Final Proposal

ARCH-753 BUILDING PERFORMANCE SIMULATION

INSTRUCTOR: MOSTAPHA SADEGHIPOUR | JAEHO JIN

Comprehensive Climate Analysis

Site: New York City

Comprehensive Climate Analysis
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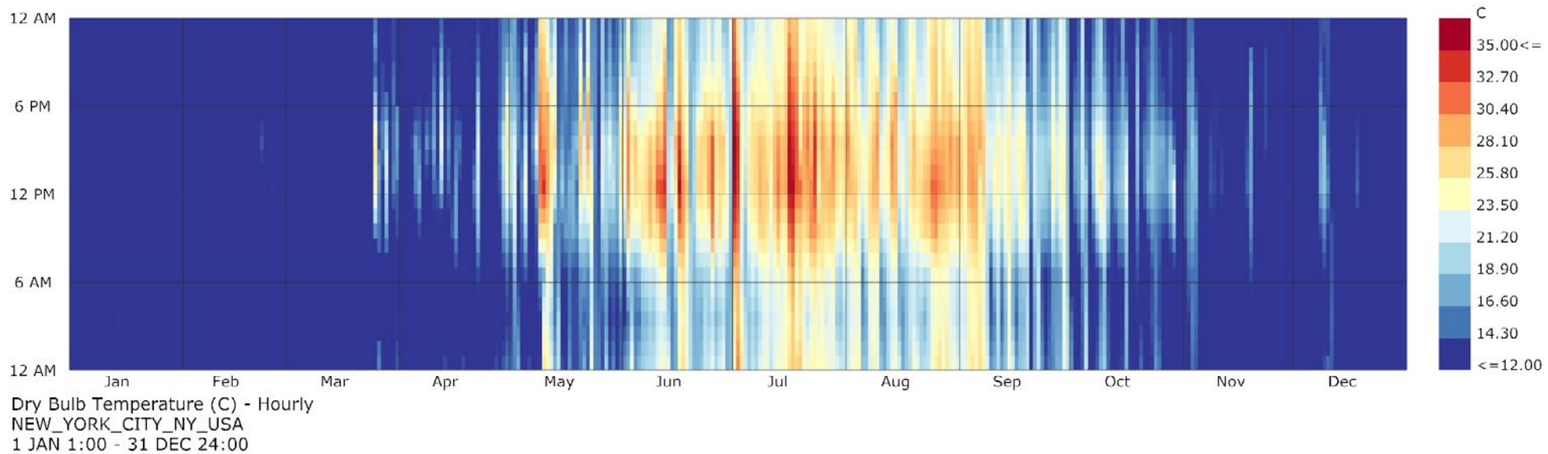
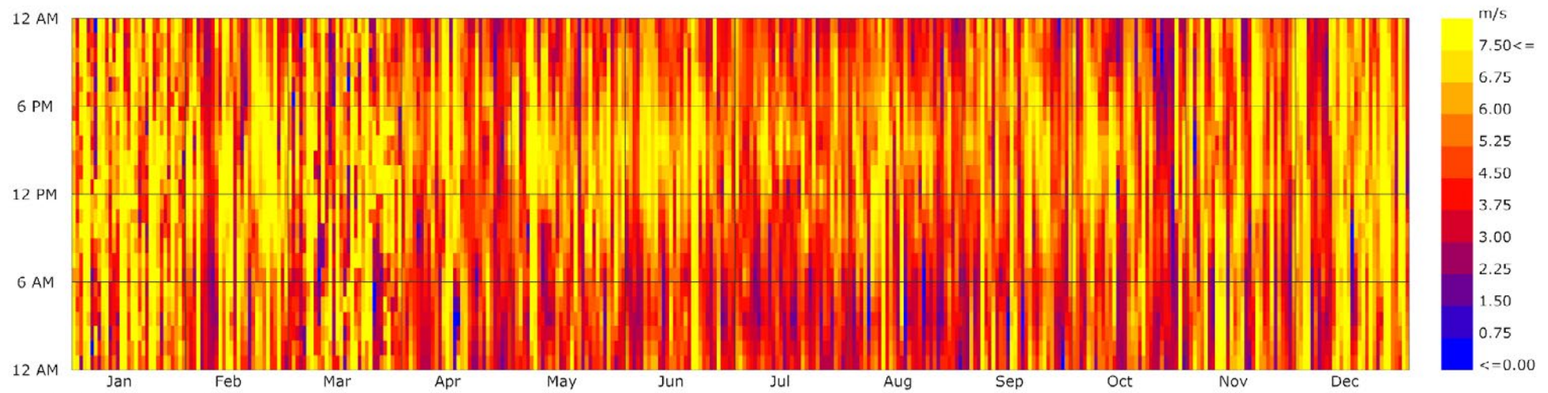
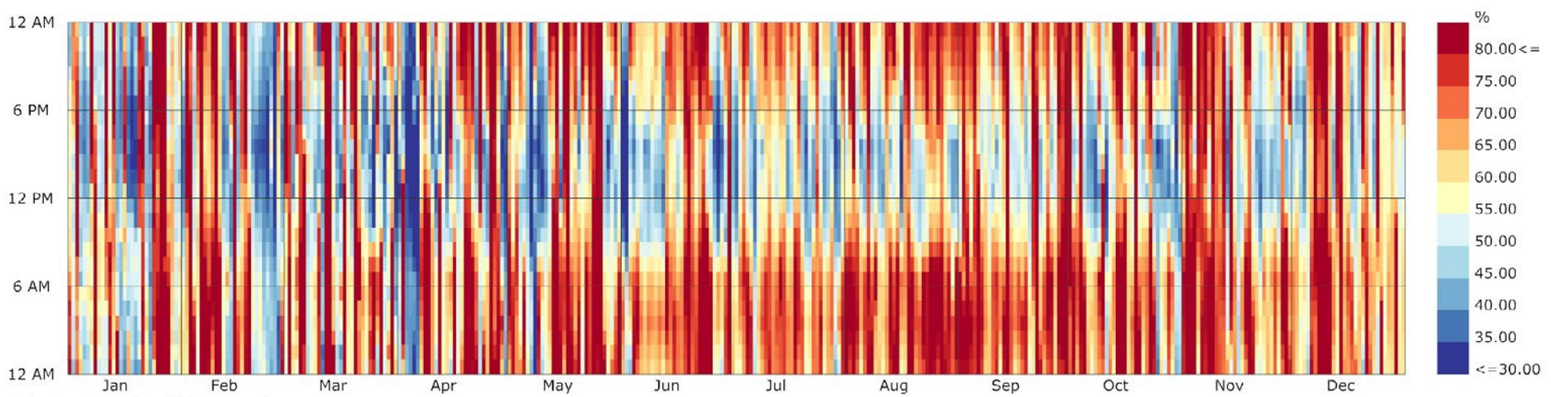
General Analysis : Temperature / Wind Speed / Humidity



Dry Bulb Temperature (C) - Hourly
NEW_YORK_CITY_NY_USA
1 JAN 1:00 - 31 DEC 24:00



Wind Speed (m/s) - Hourly
NEW_YORK_CITY_NY_USA
1 JAN 1:00 - 31 DEC 24:00

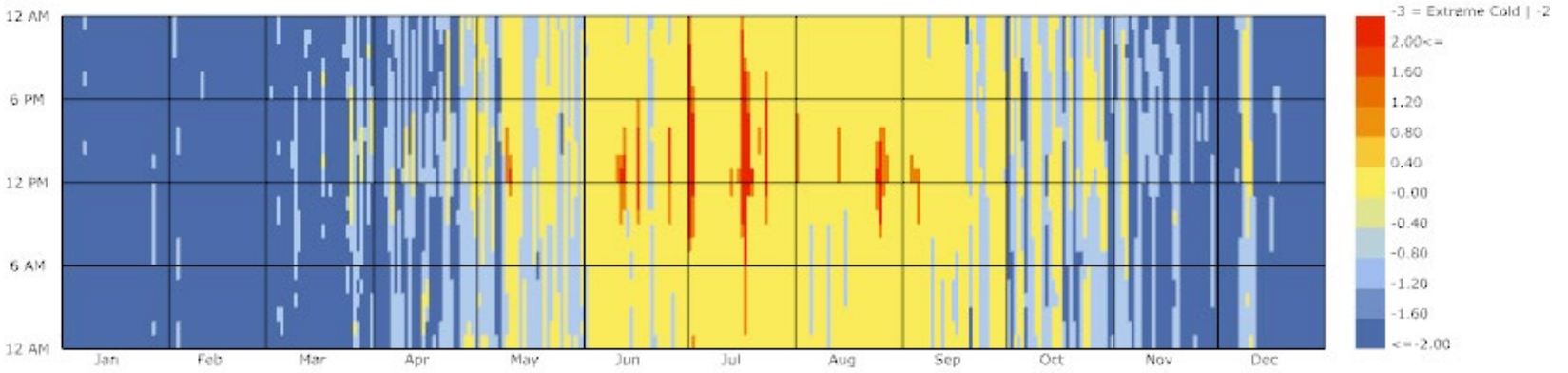


Relative Humidity (%) - Hourly
NEW_YORK_CITY_NY_USA
1 JAN 1:00 - 31 DEC 24:00

New York City is basically Cold in Winter and relatively comfortable in Summer. In the graph there is strong wind coming from Hudson river around Manhattan where is my site. Besides, relative Humidity is higher than normal.

Calculate Outdoor Comfort

General Analysis : Temperature / Wind Speed / Humidity

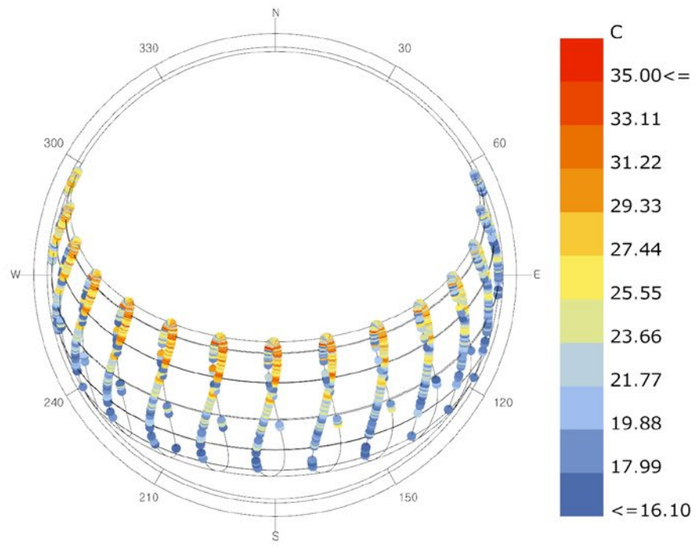


Percent of Time Comfortable: ***38%***

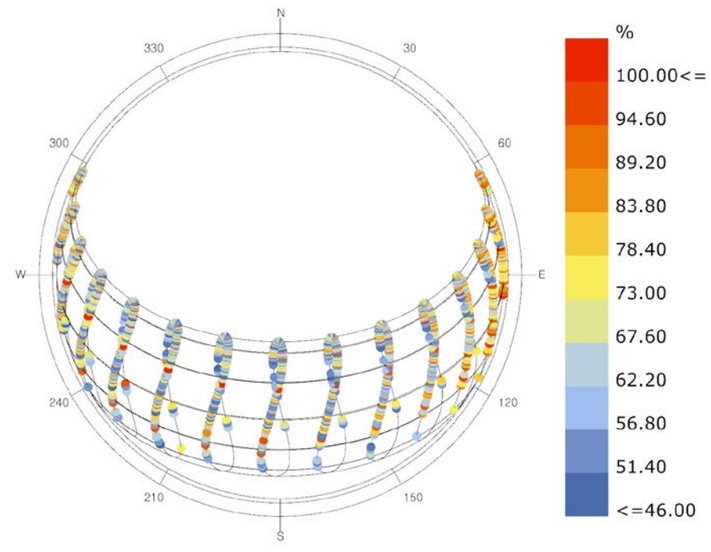
Heat Stress: ***0.9%***

Cold Stress: ***41.6%***

Sunlight is normaly on 40 degree latitude which is good condition for getting well sunlight.



