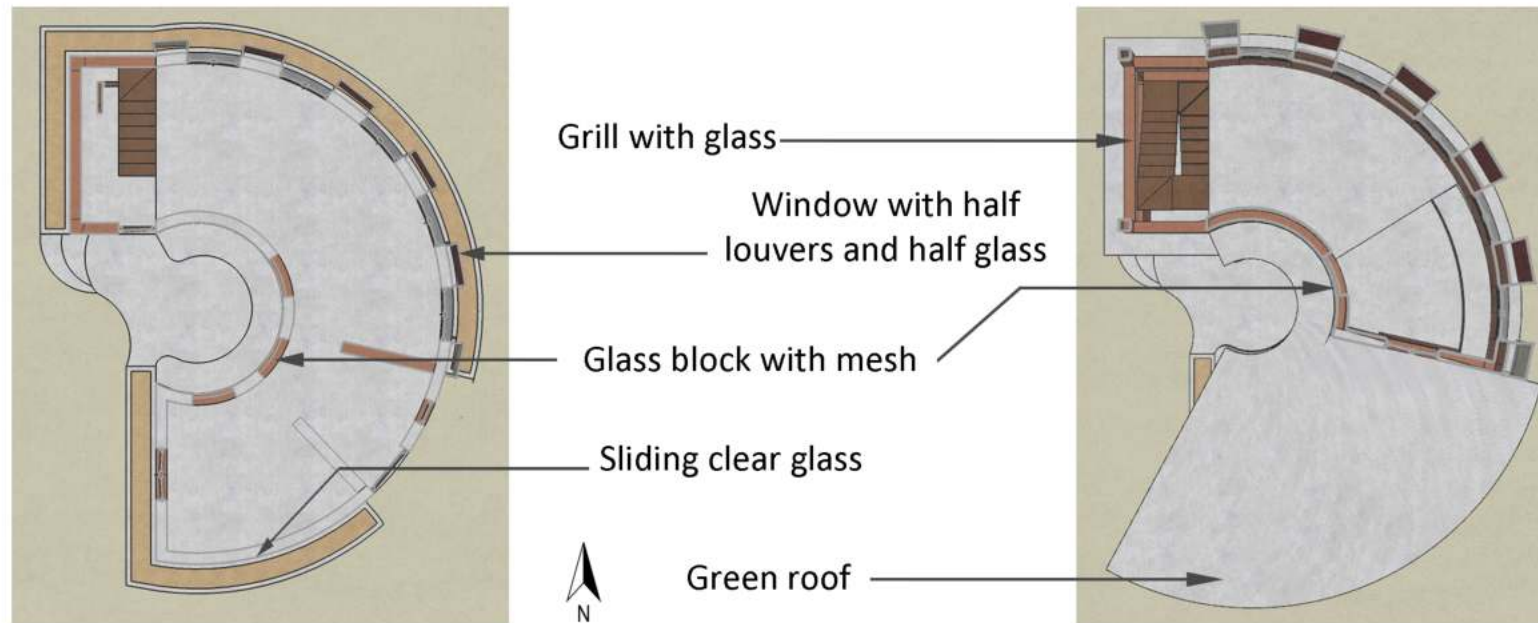
NO. OF FLOORS : G+1 structure

TOTAL BUILT UP AREA : 82 sq. m (883 sq.ft)

GROUND FLOOR : 50.3 sq. m (542 sq.ft)

MEZZANINE FLOOR : 31.6 sq. m (342 sq.ft)





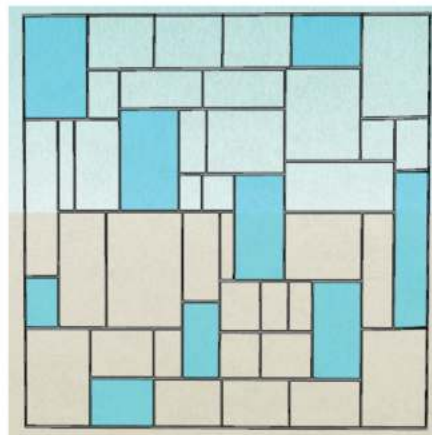
Ground floor

Mezzanine floor

FENESTRATION



Window with half louver and half clear glass



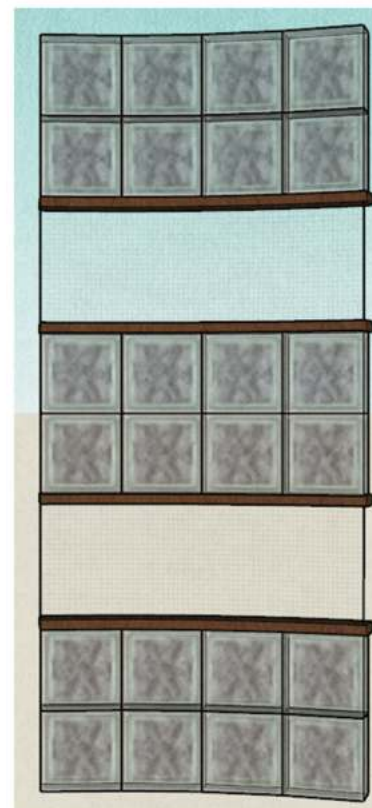
Steel grill with frosted glass

Reflantance of surfaces

Wall - 0.5

Floor - 0.2

Ceiling - 0.8



Glass block with mesh



MATERIALS USED

WALL

8" Porotherm with 1" handmade brick

ROOF

Thatch roof with PV panels

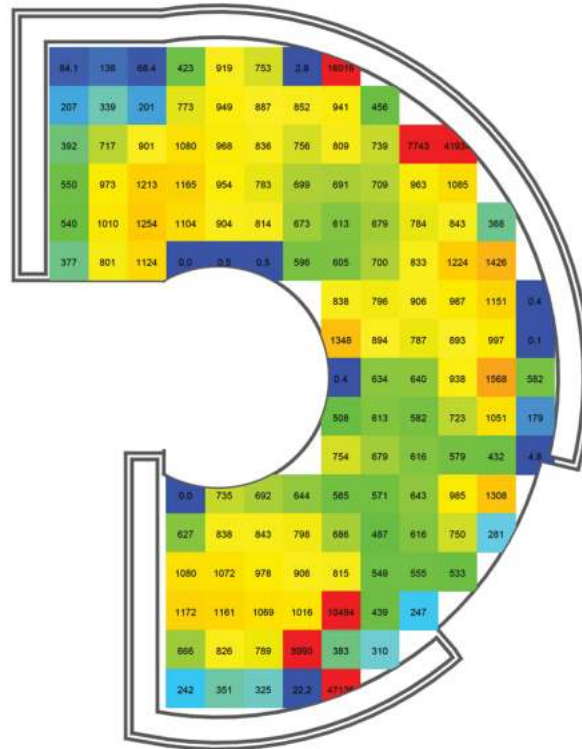
Green roof



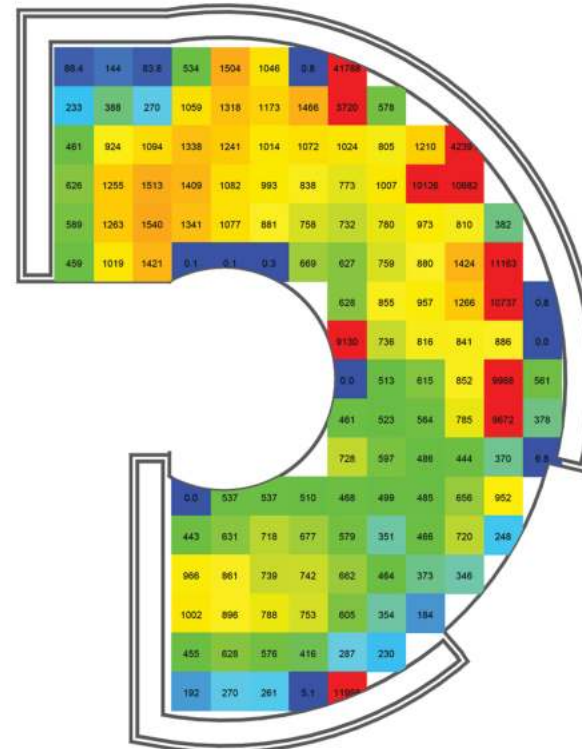
Porotherm



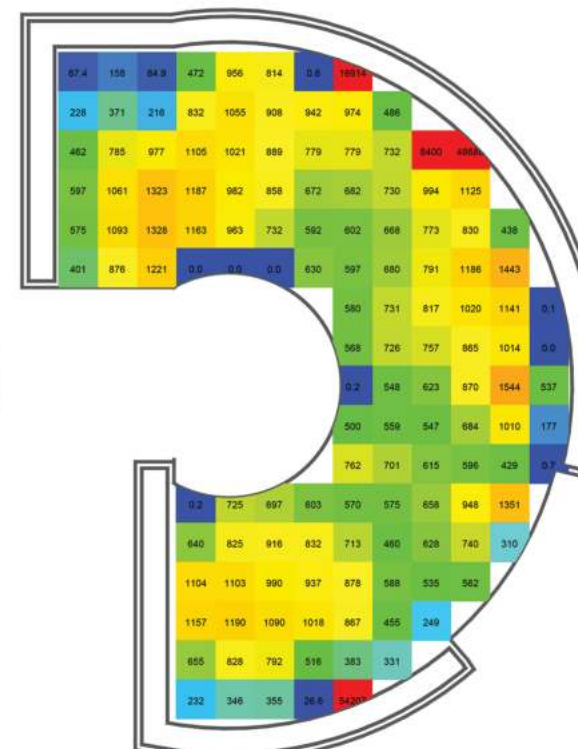
Handmade brick



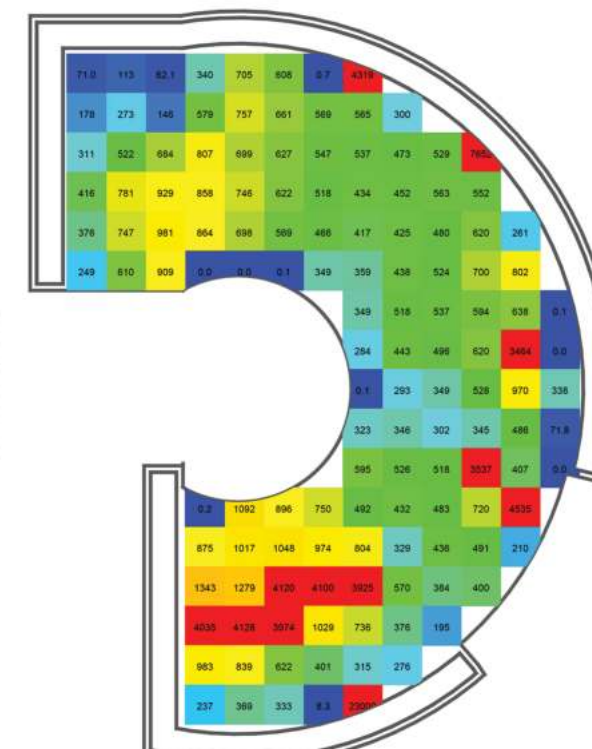
MARCH



JUNE



SEPTEMBER



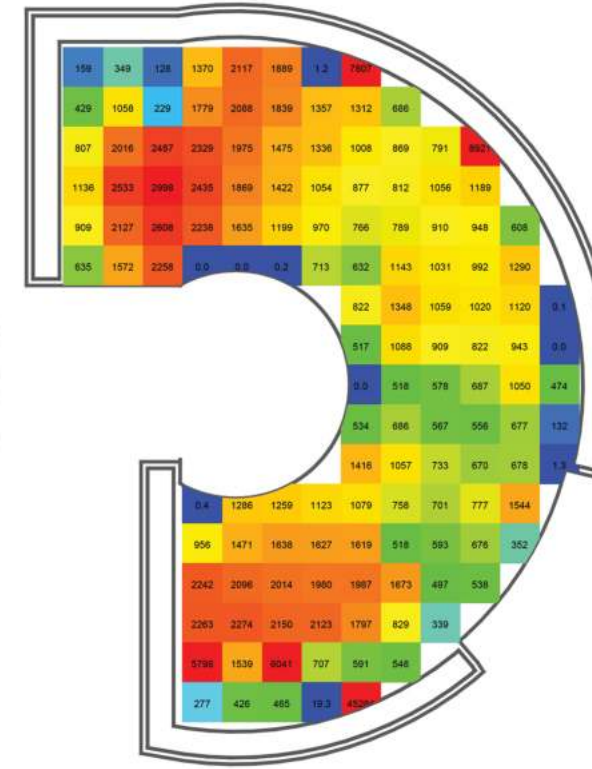
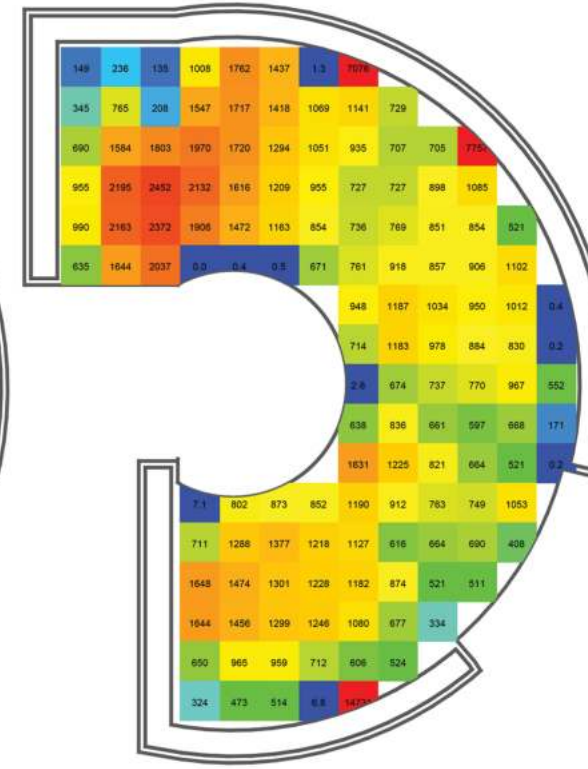
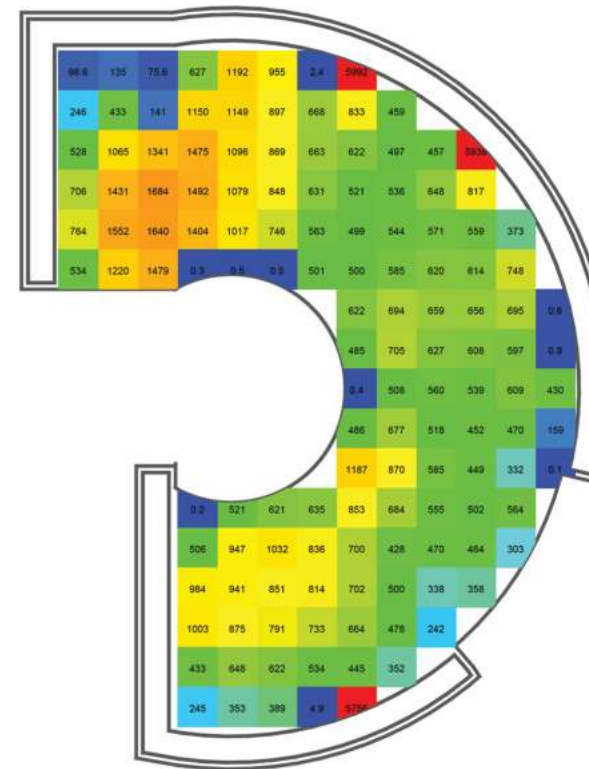
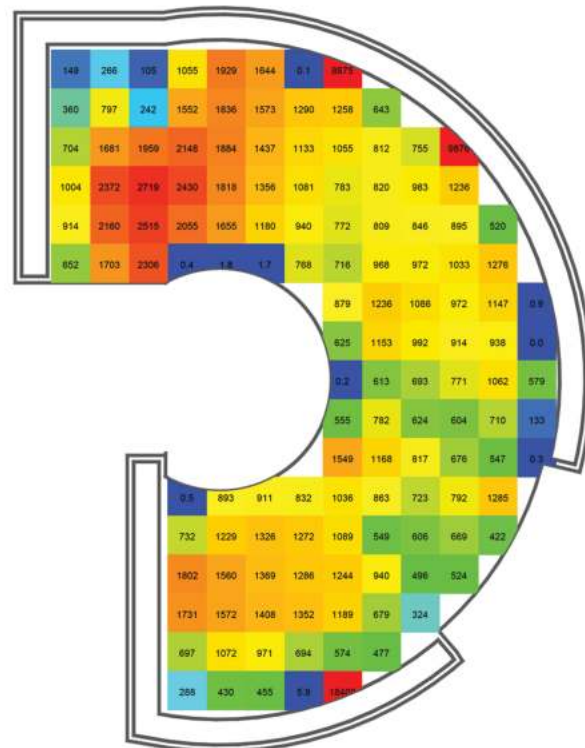
DECEMBER

AT 9:00 AM

The working area receives daylight of 400 to 1500 lux

The conference room receives daylight of 600 to 1200 lux

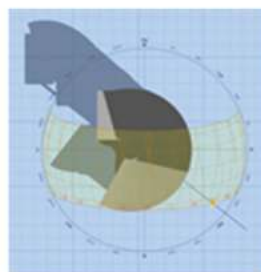
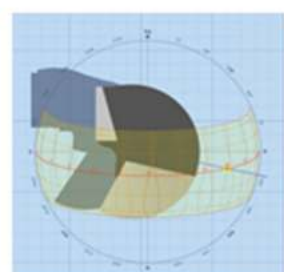
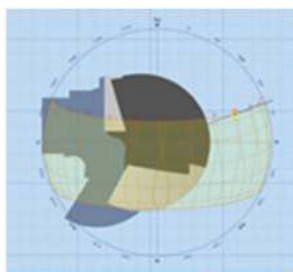
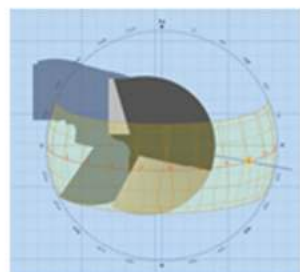
, and maximum of 4000 lux during december



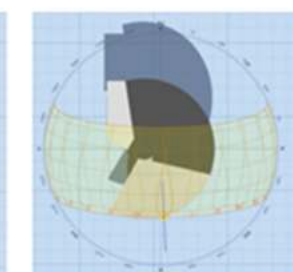
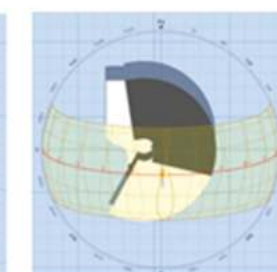
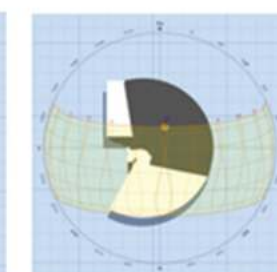
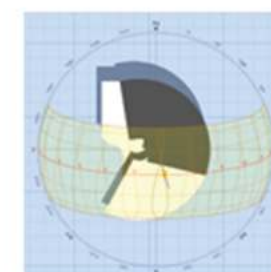
AT 12:00 PM

The working area receives daylight of 500 to 2000 lux

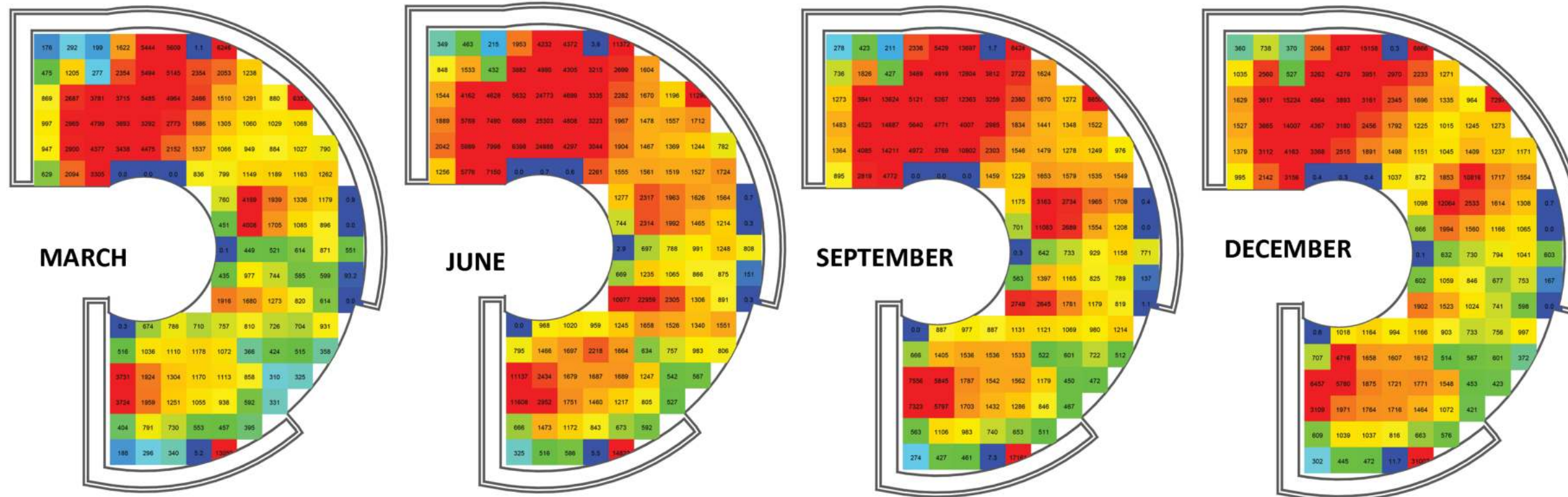
The conference room receives daylight of 800 to 2000 lux



Sun path and shadow at 9:00 AM



Sun path and shadow at 12:00 PM



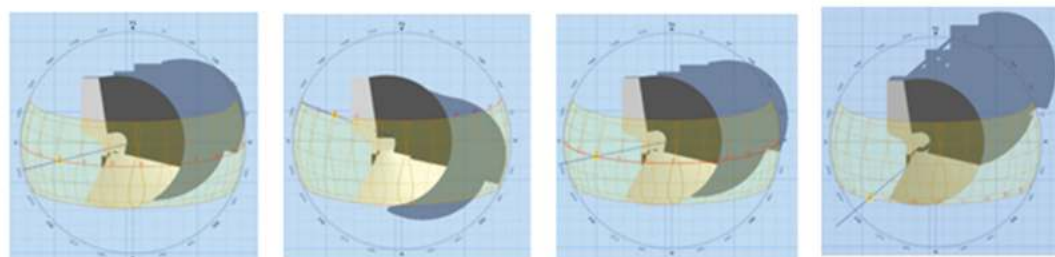
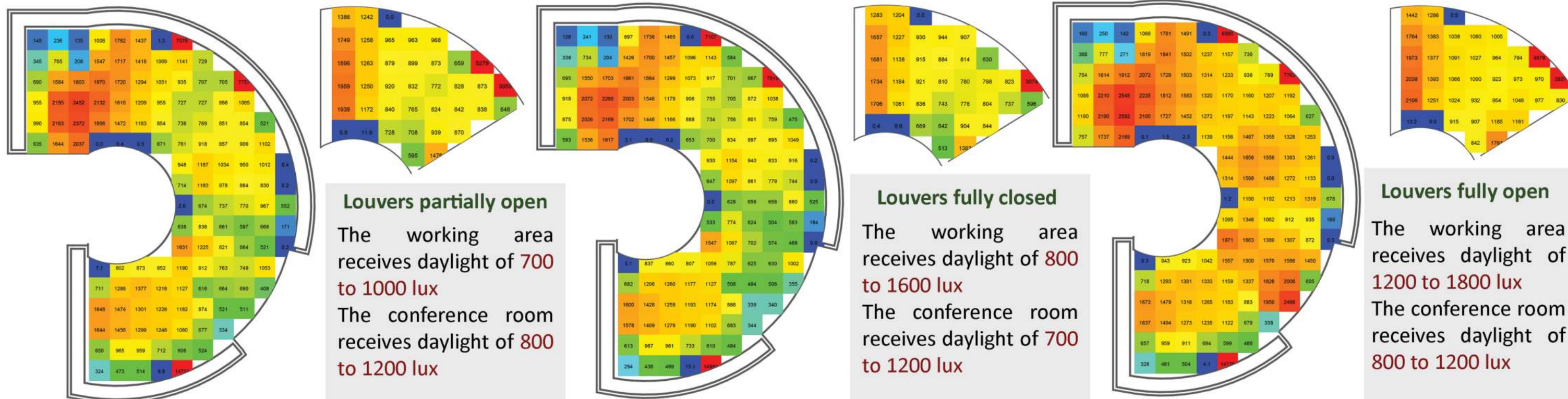
AT 3:00 PM

The working area receives daylight of 400 to 1500 lux

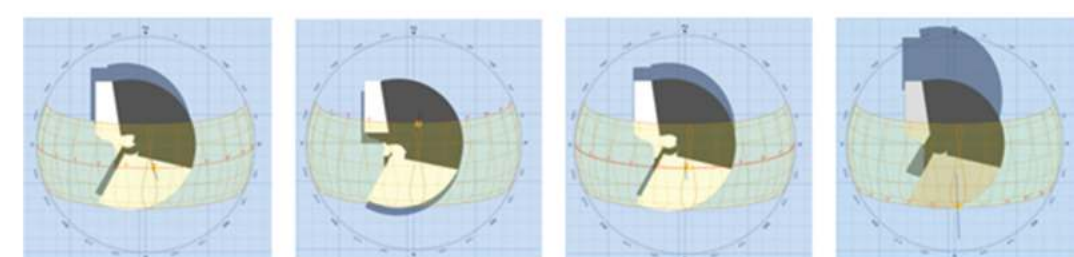
The conference room receives daylight of 600 to 1200 lux

, and maximum of 4000 lux during december

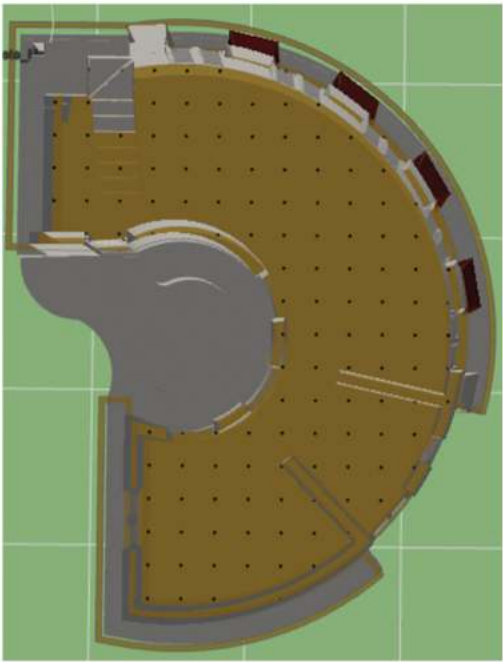
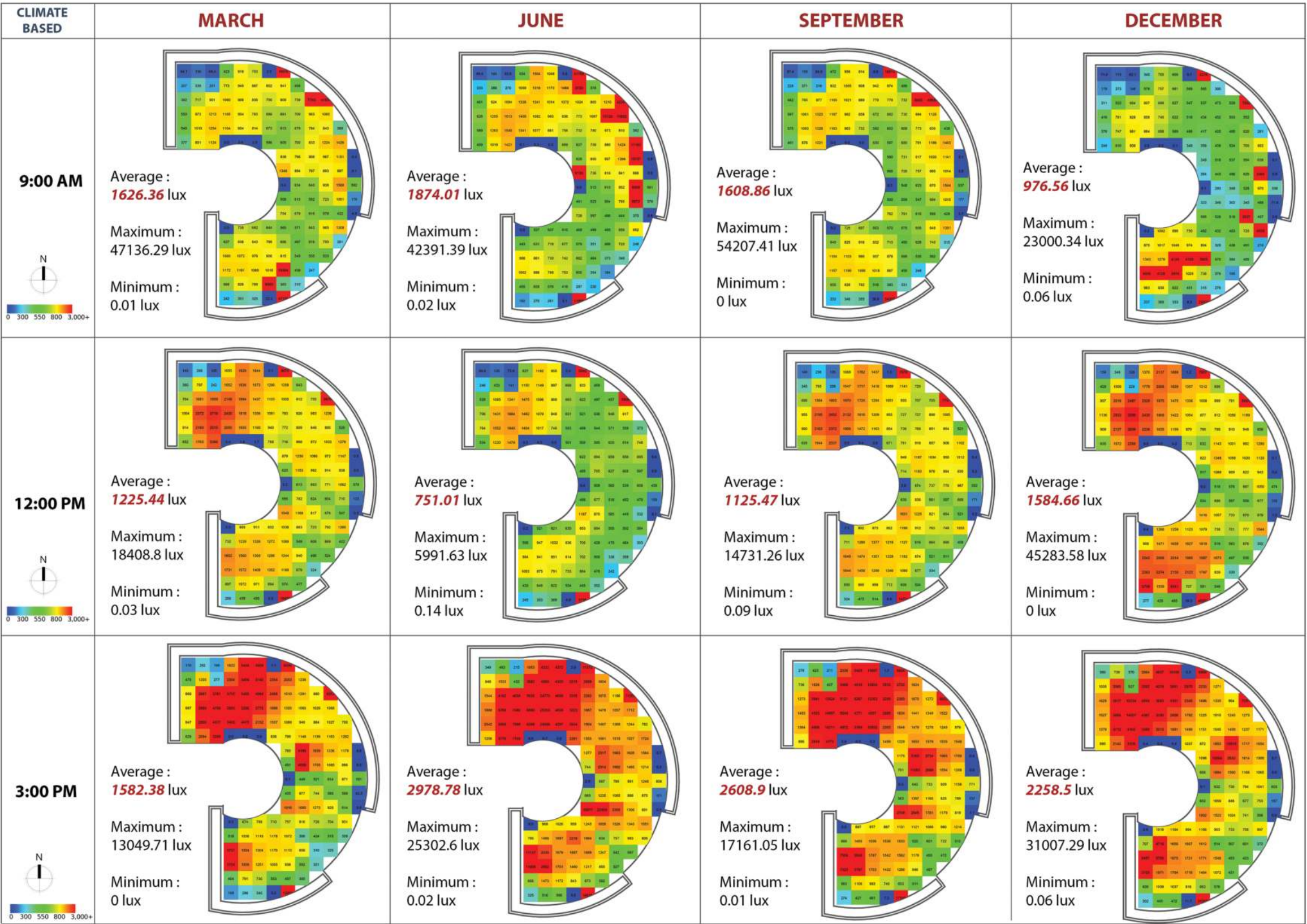
DAYLIGHT SIMULATION DURING 12:00 PM AT SEPTEMBER



