Assignment 4 Daylight Analysis and Shading Design for Dream Room

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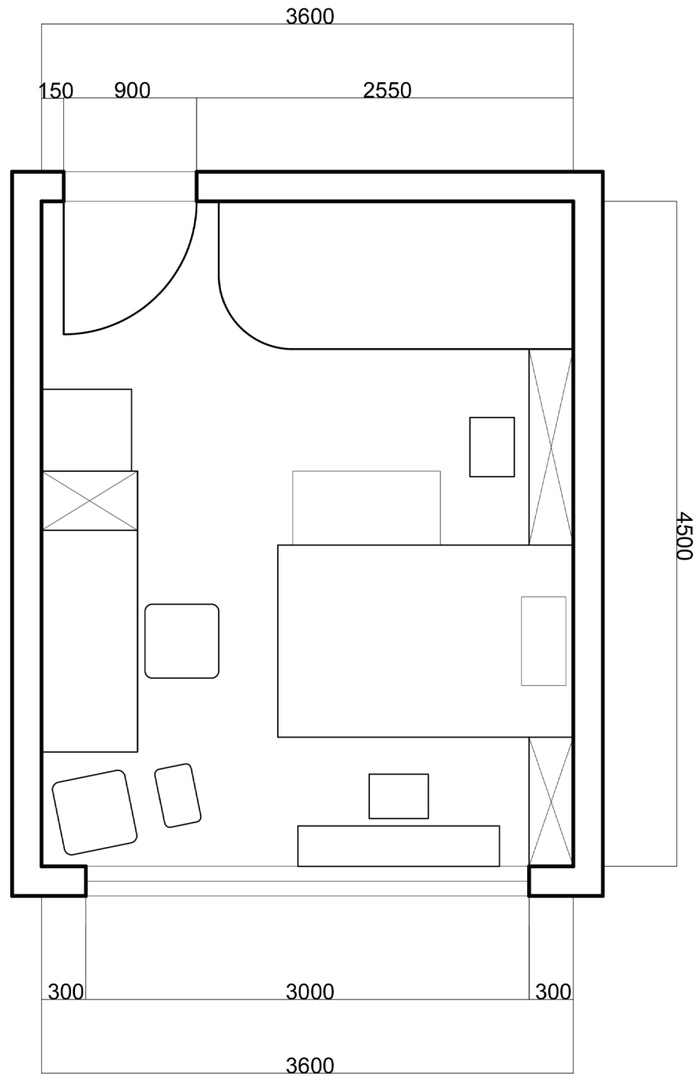
About My Dream Room

1. The temperature in Philadelphia is somehow extreme and comfortable hours only take up 25% in one year. So, during the winter, the room should get more sunshine but in summer, there should be useful shading device.

2. Because of the temperature difference, the wall should be have better insulation to save the energy for heating and airconditioning. Also, I have the requirement of a large window, so the choice of the glass also should be considered.

3.The orientation of the room should facing south, shoutheast or southwest, which could make use of natural ventilation when the temperature and relative humidity is comfortable.