Sun-Path Diagram - Latitude: 40.78
Hourly Data: Dry Bulb Temperature (C)
New York Central Prk Obs Belv_NY_USA
... ...
Conditional Selection Applied:
Dry Bulb Temperature>16
and Relative Humidity>45
1886.0 hours of total 4404.0 sun up hours(42.82%).



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Site: New York City

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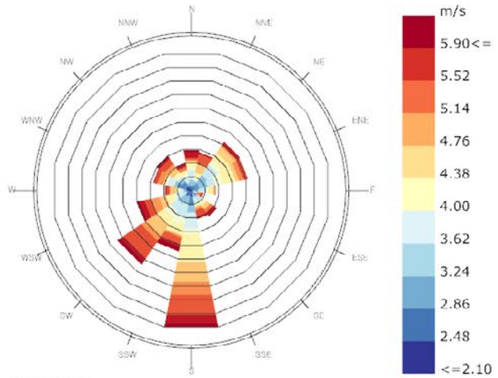
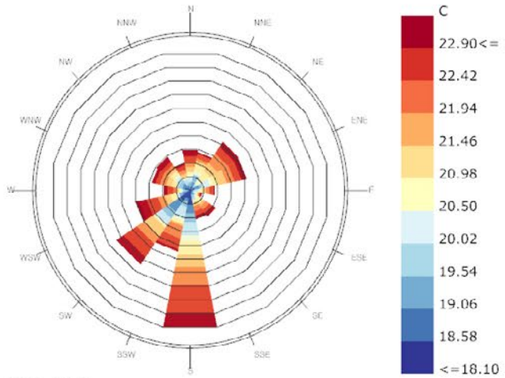


Wind-Rose
NEW_YORK_CITY_NY_USA
1 JAN 1:00 - 31 DEC 24:00
Hourly Data: Wind Speed (m/s)
Calm for 0.00% of the time = 0 hours.
Each closed polyline shows frequency of 0.2%. = 15 hours.
...
Conditional Selection Applied:
2<Wind Speed<6
and 18<Dry Bulb Temperature<23
and 20<Relative Humidity<80
871.0 hours of total 8760.0 hours (9.94%).



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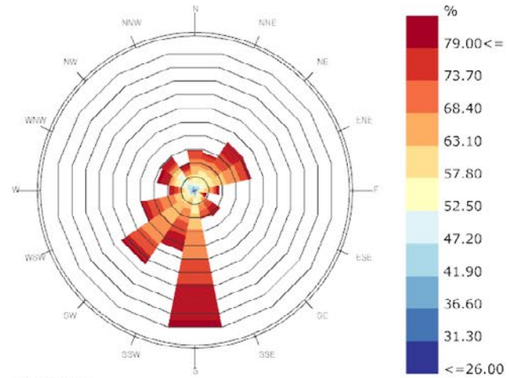

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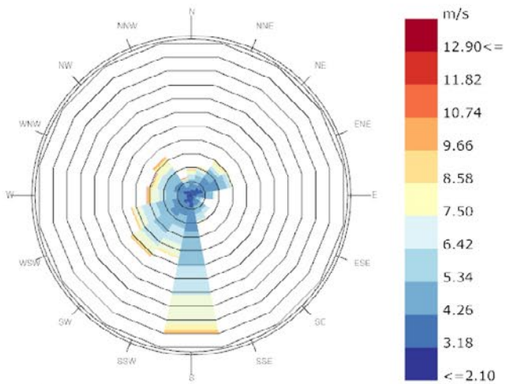
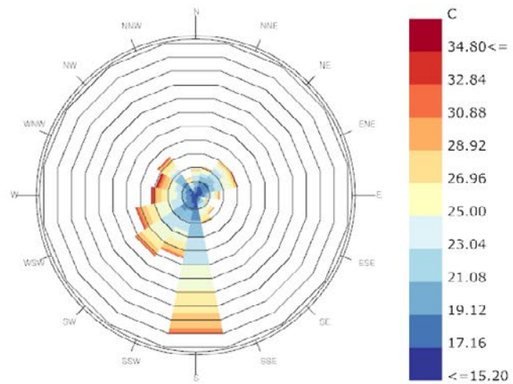


Wind-Rose
NEW_YORK_CITY_NY_USA
1 JAN 1:00 - 31 DEC 24:00
Hourly Data: Wind Speed (m/s)
Calm for 0.00% of the time = 0 hours.
Each closed polyline shows frequency of 0.7%. = 59 hours.
...
Conditional Selection Applied:
2<Wind Speed
and 15<Dry Bulb Temperature<35
and 0<Relative Humidity<80
3046.0 hours of total 8760.0 hours (34.77%).



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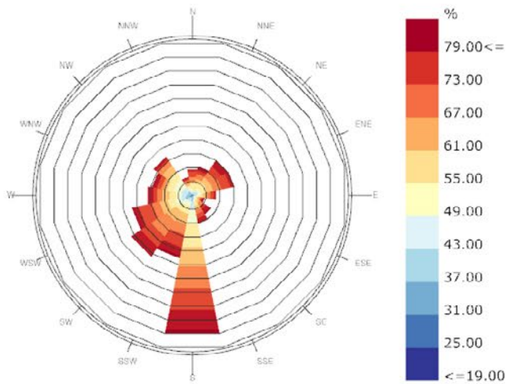

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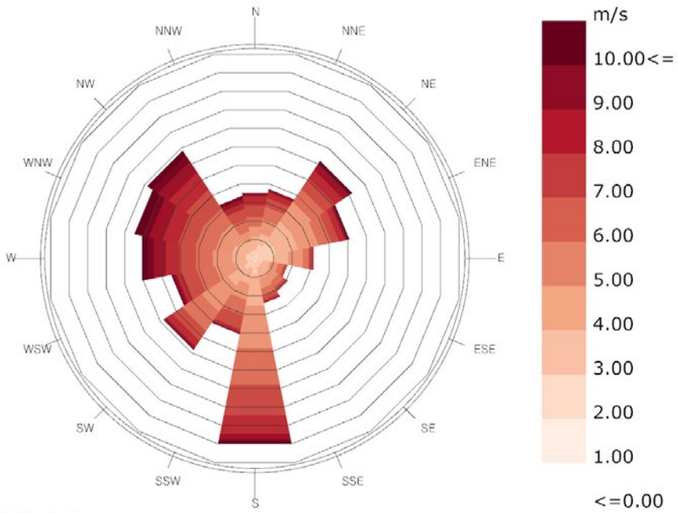
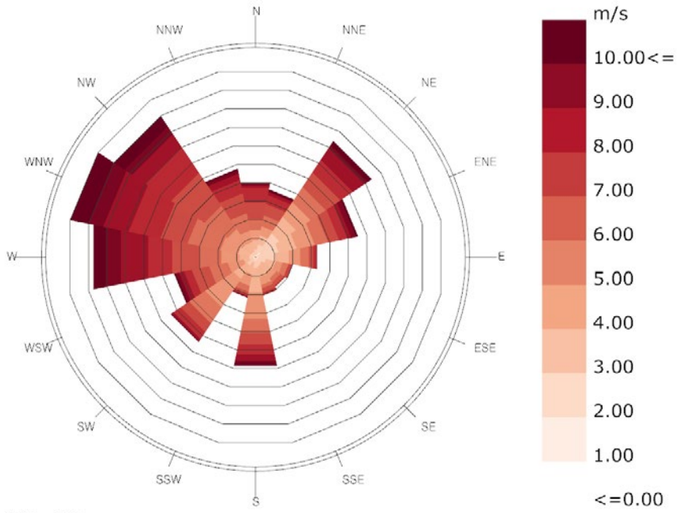
Wind Speed and Direction for Natural Ventilation

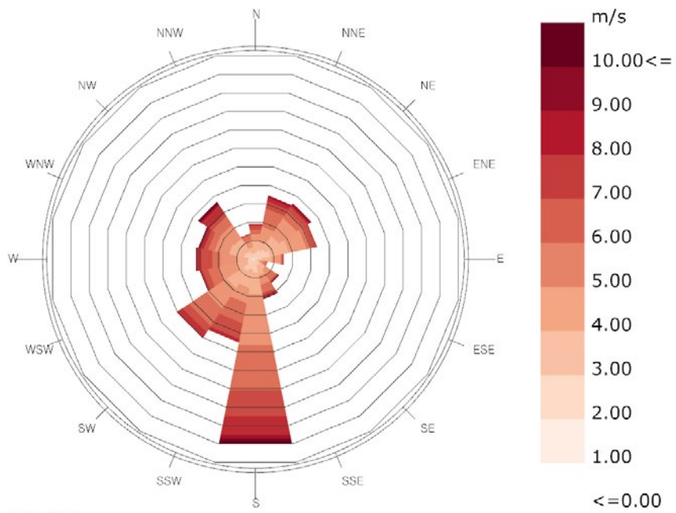
General Analysis : Temperature / Wind Speed / Humidity



Wind-Rose
NEW_YORK_CITY_NY_USA
1 JAN 1:00 - 31 DEC 24:00
Hourly Data: Wind Speed (m/s)
Calm for 0.23% of the time = 20 hours.
Each closed polyline shows frequency of 1.3%. = 113 hours.



Wind-Rose
NEW_YORK_CITY_NY_USA
1 NOV 1:00 - 31 MAR 24:00
Hourly Data: Wind Speed (m/s)
Calm for 0.28% of the time = 10 hours.
Each closed polyline shows frequency of 1.2%. = 43 hours.