Sun path and shadow at 3:00 PM



Sun path and shadow at 12:00 PM



As per NBC

General office :
300 - 500 - 700 lux

Computer workstation :
300 - 500 - 700 lux

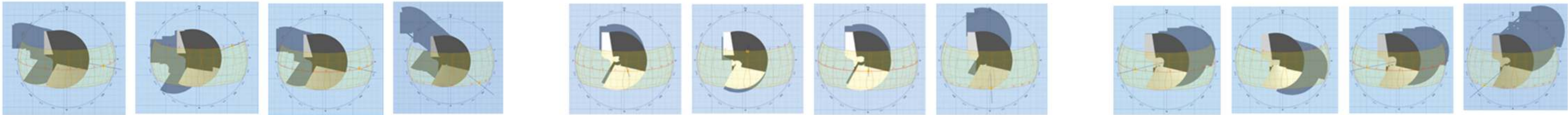
Conference room :
300 - 500 - 700 lux

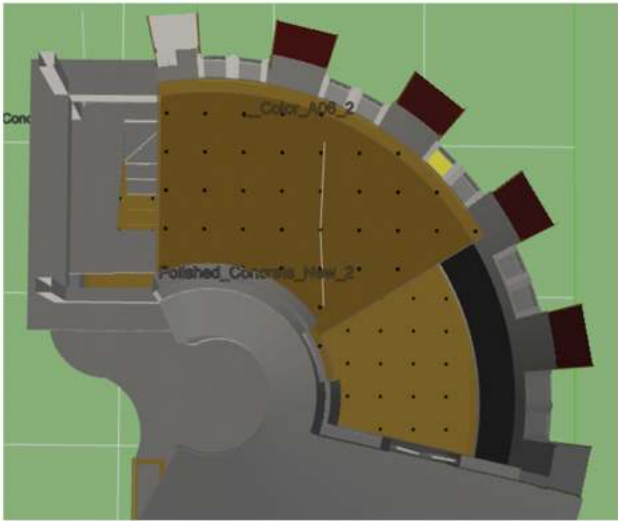
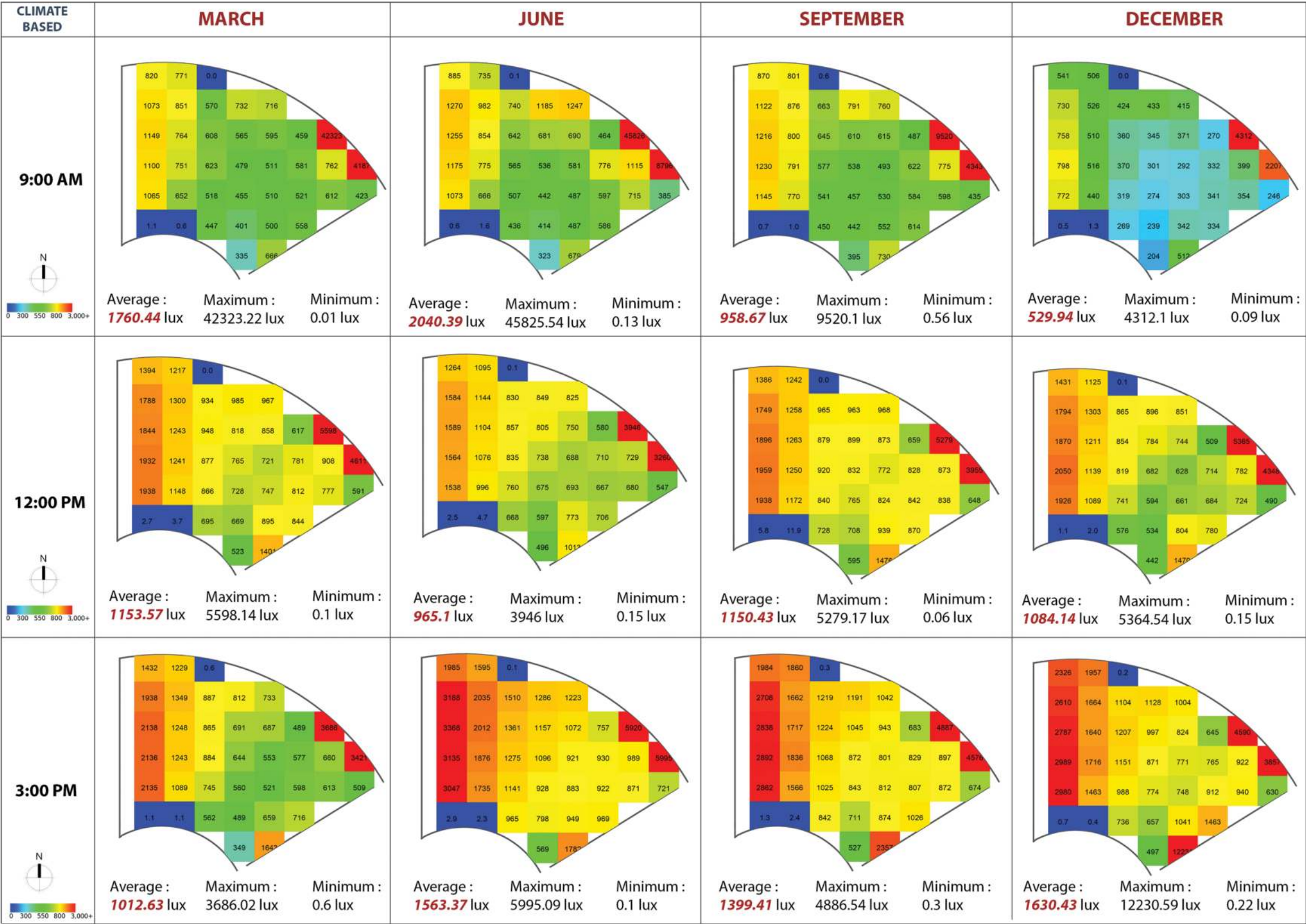
	9:00 AM	12:00PM	3:00PM
Working area	400 - 1500 lux	500 - 2000 lux	1200 - 1500 lux
Conference room	600 - 1200 lux	800 - 2000 lux	800 - 1500 lux

9:00 AM

12:00 PM

3:00 PM

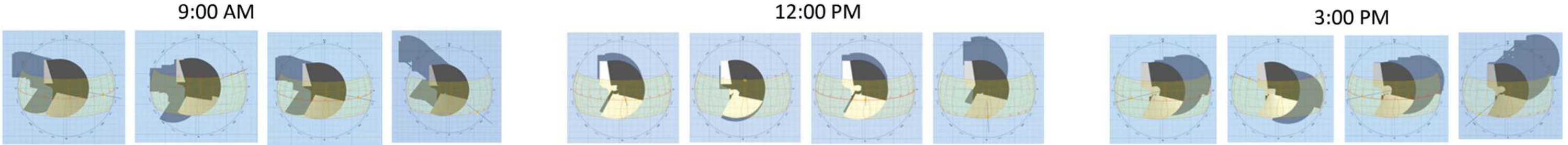


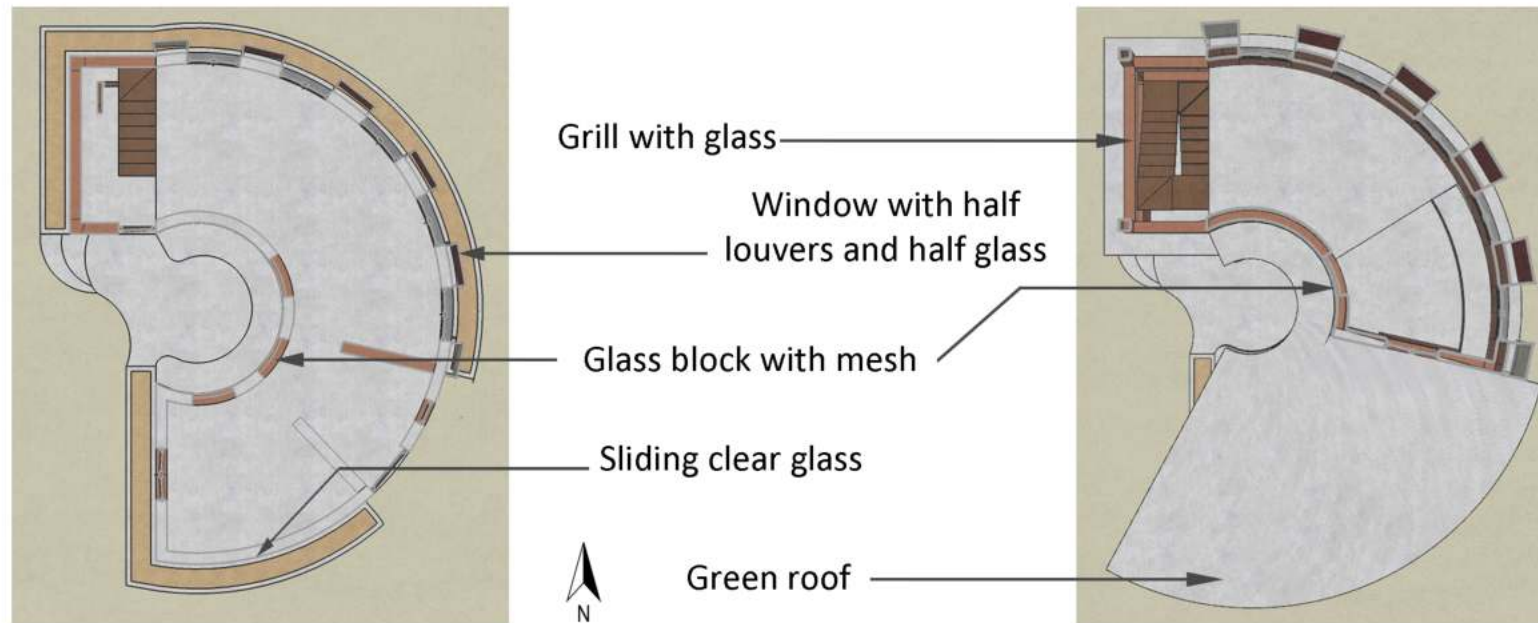


As per NBC

General office :
300 - 500 - 700 lux

9:00 AM	12:00 PM	3:00 PM
300 - 800 lux	600 - 1200 lux	700 - 1200 lux



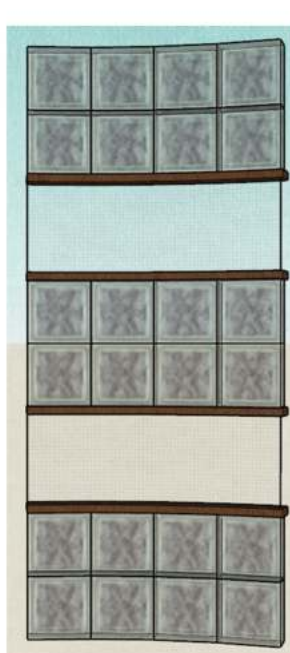
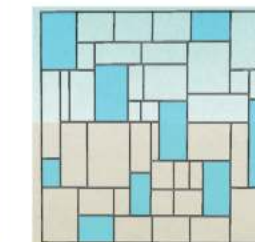


Ground floor

Mezzanine floor



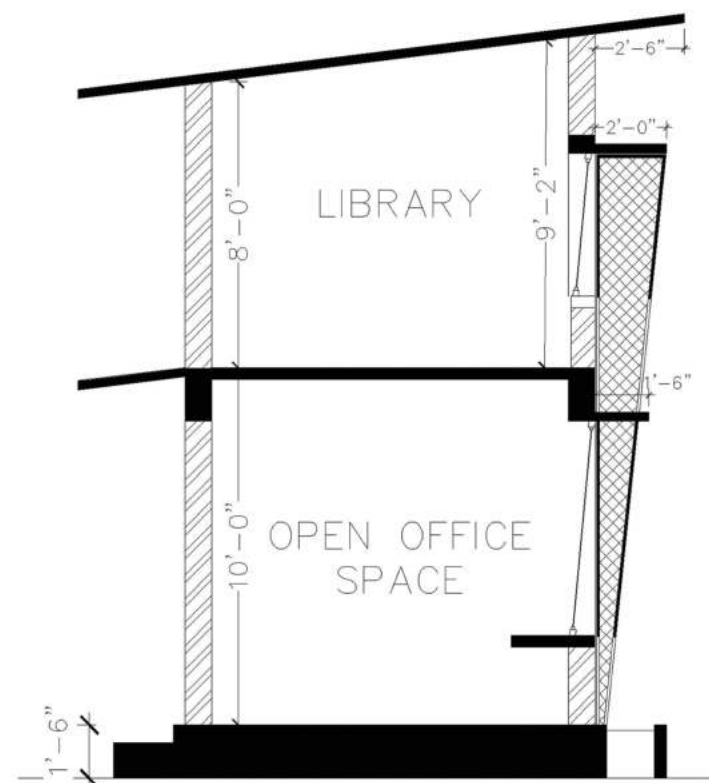
Wooden window with louver and glass



Glass block with mess



Having different shutters for window , one for louvers and other for glass , which will help in reducing glare



To increase the length of the shading device and trellis on the east facade will help in reducing the glare as well as solar insolation.

SP41 - CALCULATION FOR SHADING DEVICE											
WINDOW	WIDTH	HEIGHT	CASE 1	CASE 2	CASE 3	ANGLE TOW S	PF	SPACING	PROJECTION in c.m.	SPACING	NO OF LOUVERS
W1	106.68	182.88	V	H	EC	45	0.53	106.68	201.2830189	50.32075472	4
						60	1.27	106.68	84	42	2
EAST					EC						
					V	30	0.31	106.68	344.1290323	57.35483871	6
					V	45	0.73	106.68	148.1369863	48.71232877	3
					V	60	1.46	106.68	73.06849315	36.53424658	2
					H	0	0.84	182.88	217.7142857	54.42857143	4
					H	15	1.11	182.88	164.7567568	54.91891892	3
					H	30	1.42	182.88	128.7887324	64.3943662	2
					H	45	1.84	182.88	99.39130435	49.69565217	2
					H	60	2.57	182.88	71.15953307	35.57976654	2

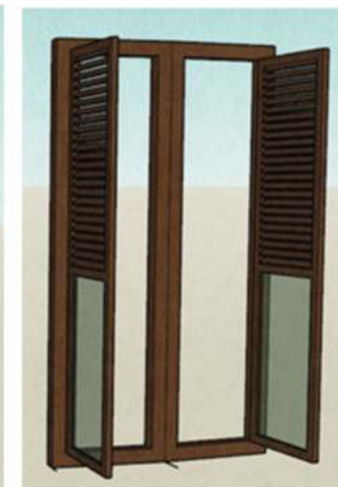
To provide ventilation , porotherm bricks can be used as vent above the lintel level for the hot air to move out.

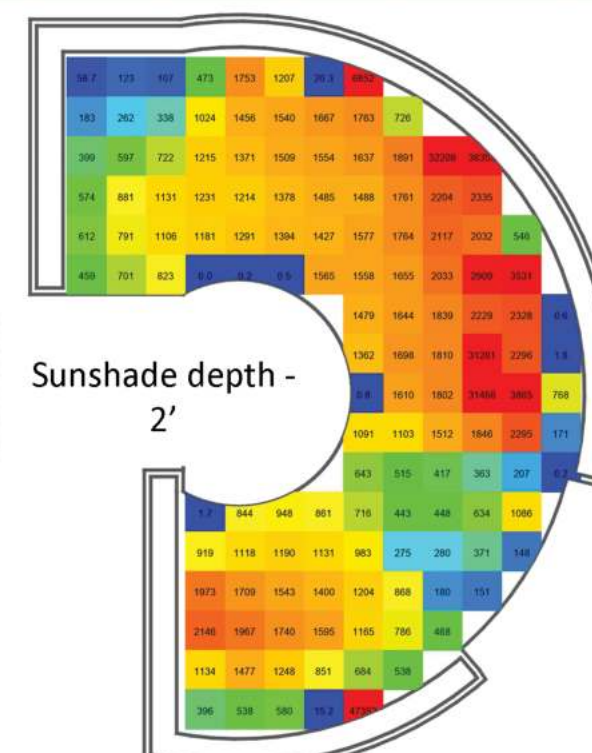
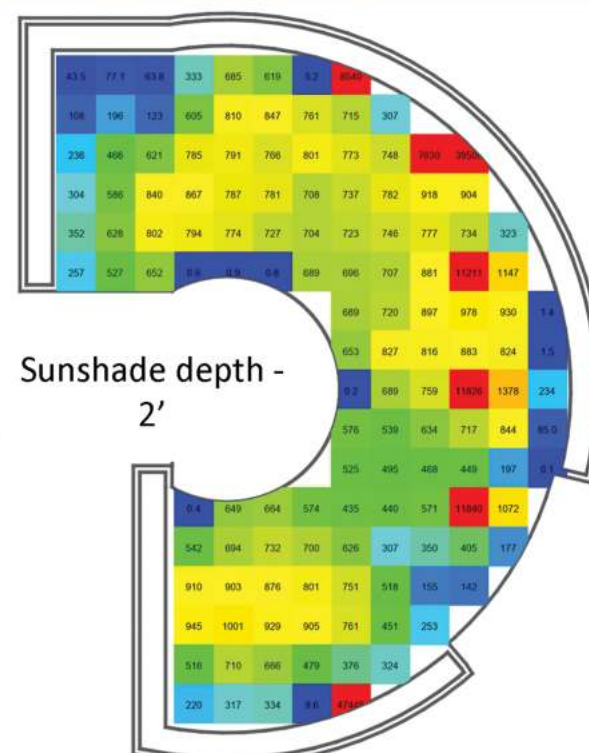
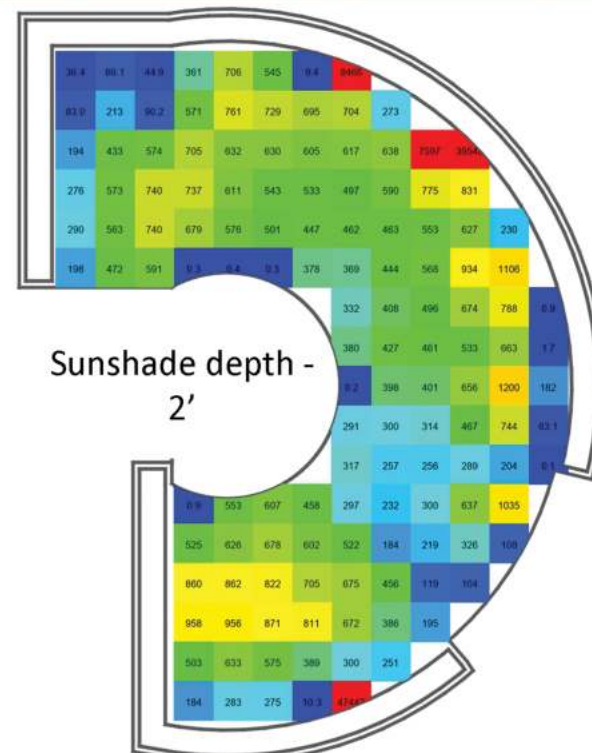
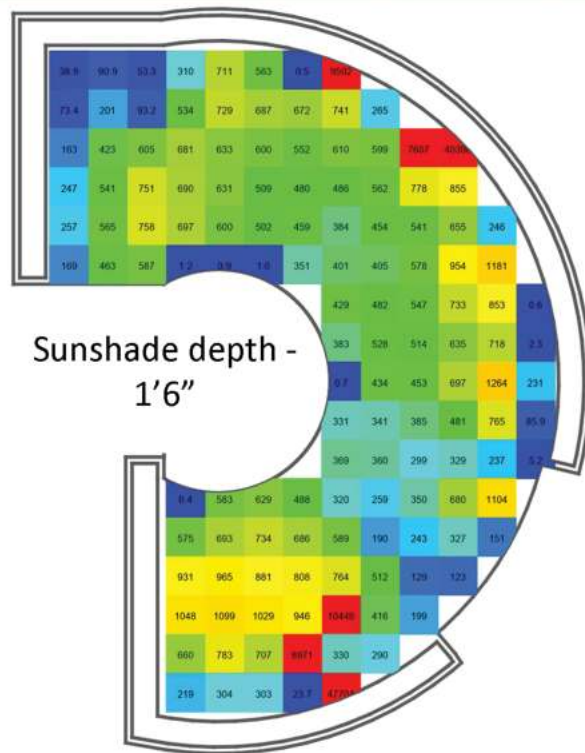
The neighbouring building height was considered as 10' for this simulations

Windows closed

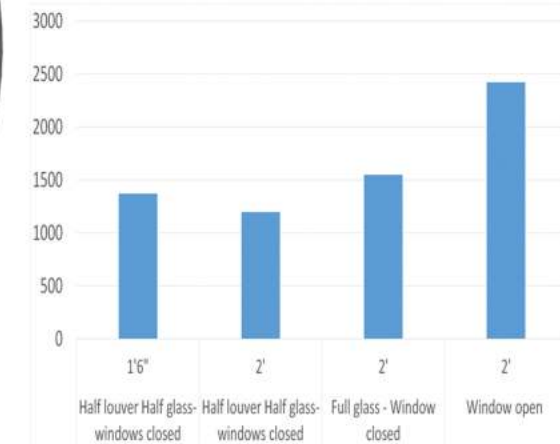
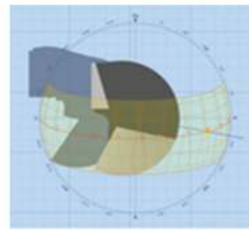
Half louver and half glass - Sunshade depth 1'6"
Half louver and half glass - Sunshade depth 2'
Full glass - Sunshade depth 2'

Windows open





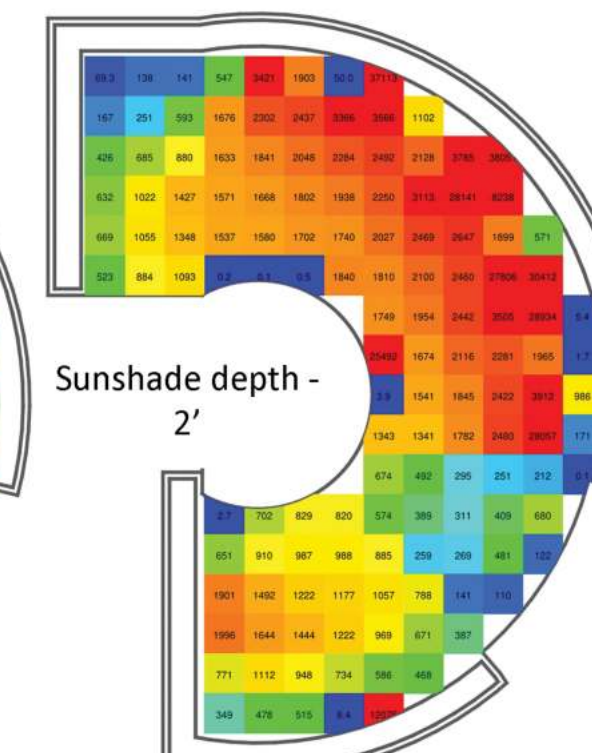
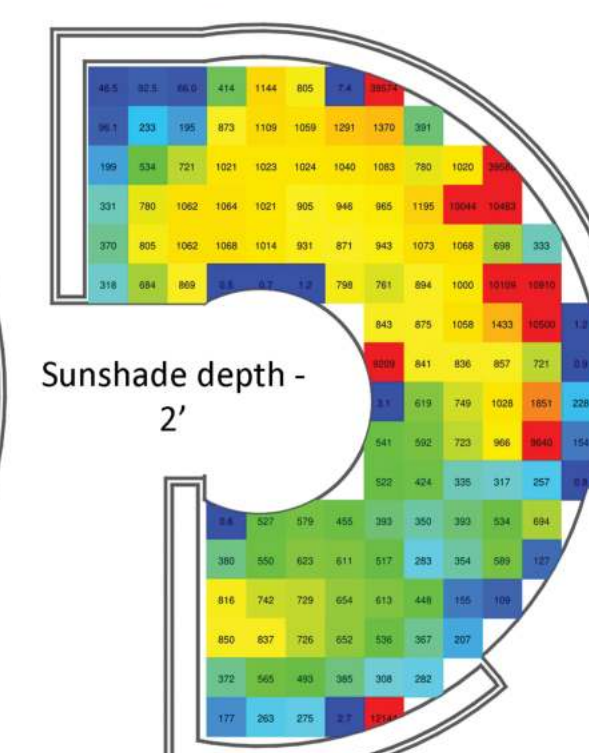
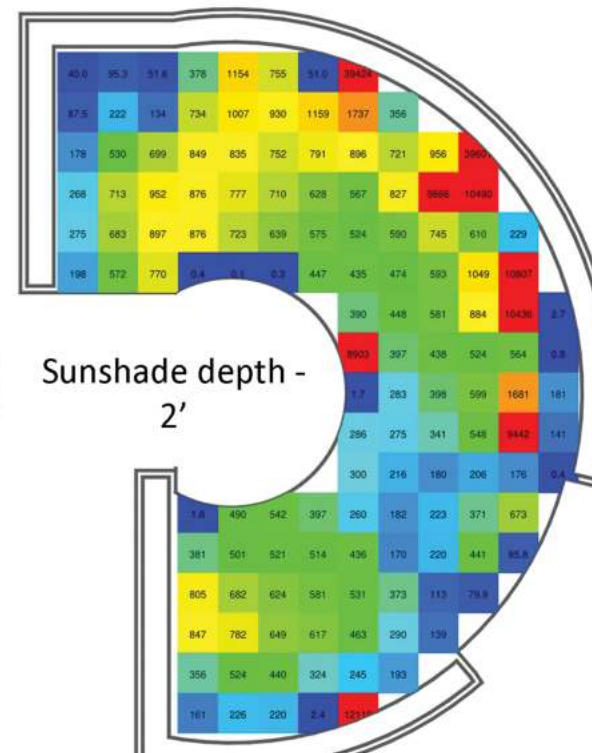
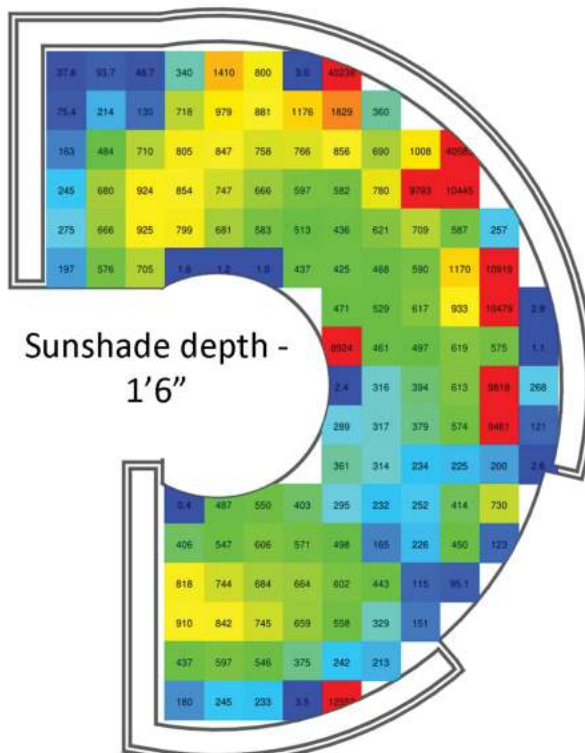
MARCH



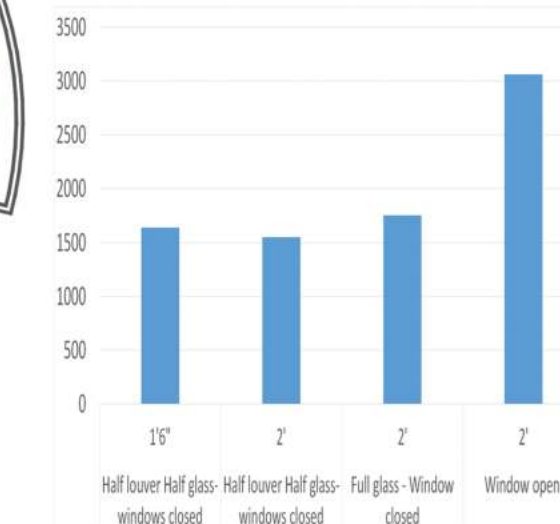
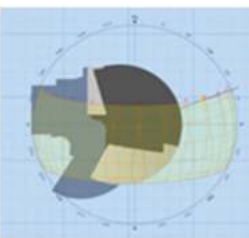
WINDOWS CLOSED WITH HALF LOUVER AND HALF GLASS

WINDOWS CLOSED WITH FULL GLASS, VLT-0.65

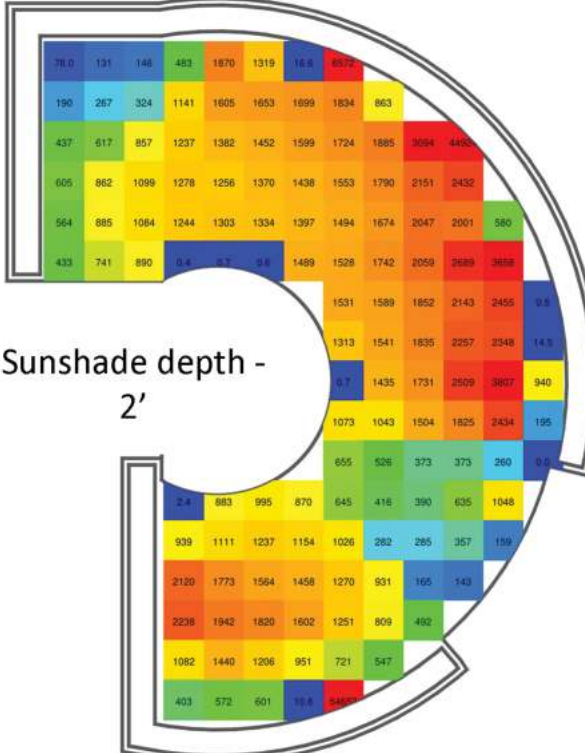
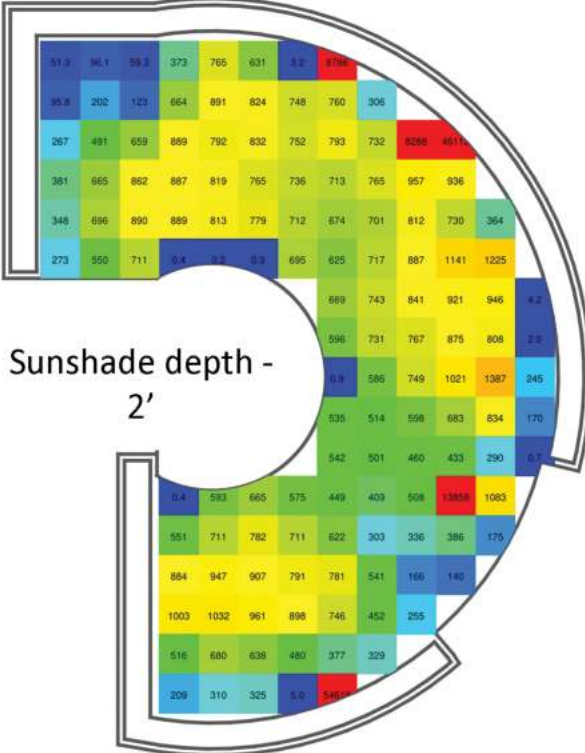
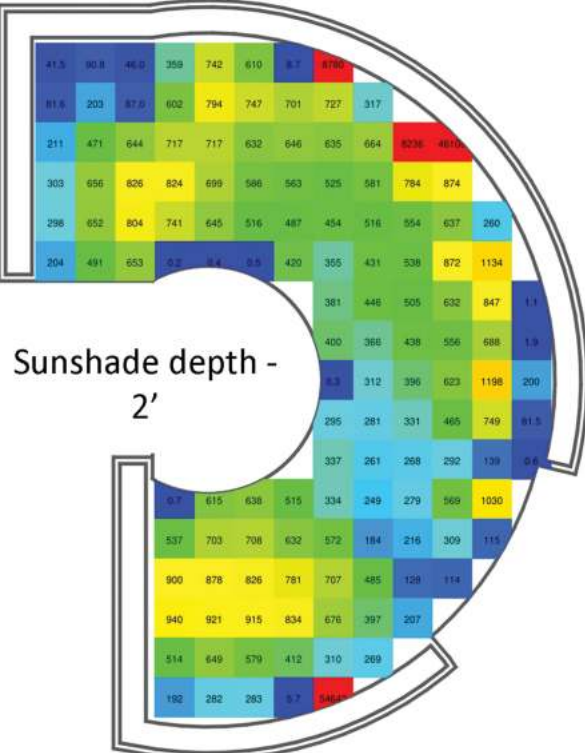
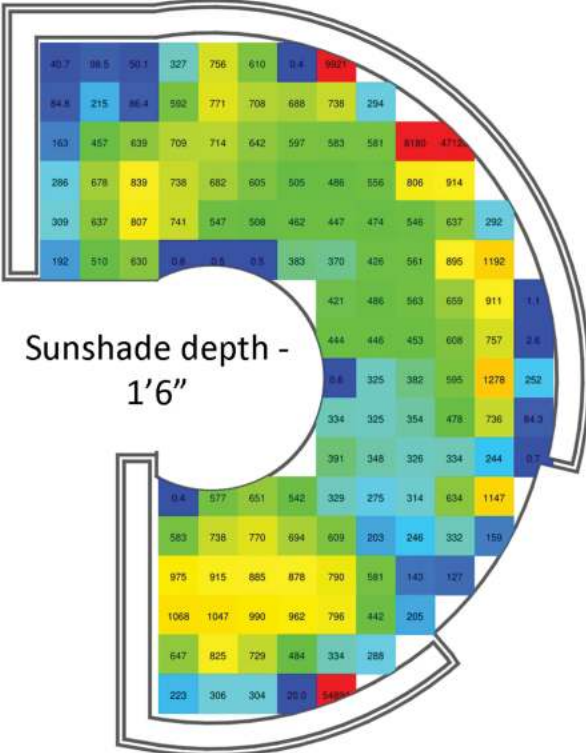
WINDOWS OPEN