Plan of Dream Room

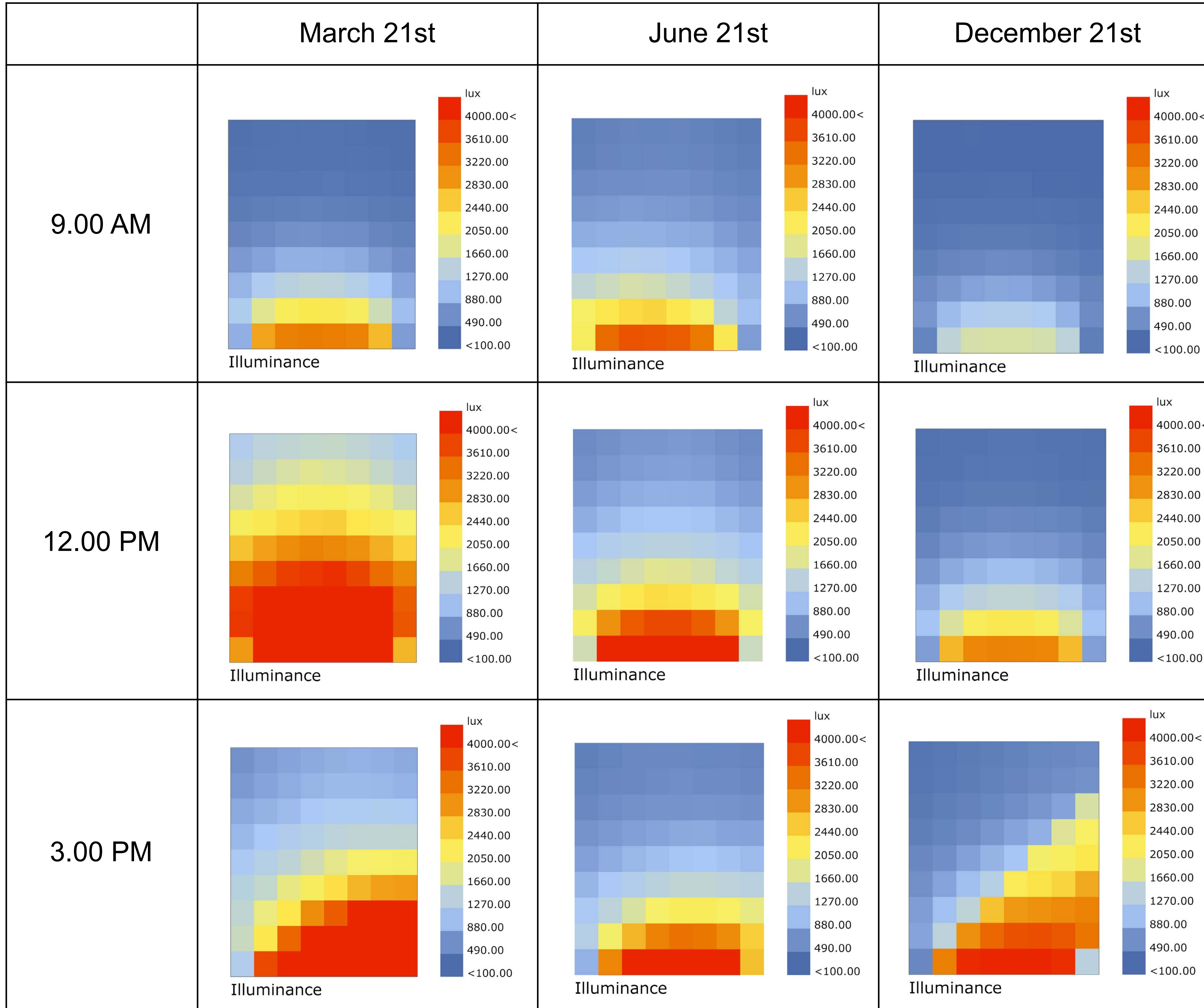
Seasonal Daylight Analysis without Shading

Location: Philadelphia

My room gets uneven daylight, and especially in Winter, there is not enough daylight at the back of the room. But because of the broad window, at noon in Spring, there is too much daylight in the room.

Problem1: Not enough daylight at the back of the room.

Problem2: Too much daylight at noon.



