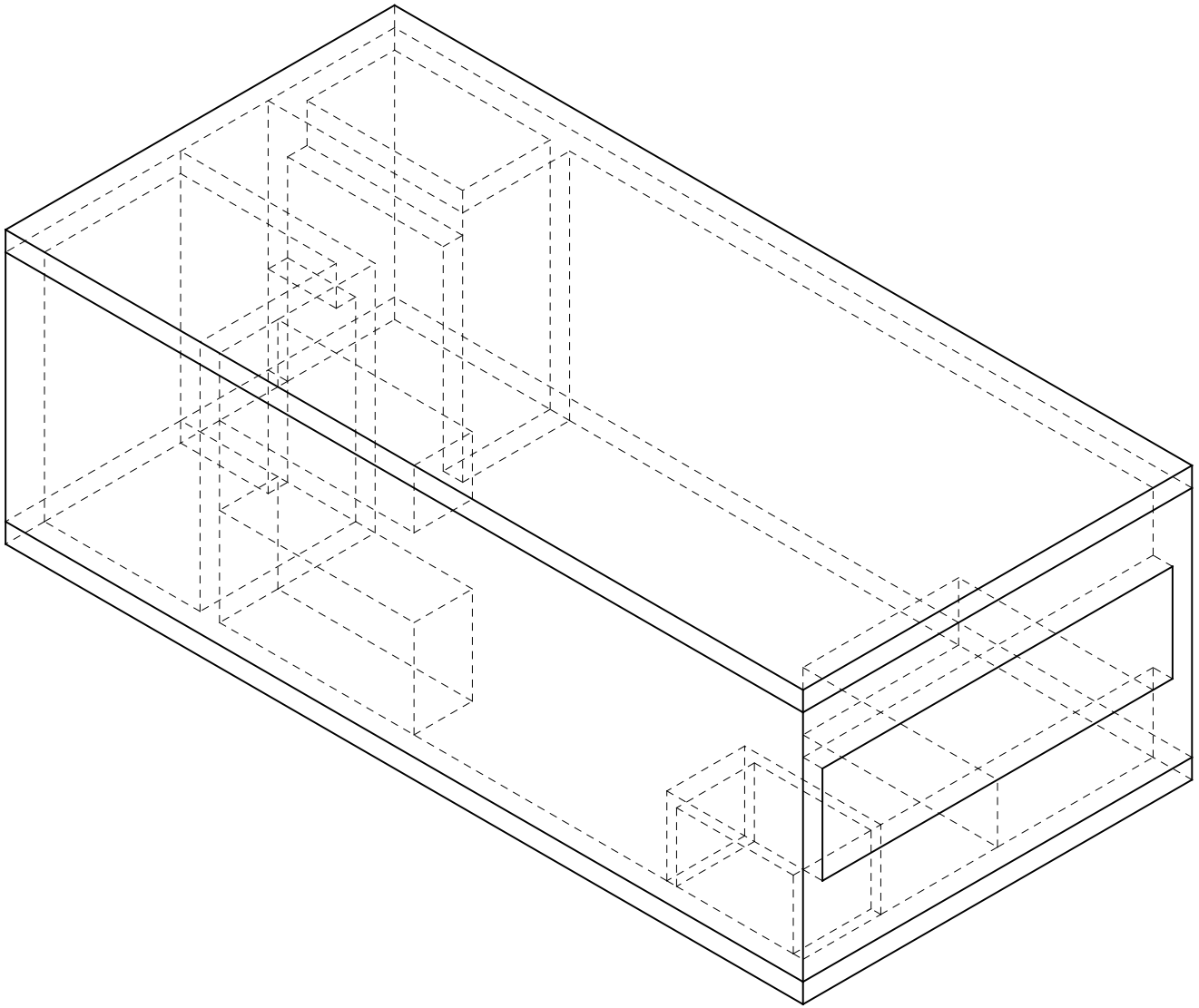
Daylight Simulation

171022 Assignment_4
DREAM ROOM in Philadelphia



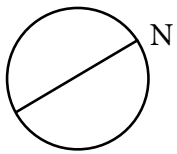
City: Philadelphia, PA

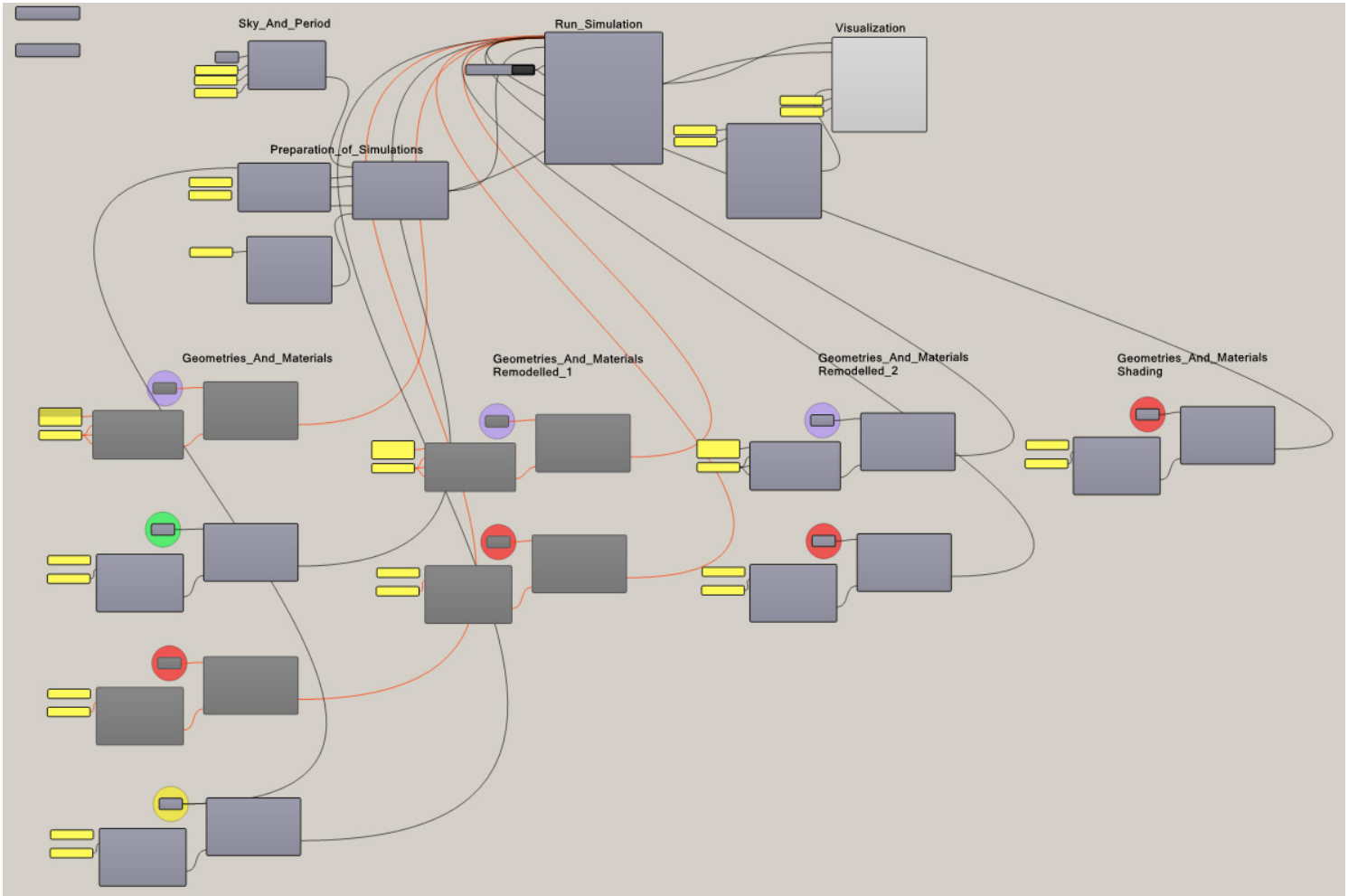
Latitude: 39.8683

Longitude: -75.2311

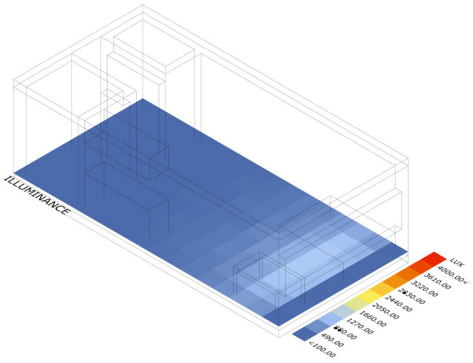
Climate:
According to the Köppen climate classification, Philadelphia falls under the northern periphery of the humid subtropical climate zone (Köppen Cfa),[71] whereas according to the Trewartha climate classification, the city has a temperate maritime climate (Do).