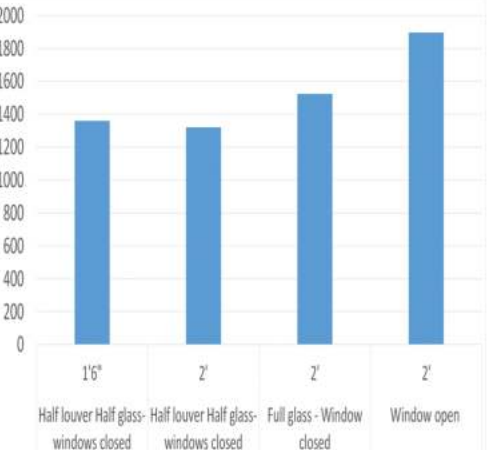
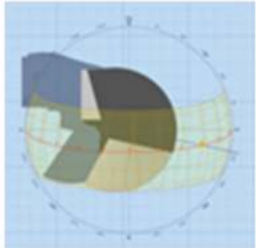
JUNE



TYPE OF WINDOW	Half louver Half glass- windows closed - 1'6" sunshade	Half louver Half glass- windows closed - 2' sunshade	Full glass - Window closed	Window open	TYPE OF WINDOW	Half louver Half glass- windows closed - 1'6" sunshade	Half louver Half glass- windows closed - 2' sunshade	Full glass - Window closed	Window open
Average lux	1371.98 lux	1198.23 lux	1548.42 lux	2419.81 lux	Average lux	1640.88 lux	1548.38 lux	1751.54 lux	3062.25 lux



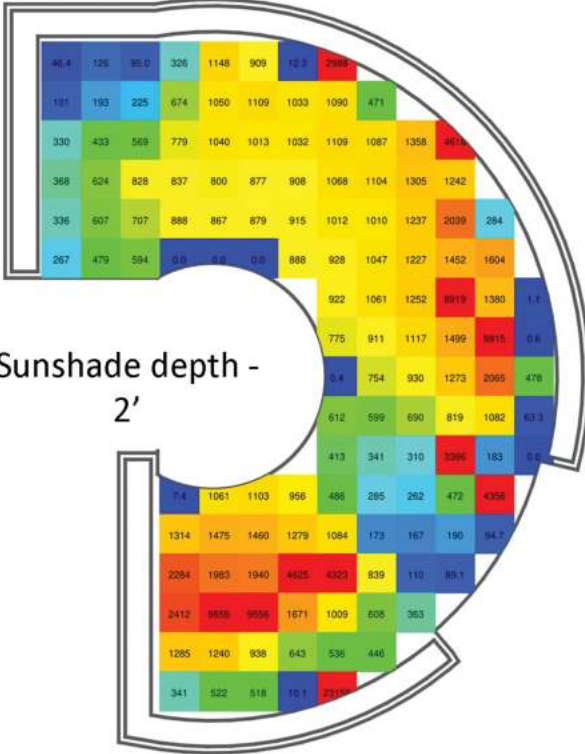
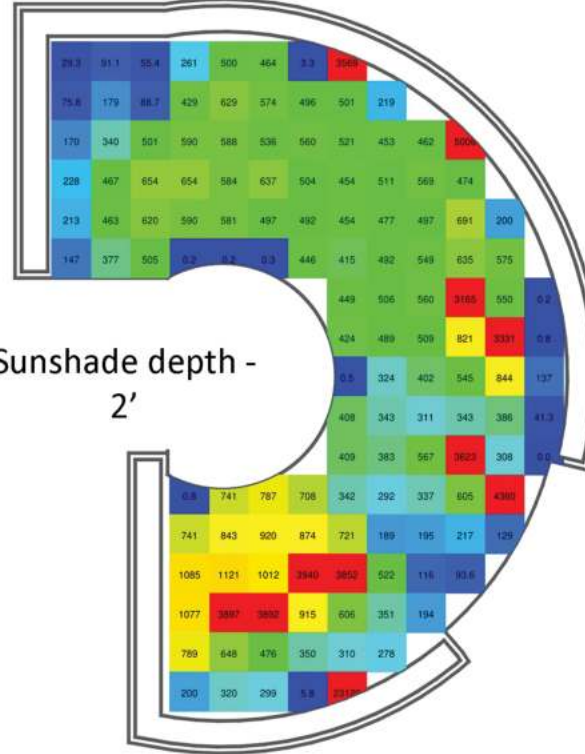
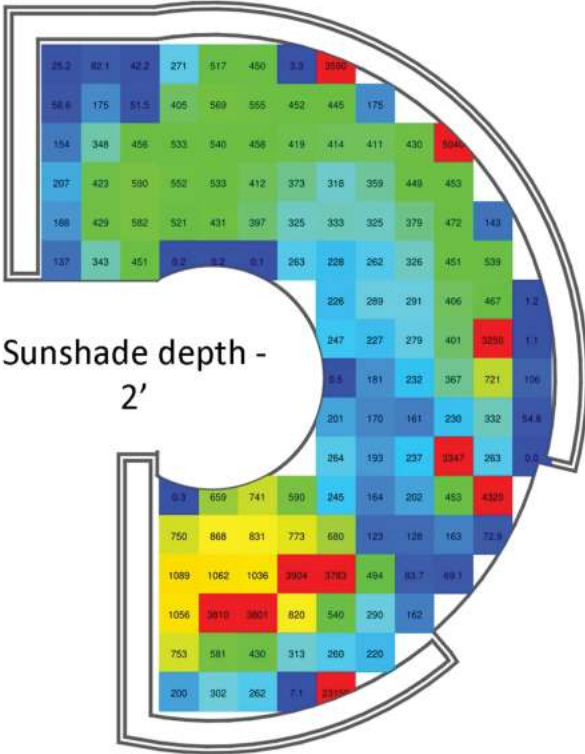
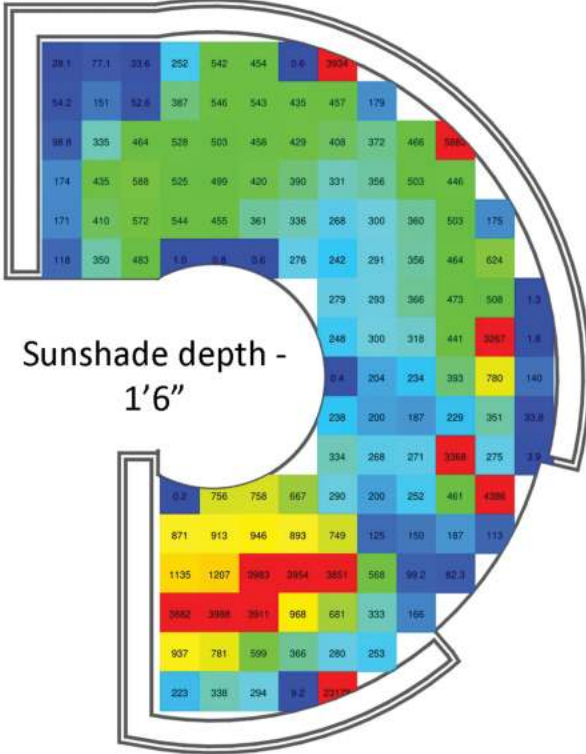
SEPTEMBER



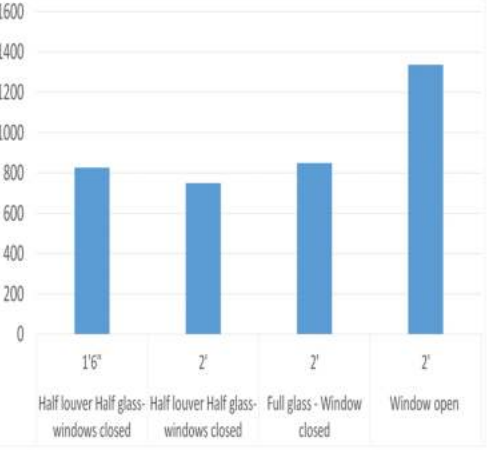
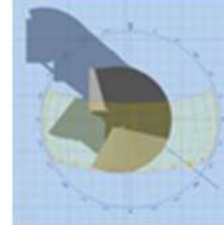
WINDOWS CLOSED WITH HALF LOUVER AND HALF GLASS

WINDOWS CLOSED WITH FULL GLASS, VLT-0.65

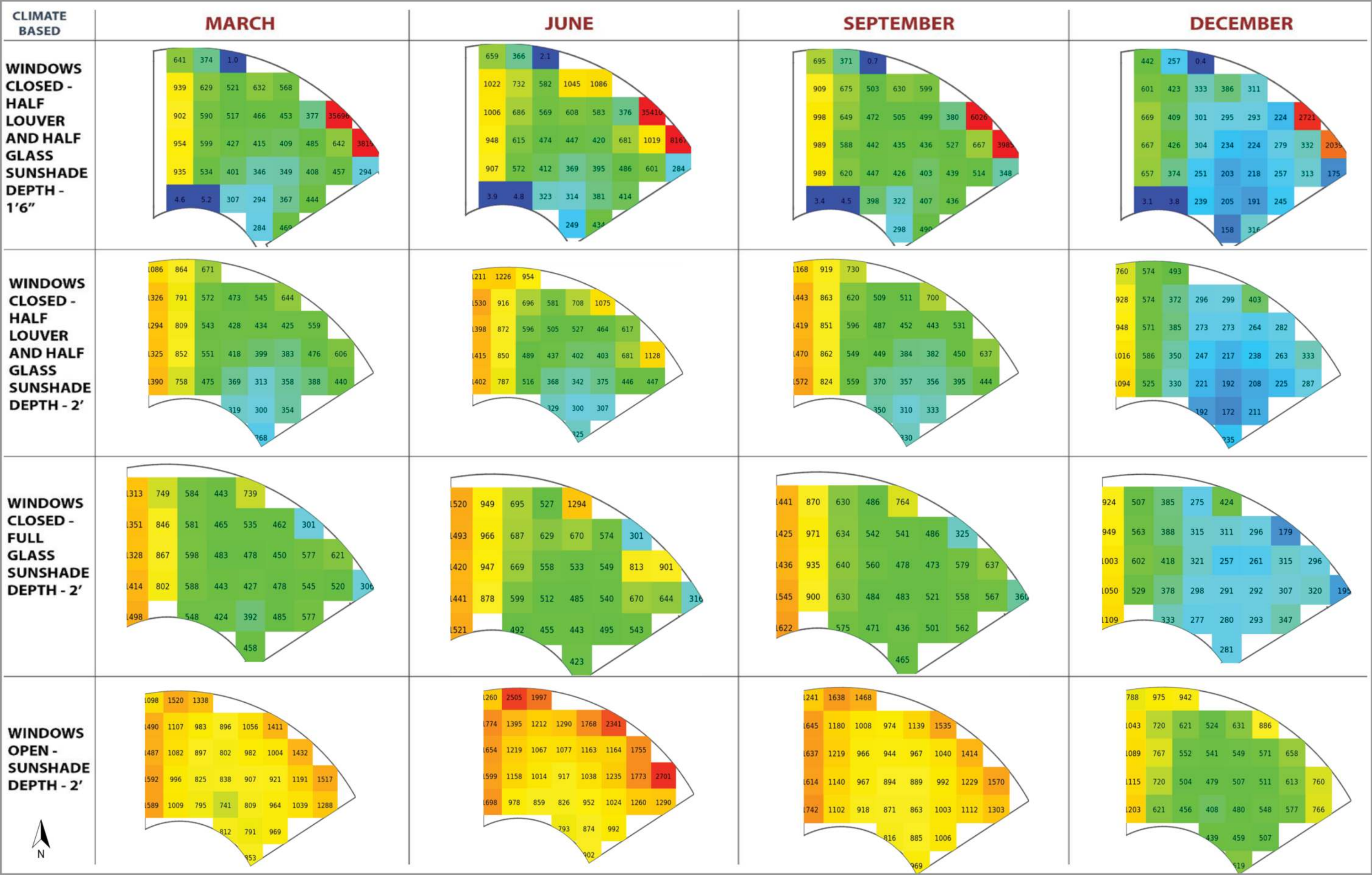
WINDOWS OPEN



DECEMBER

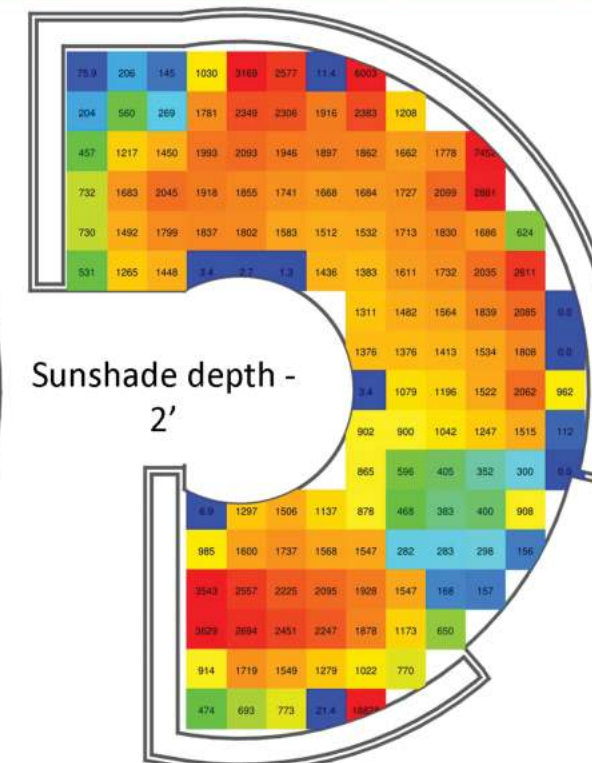
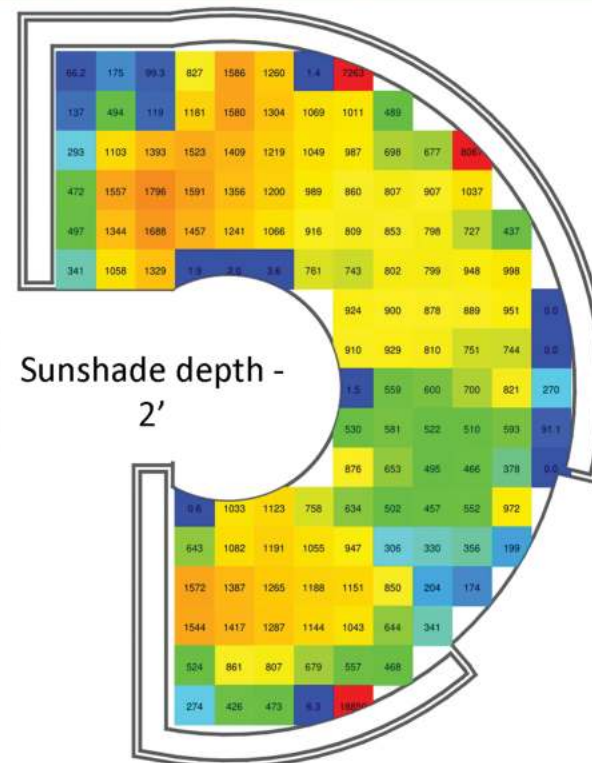
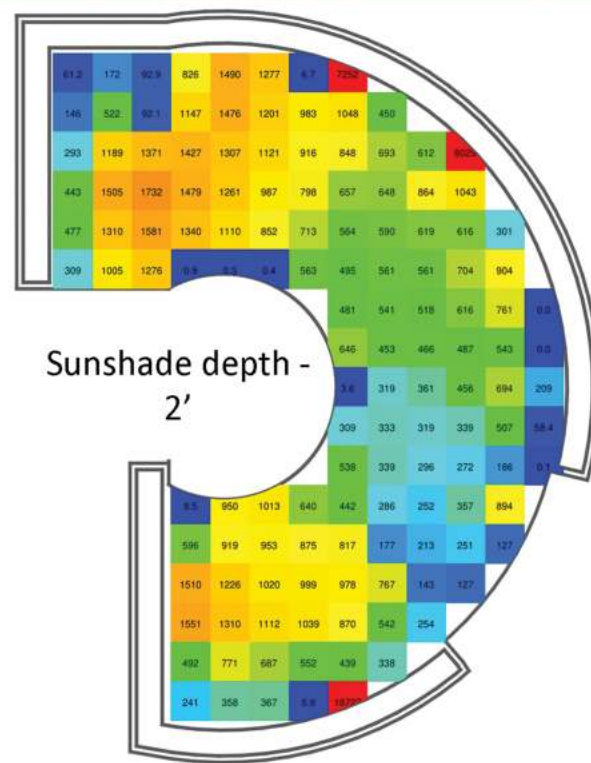
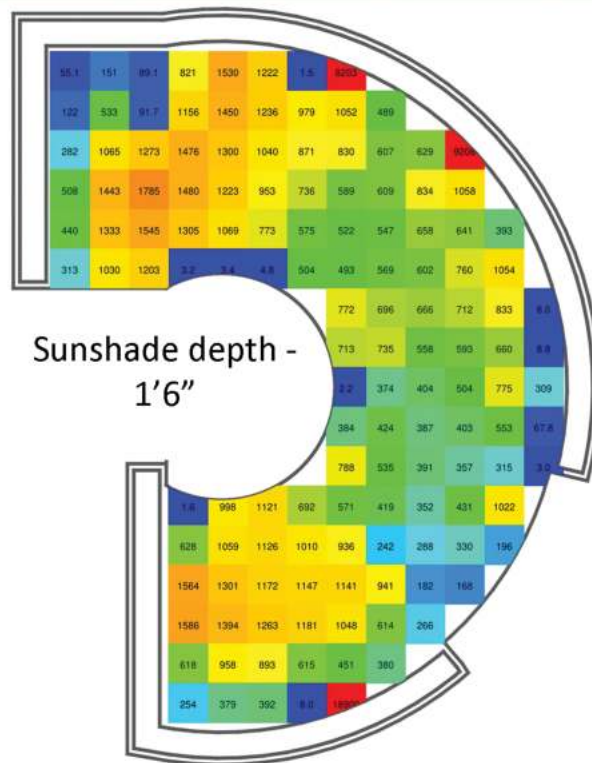


TYPE OF WINDOW	Half louver Half glass- windows closed - 1'6" sunshade	Half louver Half glass- windows closed - 2' sunshade	Full glass - Window closed	Window open	TYPE OF WINDOW	Half louver Half glass- windows closed - 1'6" sunshade	Half louver Half glass- windows closed - 2' sunshade	Full glass - Window closed	Window open
Average lux	1359.42 lux	1321.51 lux	1524.61 lux	1896.58 lux	Average lux	826.19 lux	749.35 lux	848.23 lux	1337.05 lux

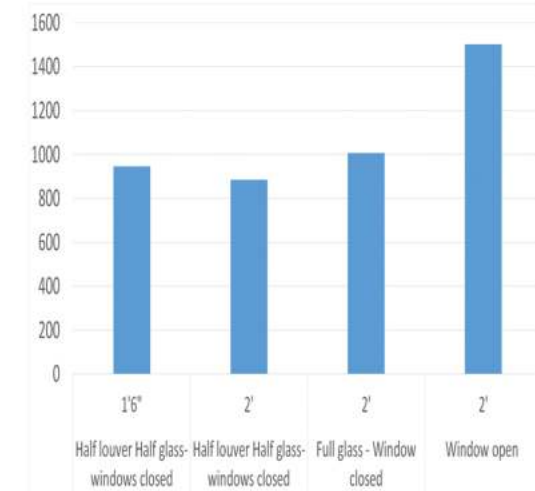
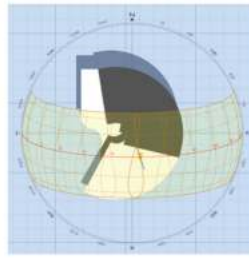


DAYLIGHT SIMULATION DURING 12:00 PM AT MARCH AND JUNE

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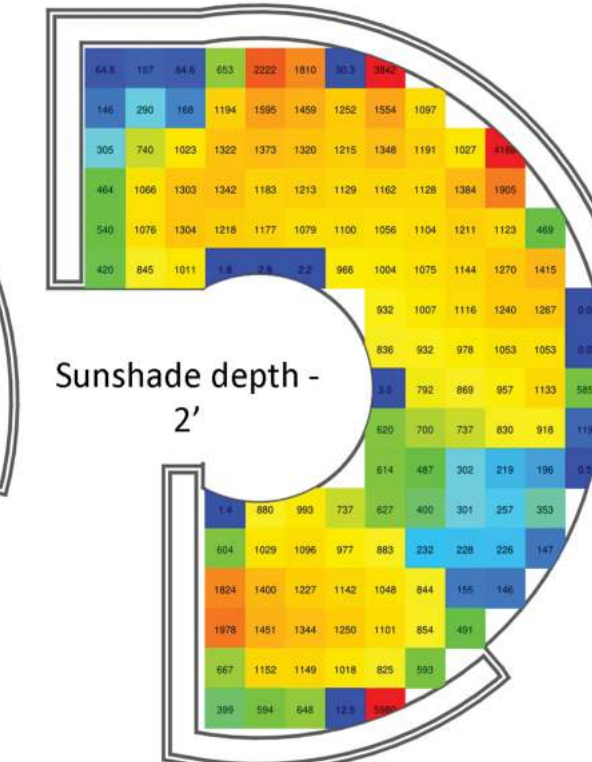
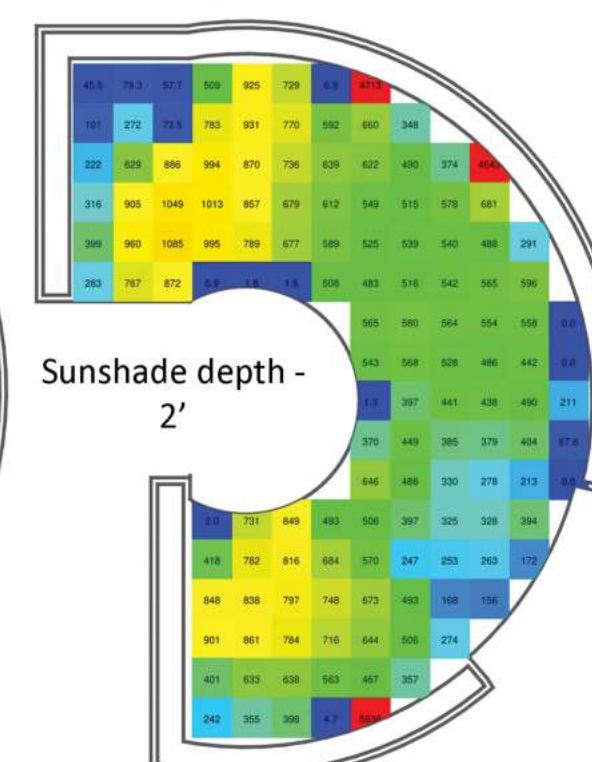
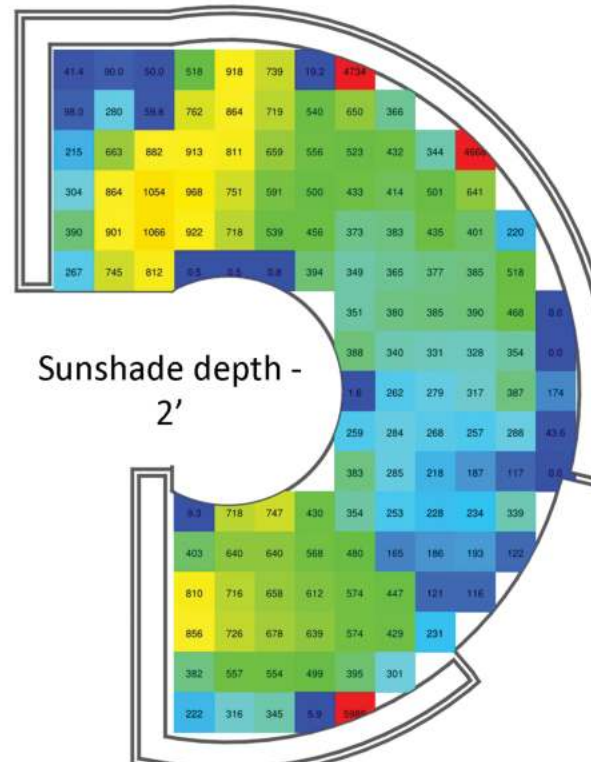
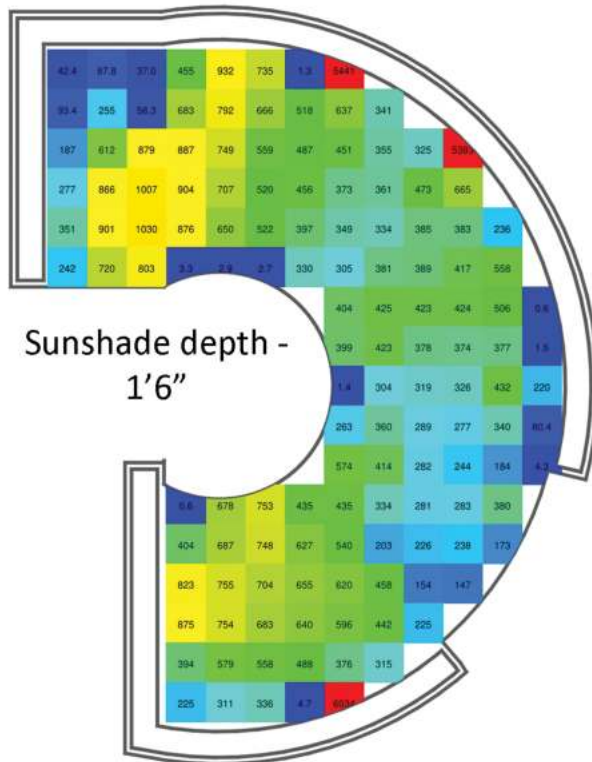
MARCH



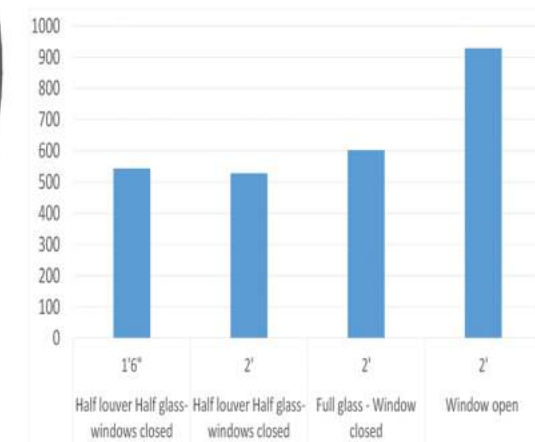
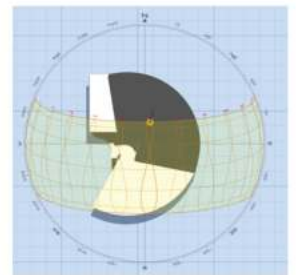
WINDOWS CLOSED WITH HALF LOUVER AND HALF GLASS