Shading Design

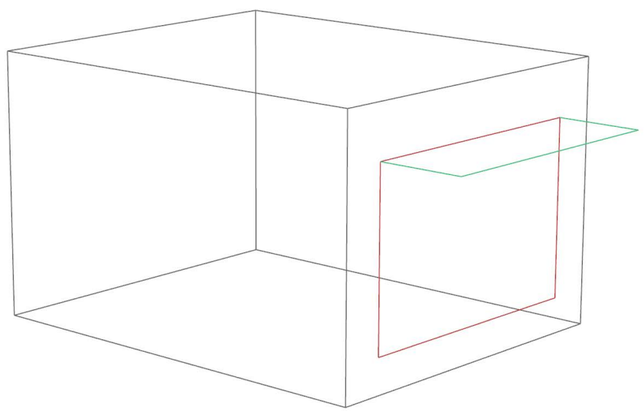
Type 1: Single Horizontal Shading

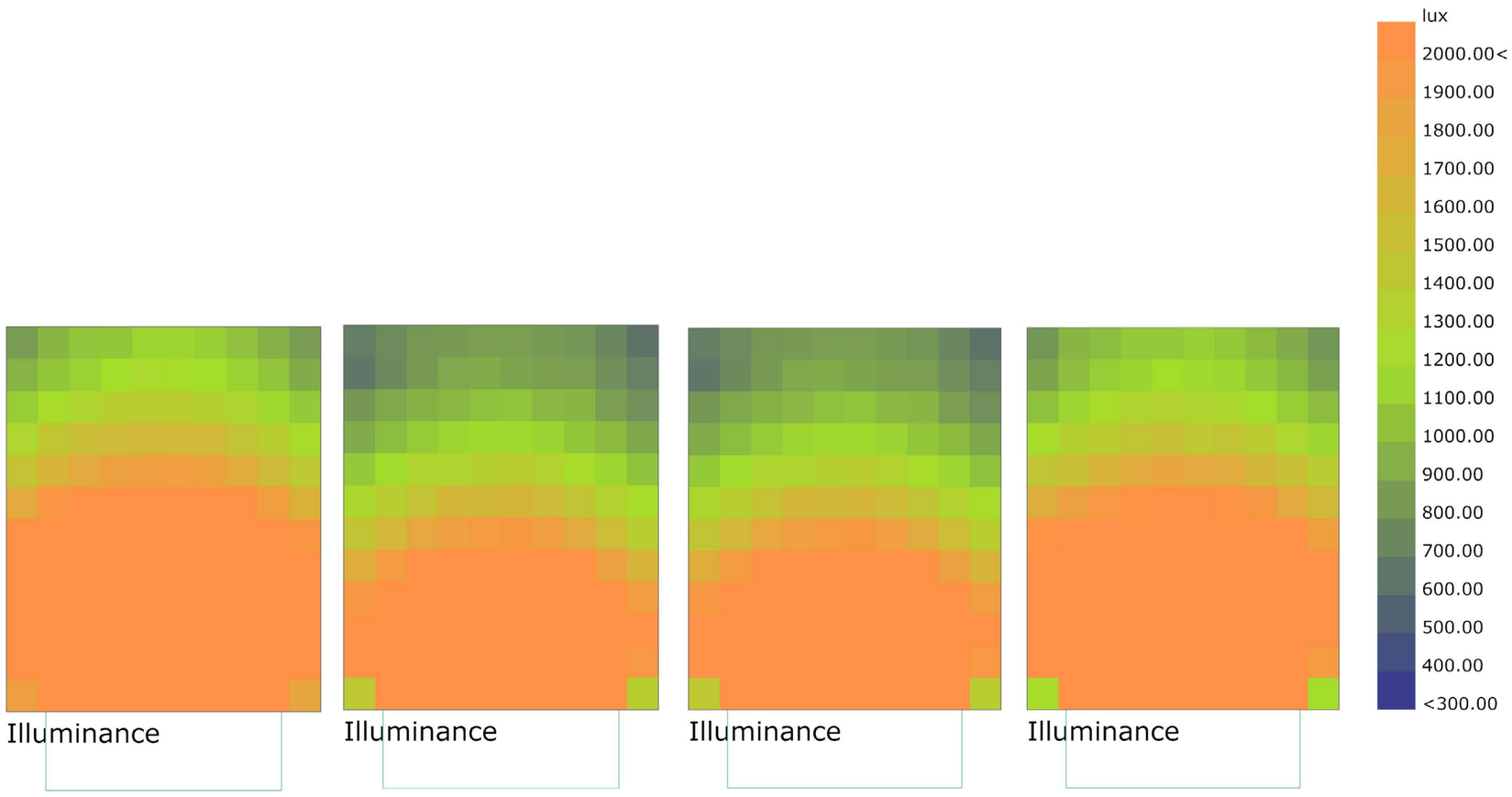
Assuming that the width of shading device is 1 meter, which is easily to support and construct, below are the daylight analysis of different height of the horizontal shading device.