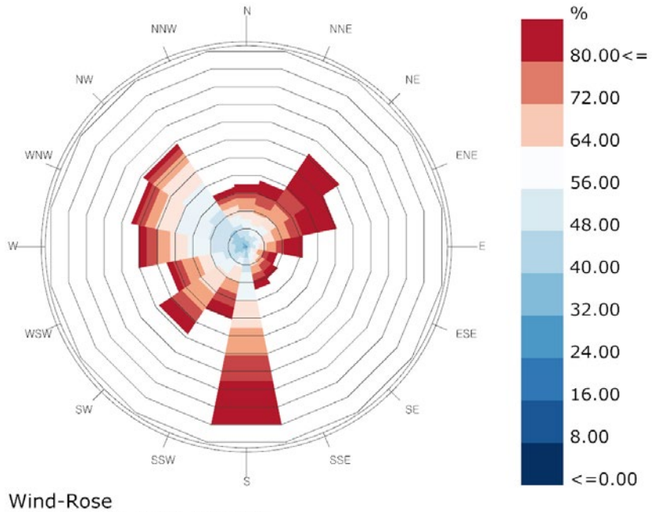


Wind-Rose
NEW_YORK_CITY_NY_USA
1 JUL 1:00 - 30 SEP 24:00
Hourly Data: Wind Speed (m/s)
Calm for 0.27% of the time = 6 hours.
Each closed polyline shows frequency of 1.9%. = 41 hours.

Strong Wind in Especailly Winter Season

Wind Rose Relatively Humidity for Natural Ventilation

General Analysis : Temperature / Wind Speed / Humidity



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NEW_YORK_CITY_NY_USA
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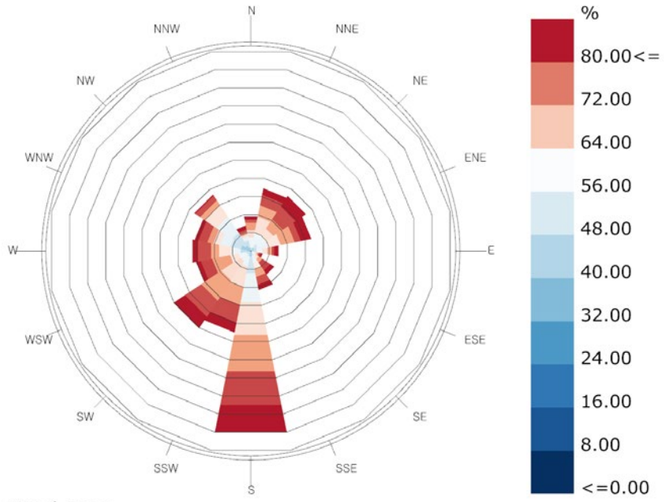
Hourly Data: Relative Humidity (%)
Calm for 0.23% of the time = 20 hours.
Each closed polyline shows frequency of 1.3%. = 113 hours.



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NEW_YORK_CITY_NY_USA
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Hourly Data: Relative Humidity (%)
Calm for 0.27% of the time = 6 hours.
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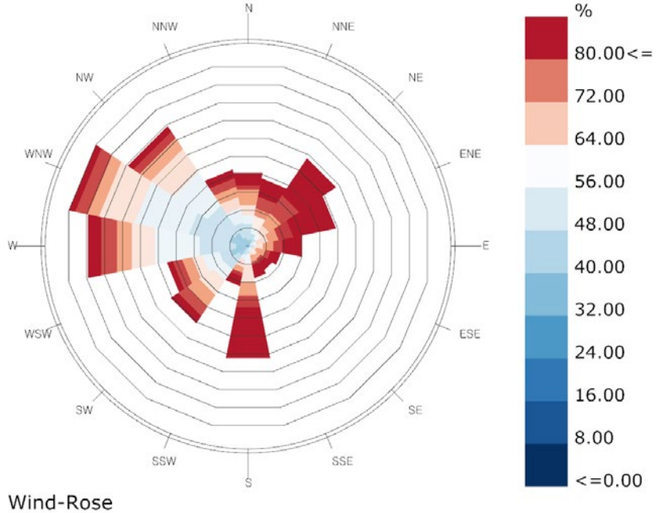
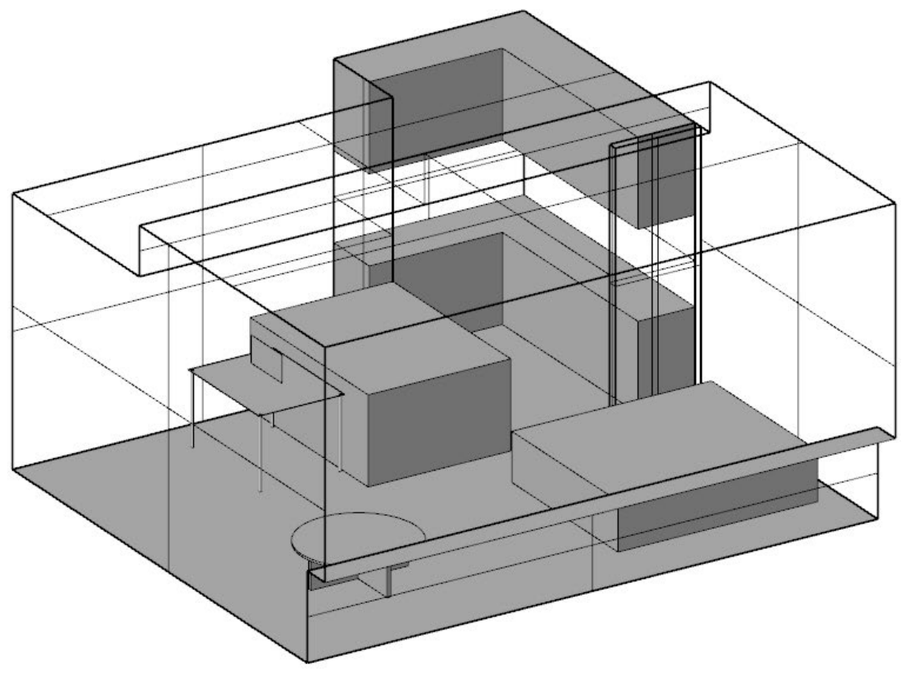
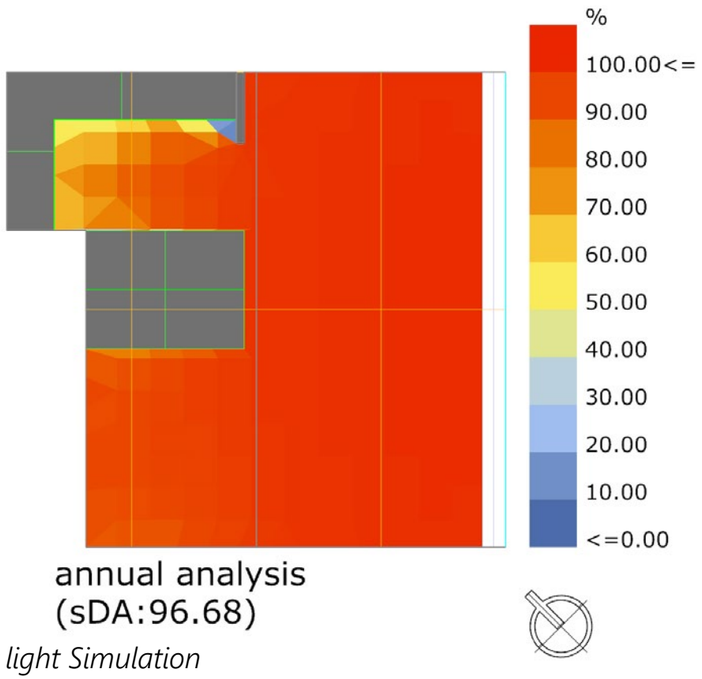


Wind-Rose
NEW_YORK_CITY_NY_USA
1 NOV 1:00 - 28 FEB 24:00
Hourly Data: Relative Humidity (%)
Calm for 0.14% of the time = 4 hours.
Each closed polyline shows frequency of 1.3%. = 36 hours.

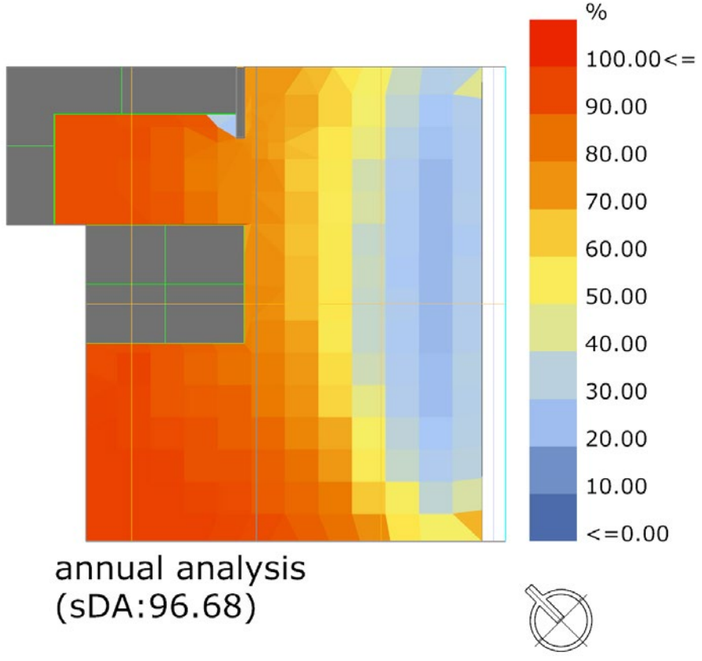
Strong Wind is coming from west side where is Hudson River, but normally wind is coming from south.