[72] Summers are typically hot and muggy, fall and spring are generally mild, and winter is cold. (Wikipedia)

Wind:
Generally, not too extreme, however, sometimes in winter, it's quite strong.

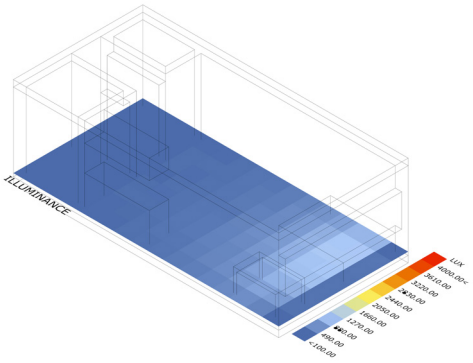




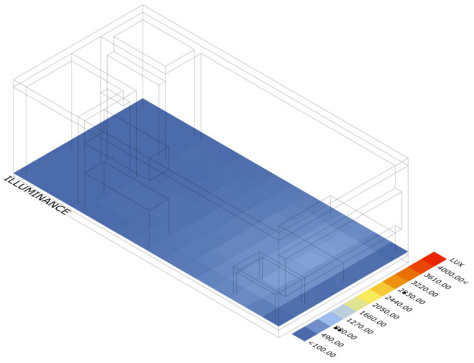
My overall Grasshopper strategy is below. First, I simulated current condition. Second, I tried to bringing enough daylight just by changing the shape and size of the window. Lastly, I added shading to optimize the adequate daylight.