Date: March 21st (the day that has strongest glare)

Result

When the shading pad is at the top edge of the window (around 2.4m), it will block some sunlight, but does not work well enough. There is still serious glare under this condition.

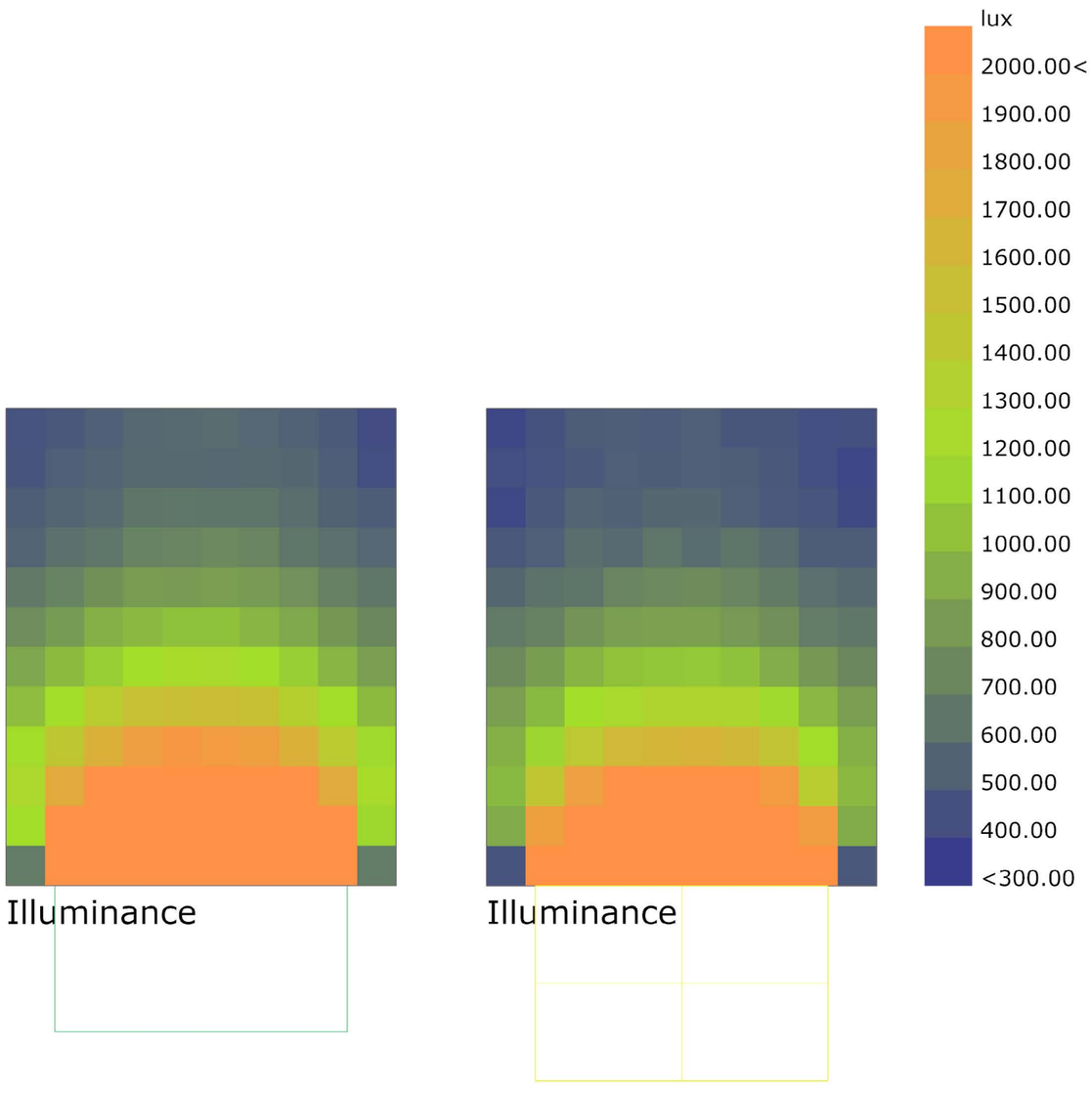




Type 1: Single Horizontal Shading

If the shading became wider... ...