Base-case Model Assessment
Energy Analysis and Major Issues





Day light Simulation

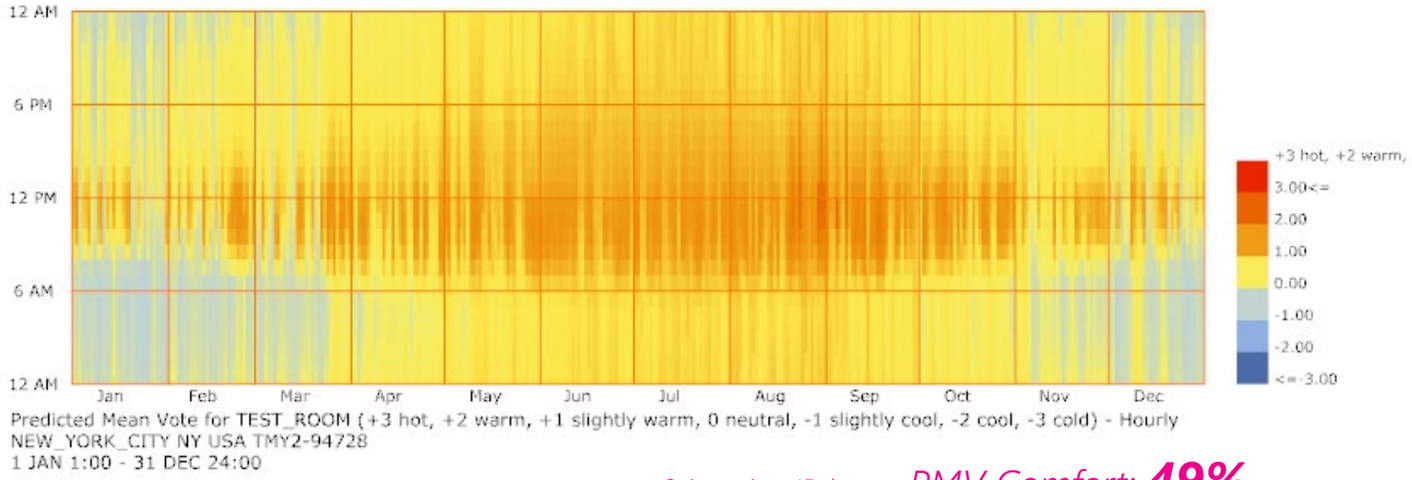


Usefull Day light Simulation

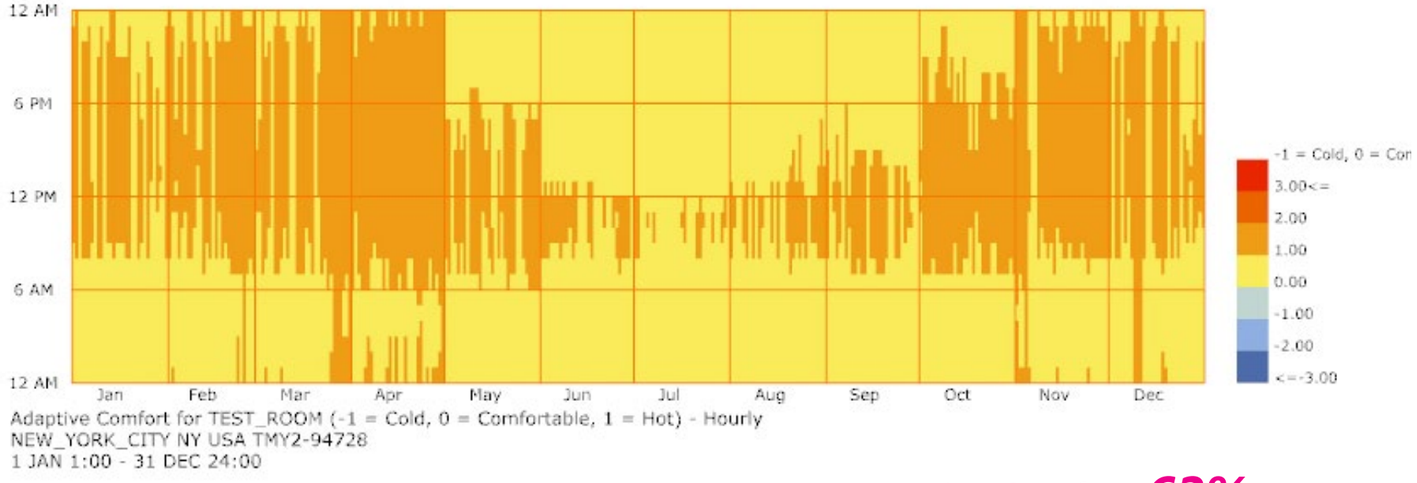
Total Thermal: ***3660***

Total Cooling: ***3286***

Total Heating: ***373***



Orientation 45 degree _PMV Comfort: ***49%***

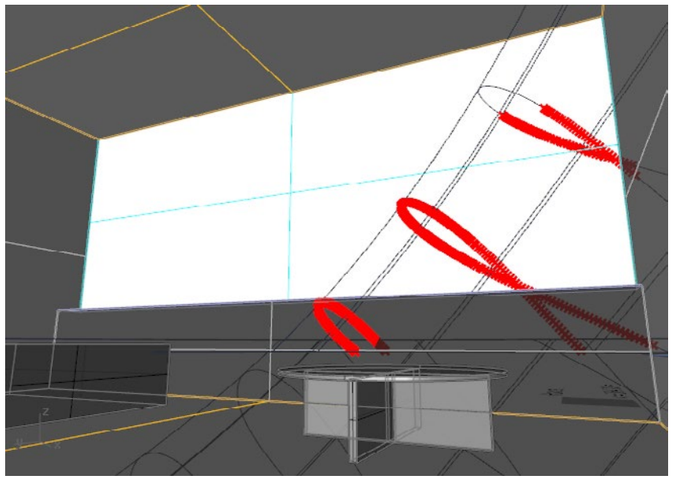


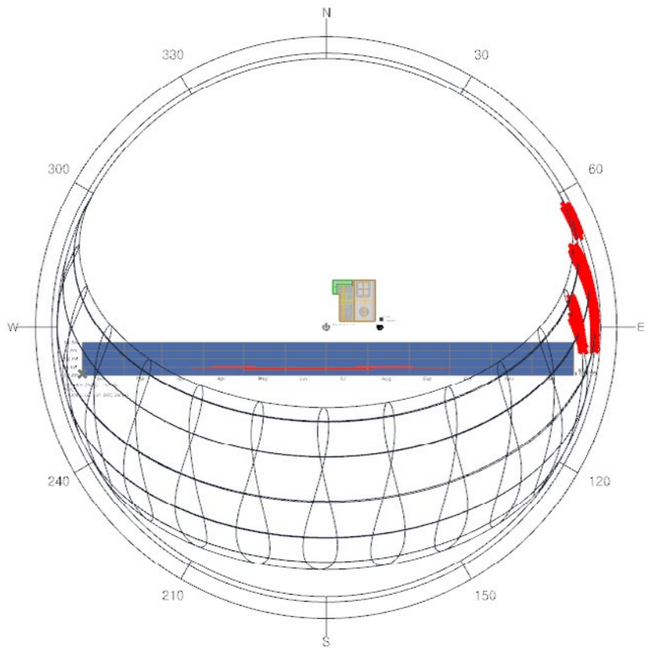
Orientation 45 degree _Adaptive Comfort: ***62%***

When is Sun Visible in the Room

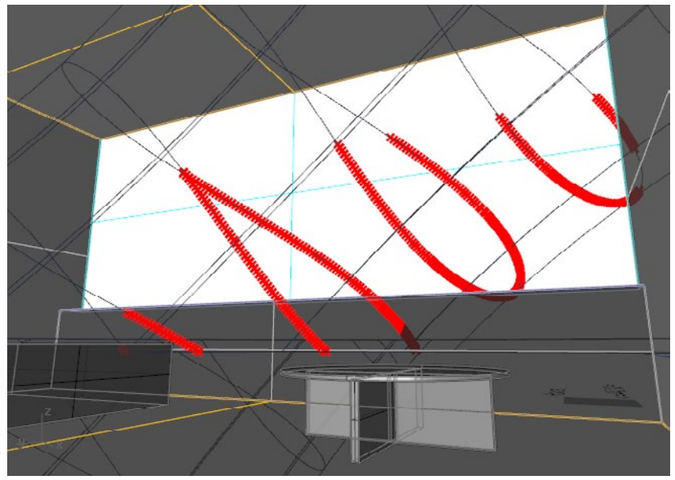
General Analysis : Temperature / Wind Speed / Humidity