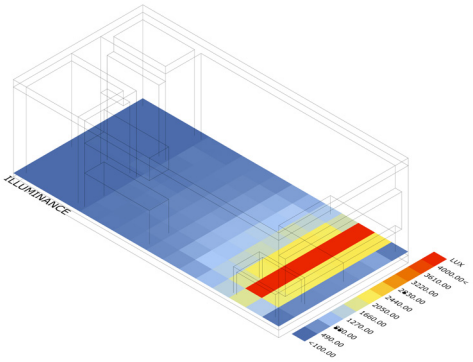
March 21, 09 am



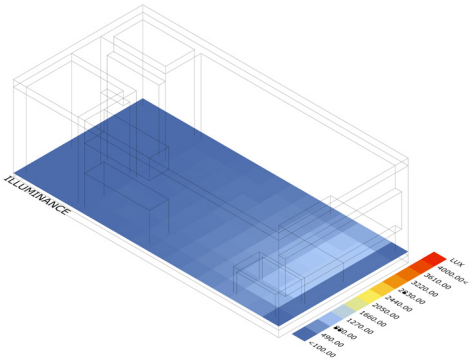
March 21, 12 pm



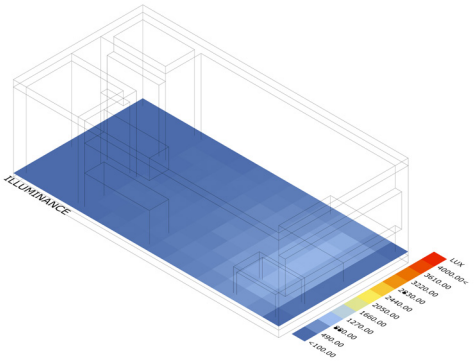
March 21, 15 pm



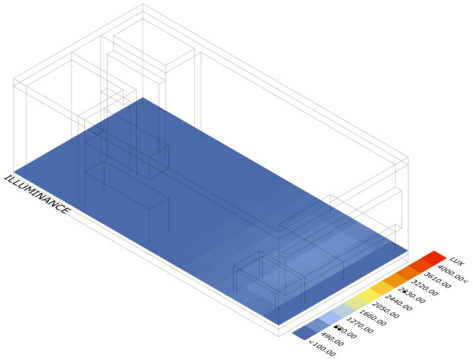
June 21, 09 am