It would work better, but may be too wide.



H=2.4m, W=1.5m

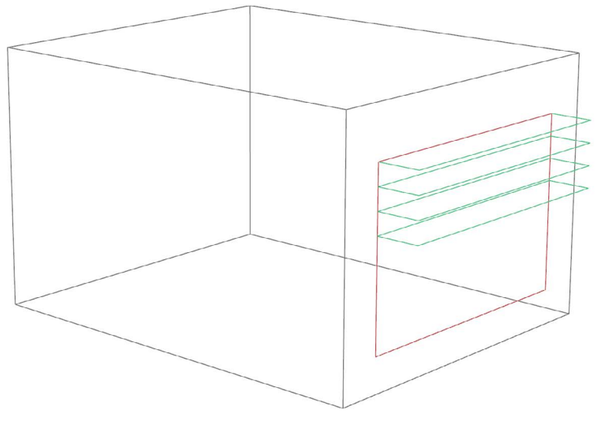
H=2.4m, W=2m

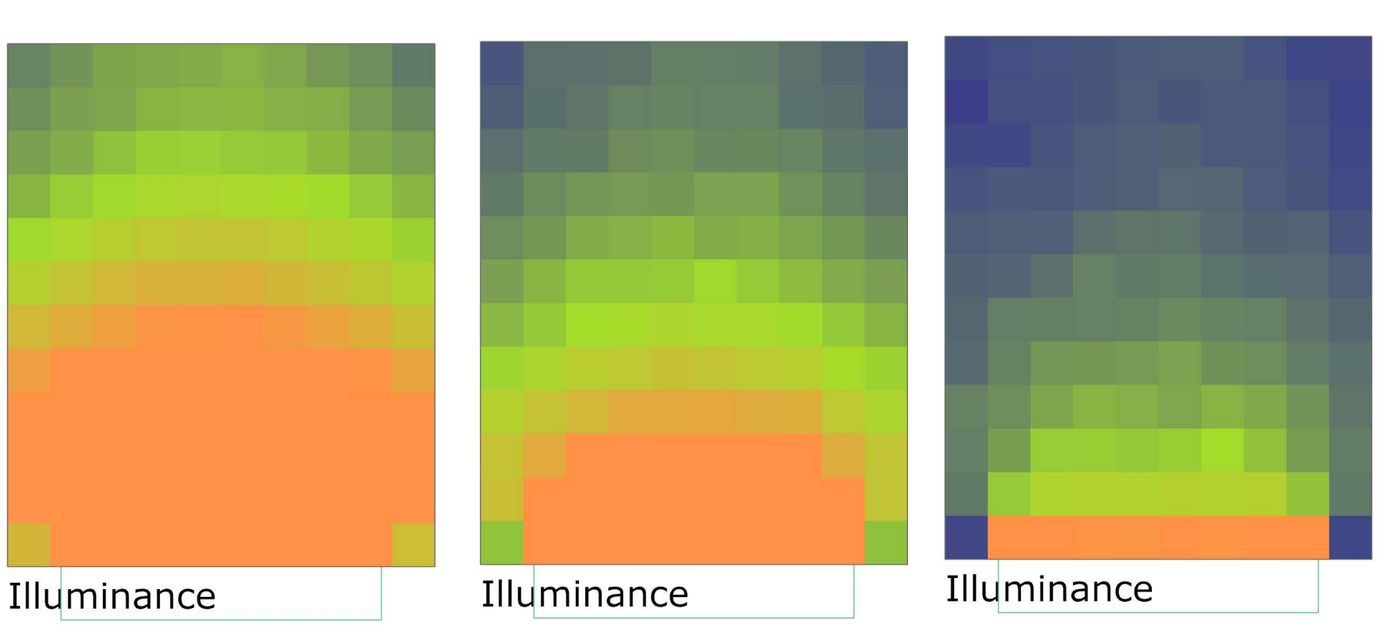
Type 2: Horizontal Louvers Shading

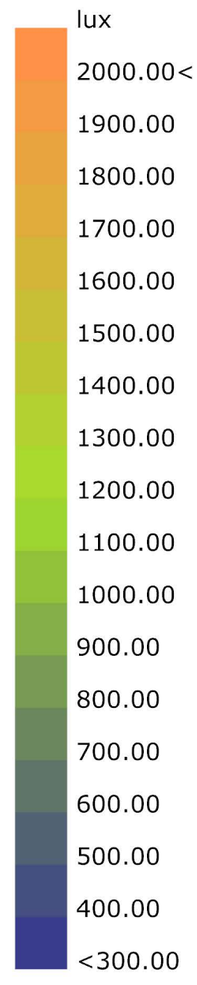
Width: 0.5m
Gap Distance: 0.25m

Result

Multiple layer of horizontal shading pads work much more obviously. And 6 layers-horizontal shading pads will block most unnecessary daylight and keep the room bright.







Width of Each: 0.5m, 2 Layers