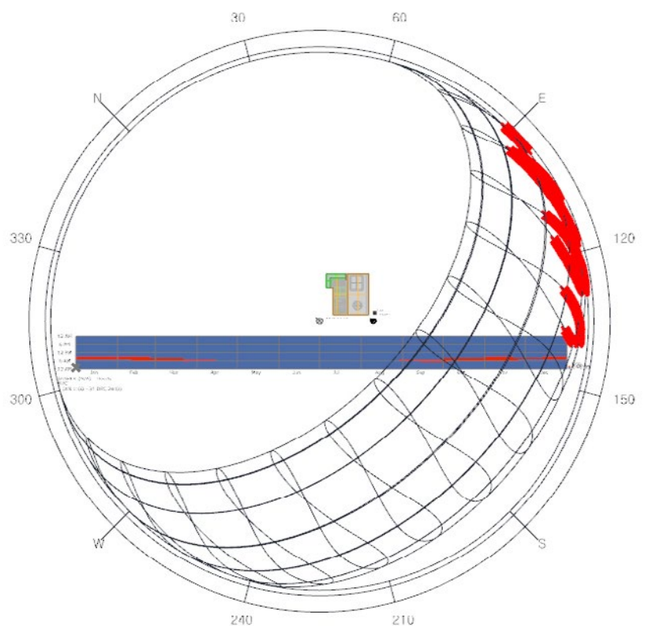
North **0** *Degree*



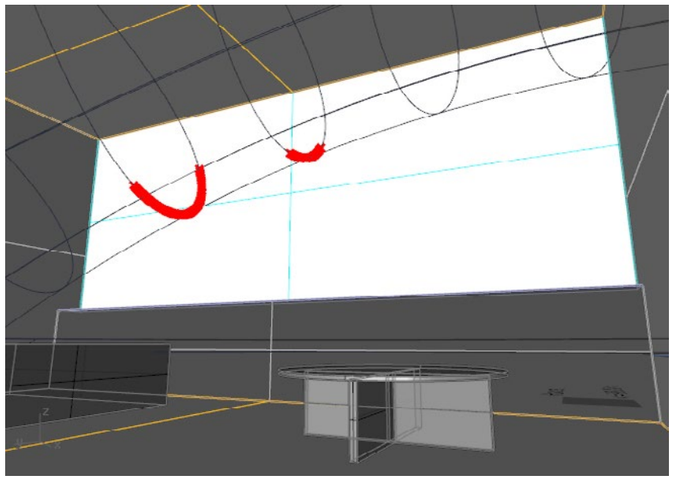


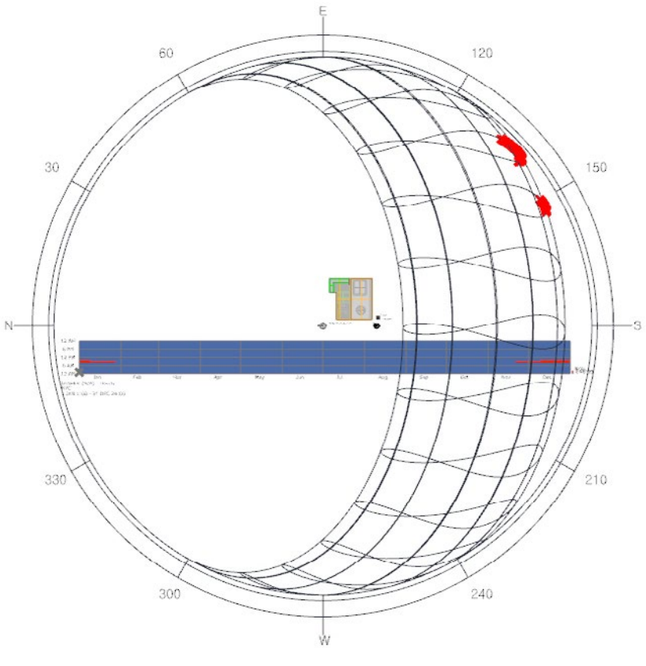
Norh **45** *Degree*





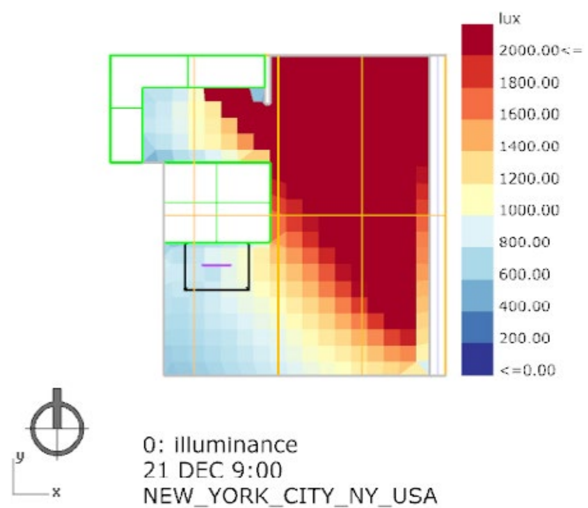
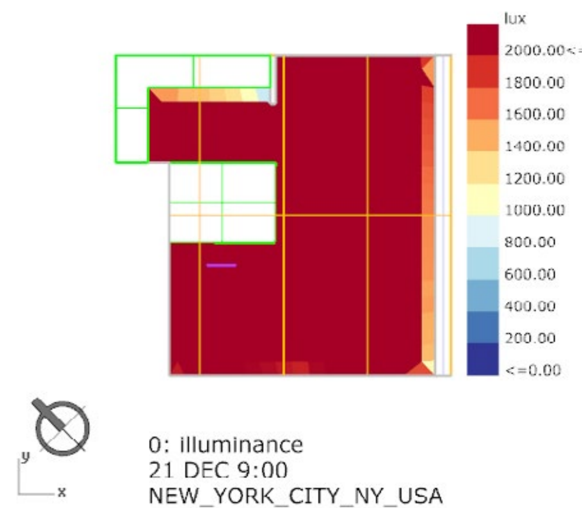
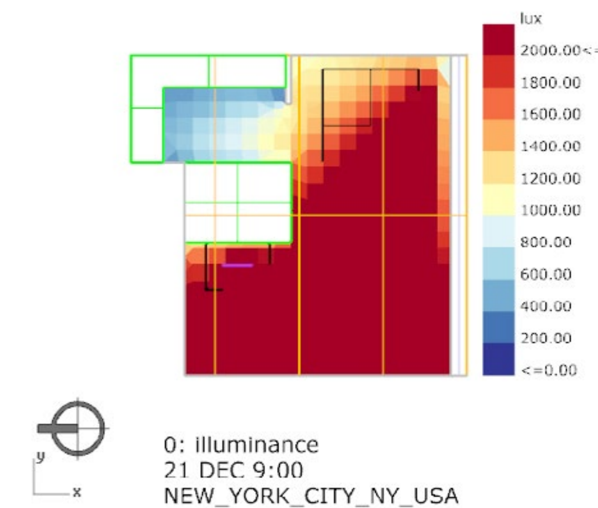
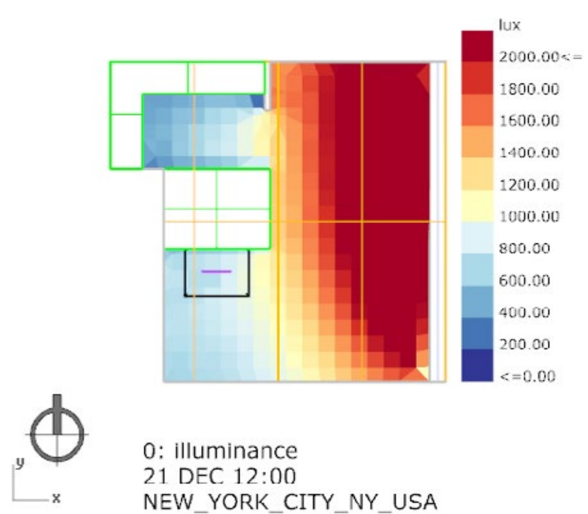
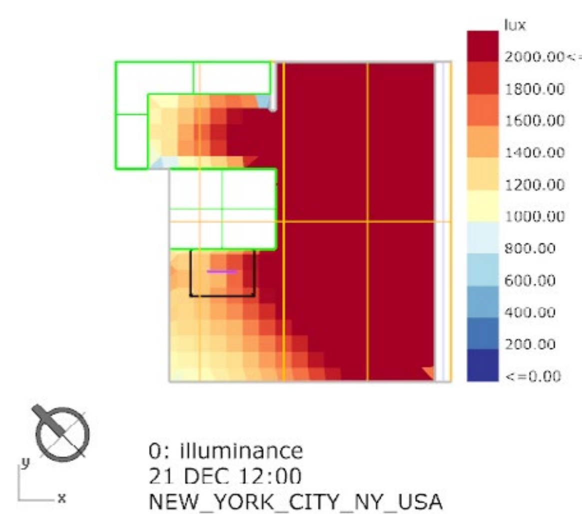
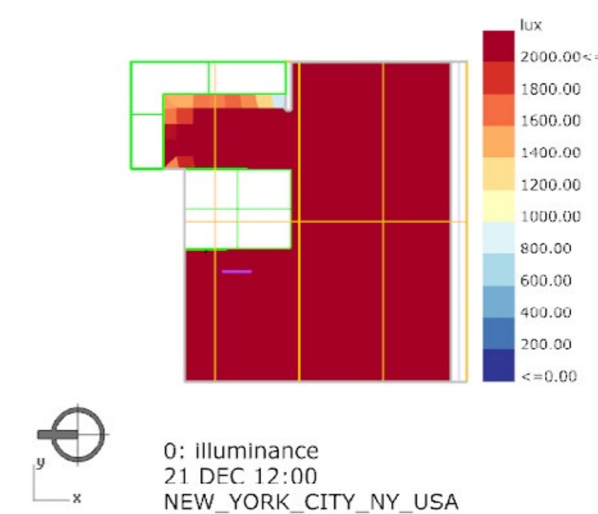
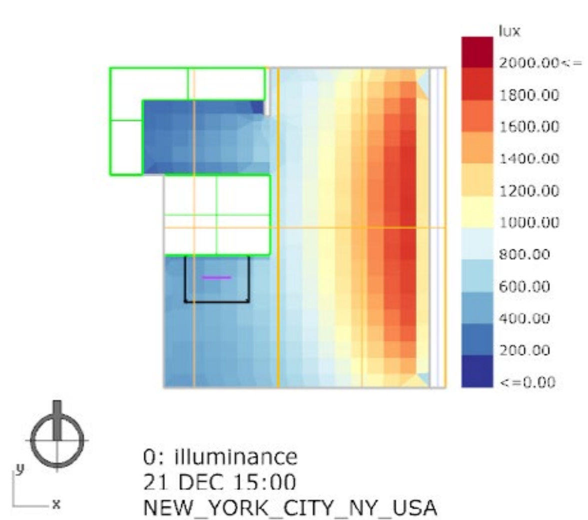
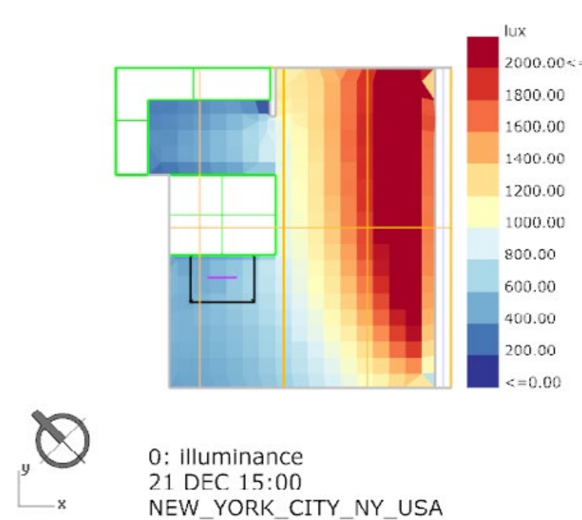
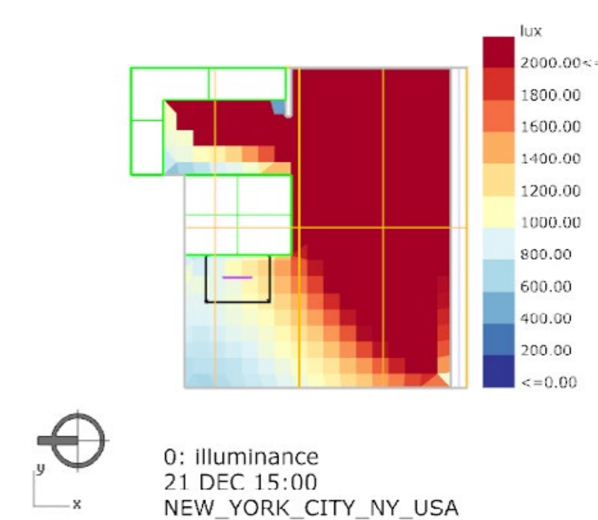
Norh **90** *Degree*





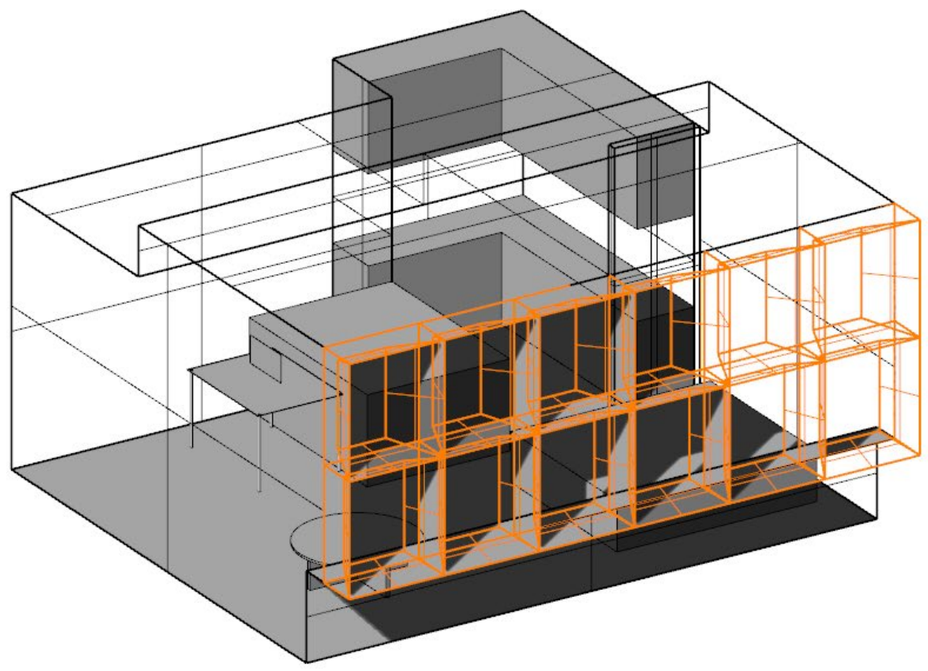
When is Sun Visible in the Room

General Analysis : Temperature / Wind Speed / Humidity

	*North **0** Degree*	*Norh **45** Degree*	*Norh **90** Degree*
December 21th *9 AM*			
December 21th *12 AM*			
December 21th *15 AM*			

Design Proposal

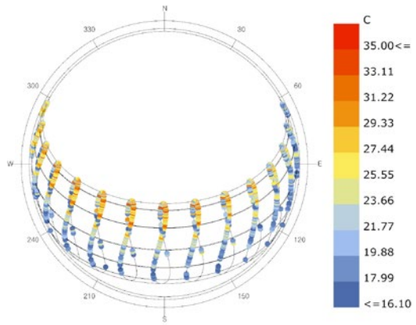
Result of simulations & Support Previous assumption



Design Issue 1

sun Path & Angle

New York City is basically Cold in Winter and relatively comfortable in Summer. In the graph there is strong wind coming from Hudson river around Manhattan where is my site. Besides, relative Humidity is higher than normal.