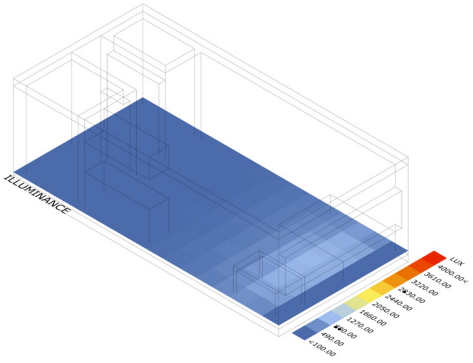
June 21, 12 pm



June 21, 15 pm



December 21, 09 am



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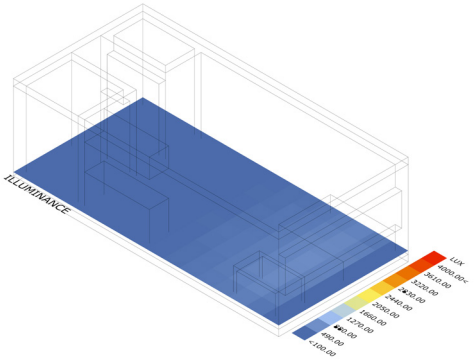
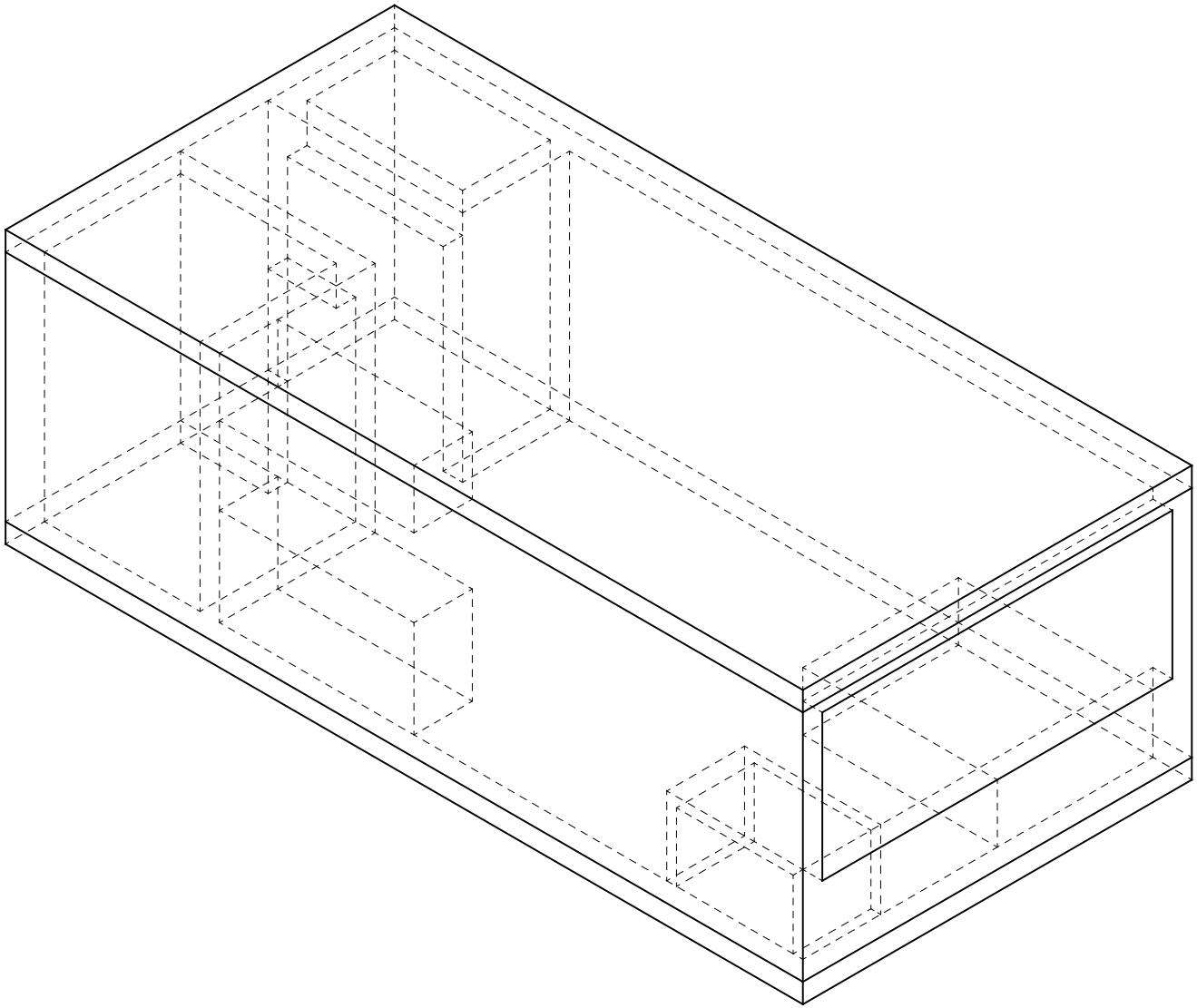