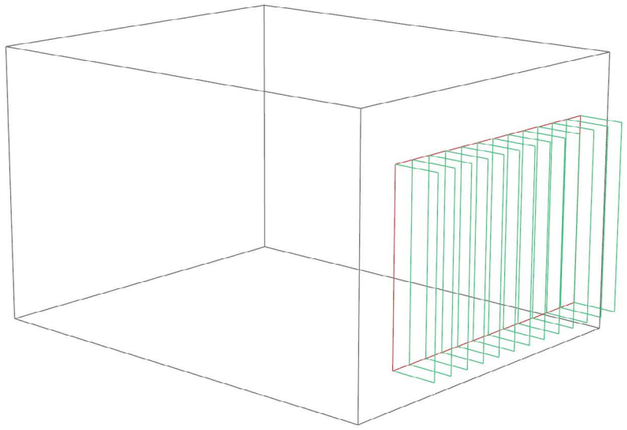
Width of Each: 0.5m, 4 Layers

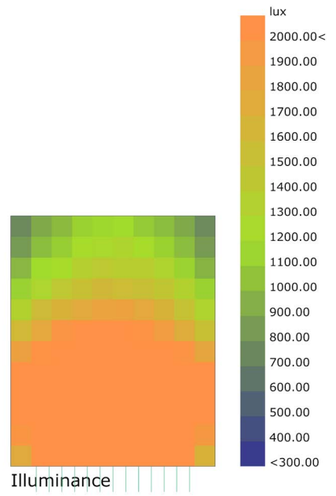
Width of Each: 0.5m, 6 Layers

Type 3: Vertical Louvers Shading

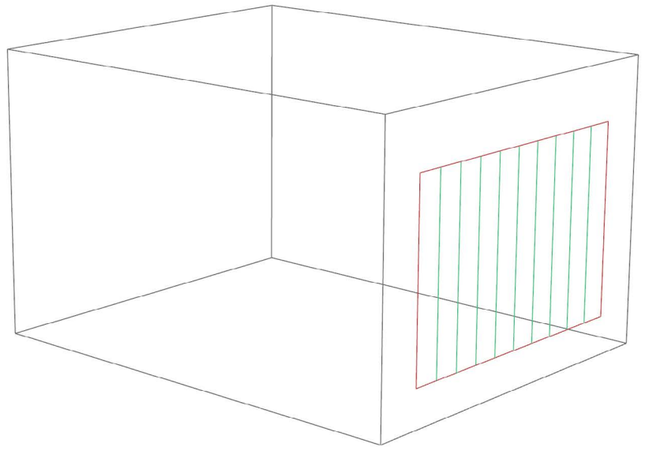
Result

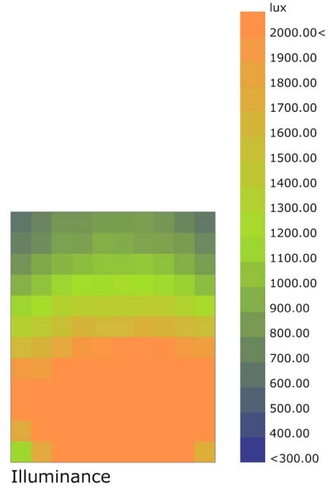
Even though the density of vertical louvers is quite high, the daylight is still too strong for the room. And the louvers will block much views. So vertical louvers shading is not a good choice.