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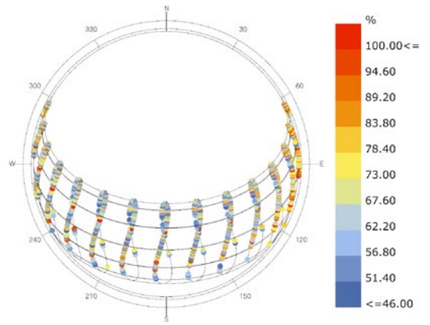

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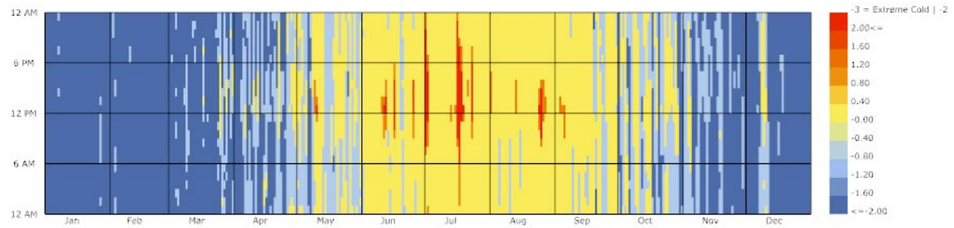
Design Issue 2

Cold Stress in winter_Adaptive Comfortable

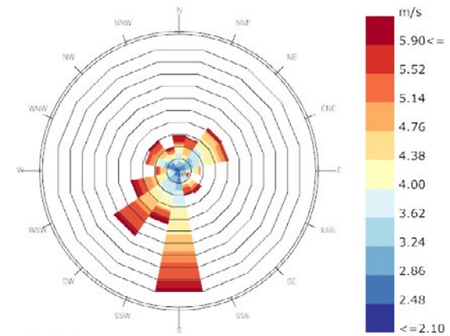
New York City is basically Cold in Winter and relatively comfortable in Summer. In the graph there is strong wind coming from Hudson river around Manhattan where is my site. Besides, relative Humidity is higher than normal.



Design Issue 3

Strong Wind Speed from West at Hudson River

New York City is basically Cold in Winter and relatively comfortable in Summer. In the graph there is strong wind coming from Hudson river around Manhattan where is my site. Besides, relative Humidity is higher than normal.



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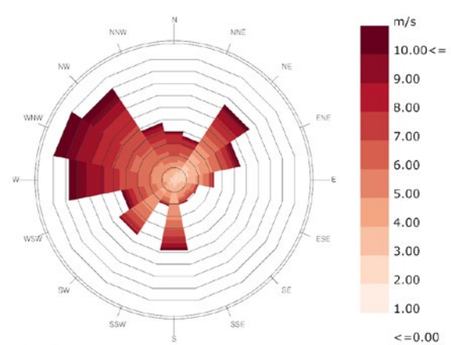
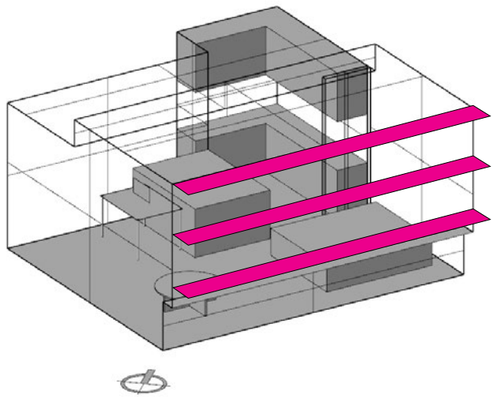
and 20<Relative Humidity<80
871.0 hours of total 8760.0 hours (9.94%).

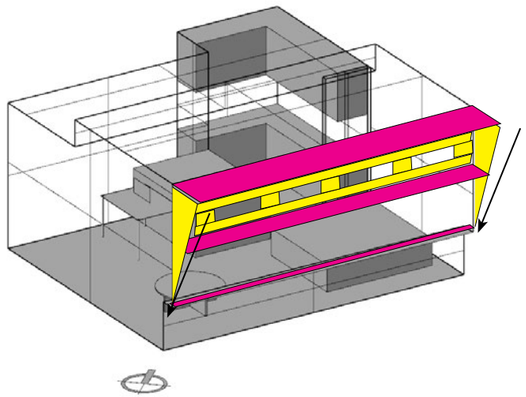


Wind-Rose
NEW_YORK_CITY_NY_USA
1 NOV 1:00 - 31 MAR 24:00
Hourly Data: Wind Speed (m/s)
Calm for 0.28% of the time = 10 hours.
Each closed polyline shows frequency of 1.2%. = 43 hours.