WINDOWS CLOSED WITH FULL GLASS, VLT-0.65

WINDOWS OPEN

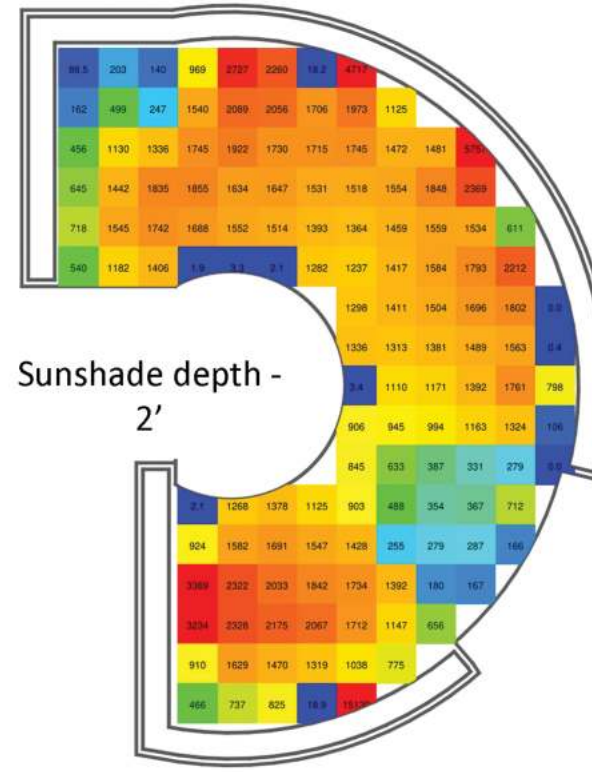
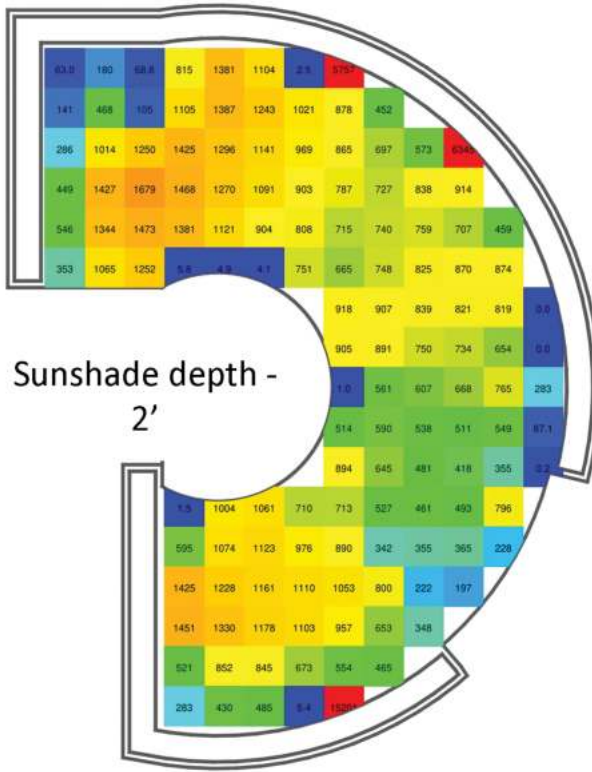
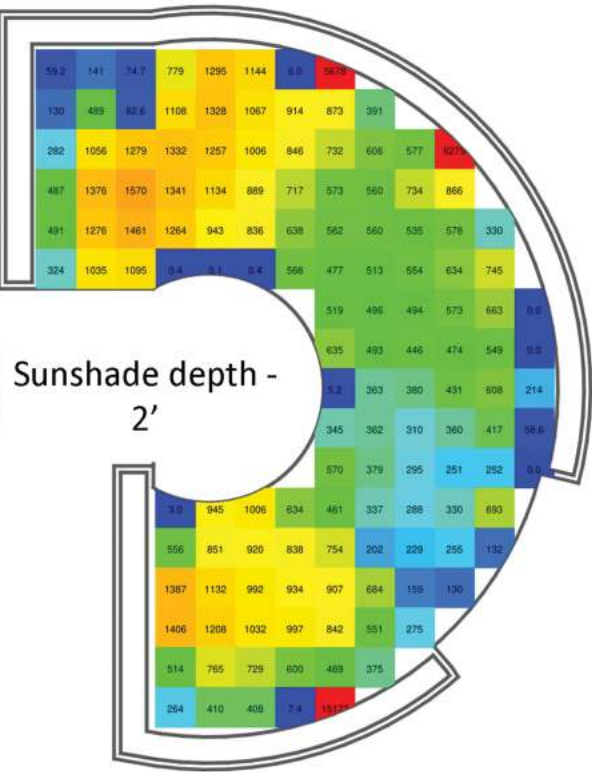
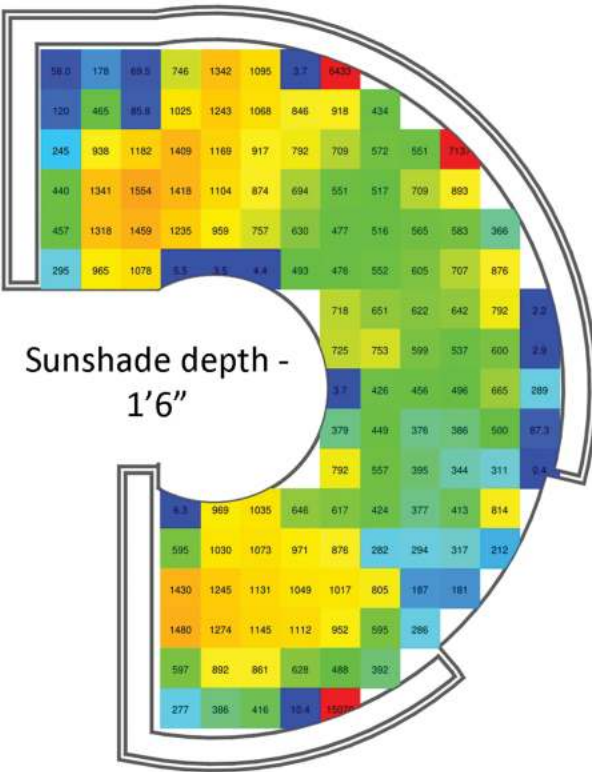


JUNE

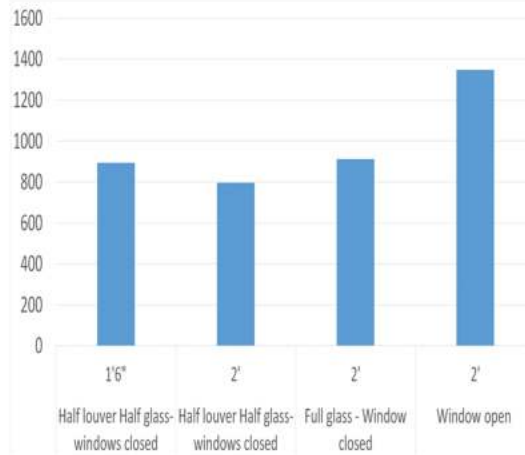
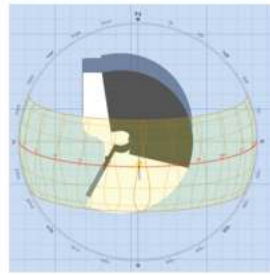


TYPE OF WINDOW	Half louver Half glass- windows closed - 1'6" sunshade	Half louver Half glass- windows closed - 2' sunshade	Full glass - Window closed	Window open
Average lux	945.22 lux	884.43 lux	1006.4 lux	1500.07 lux

TYPE OF WINDOW	Half louver Half glass- windows closed - 1'6" sunshade	Half louver Half glass- windows closed - 2' sunshade	Full glass - Window closed	Window open
Average lux	543.54 lux	528.02 lux	602.01 lux	928.99 lux



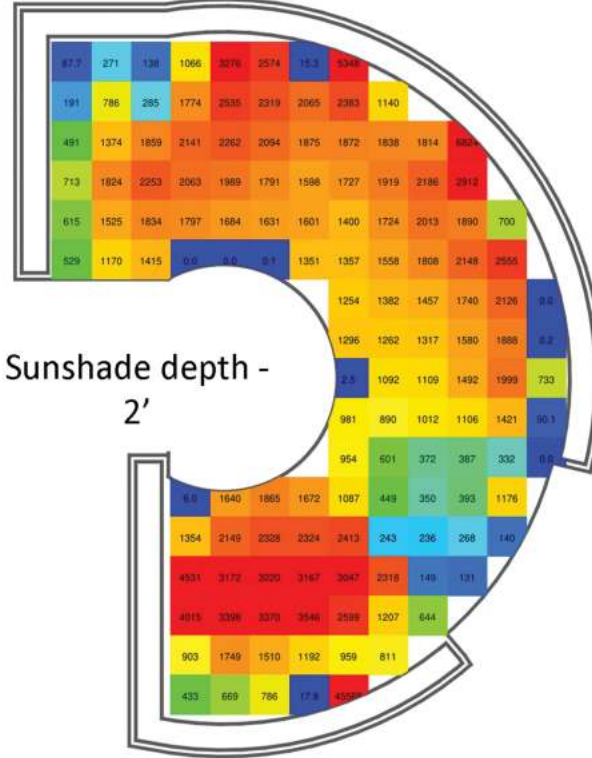
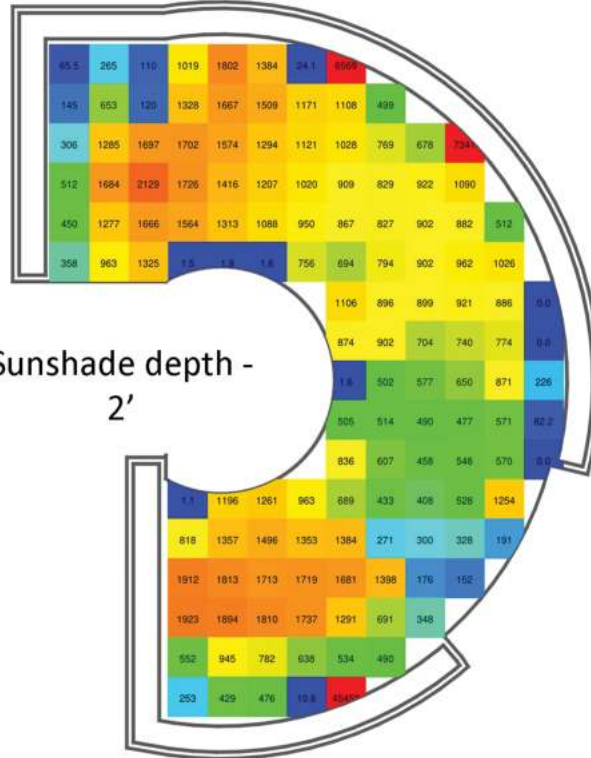
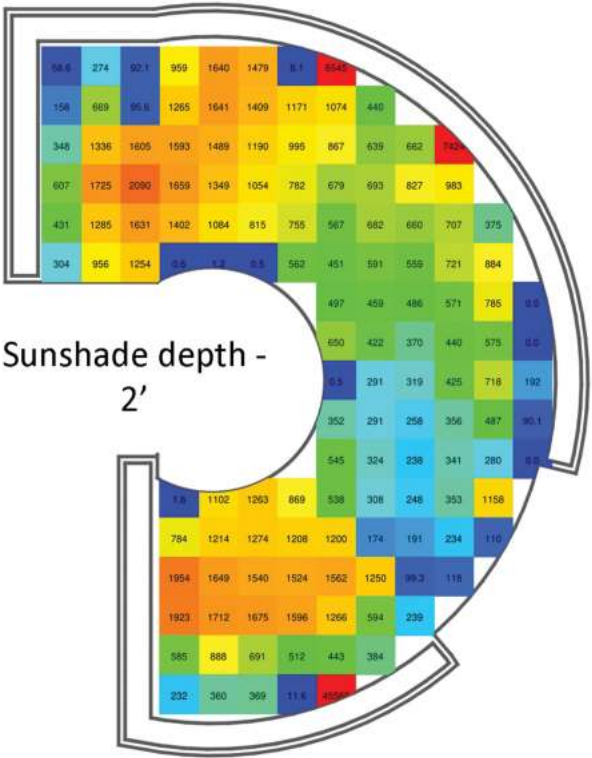
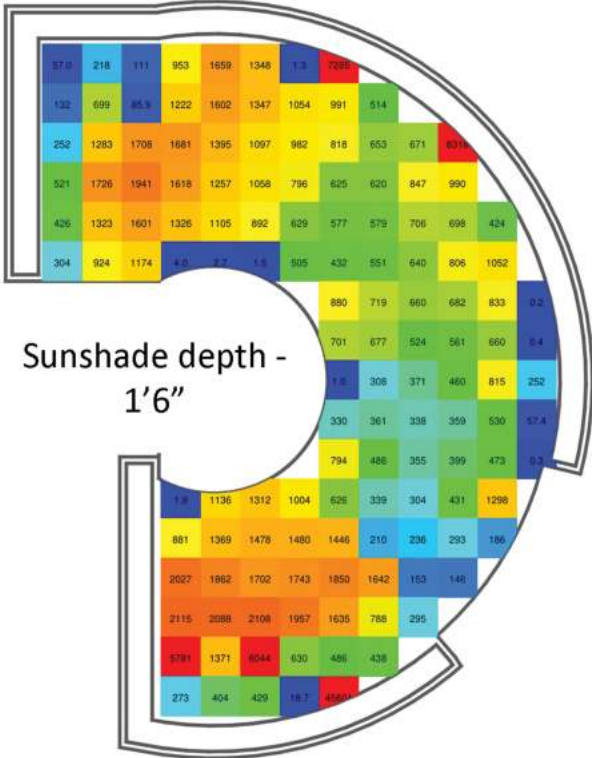
SEPTEMBER



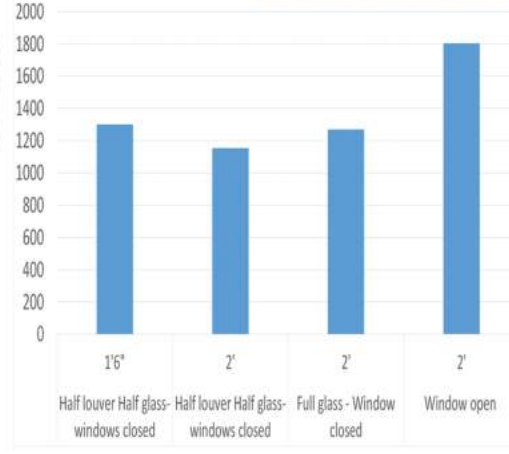
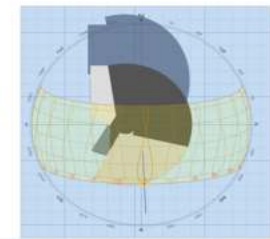
WINDOWS CLOSED WITH HALF LOUVER AND HALF GLASS

WINDOWS CLOSED WITH FULL GLASS, VLT-0.65

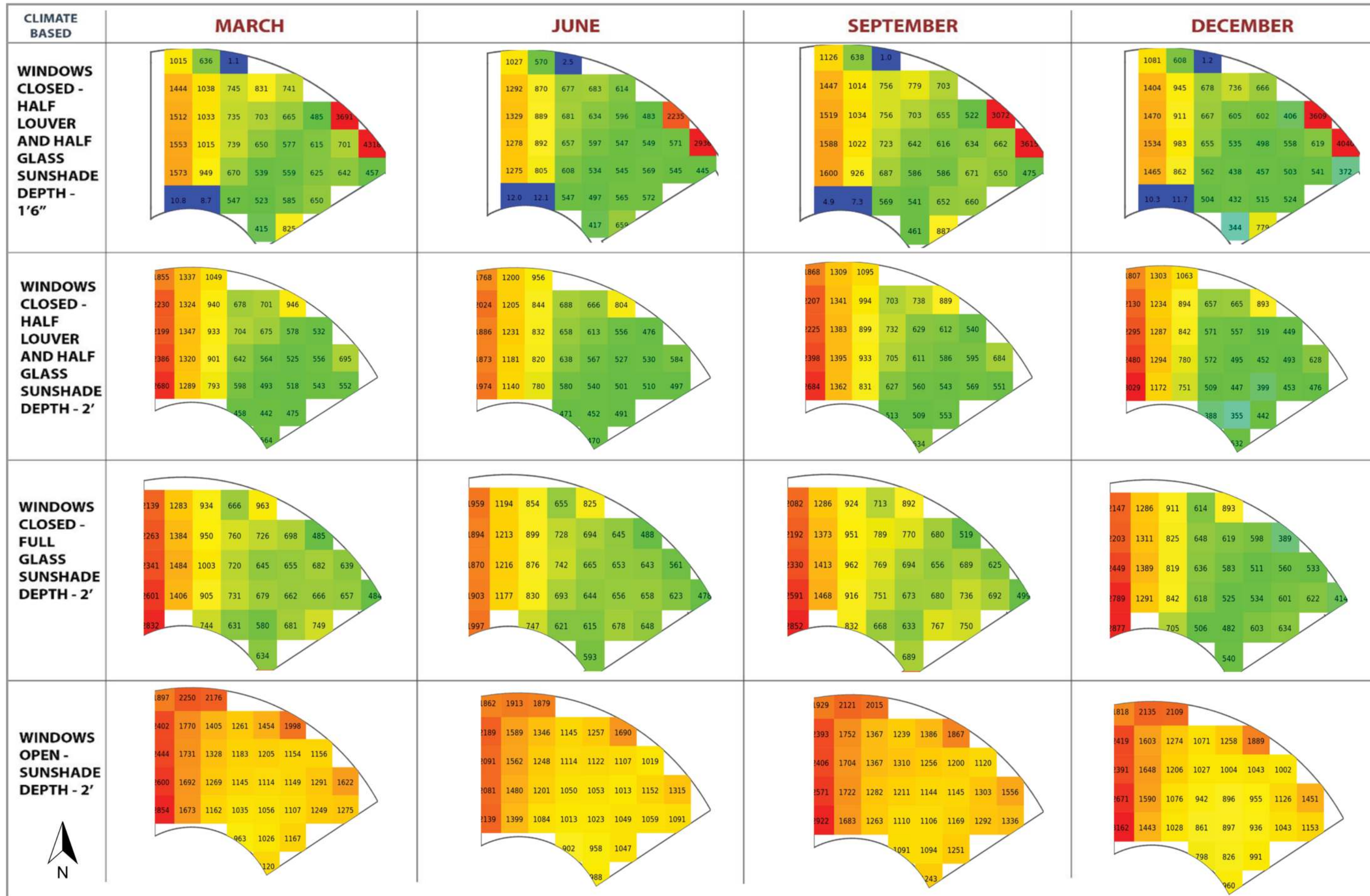
WINDOWS OPEN

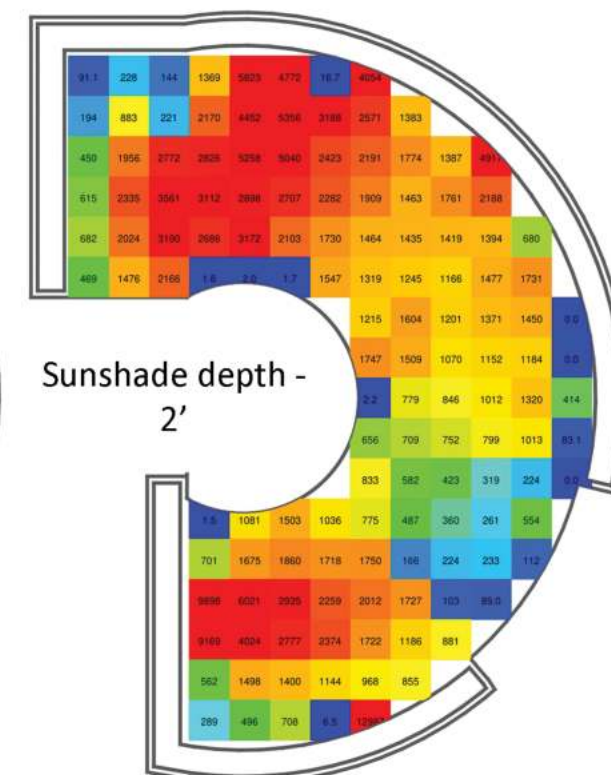
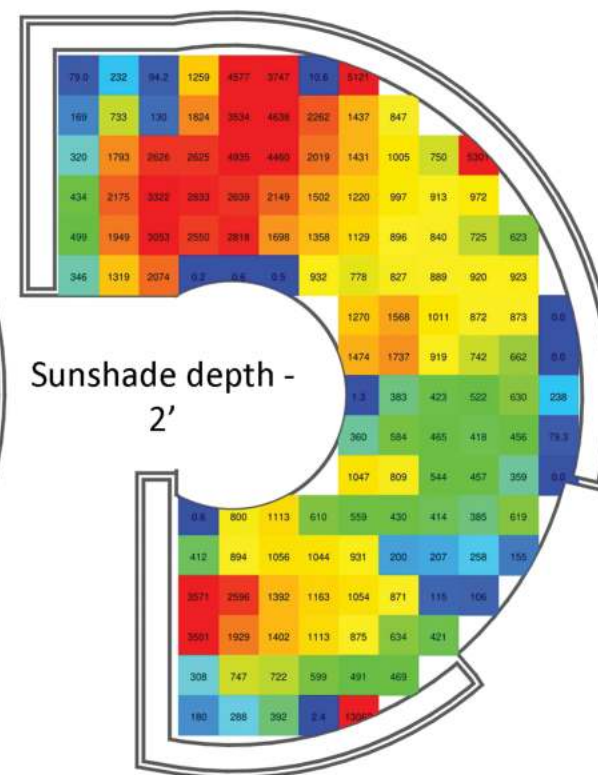
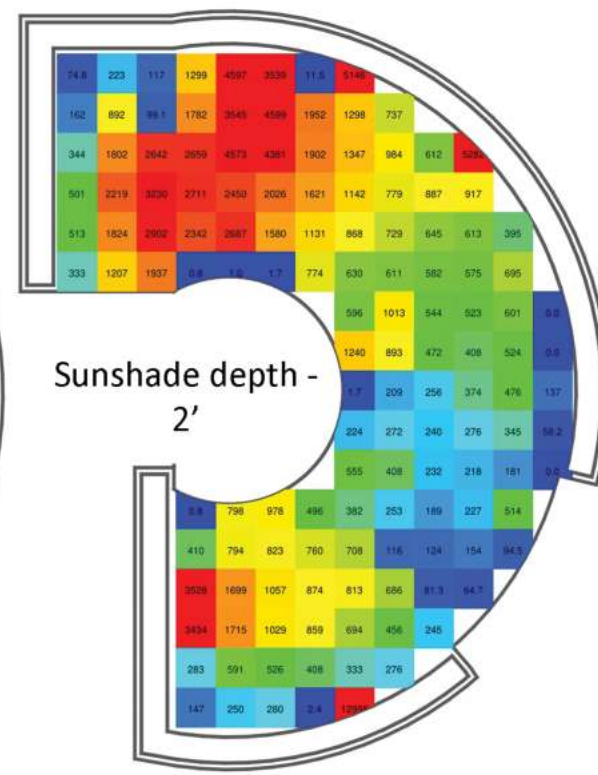
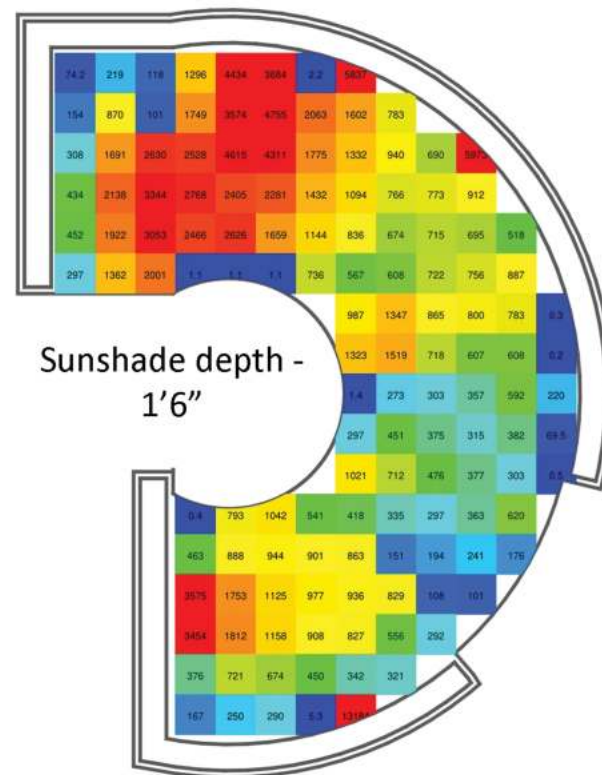


DECEMBER

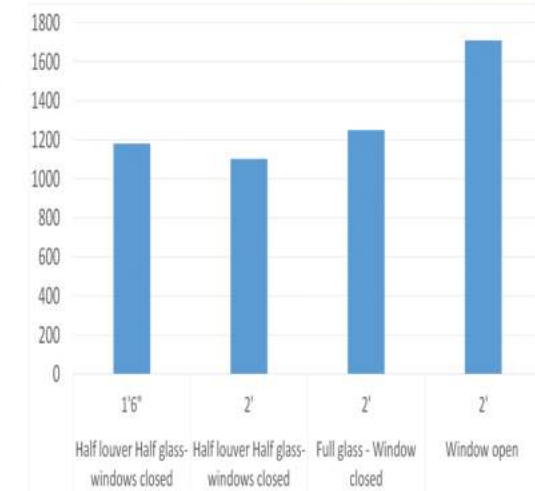
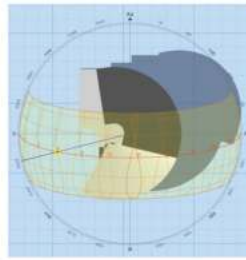


TYPE OF WINDOW	Half louver Half glass- windows closed - 1'6" sunshade	Half louver Half glass- windows closed - 2' sunshade	Full glass - Window closed	Window open	TYPE OF WINDOW	Half louver Half glass- windows closed - 1'6" sunshade	Half louver Half glass- windows closed - 2' sunshade	Full glass - Window closed	Window open
Average lux	894.14 lux	797.13 lux	911.77 lux	1347.45 lux	Average lux	1299.45 lux	1153.17 lux	1270.08 lux	1803.39 lux





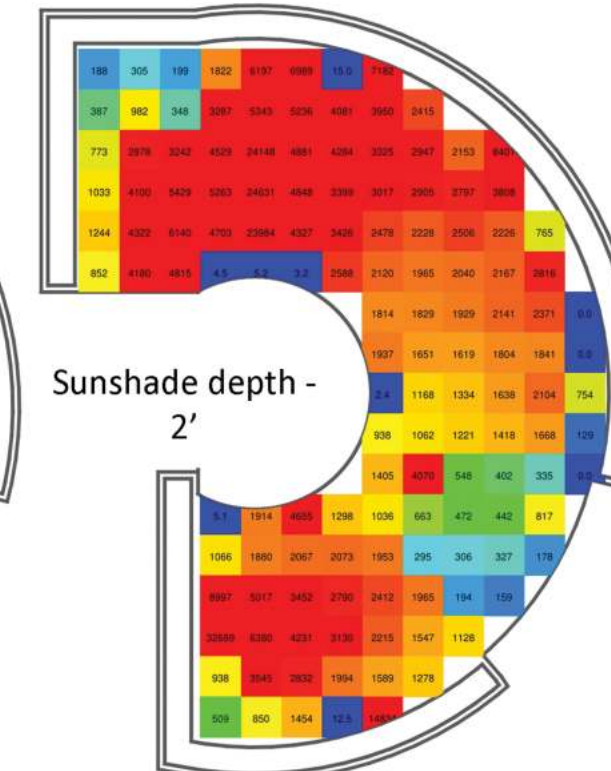
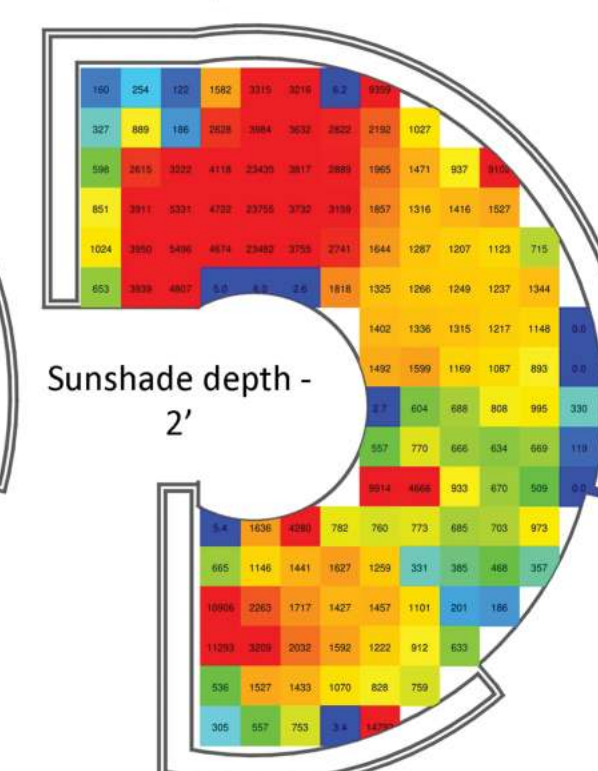
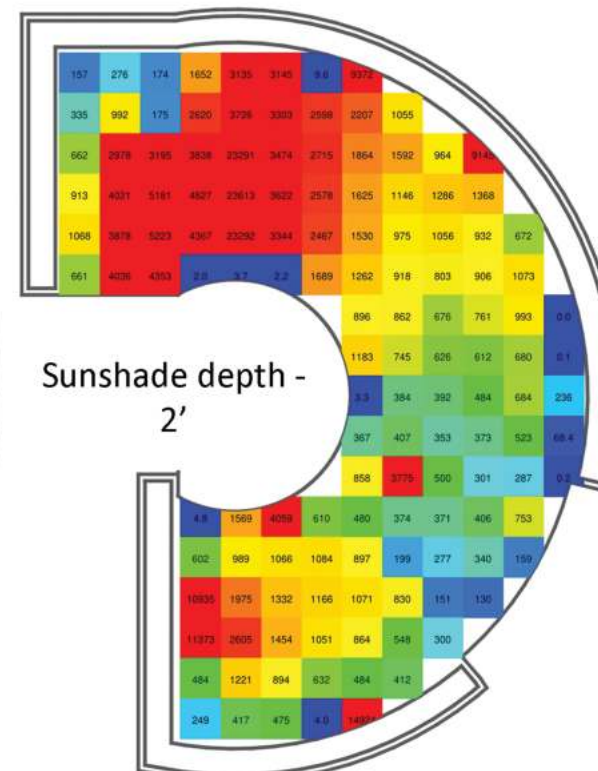
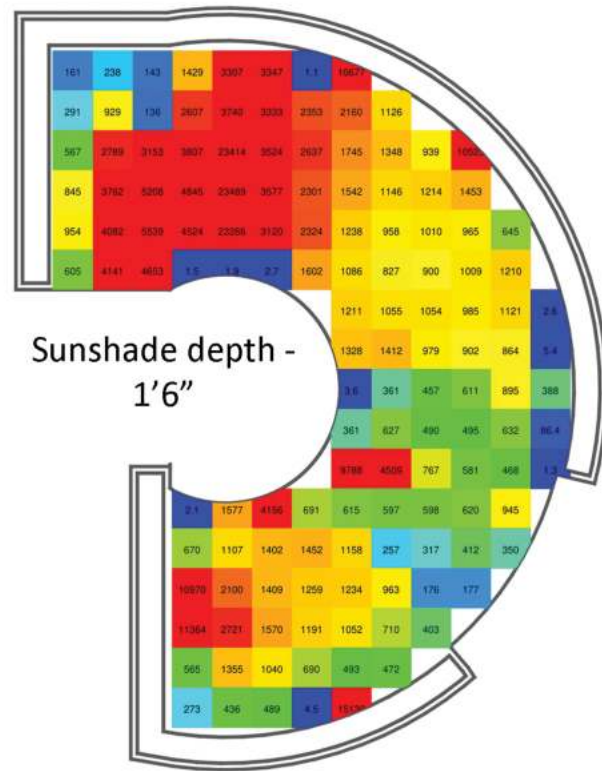
MARCH



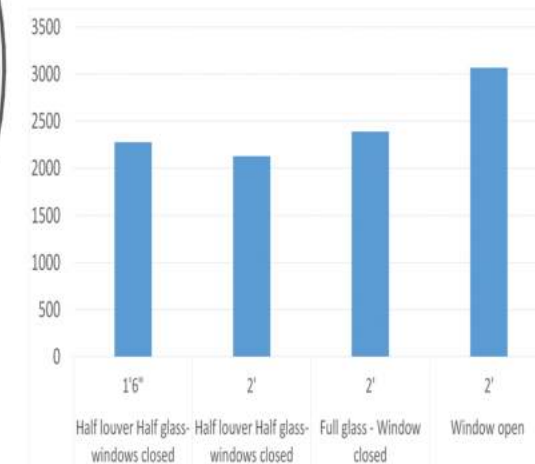
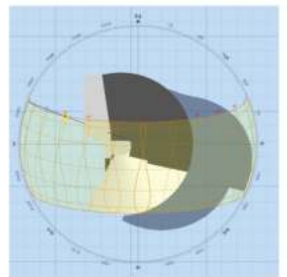
WINDOWS CLOSED WITH HALF LOUVER AND HALF GLASS