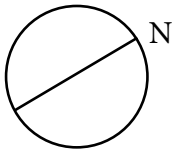
December 21, 15 pm

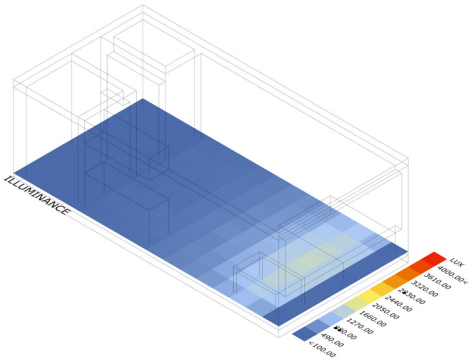
The window of my room is facing East, located at the center of the facade, and occupying about half of the wall.
Even if its orientation is totally East, approximately half of the living space receiving more than minimum amount of adequate daylight.
Still, for the rest of the living space, more daylight need to be brought in.



REMODELLED TYPE 1.

Scale of the window increased vertically, so that it can bring more daylight.





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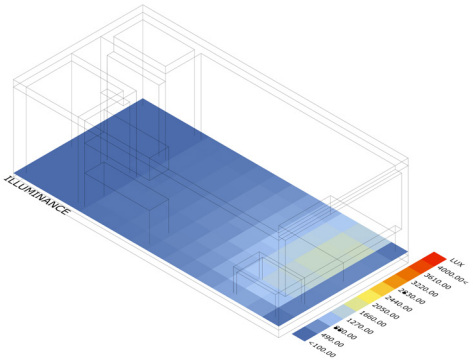