A
Width: 0.5m
Gap Distance: 0.25m



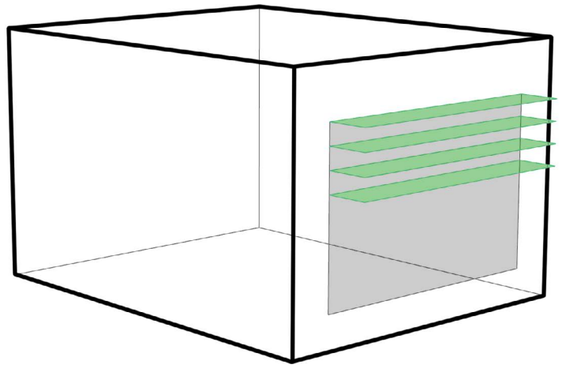


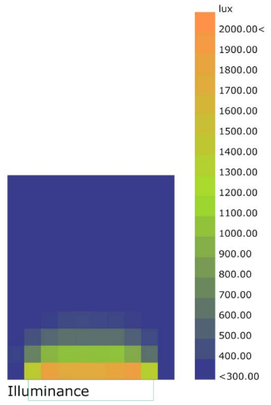
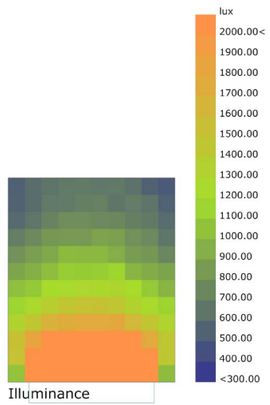
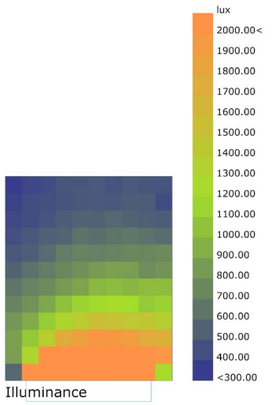
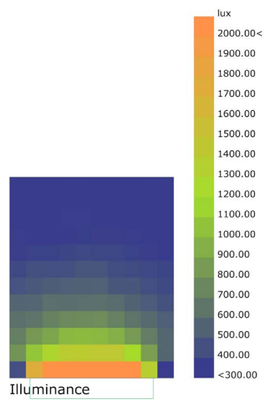
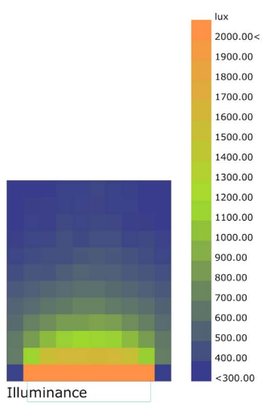
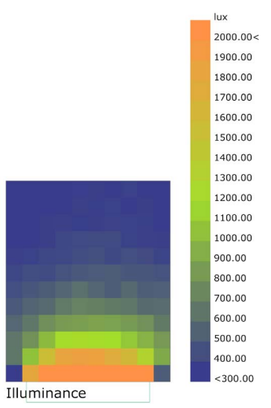
B
Width: 0.3m
Gap Distance: 0.3m

Seasonal Daylight Analysis with Shading

Location: Philadelphia

Through the comparison of three shading system, I would choose horizontal louvers shading system. It is simpler but more efficient. And in order to balance the difference between Spring and Winter, I will use the 4-layer horizontal louvers shading pads.



	March 21st	June 21st	December 21st
9.00 AM			
12.00 PM			
3.00 PM