WINDOWS CLOSED WITH FULL GLASS, VLT-0.65

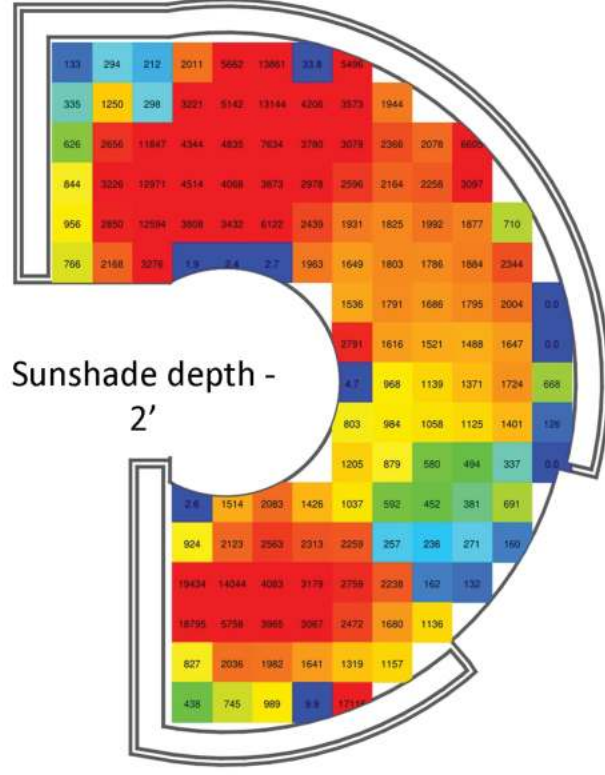
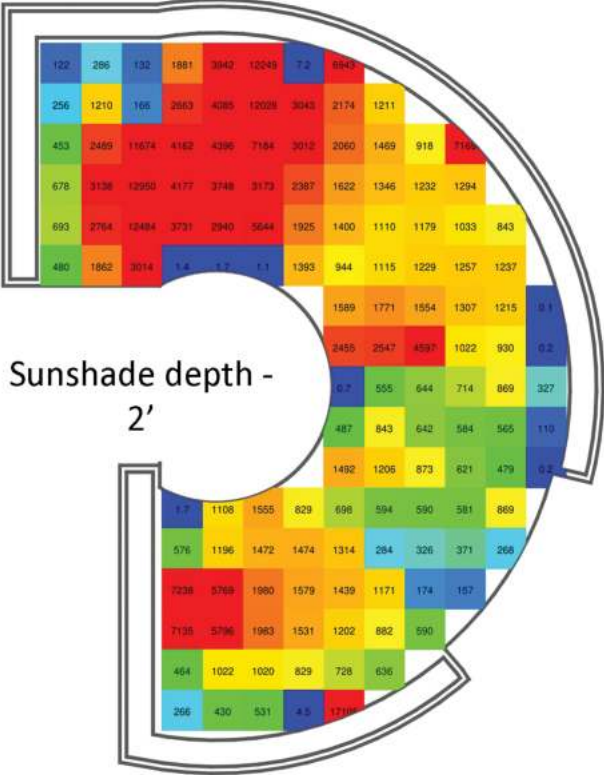
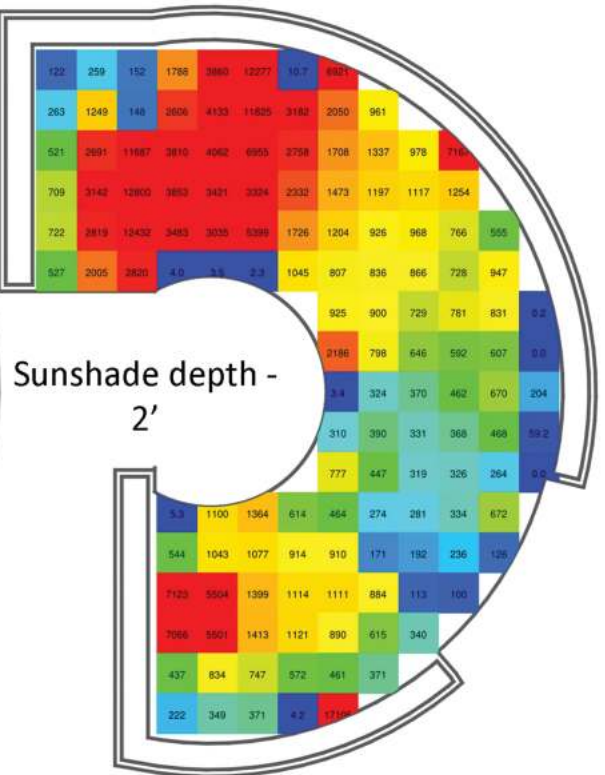
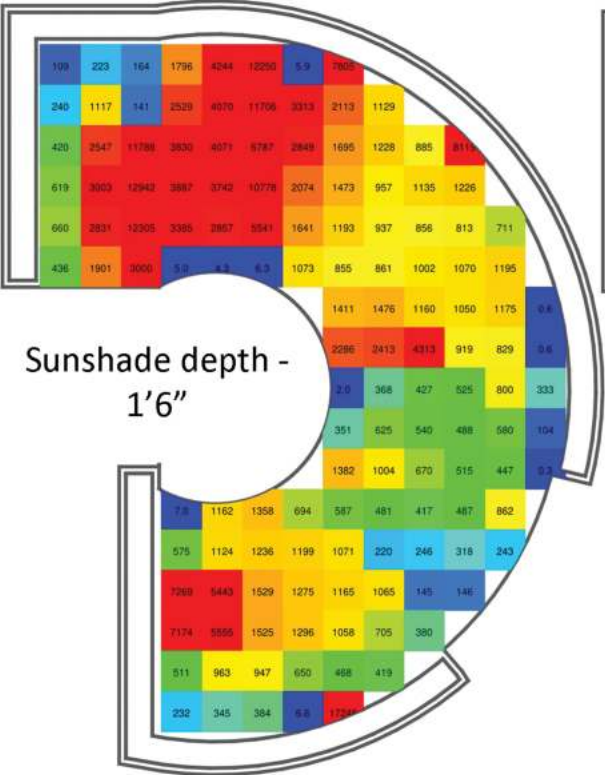
WINDOWS OPEN



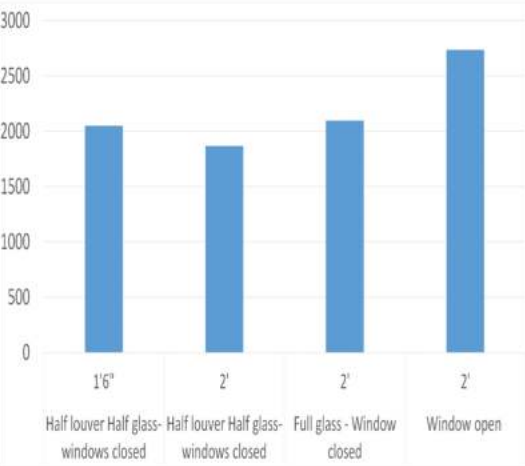
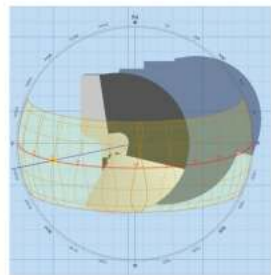
JUNE



TYPE OF WINDOW	Half lower Half glass- windows closed - 1'6" sunshade	Half lower Half glass- windows closed - 2' sunshade	Full glass - Window closed	Window open	TYPE OF WINDOW	Half lower Half glass- windows closed - 1'6" sunshade	Half lower Half glass- windows closed - 2' sunshade	Full glass - Window closed	Window open
Average lux	1179.99 lux	1102.82 lux	1250.13 lux	1709.34 lux	Average lux	2278.01 lux	2128.4 lux	2389.64 lux	3068.23 lux



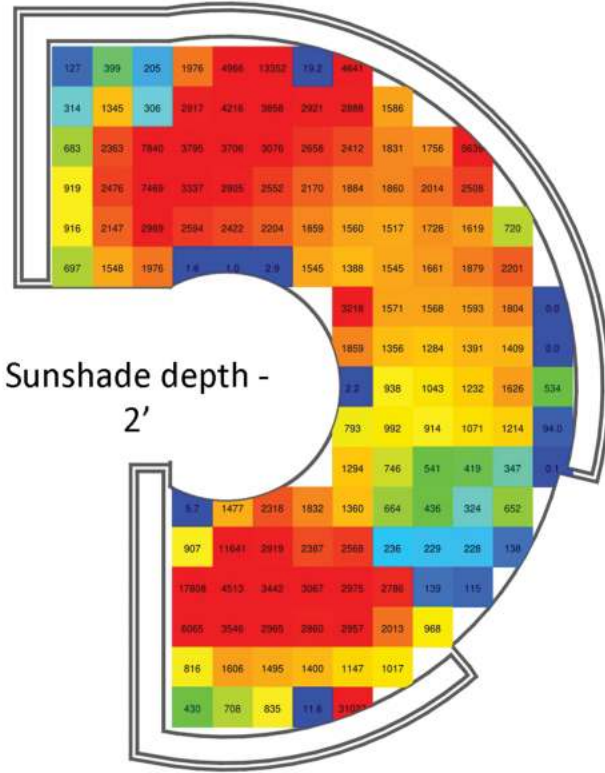
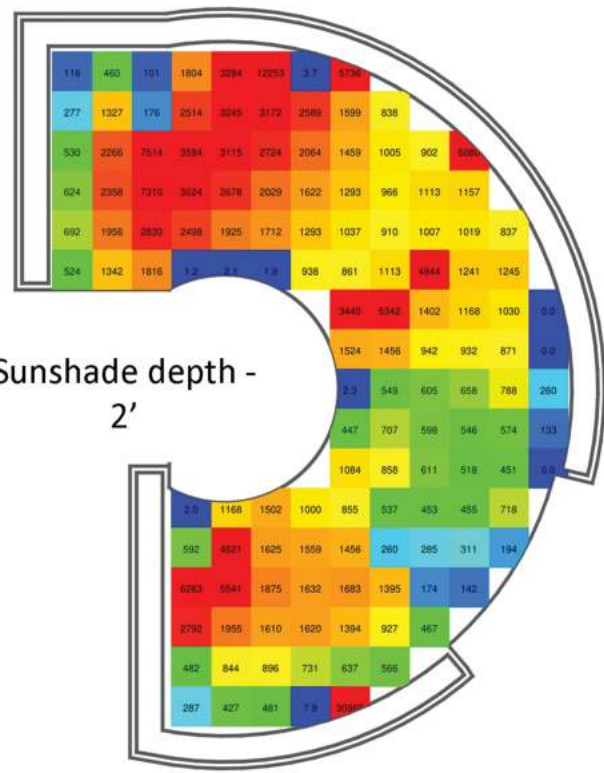
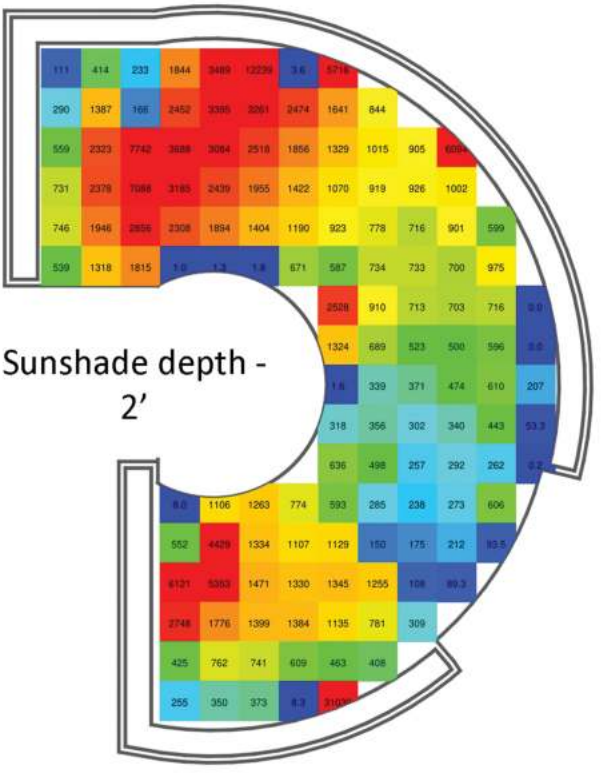
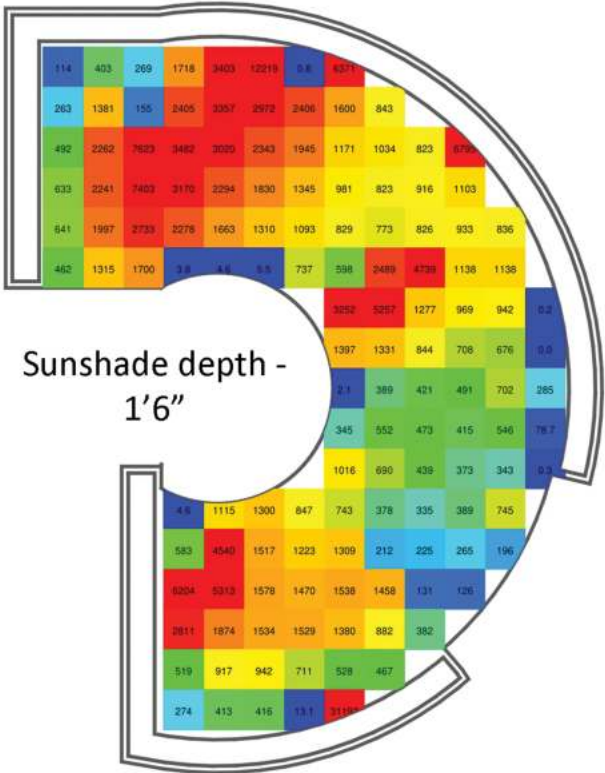
SEPTEMBER



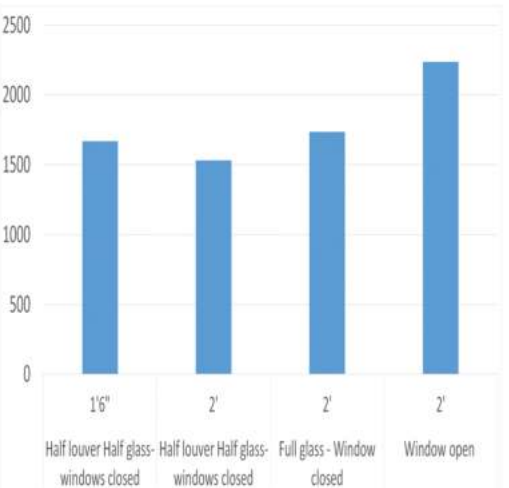
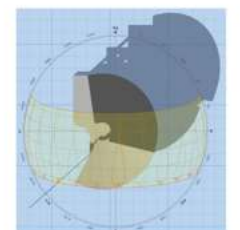
WINDOWS CLOSED WITH HALF LOUVER AND HALF GLASS

WINDOWS CLOSED WITH FULL GLASS, VLT-0.65

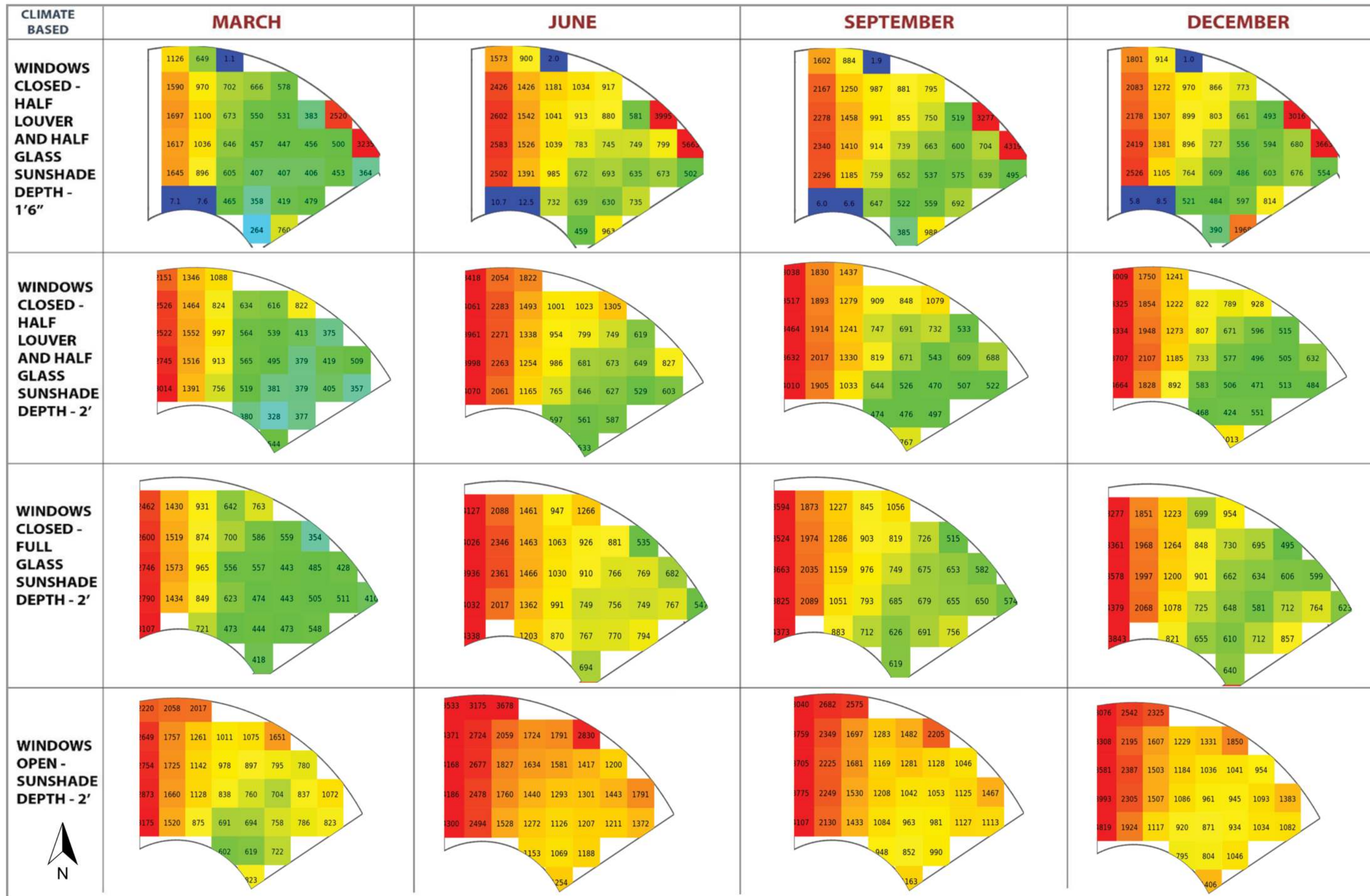
WINDOWS OPEN

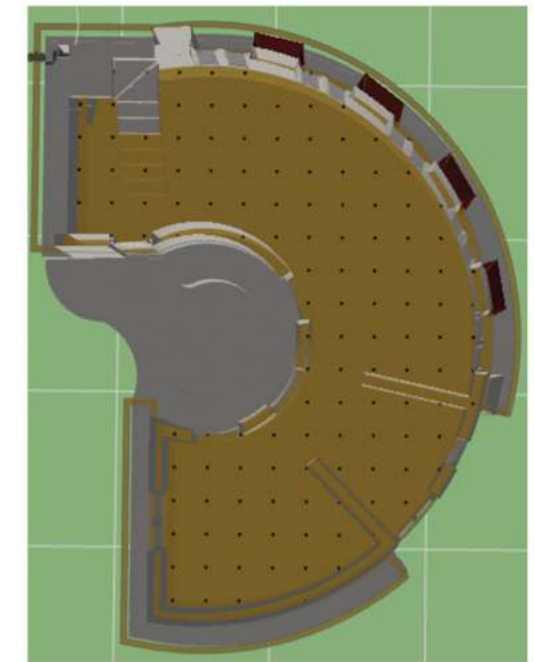
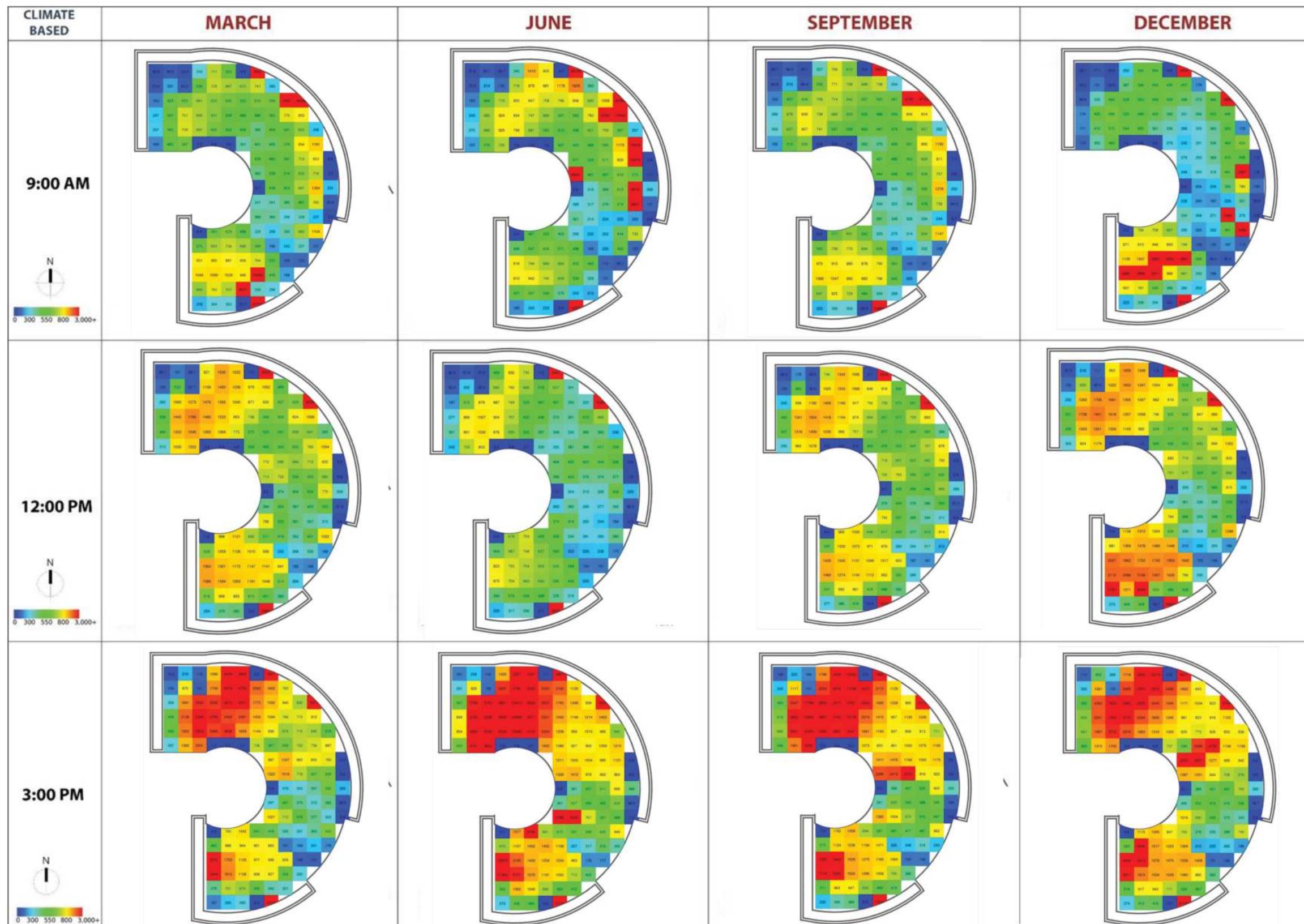


DECEMBER



TYPE OF WINDOW	Half louver Half glass- windows closed - 1'6" sunshade	Half louver Half glass- windows closed - 2' sunshade	Full glass - Window closed	Window open	TYPE OF WINDOW	Half louver Half glass- windows closed - 1'6" sunshade	Half louver Half glass- windows closed - 2' sunshade	Full glass - Window closed	Window open
Average lux	2047.7 lux	1867.92 lux	2096.16 lux	2734.5 lux	Average lux	1668.57 lux	1531.8 lux	1733.97 lux	2237.03 lux





WINDOWS CLOSED- HALF LOUVER AND HALF GLASS

SUNSHADE DEPTH - 1'6"



As per NBC

General office :
300 - 500 - 700 lux

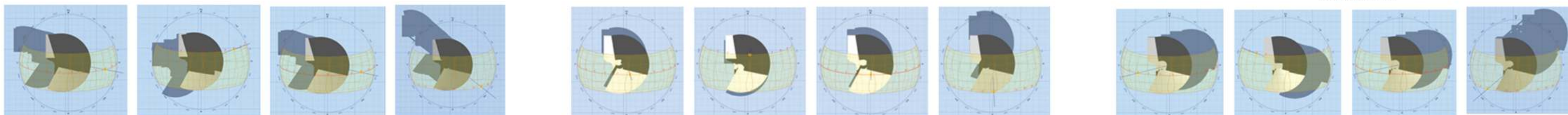
Computer workstation :
300 - 500 - 700 lux

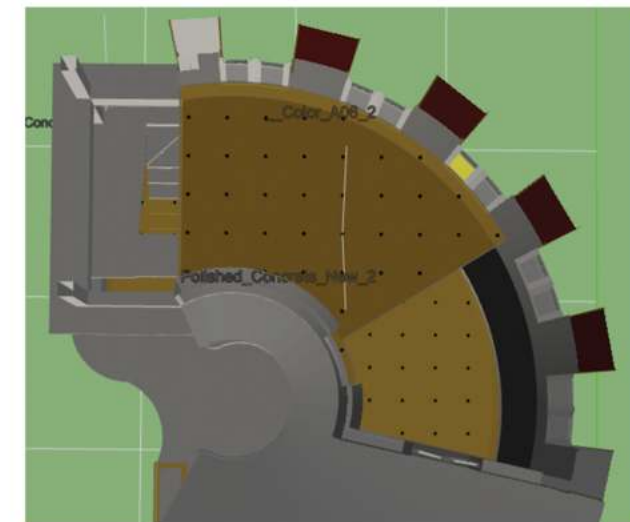
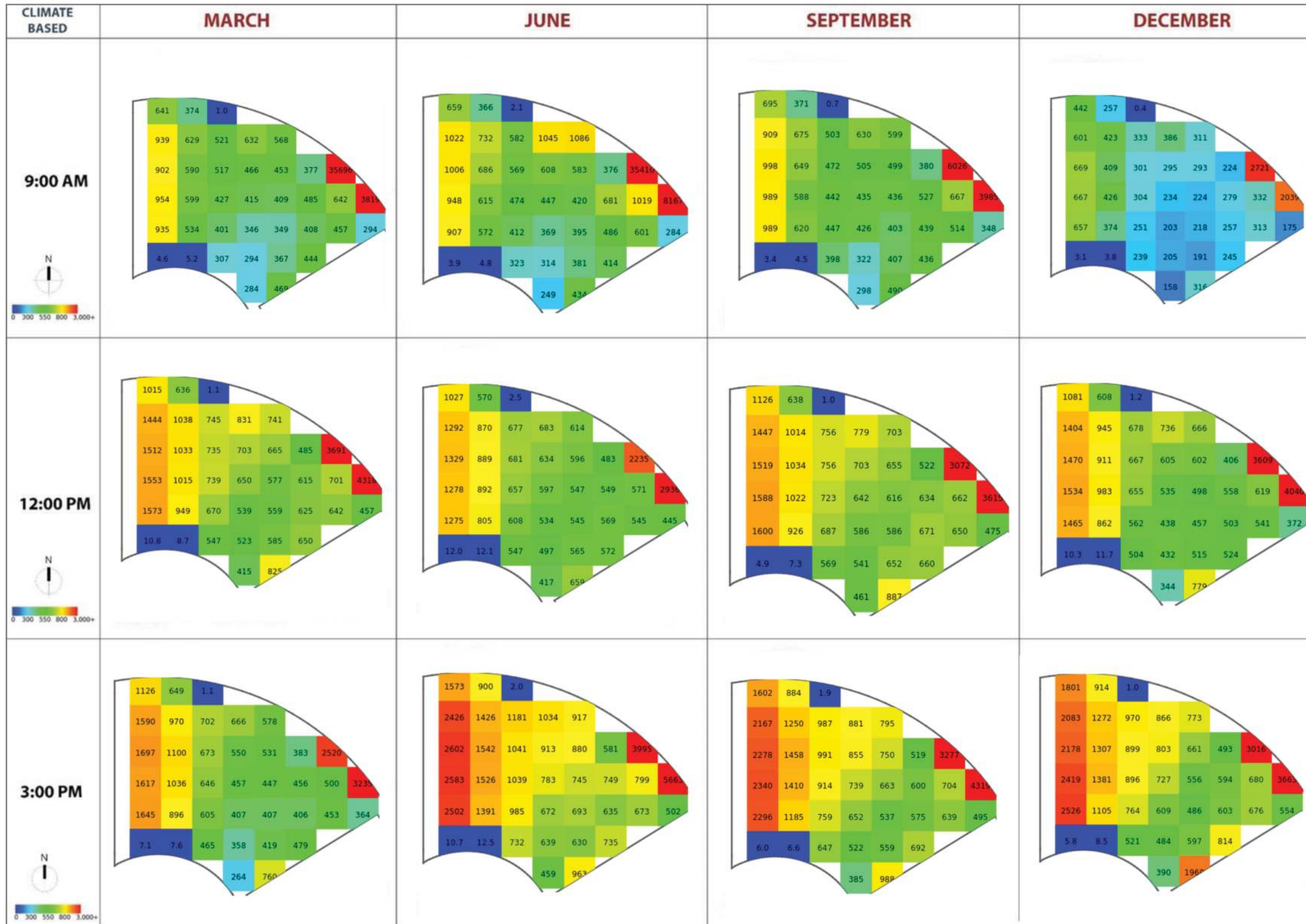
Conference room :
300 - 500 - 700 lux

9:00 AM

12:00 PM

3:00 PM





WINDOWS CLOSED- HALF LOUVER AND HALF GLASS

SUNSHADE DEPTH - 1'6"