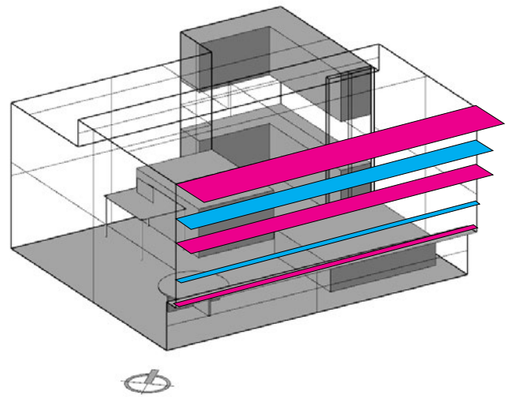
Design Strategy 1

Horizontal Louver for Consistent Sunlight from South



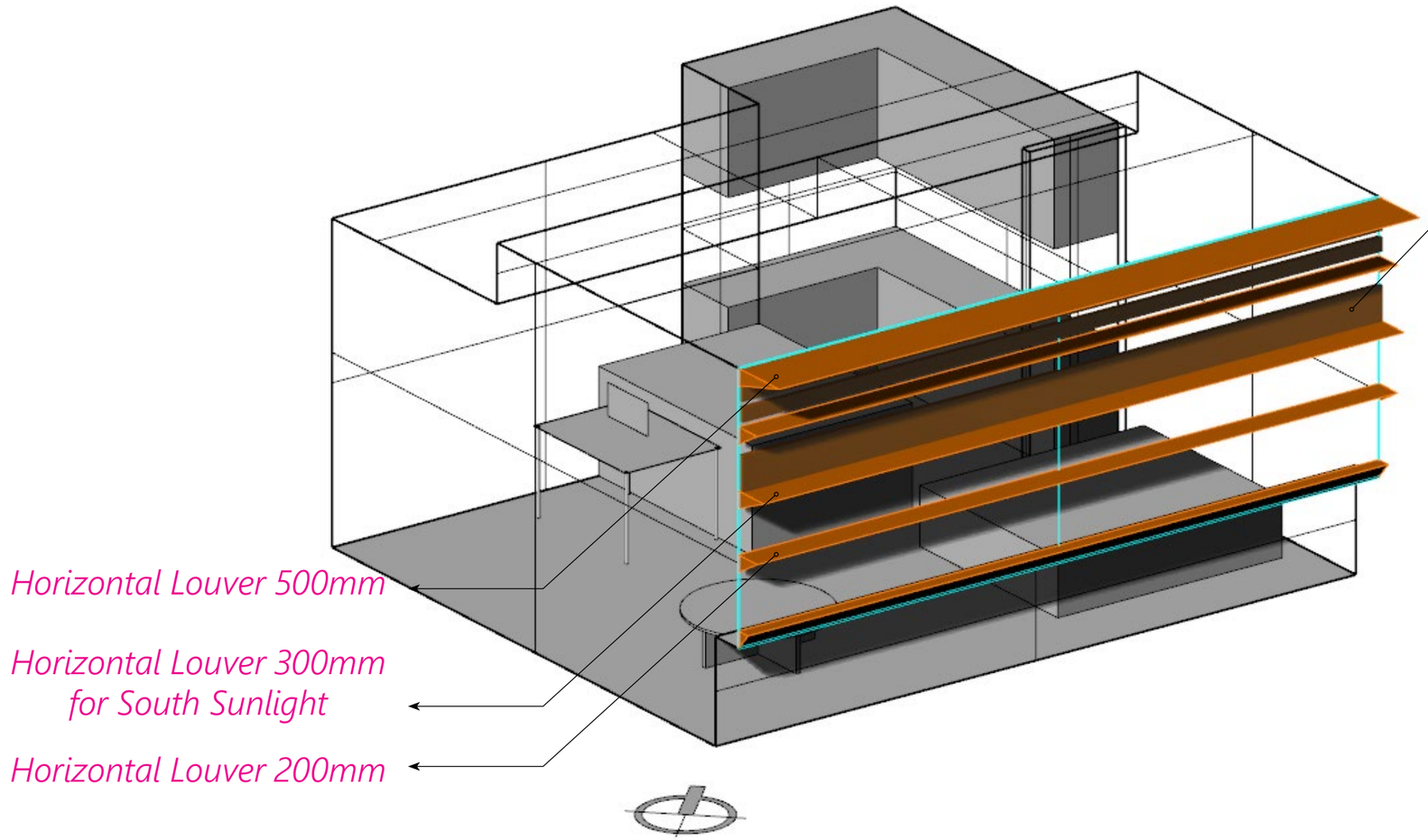
Design Strategy 2

Decreasing the Total facade Area of tranparent
Thinking of angle of sunlight

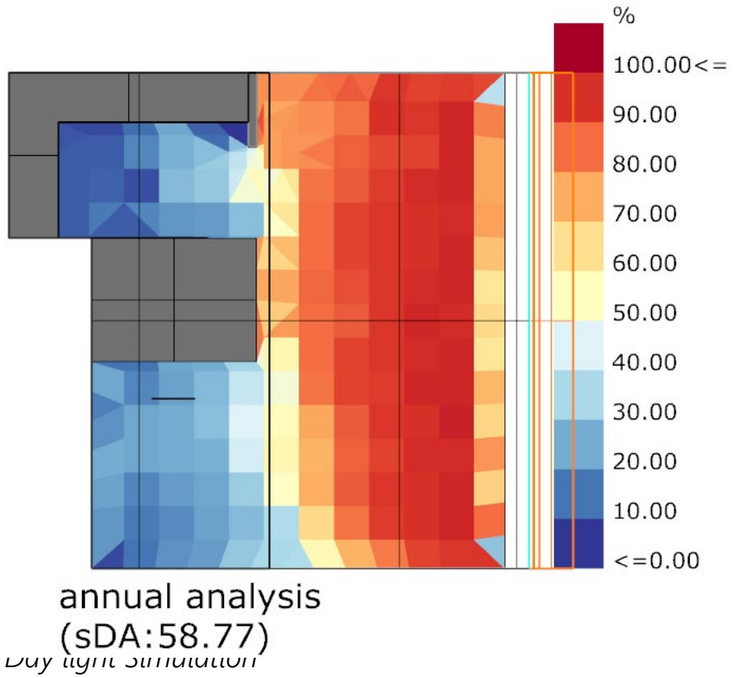


Design Issue 3

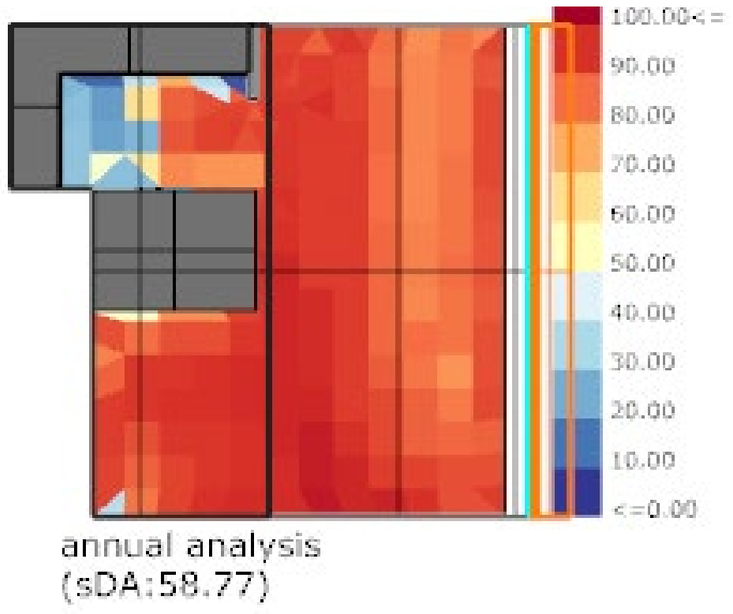
Wind path from another horizontal element



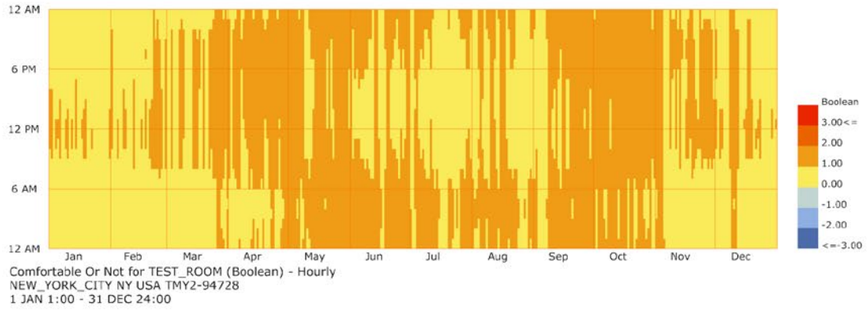
Proposal 1st



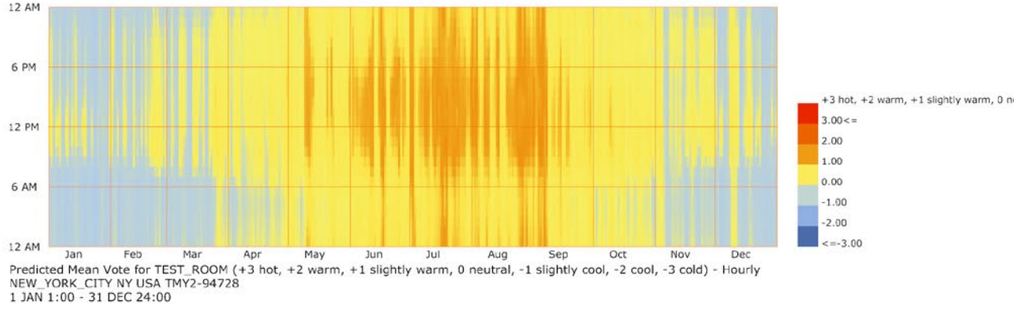
Day light Simulation

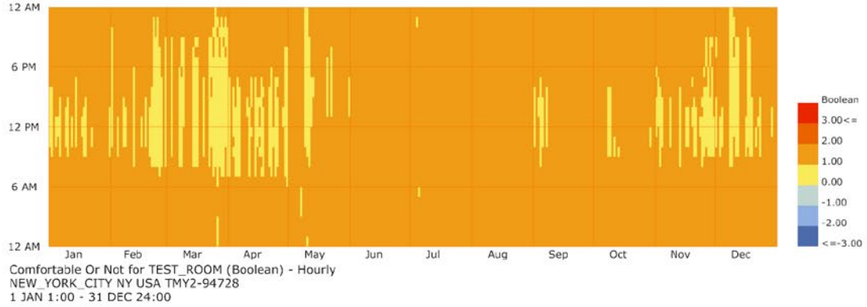


Usefull Day light Simulation
Lux 100~2000

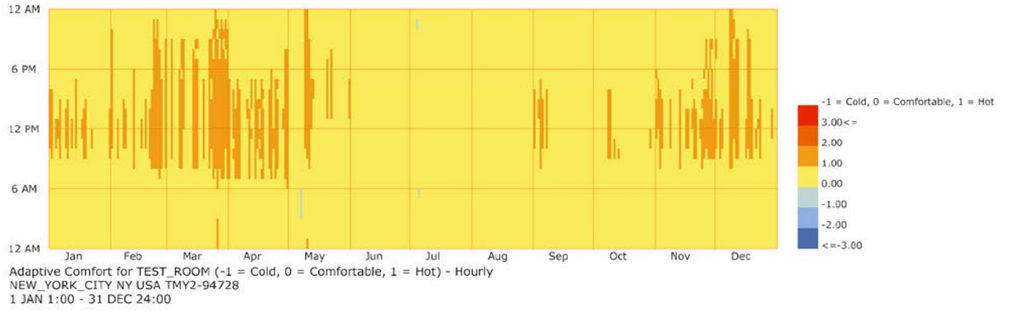


Orientation 45 degree _PMV Comfort: ***46%***

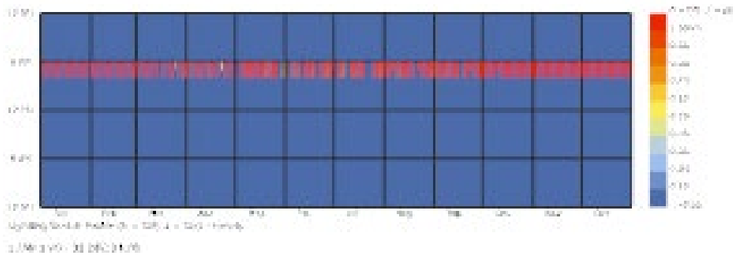


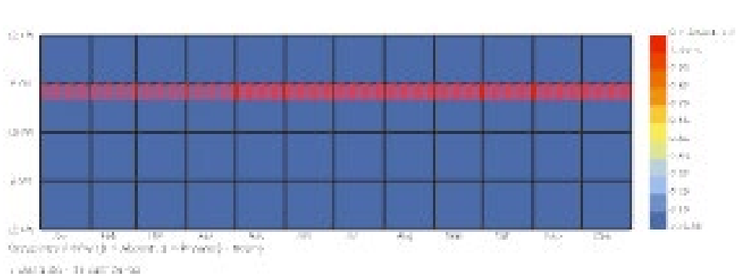


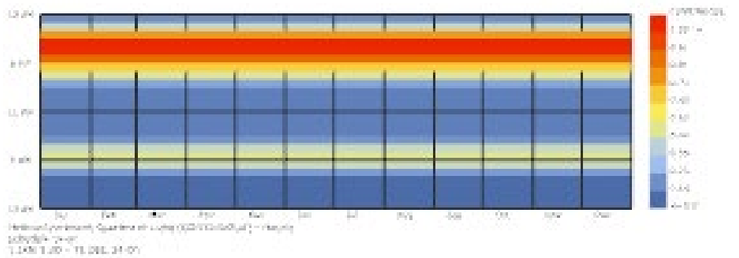
Orientation 45 degree _Adaptive Comfort: ***89%***