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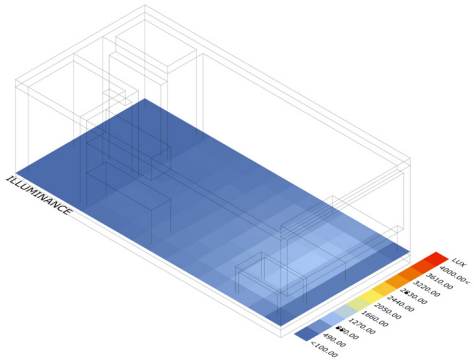

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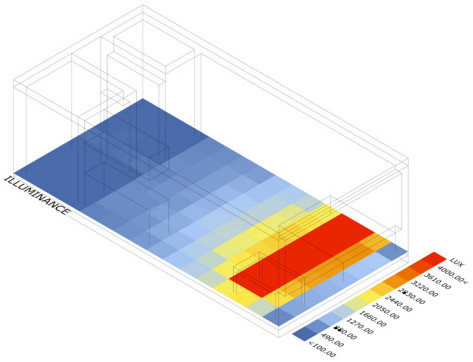
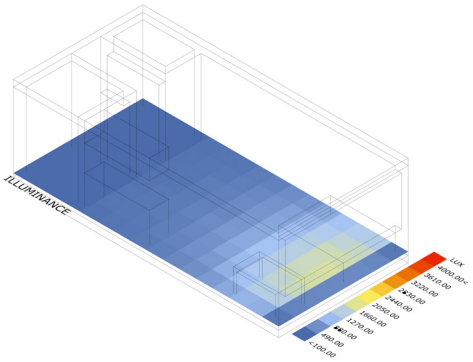
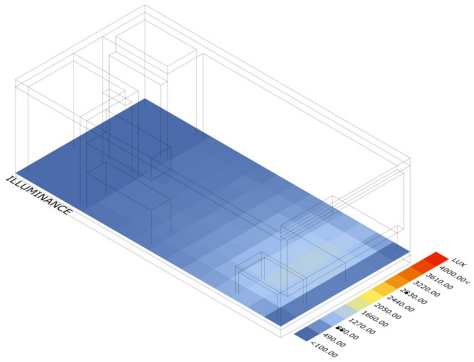


June 21, 09 am



June 21, 12 pm



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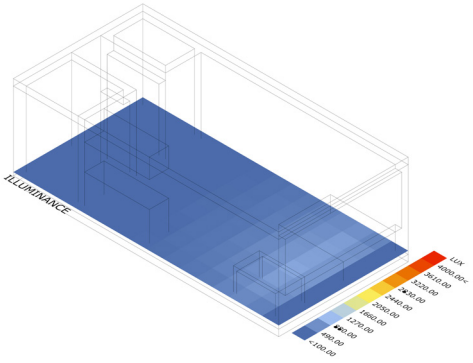

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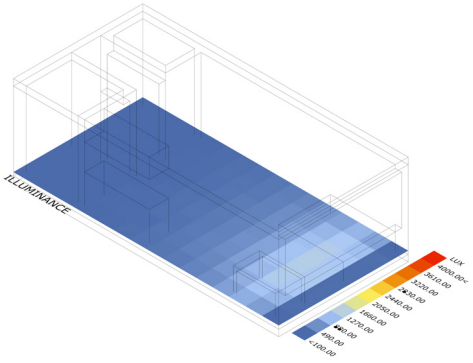