As per NBC

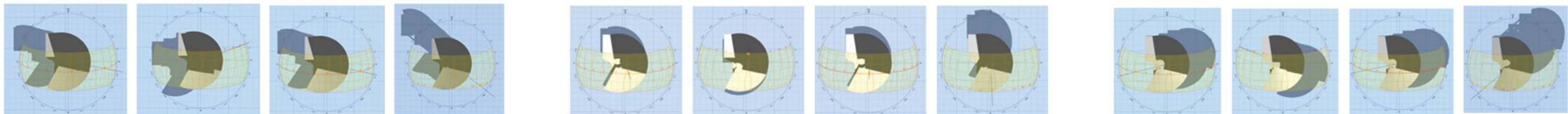
General office :
300 - 500 - 700 lux

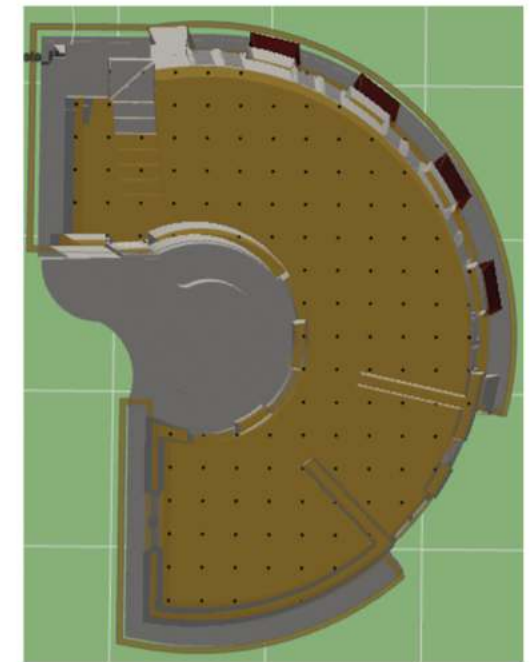
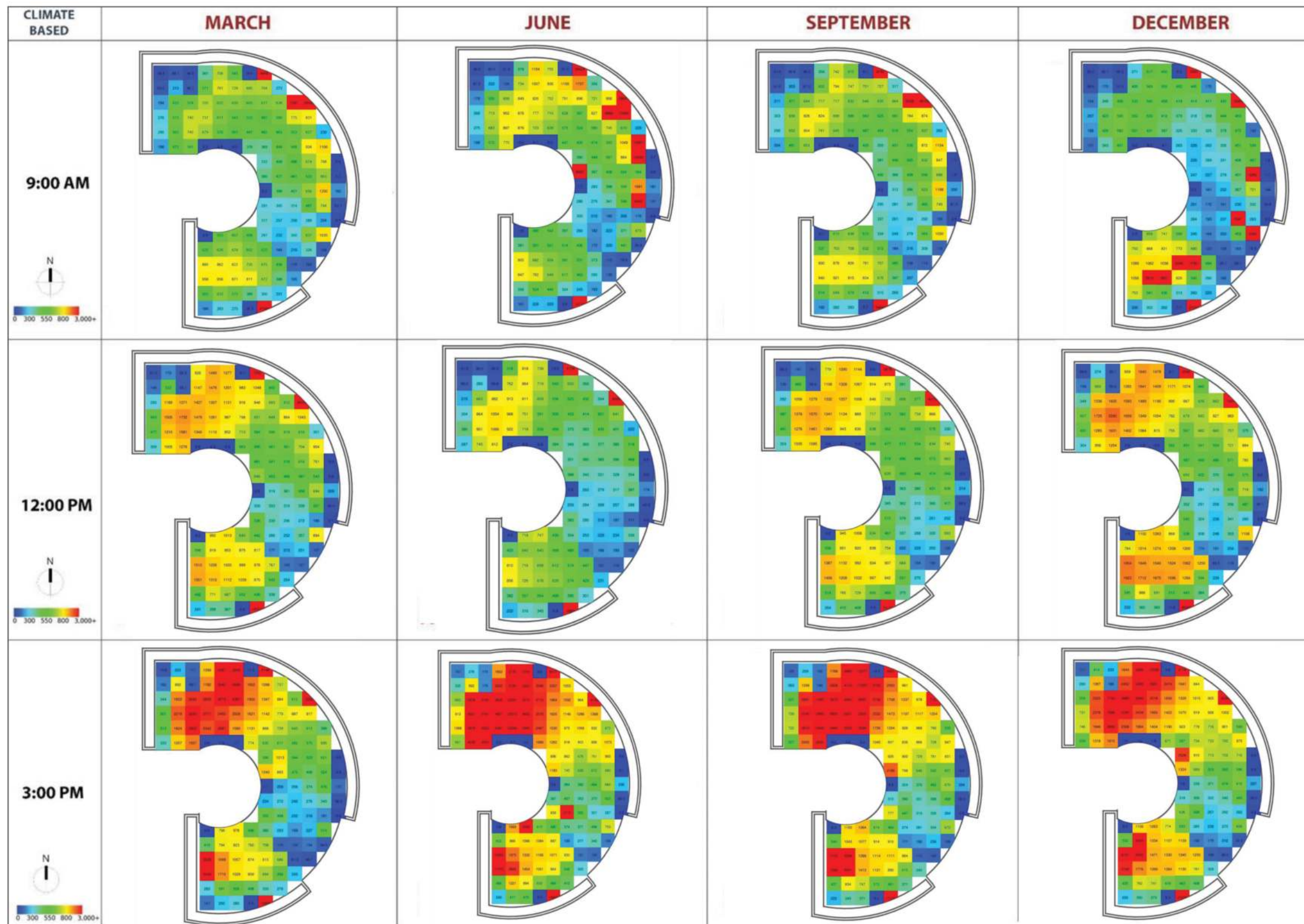


9:00 AM

12:00 PM

3:00 PM





WINDOWS CLOSED- HALF LOUVER AND HALF GLASS

SUNSHADE DEPTH - 2'



As per NBC

General office :
300 - 500 - 700 lux

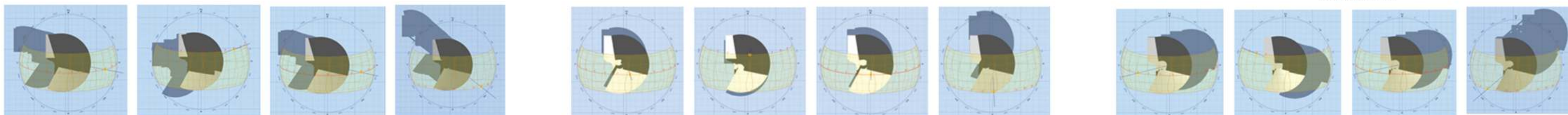
Computer workstation :
300 - 500 - 700 lux

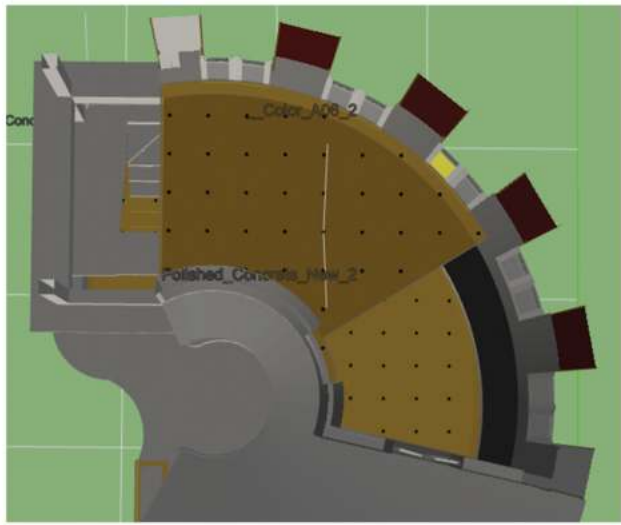
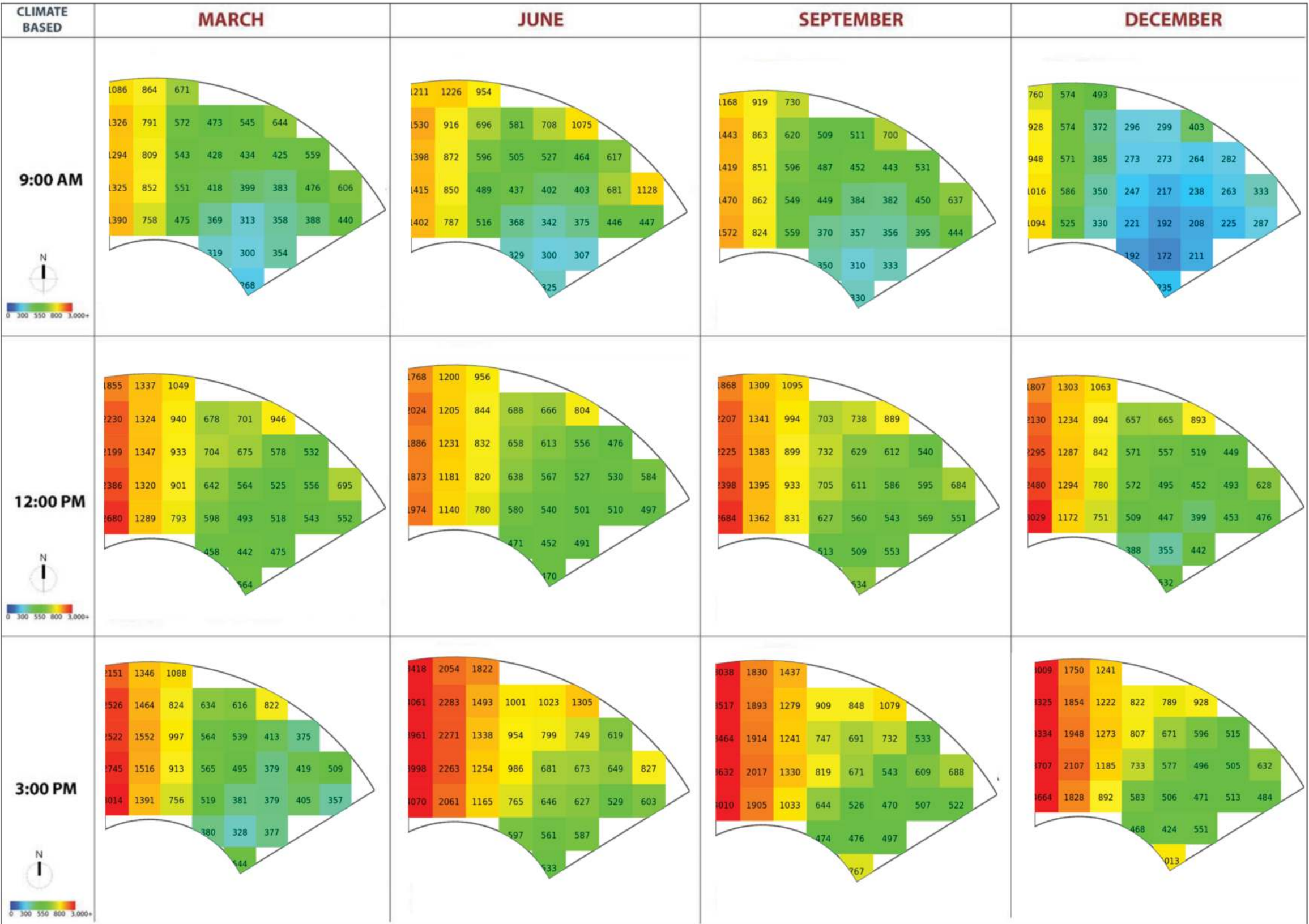
Conference room :
300 - 500 - 700 lux

9:00 AM

12:00 PM

3:00 PM





WINDOWS CLOSED- HALF LOUVER AND HALF GLASS

SUNSHADE DEPTH - 2'



As per NBC

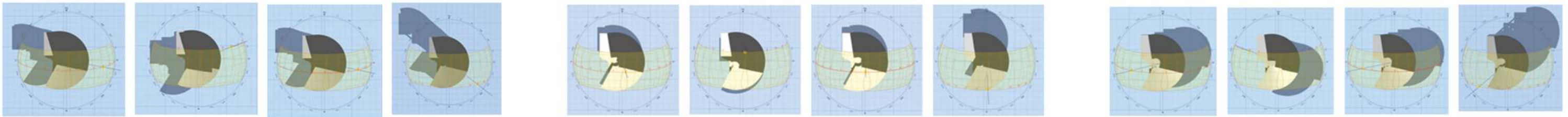
General office :
300 - 500 - 700 lux

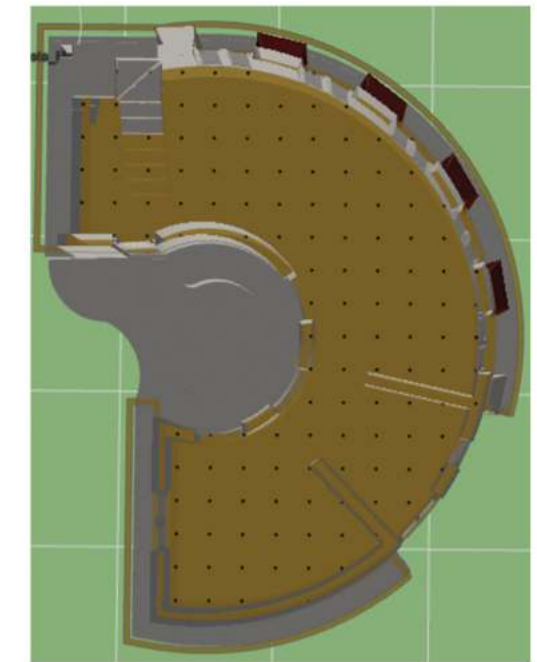
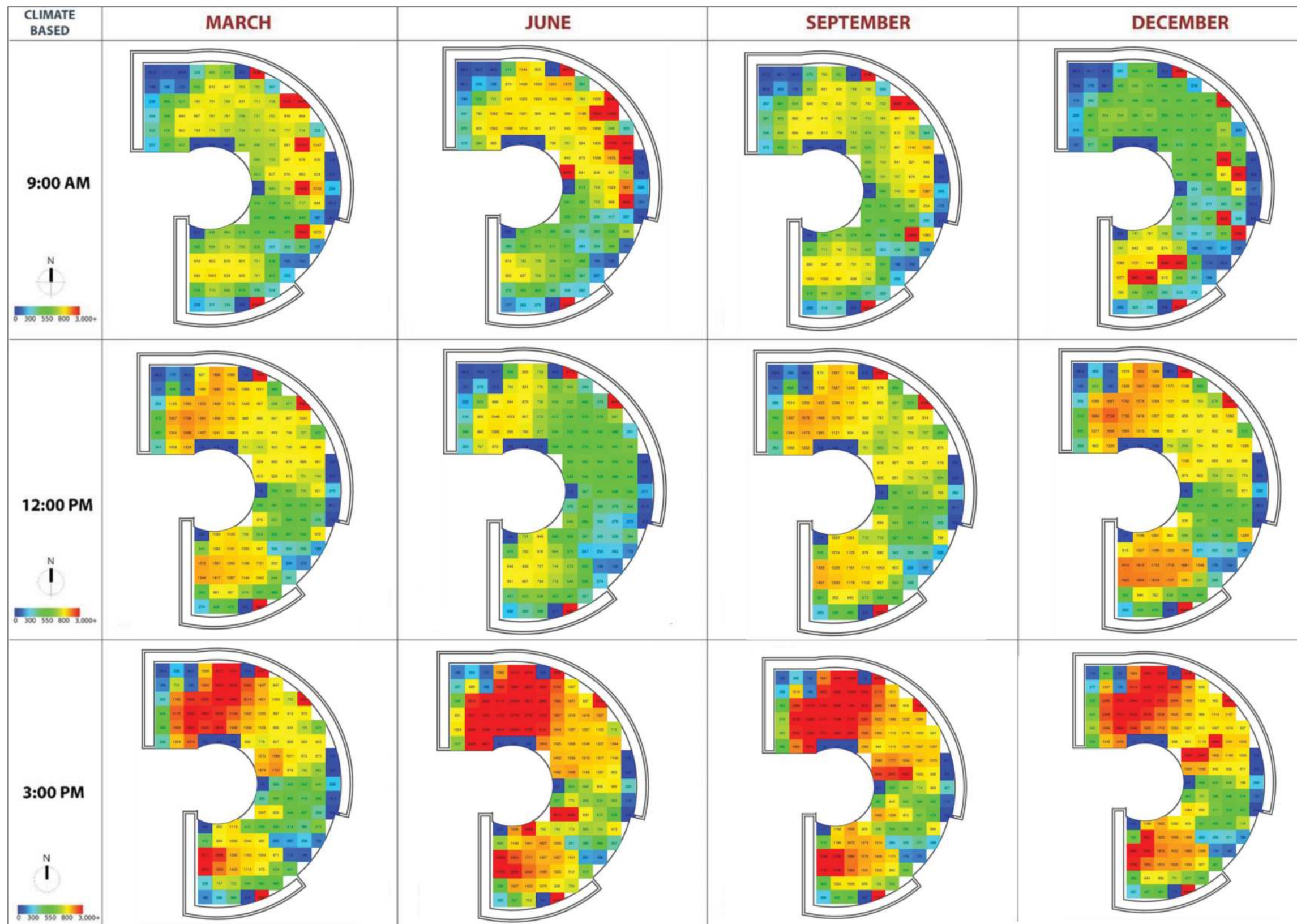


9:00 AM

12:00 PM

3:00 PM





WINDOWS CLOSED
FULL GLASS

SUNSHADE DEPTH - 2'



As per NBC

General office :
300 - 500 - 700 lux

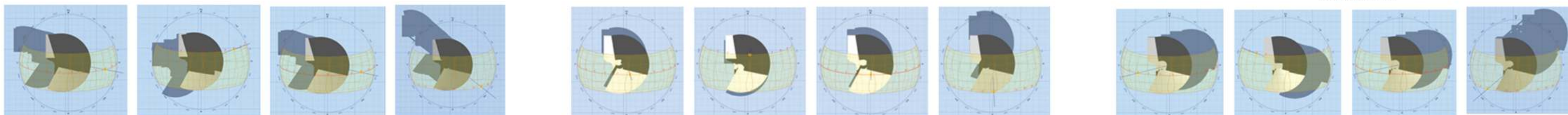
Computer workstation :
300 - 500 - 700 lux

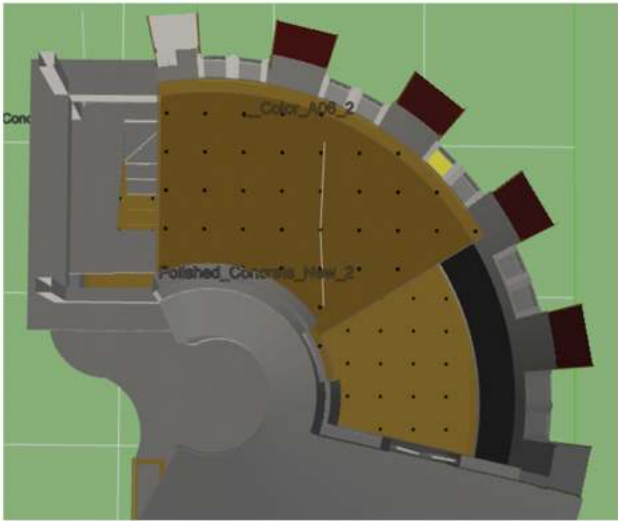
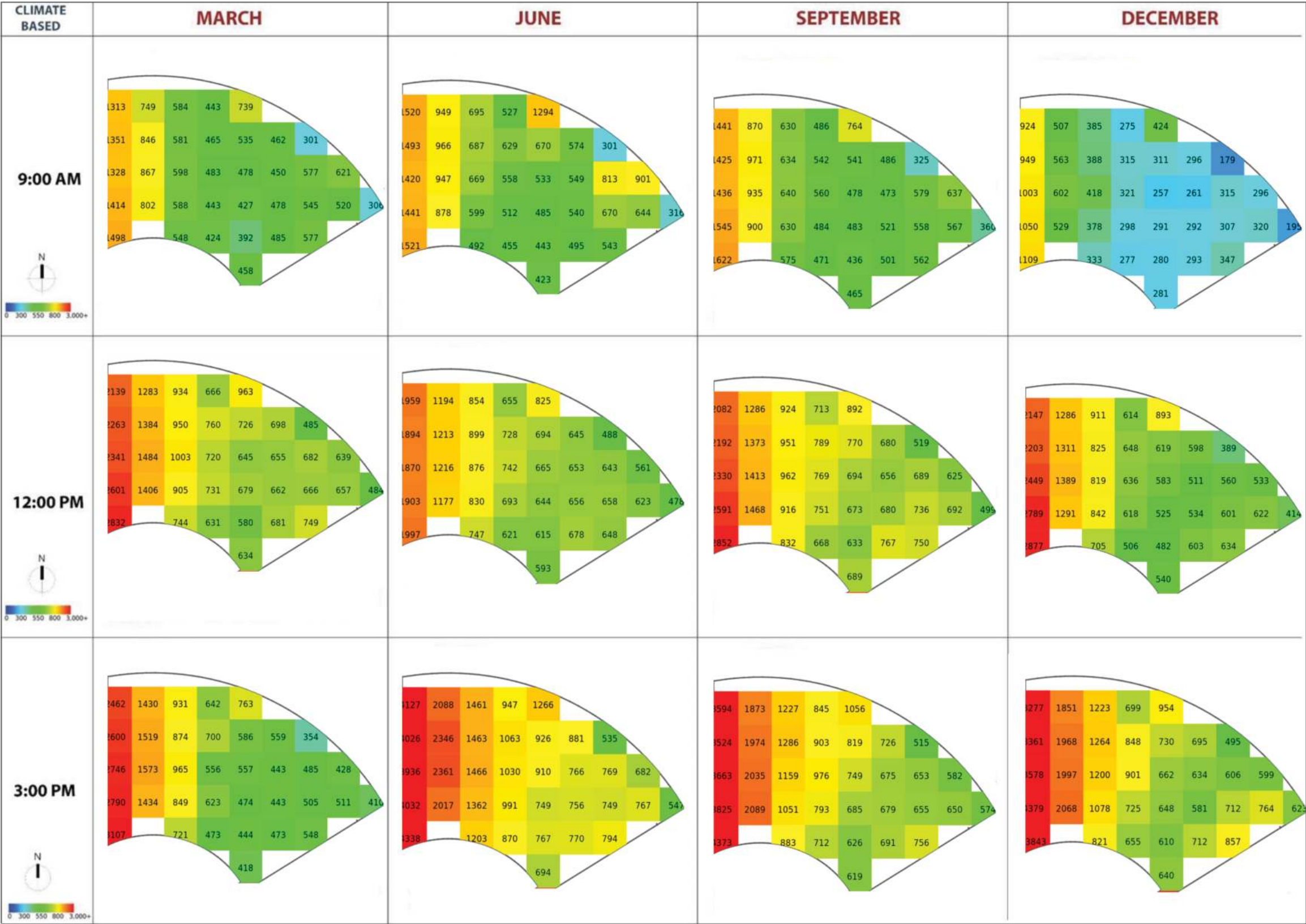
Conference room :
300 - 500 - 700 lux

9:00 AM

12:00 PM

3:00 PM





WINDOWS CLOSED-
FULL GLASS

SUNSHADE DEPTH - 2'



As per NBC

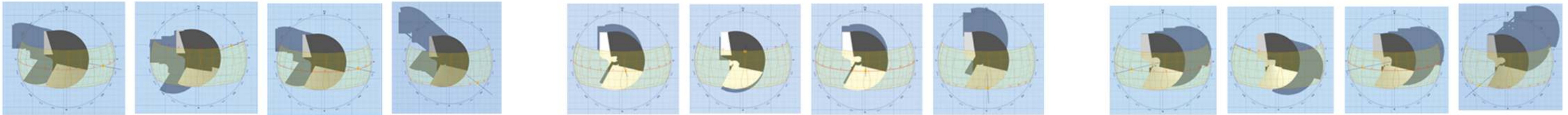
General office :
300 - 500 - 700 lux

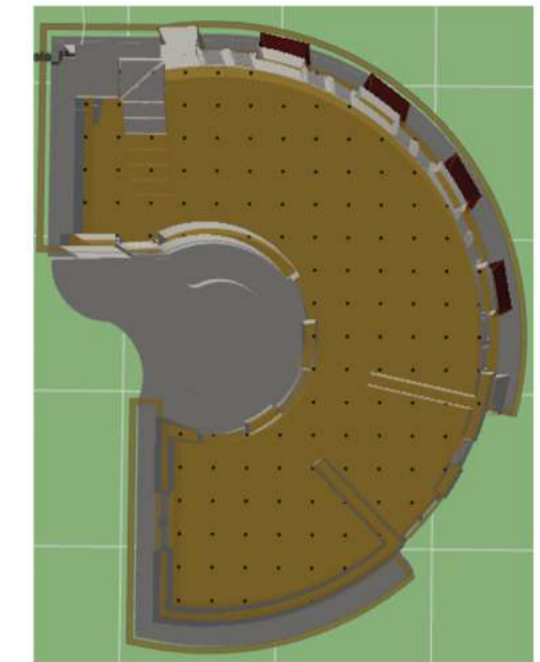
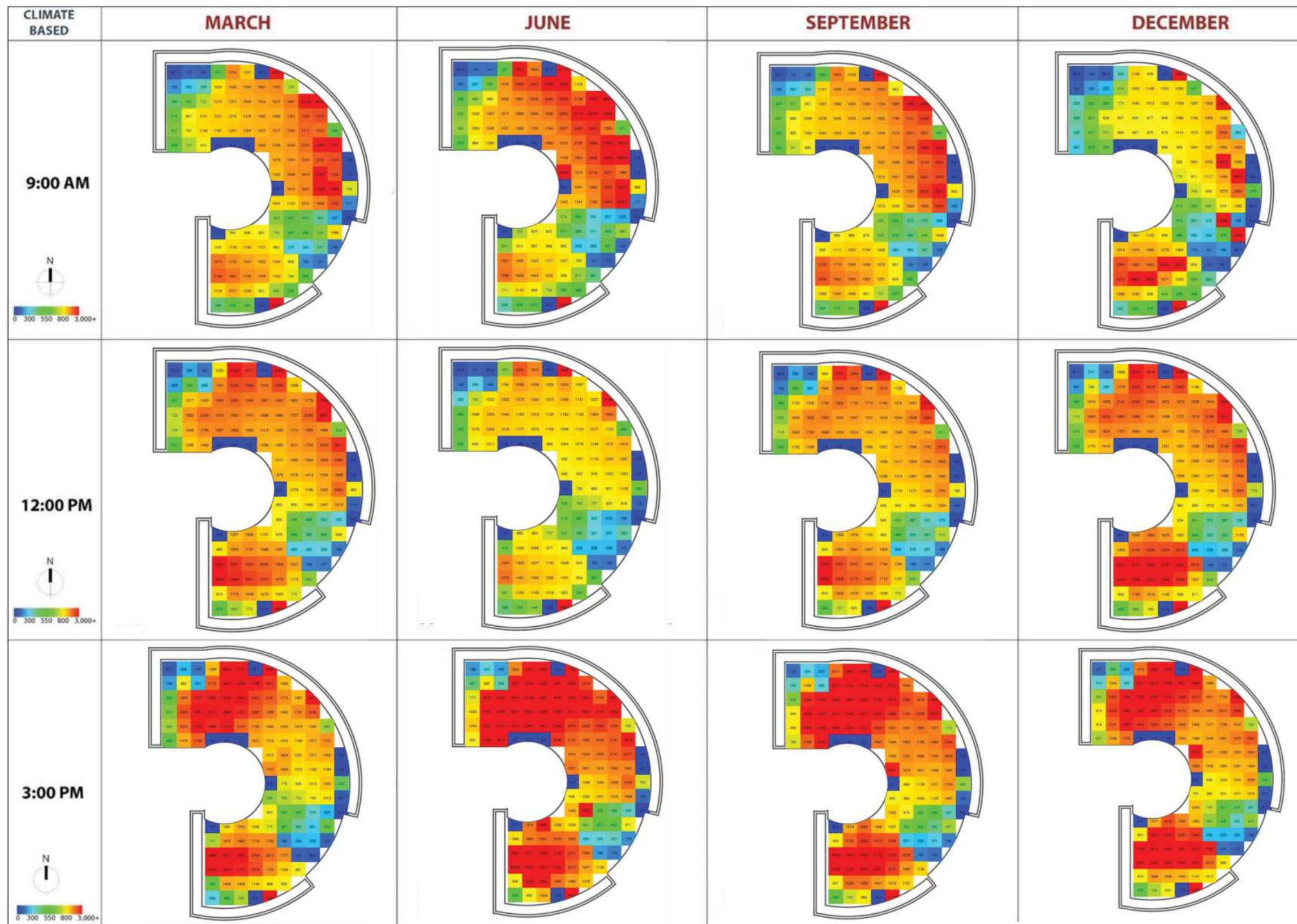


9:00 AM

12:00 PM

3:00 PM





WINDOWS OPEN

SUNSHADE DEPTH - 2'



As per NBC

General office :
300 - 500 - 700 lux

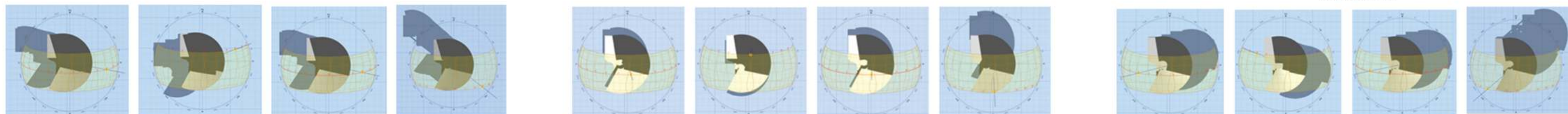
Computer workstation :
300 - 500 - 700 lux

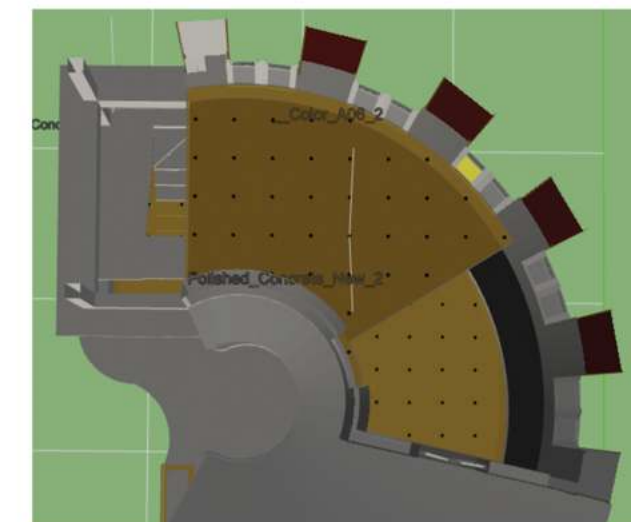
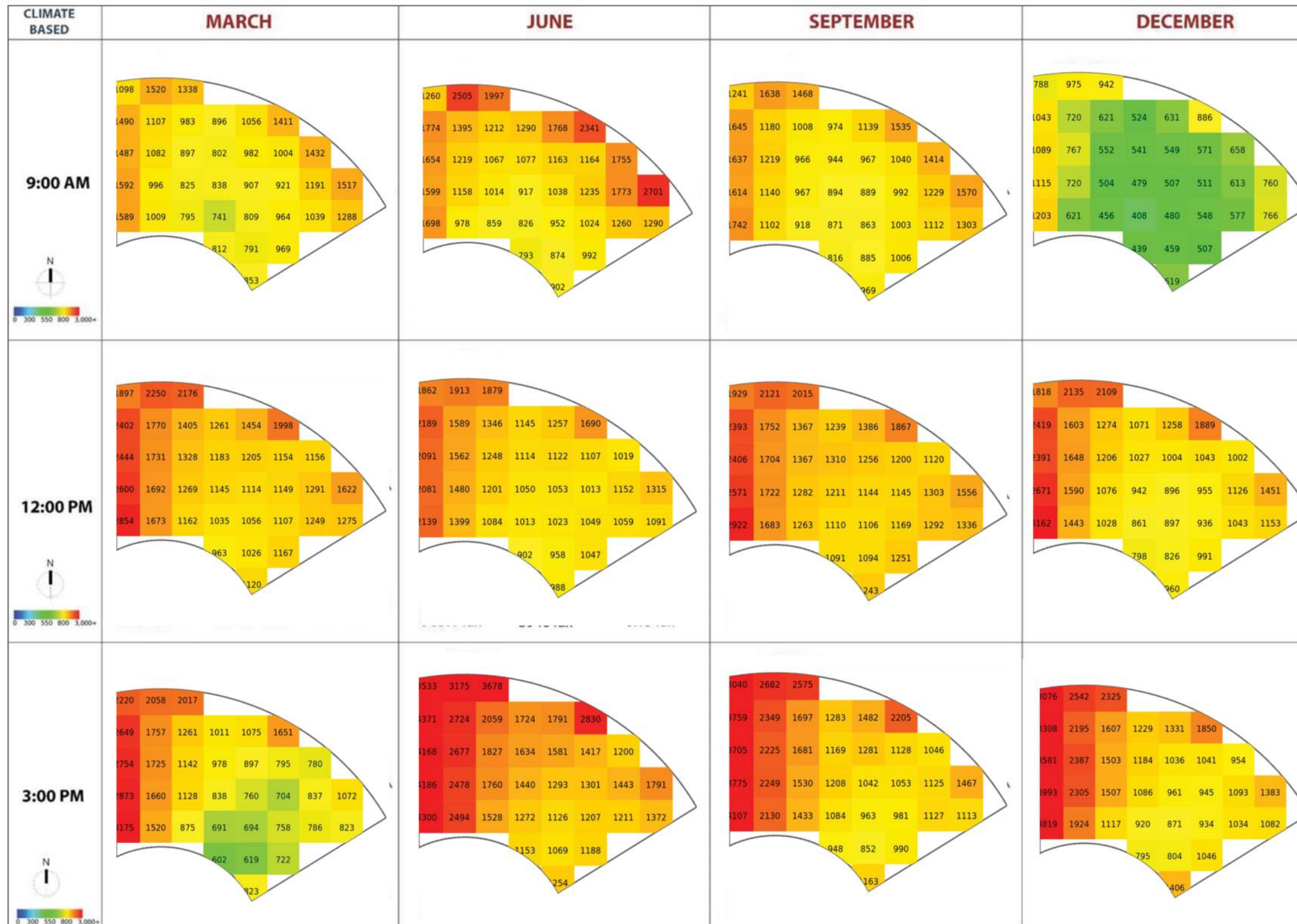
Conference room :
300 - 500 - 700 lux