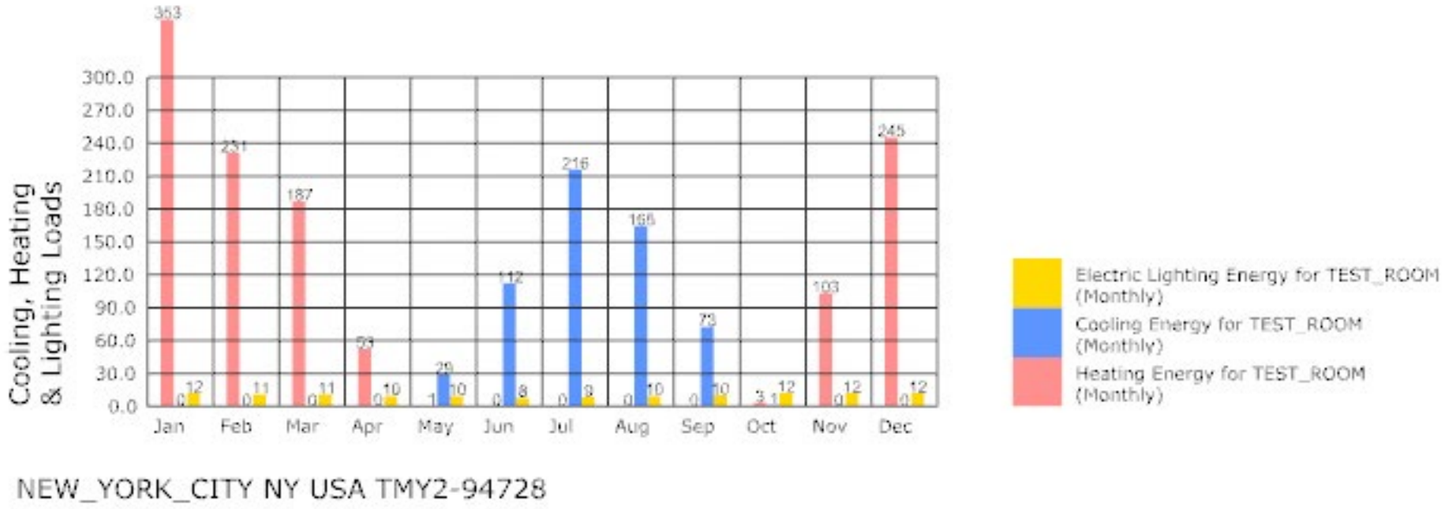


Heating & Cooling Energy Analysis



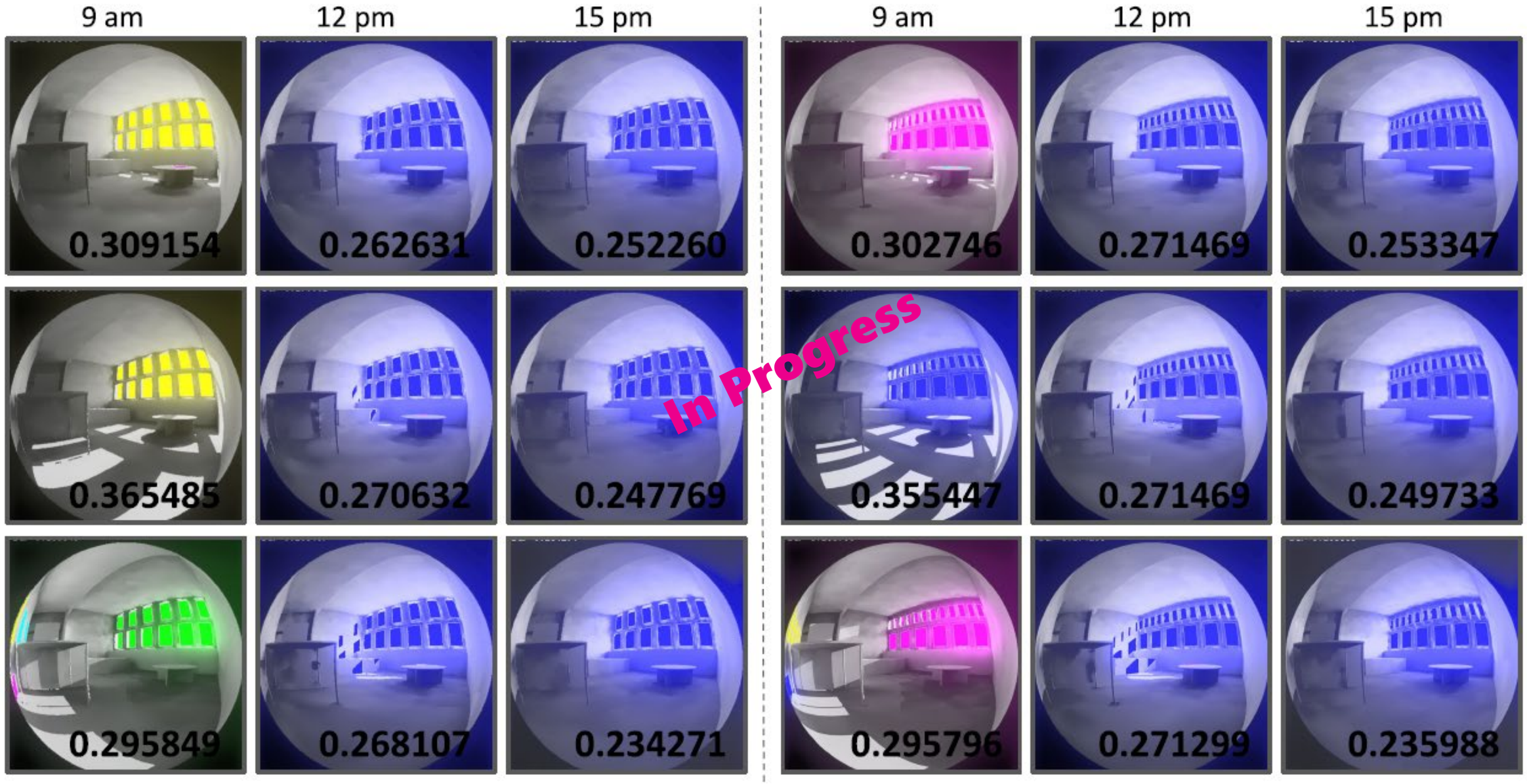


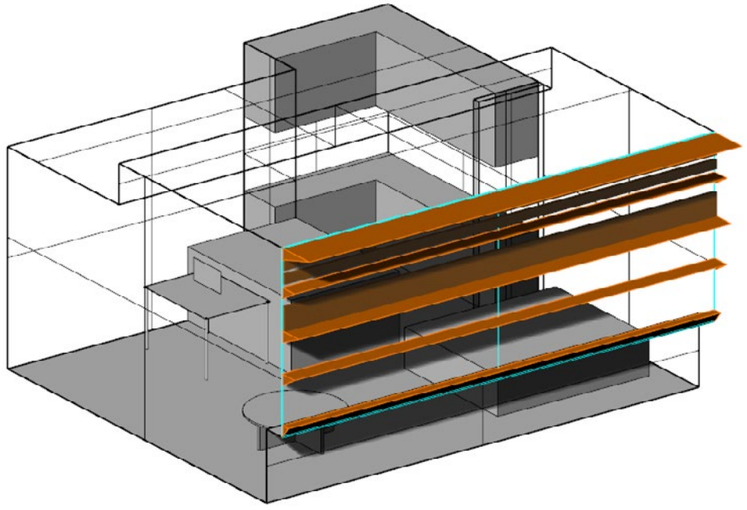




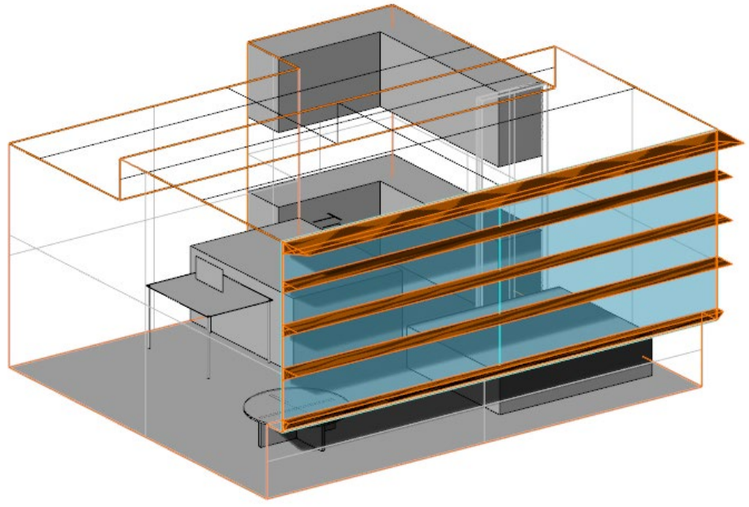
NEW_YORK_CITY NY USA TMY2-94728

Glare Analysis

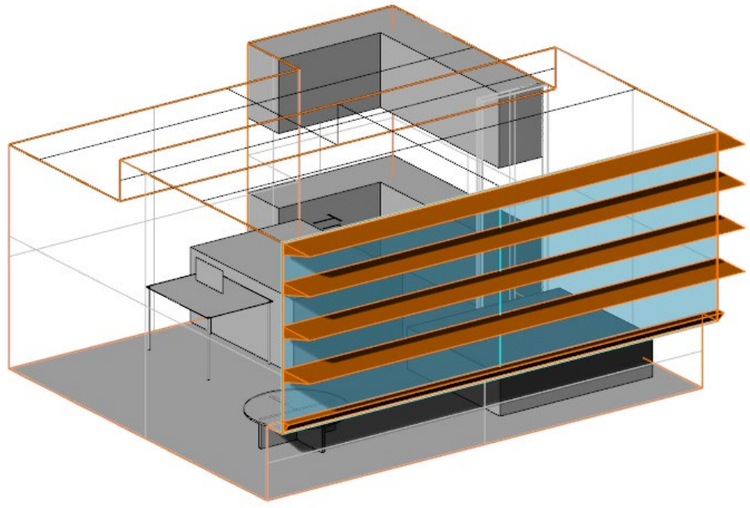




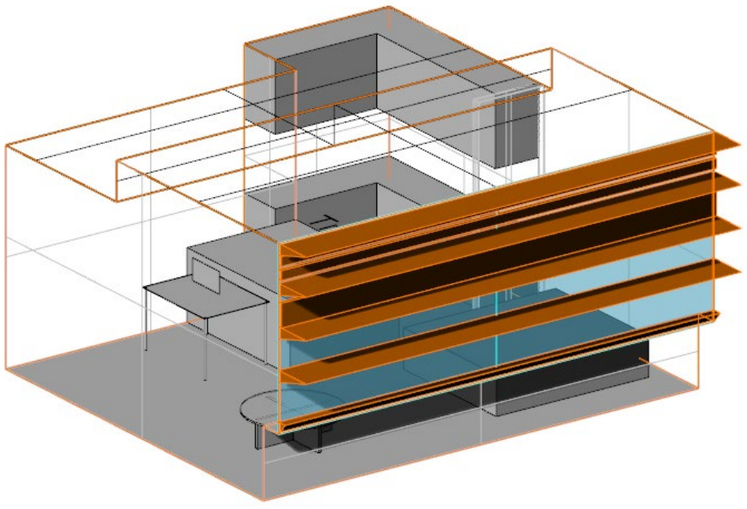
Adaptive Comfort : ***89.23%***
PMV : ***46.34%***



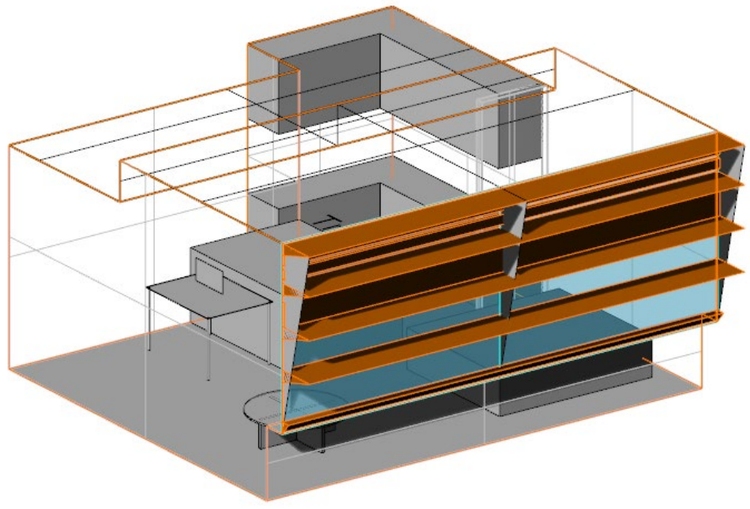
Adaptive Comfort : ***87.07%***
PMV : ***52.21%***



Adaptive Comfort : ***91.33%***
PMV : ***48.03%***



Adaptive Comfort : ***96.57%***
PMV : ***43.33%***



Adaptive Comfort : ***96.60%***
PMV : ***43.31%***

Design Proposal
Result of simulations & Support Previous assumption