9:00 AM

12:00 PM

3:00 PM





WINDOWS OPEN

SUNSHADE DEPTH - 2'



As per NBC

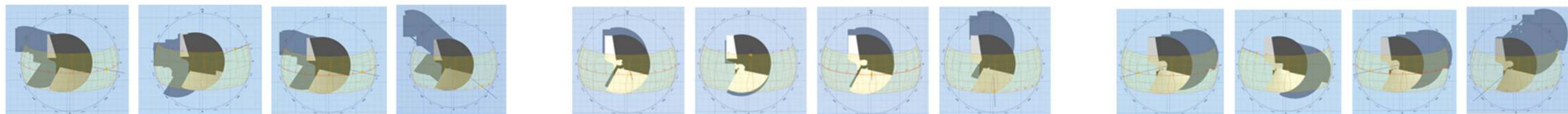
General office :
300 - 500 - 700 lux



9:00 AM

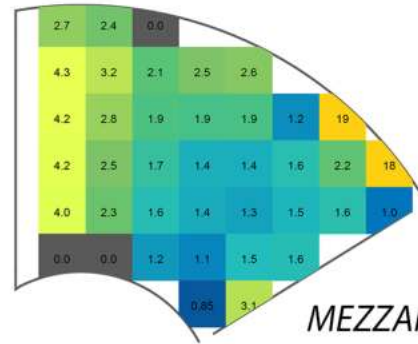
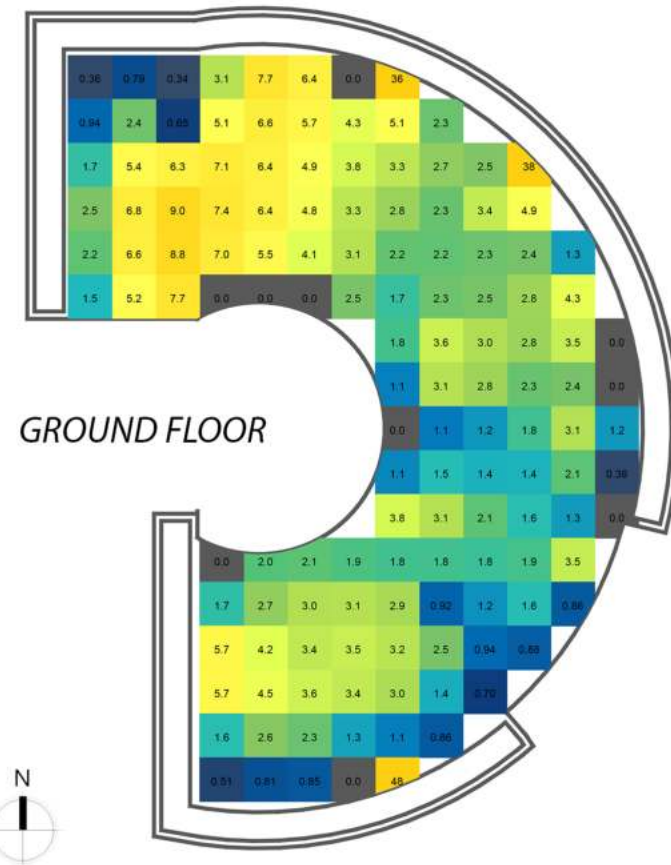
12:00 PM

3:00 PM



ANNUAL METRICS

DAYLIGHT FACTOR



MEZZANINE FLOOR

GROUND FLOOR

Average : 3.63 %

Maximum : 48.46 %

Minimum : 0 %

MEZZANINE FLOOR

Average : 2.81 %

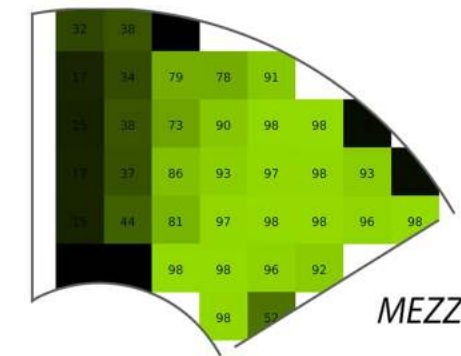
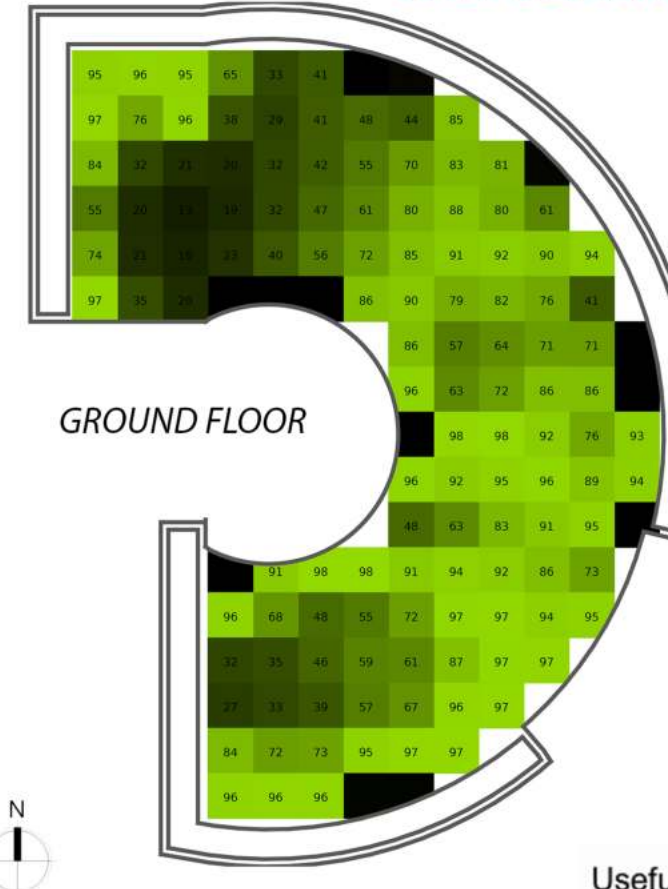
Maximum : 18.76 %

Minimum : 0 %

Daylight factor - Average : 3.44%

Daylight Factor: 3.44% 0 2 5 10%+

USEFUL DAYLIGHT ILLUMINANCE



MEZZANINE FLOOR

Average percentage of hours in each illuminance bin

bin

GROUND FLOOR

UDI-a (100 - 2000 lux): 63.98%

UDI-s (<100 lux): 8.87%

UDI-e (>2000 lux): 27.15%

MEZZANINE FLOOR

UDI-a (100 - 2000 lux): 63.44%

UDI-s (<100 lux): 8.94%

UDI-e (>2000 lux): 27.62%

Lower bound : 100 lux,
Upper bound : 2000 lux
Time threshold : 50 %**AVERAGES**

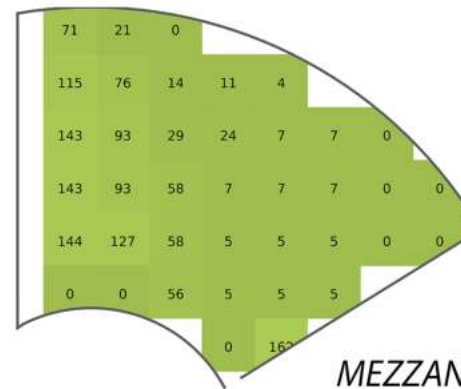
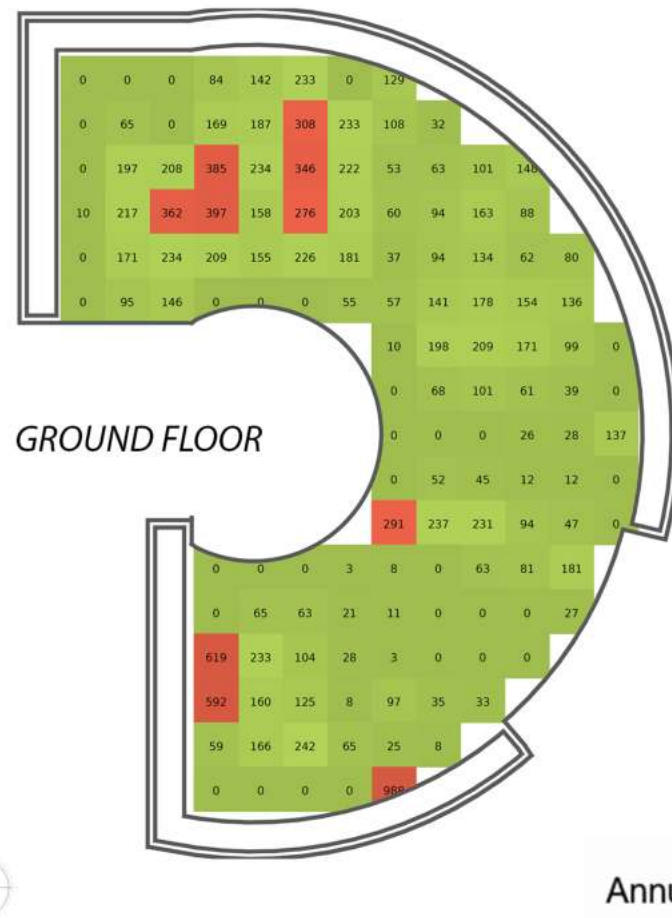
UDI-a (100 - 2000 lux): 63.86%

UDI-s (<100 lux): 8.88%

UDI-e (>2000 lux): 27.25%

Useful Daylight Illuminance_{100/2000}: 63.86% 0 100%

ANNUAL SOLAR EXPOSURE



MEZZANINE FLOOR

Period : 1/01 - 12/31

Occupancy : 10:00 AM - 6:00 PM

Time threshold : 250 hours

Percentage of analysis points $\geq 1,000$
lux for ≥ 250 hours per year

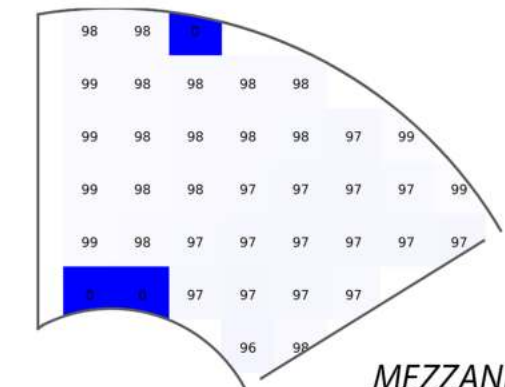
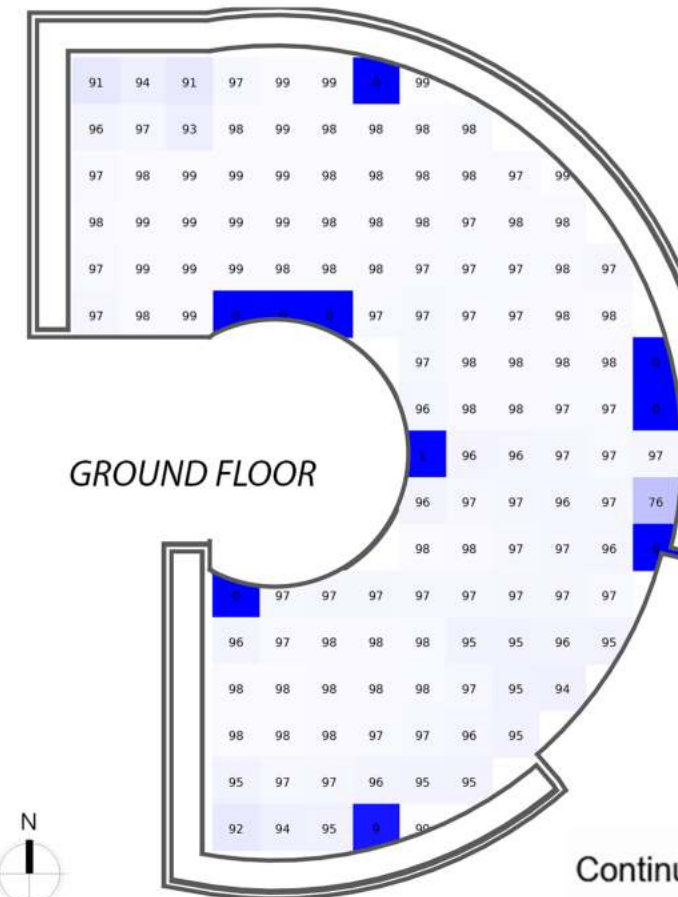
Ground floor : 7.3 %

Mezzanine floor : 0 %

Overall : 5.68 %

Annual Sunlight Exposure₂₅₀: 5.68% 0 hr 250 hr

CONTINUOUS DAYLIGHT AUTONOMY



MEZZANINE FLOOR

Period : 1/01 - 12/31

Occupancy : 10:00 AM - 6:00 PM

Illuminance target : 300 lux

Average percentage of hours ≥ 300
lux (with partial credit)

Ground floor : 89.94 %

Mezzanine floor : 90.14 %

Continuous Daylight Autonomy₃₀₀: 89.98% 0 100%

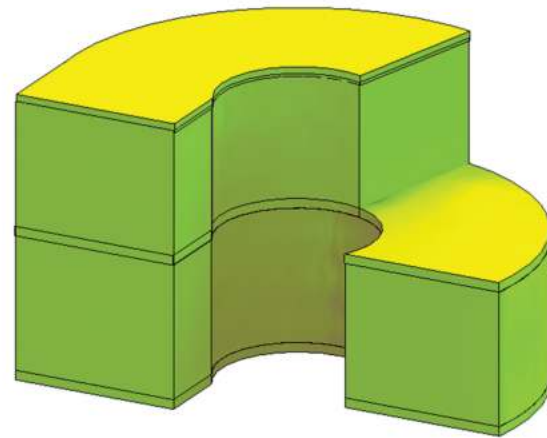


GE OFFICE

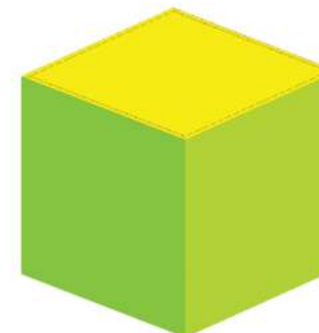
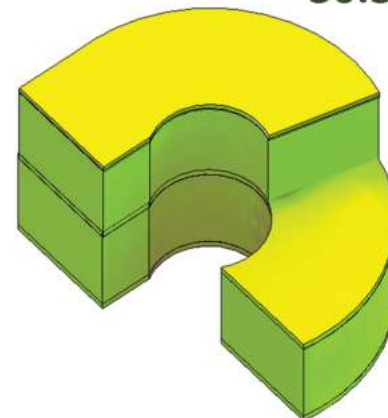
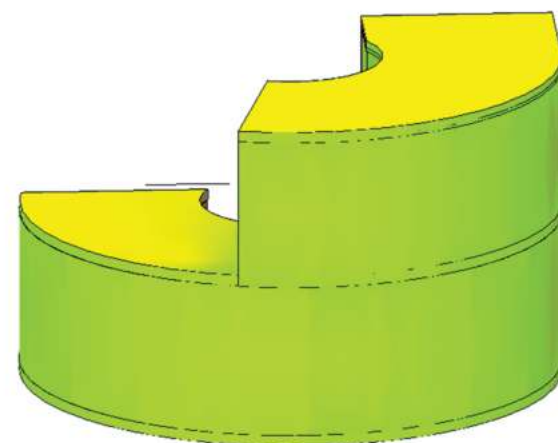
**GREEN
EVOLUTION
OFFICE**



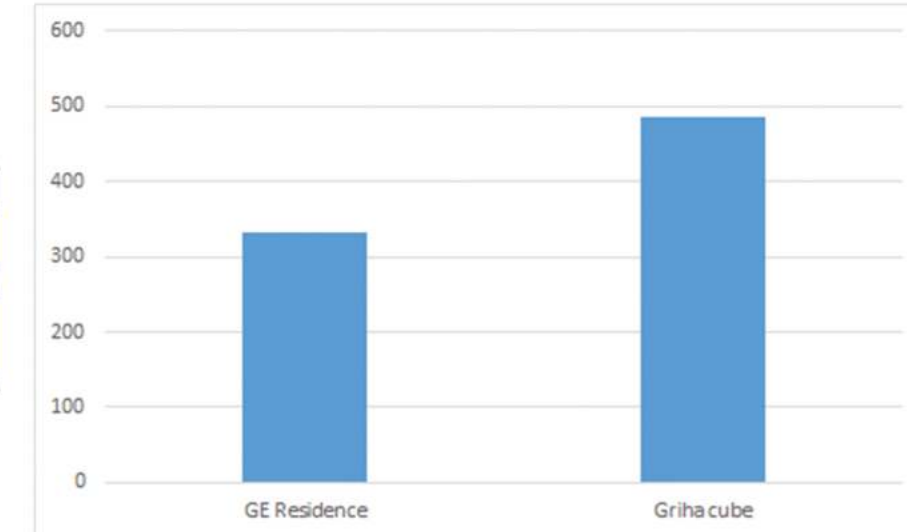
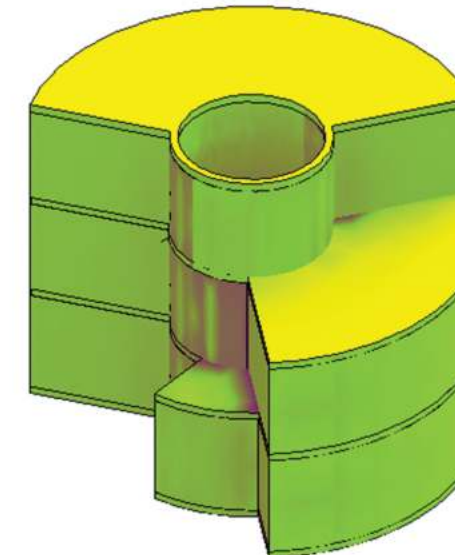
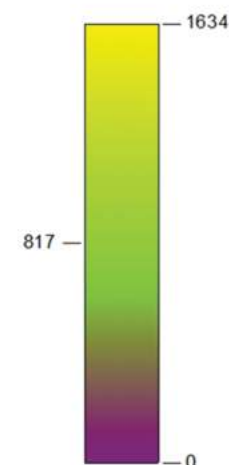
**GREEN
EVOLUTION
RESIDENCE**



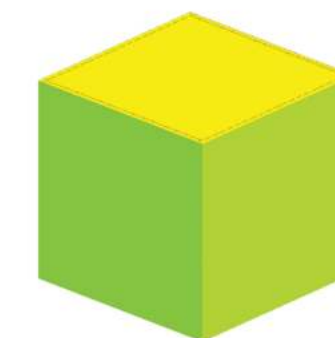
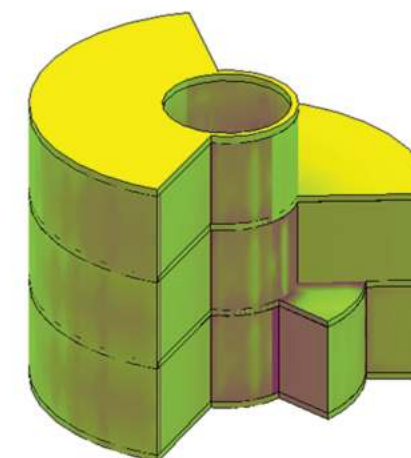
30.3% DECREASE



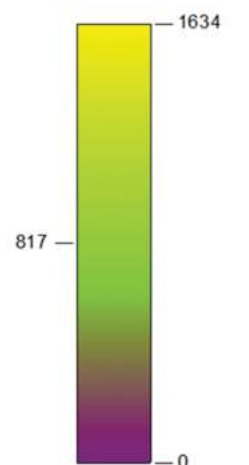
Custom Solar (kWh/m²)



31.5% DECREASE



Custom Solar (kWh/m²)



GRIHA CUBE



GRIHA CUBE

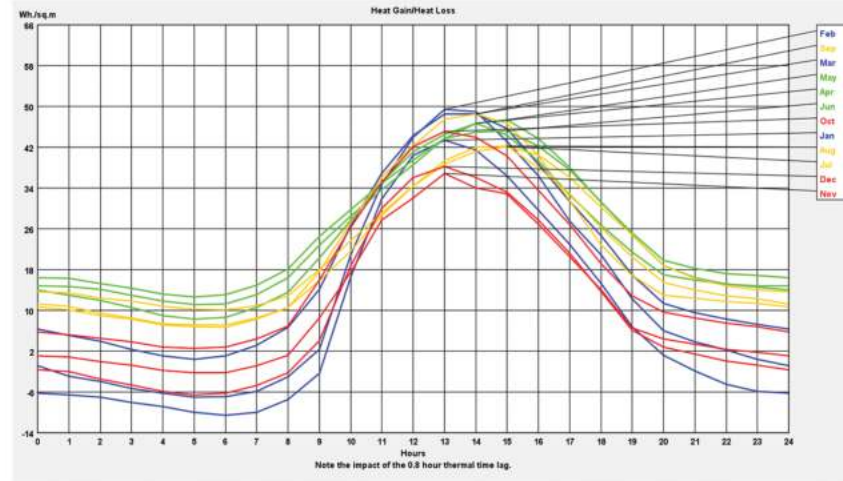
MATERIAL ANALYSIS

RAMMED EARTH - 9" THICKNESS

Wall Section Properties

Orientation (Degrees from South):	0.0
Tilt (Degrees from Horizontal):	90.0
Surface Absorptivity (%):	52.0
Ground Reflectance (%):	20.0

Total Thickness (mm):	220.0
Total R Value:	0.34
Total U Value:	2.976
Decrement Factor:	0.99
Time Lag:	-0.84

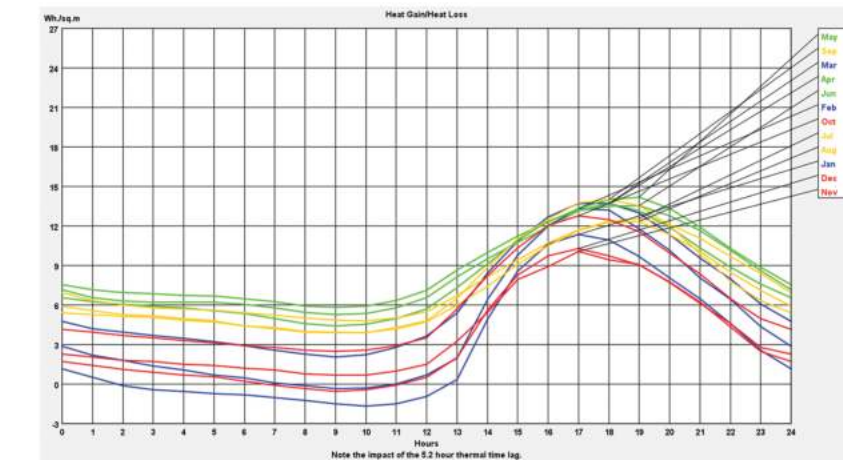
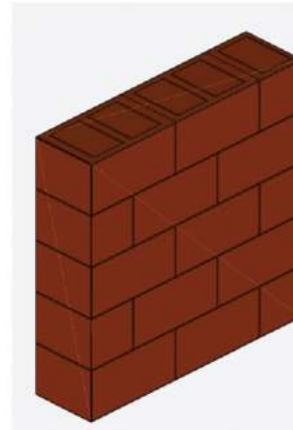


POROTHERM - 8" THICKNESS

Wall Section Properties

Orientation (Degrees from South):	0.0
Tilt (Degrees from Horizontal):	90.0
Surface Absorptivity (%):	52.0
Ground Reflectance (%):	20.0

Total Thickness (mm):	200.0
Total R Value:	0.96
Total U Value:	1.042
Decrement Factor:	0.68
Time Lag:	-5.23

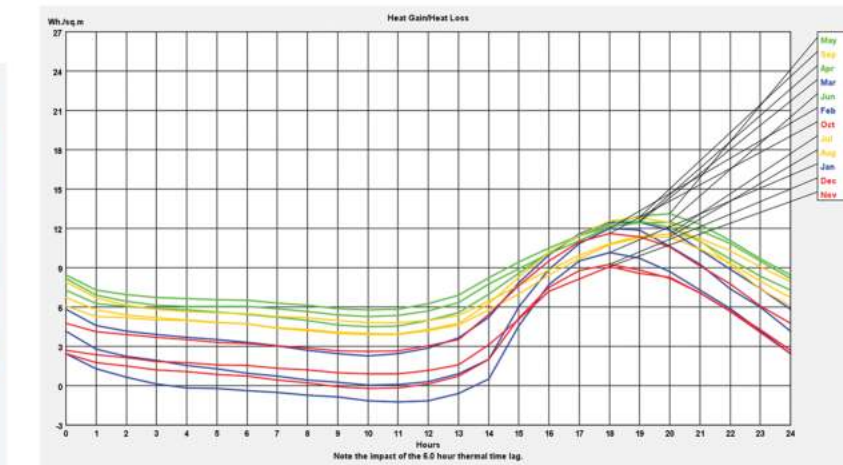
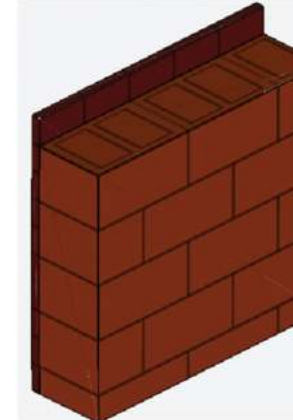


POROTHERM 8" + 1CLAY BRICK

Wall Section Properties

Orientation (Degrees from South):	0.0
Tilt (Degrees from Horizontal):	90.0
Surface Absorptivity (%):	52.0
Ground Reflectance (%):	20.0

Total Thickness (mm):	225.4
Total R Value:	1.01
Total U Value:	0.989
Decrement Factor:	0.63
Time Lag:	-6.03

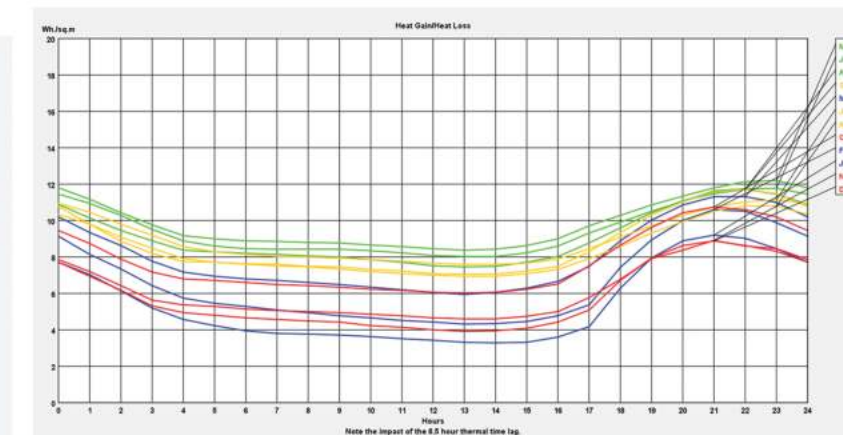
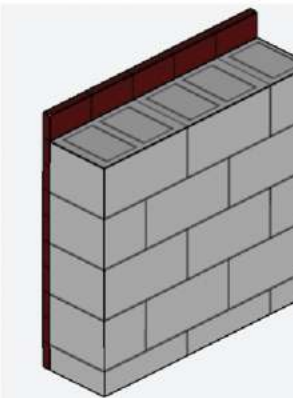


AEROCON 8" + 1CLAY BRICK

Wall Section Properties

Orientation (Degrees from South):	0.0
Tilt (Degrees from Horizontal):	90.0
Surface Absorptivity (%):	52.0
Ground Reflectance (%):	20.0

Total Thickness (mm):	225.4
Total R Value:	1.3
Total U Value:	0.771
Decrement Factor:	0.42
Time Lag:	-8.51



RAMMED EARTH - 9" THICKNESS

U-Value = 2.976 W/sqmK

Time lag = 0.8 hr

Maximum = 49 Wh/sqm

Minimum = 37 Wh/sqm

POROTHERM 8" + 1CLAY BRICK

U-Value = 0.989 W/sqmK

Time lag = 6.03hr

Maximum = 13 Wh/sqm

Minimum = 9 Wh/sqm

POROTHERM - 8" THICKNESS

U-Value = 1.042 W/sqmK

Time lag = 5.23 hr

Maximum = 14 Wh/sqm

Minimum = 10 Wh/sqm

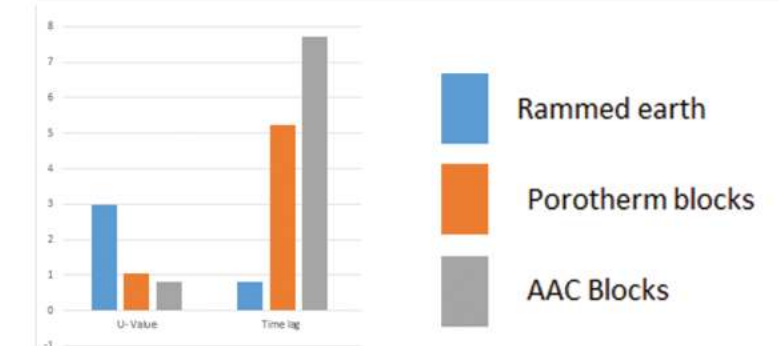
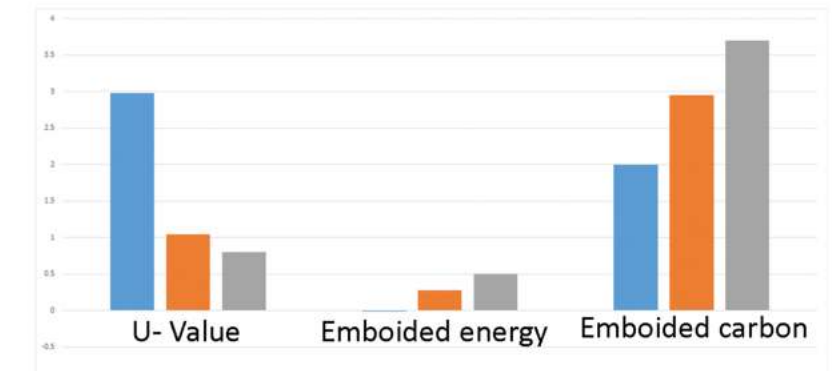
AEROCON 8" + 1CLAY BRICK

U-Value = 0.771 W/sqmK

Time lag = 8.51 hr

Maximum = 12 Wh/sqm

Minimum = 9 Wh/sqm



	Embodied carbon	Embodied energy	Data Source
AAC Blocks	0.50 Kg Co2 e	3.7 MJ	India Construction Materials Database, IFC
Flyash Bricks	0.20 Kg Co2 e	0.83 MJ	India Construction Materials Database, IFC
Bricks	0.39 Kg Co2 e	4.4 MJ	India Construction Materials Database, IFC
Concrete blocks	0.37 Kg Co2 e	3.6 MJ	India Construction Materials Database, IFC
Porotherm blocks	0.28 Kg Co2 e	2.95 MJ	EPD, Weinerberger
Stabilized soil block	0.096 Kg Co2 e	0.7 MJ	India Construction Materials Database, IFC
Rammed Earth	-0.0084 Kg Co2 e	2 MJ	India Construction Materials Database, IFC

GE OFFICE + RESIDENCE

Fixture Type	Daily Uses	Duration (minutes)	Users	Baseline Case		Design Case	
				Flow rate (LPF / LPM)	Waste Water Generation	Flow rate (LPF / LPM)	Waste Water Generation
Water Closet -HF	1	0	16	6	96	4	64
Water Closet -LF	4	0	16	3	192	2	128
Health Faucet	1	0.25	16	8	128	6	96
Faucets	8	0.25	16	8	1024	2.5	320
Kitchen Sink	6	0.25	16	8	768	2.5	240
Showerhead	1	8	6	10	60	6	36
				Total Daily Volume (litres)	2,268	Total Daily Volume (litres)	884
				Annual Working Days	365	Annual Working Days	365
				Total Annual Volume	8,27,820	Total Annual Volume	3,22,660
Reduction in water consumption without considered waste water reuse							61.02%
Daily reuse of treated waste water for flushing							192
Annual reuse of treated waste water for flushing							70,080
Daily Volume of Potable water (litres)							692
Annual Volume of Potable water (Litres)							252580
Total reduction in potable water consumption with Flushing Reuse							69.49%

Drinking + cooking water requirement

Per capita per day	10	litres
Per day	40	litres
Per year	14,600	litres
Flushing water requirement		
Per capita per day	16	litres
Per day	64	litres
Per year	23,360	litres
Domestic water requirement		
Per capita per day	100	
Per day	400	
Per year	1,46,000	litres
Grey water per day	360	
Total requirement per day	504	litres
Total requirement per year	1,83,960	litres

As per standards

2 large volumes + 4 small volumes of flush use

--> Treated using a single family bio-digester and reused for watering plants (drip)

As per standards, but can be reduced by at least 20% using low flow fixtures

90% of domestic water requirement --> Treated using canna bed and reused for watering plants (or for flushing if desired)

Occupancy	6
-----------	---

Use	LPD/person
Drinking	5
Cooking	5
Washing clothes	20
Cleaning of houses	10

Consumed	60
Wastewater	180

SPACE	Area (SFT)	Space Type	Lights						Reduction	Fans		Fan + Light Load
			Description	No.	Lamp Watt	Wattage	LPD	Benchmark	%	No.	Wattage	Wattage
Ground floor												
Entrance Porch	60.18	Exterior	Ceiling Light	1	5	5	0.89	2.5	64.23%	1	35	40
			Wall Light	2	5	10	1.79		28.45%		0	10
Confrence room	100.74	Living	Ceiling Light	4	10	40	4.27	5	14.52%	1	35	75
Office / work area	233.08	Living	Ceiling Light	7	10	70	3.23	5	35.35%	2	70	140
		Living	Chandlier Light	1	40	40	1.85		63.06%		0	40
Pantry	12.80	Living	Wall Light	1	10	10	8.41	5	-68.19%		0	10
Stair core	53.02	Circulatory	Wall Light	1	10	10	2.03	4	49.24%		0	10
Toilet	51.00	Living	Wall Light	2	6	12	2.53	5	49.35%		0	12
First floor												
Mezzanine	168.39	Living	Ceiling Light	7	10	70	4.47	5	10.51%	2	70	140
Residence												
Ground floor												
Entrance Porch	77.14	Exterior	Ceiling Light	4	5	20	2.79	2.5	-11.64%		0	20
Living room	112.79	Living	Ceiling Light	4	10	40	3.82	5	23.65%	1	35	75
Kitchen	184.88	Living	Ceiling Light	4	10	40	2.33	5	53.42%	1	35	75
Dining	132.73	Living	Wall Light	2	10	20	1.62	5	67.56%	1	35	55
Guest bedroom	199.66	Living	Ceiling Light	4	5	20	1.08	5	78.43%	1	35	55
Bath	42.58	Living	Wall Light	1	6	6	1.52	5	69.66%		0	6
Stair core	101.09	Circulatory	Wall Light	1	10	10	1.06	4	73.38%		0	10
Balcony	90.69	Exterior	Ceiling Light	2	6	12	1.42	2.5	43.03%	1	35	47
First floor												
Bed room 1	215.04	Living	Ceiling Light	4	5	20	1.00	5	79.98%	1	35	55
Bath 1	60.51	Living	Wall Light	1	6	6	1.07	5	78.65%		0	6
Bed room 2	215.04	Living	Ceiling Light	4	5	20	1.00	5	79.98%	1	35	55
Bath 2	60.51	Living	Wall Light	1	6	6	1.07	5	78.65%		0	6
Stair core	101.09	Circulatory	Wall Light	1	10	10	1.06	4	73.38%		0	10
Balcony	125.14	Exterior	Ceiling Light	2	6	12	1.03	2.5	58.71%	1	35	47
Second floor												
Bed room 3	215.04	Living	Ceiling Light	4	5	20	1.00	5	79.98%	1	35	55
Bath 3	60.51	Living	Wall Light	1	6	6	1.07	5	78.65%		0	6
Open Terrace	279.09	Exterior	Wall Light	1	6	6	0.23	2.5	90.74%		0	6

GE RESIDENCE

Note: Only the light green cells with the thick borders can be edited. Change the values in these cells for doing "What-If" analysis.

Energy Calculations	Without AC	With AC year long	With AC - 6 months of year
- Predictable loads	9.76	51.76	30.76
- Solar PV capacity required	2.97	15.74	9.36

Energy use calculations			
24 x 7 uses	No. running at any point	Wattage	Daily Energy (kWh)
- Ceiling Fans (BLDC)	5	35	4.2
- Refrigerator (4 Star rated 310 Litre)	1		2

Other Equipment	No. running at any point	Wattage	Daily Energy (kWh)
- Kitchen Gadgets (On average - 2 hours)	5	35	0.35
- Other (On average - 2 hours)	1	200	0.4

Interior lighting		
Built-up Area (SqM)	192	SqM
Lighting Power Density (30% less than IGBC)	3.5	W/SqM
Hours of use	6	Hours
% of spaces illuminated at any point	60%	
	2.42	kWh

Air-conditioners		
2 Ton 5 Star Rated Non-Inverter AC	1.4	kWh
Number of ACs	3	
Hours of use each	10	Hours
	42	kWh

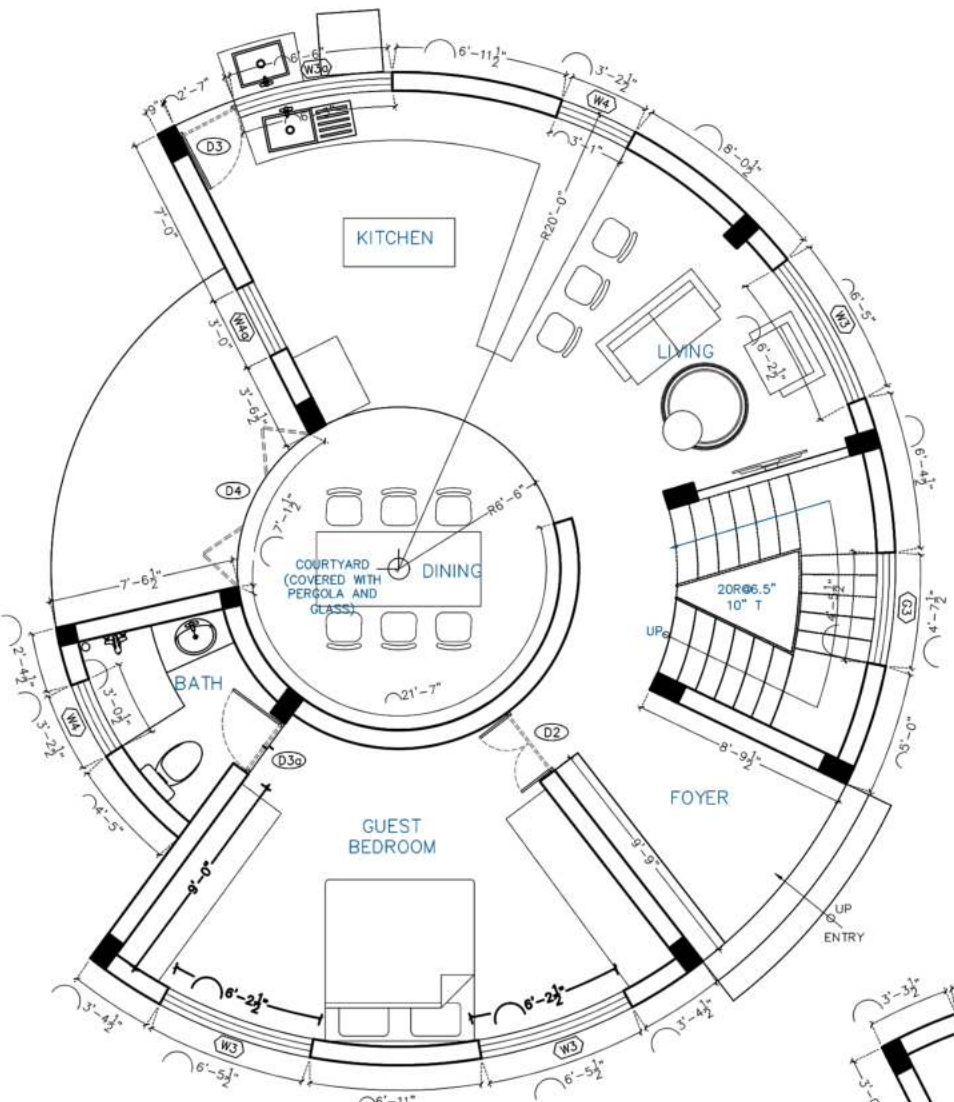


GE OFFICE

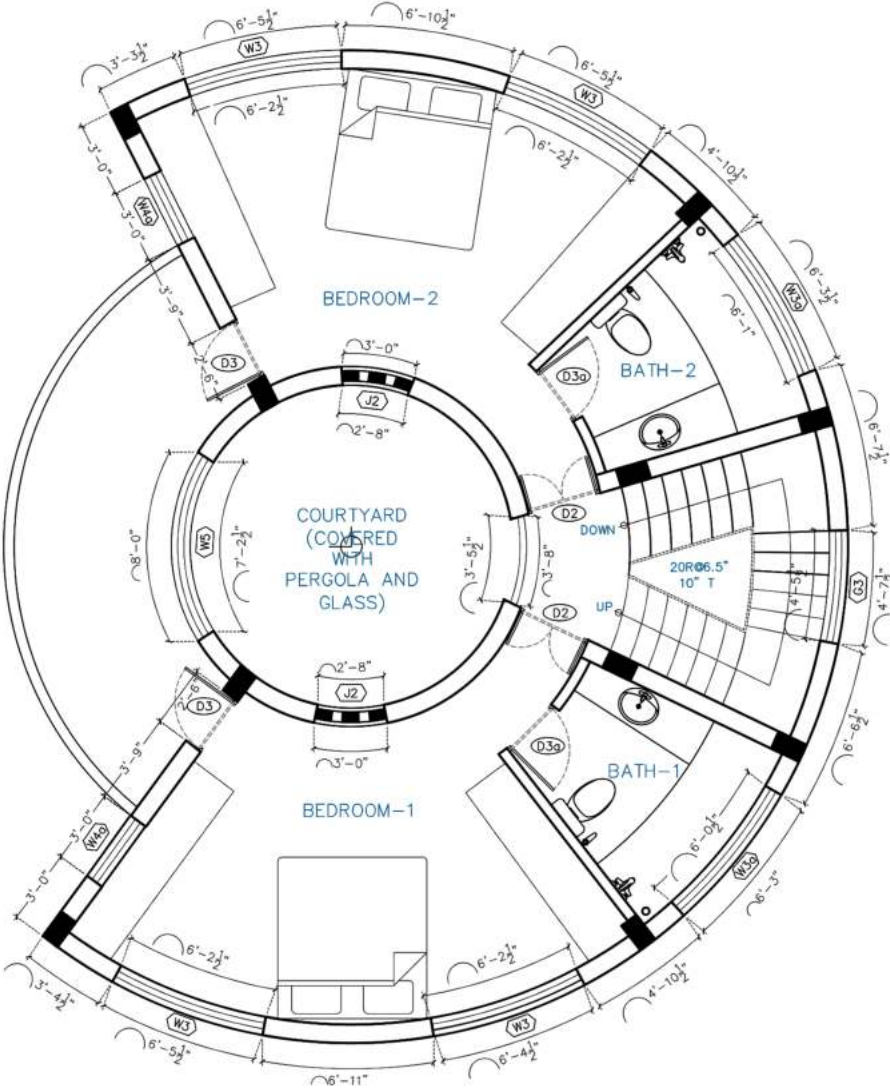
Energy Calculations	Without AC
- Predictable loads	8.08
- Solar PV capacity required	2.46

Energy use calculations			
Used during occupancy hours	No. running at any point	Wattage	Daily Energy (kWh)
- Ceiling Fans (BLDC)	4	35	3.36
- Laptop (On average - 8 hours)	10	50	4
- Other (On average - 2 hours)	1	200	0.4

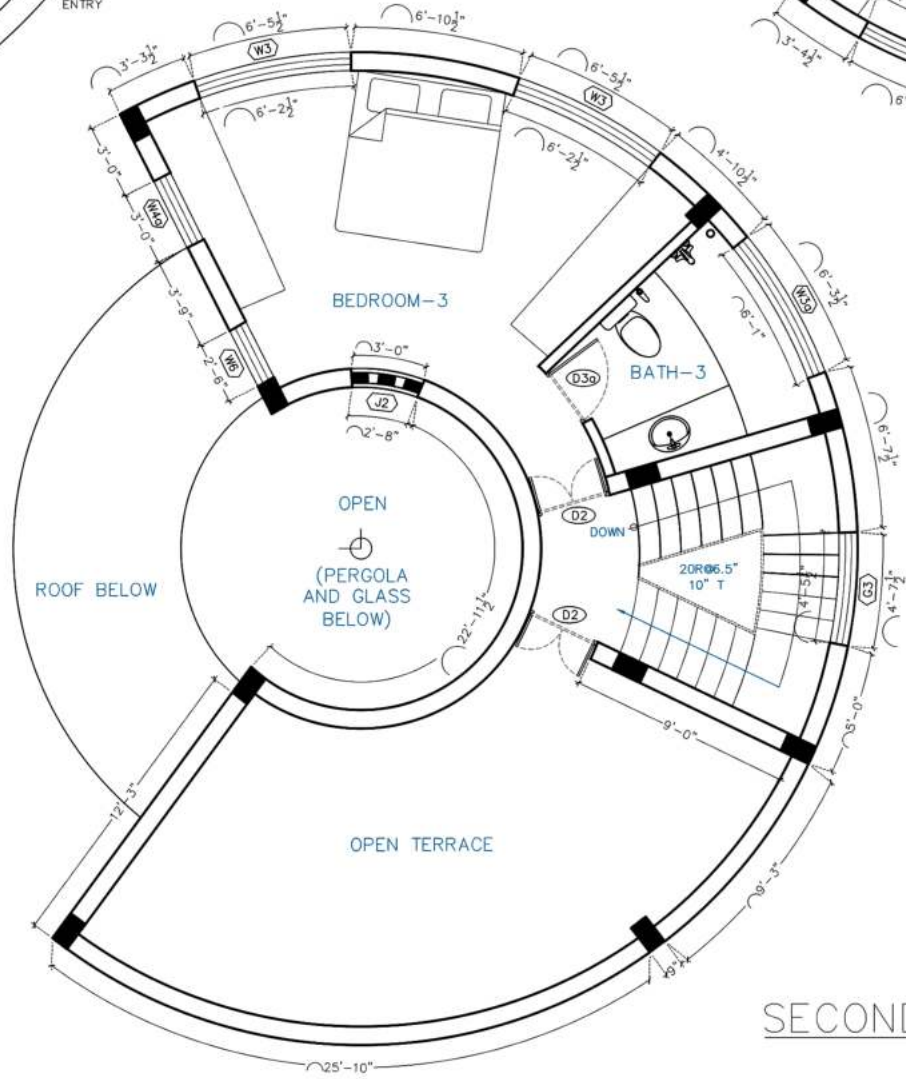
Interior lighting		
Built-up Area (SqM)	77	SqM
Lighting Power Density (30% less than IGBC)	3.5	W/SqM
Hours of use	2	Hours
% of spaces illuminated at any point	60%	
	0.32	kWh



GROUND FLOOR PLAN



FIRST FLOOR PLAN



SECOND FLOOR PLAN

TITLE:
**ARCHITECTURAL
DRAWINGS**

PROJECT:
**PJ XX- GE
RESIDENCE**

DRAWING TYPE:
ELECTRICAL LAYOUT

DATE:

FILE NAME:

GE RESIDENCE.dwg

NORTH:



RELEASED FOR:

☐ CONCEPT ☐ SCHEMATIC
☐ APPROVAL ☒ CONSTRUCTION

ARCHITECT:



Workflo Greeta Towers,
Industrial Estate, Perungudi,
OMR Phase 1, Chennai
Tamil Nadu 600096, India

DRAFTED BY :

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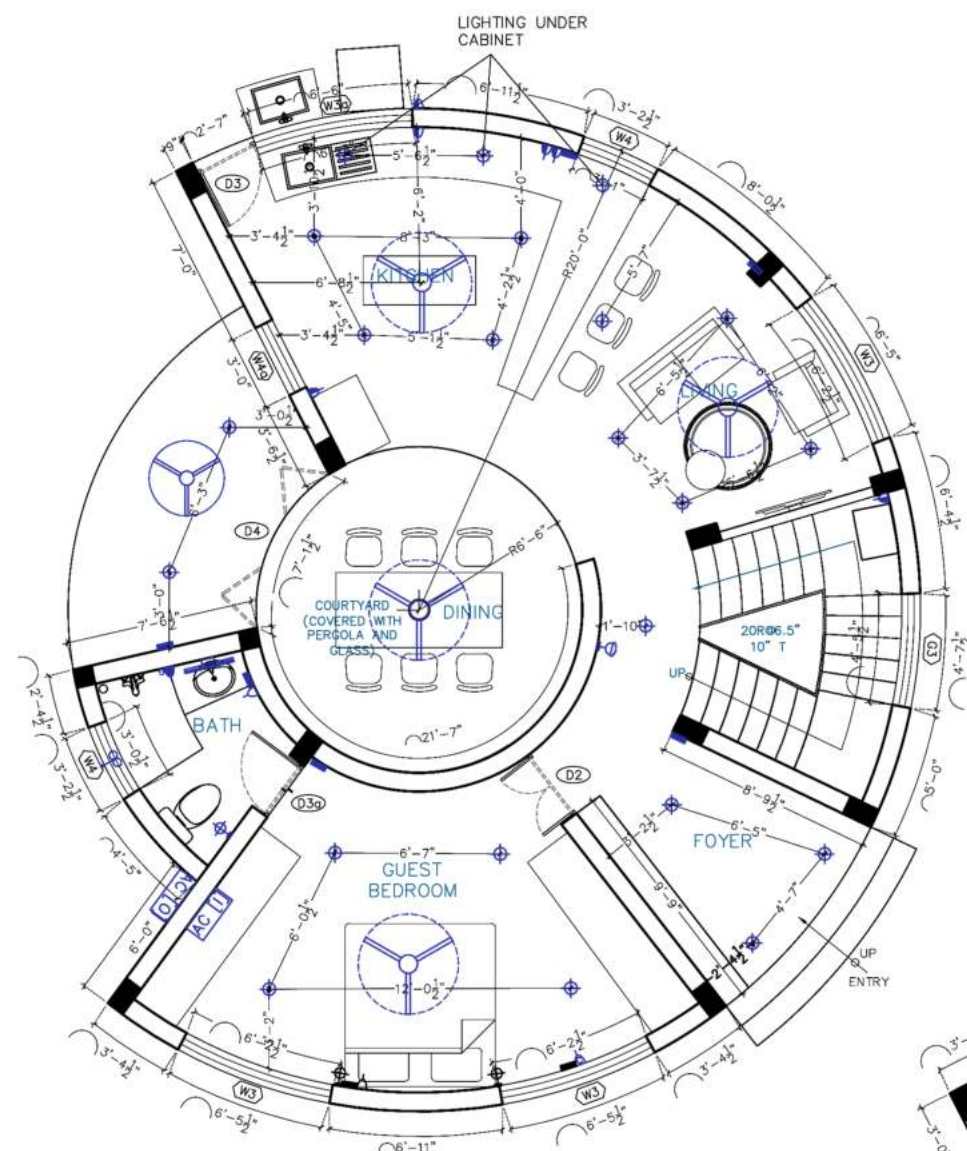
CLIENT:

GE OFFICE

SHEET SIZE:

A3

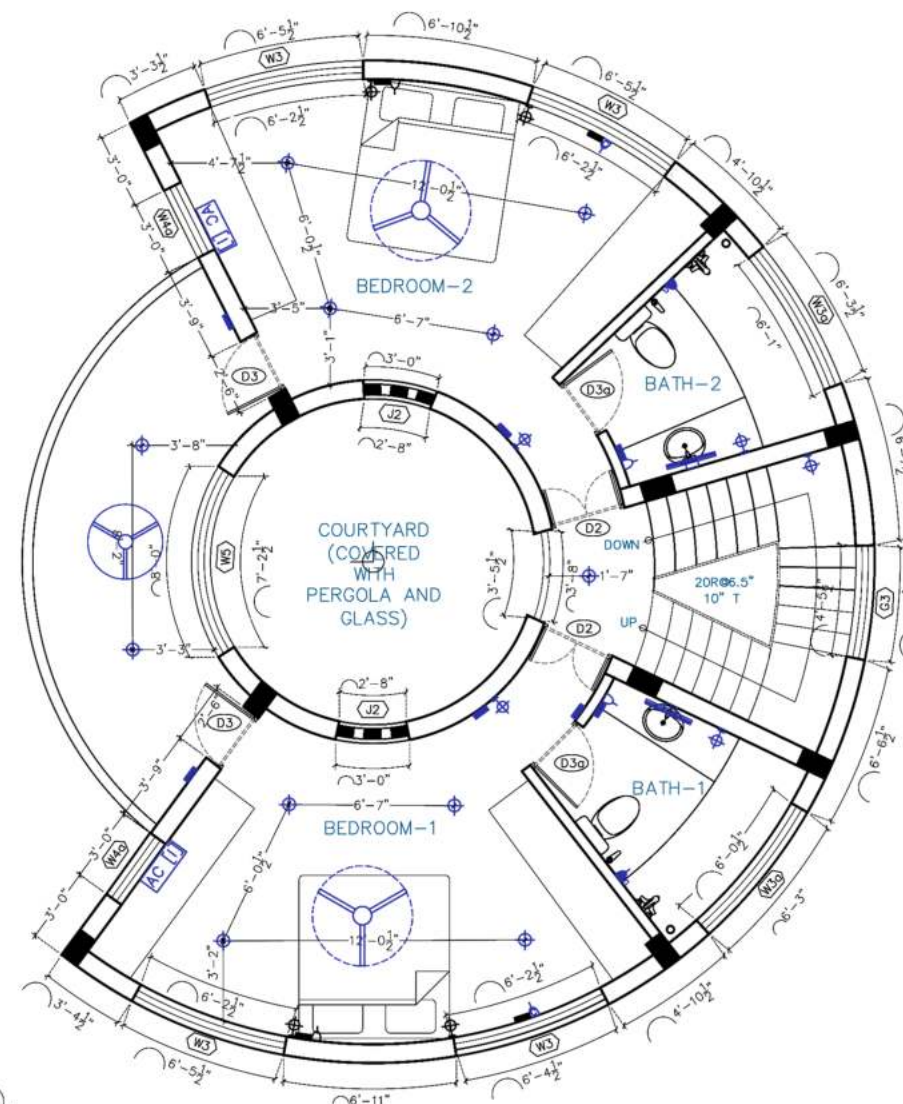
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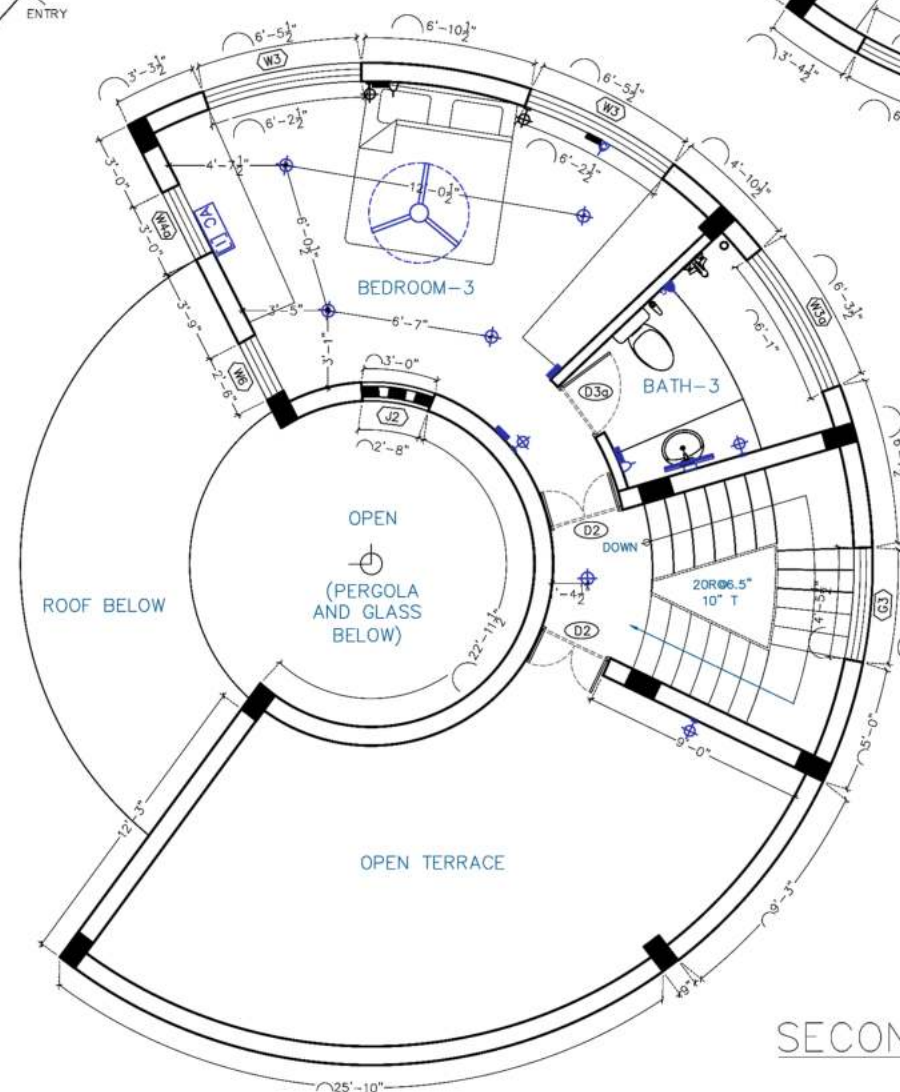
GROUND FLOOR PLAN

LEGEND	
DR	DRYER
WM	WASHING MACHINE
DW	DISH WASHER
RF	REFRIGERATOR
RO	RO FILTER

SB	SWITCH BOARD (2'-6" FROM FFL)
SB	SWITCH BOARD (4'-6" FROM FFL)
Δ	6A SOCKET OUTLET (2'-6" FROM FFL)
Δ	6A SOCKET OUTLET (7'-6" FROM FFL)
⊕	FOOT LIGHT (1'-0" FROM FFL) (DC POWER)
⊕	WALL LIGHT (2'-6" FROM FFL) (DC POWER)
⊕	WALL LIGHT (7'-6" FROM FFL) (DC POWER)
⊕	CEILING FAN - 2FT & 4 FT (DC POWER)
⊕	CHANDLIER (DC POWER)
⊕	TELEPHONE OUTLET (2'-6" FROM FFL)
⊕	TV OUTLET (2'-6" FROM FFL)
⊕	MIRROR LIGHT WITH SWITCH (6'-6" FROM FFL)
⊕	BELL PUSH SWITCH (4'-6" FROM FFL)
⊕	BUZZER (7'-6" FROM FFL)
⊕	16A SOCKET



FIRST FLOOR PLAN



SECOND FLOOR PLAN

⊕	GEYSER SOCKET 7'-6" FROM FFL
⊕	20A SOCKET & SWITCH @ 3' FROM FFL
⊕	20 A SOCKET @ 9'-6" FROM FFL & SWITCH @ 4'-6" FROM FFL
⊕	EXHAUST FAN @ VENTILATOR LVL
⊕	COMPUTER SOCKET OUTLET (2'-6" FROM FFL)
⊕	MCB TYPE DISTRIBUTION BOARD (5'-0" FROM FFL)
⊕	CEILING LIGHT (DC POWER)
⊕	SURVEILLANCE CAMERA
⊕	GATE LIGHT
AC U	AIR CONDITIONER INDOOR UNIT
AC O	AIR CONDITIONER OUTDOOR UNIT
▽	DATA POINT
⊕	WIFI