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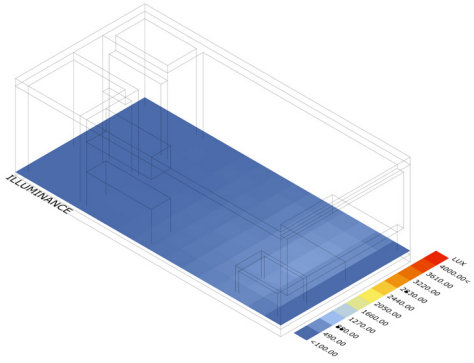
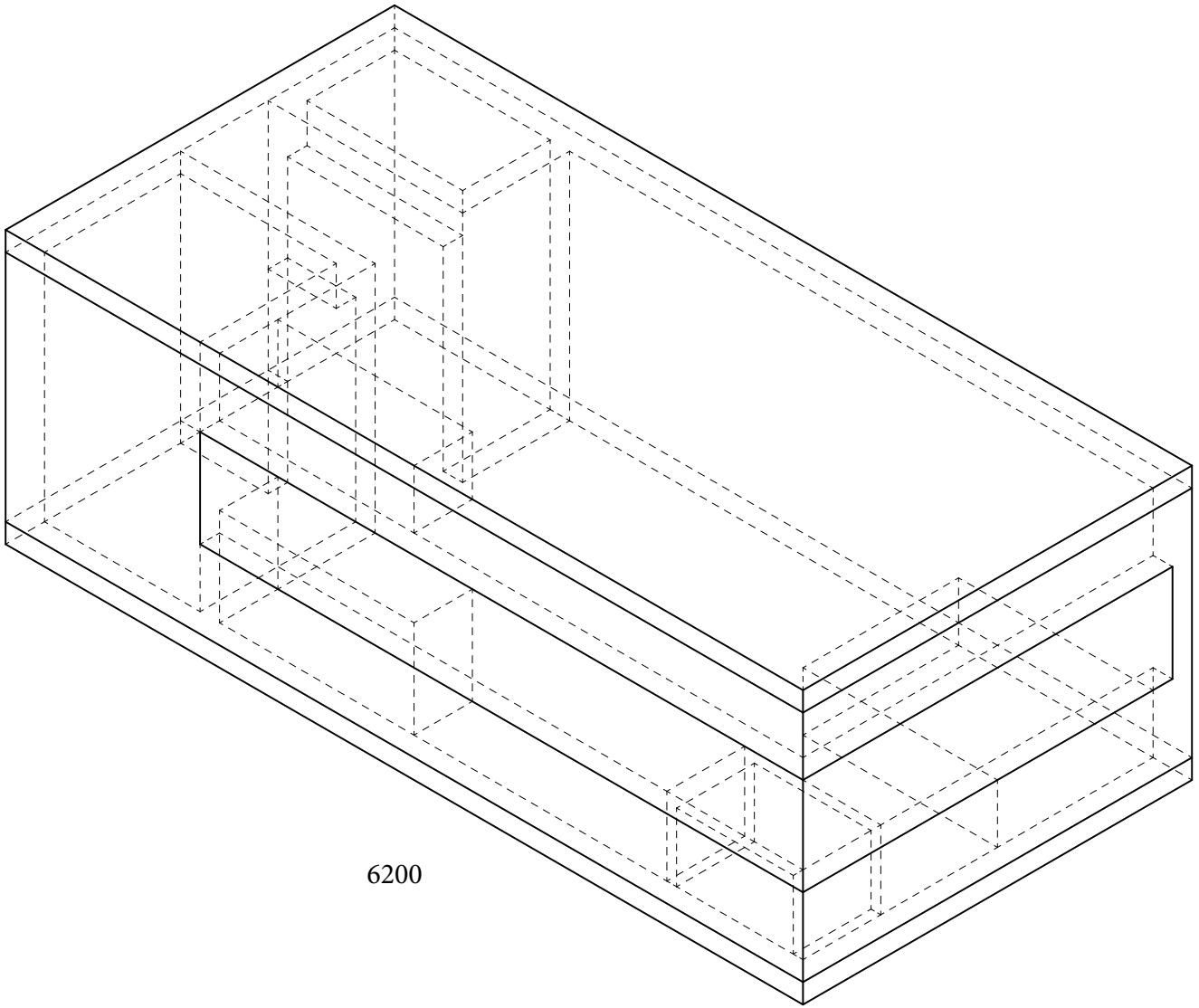


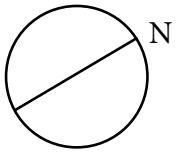
December 21, 15 pm

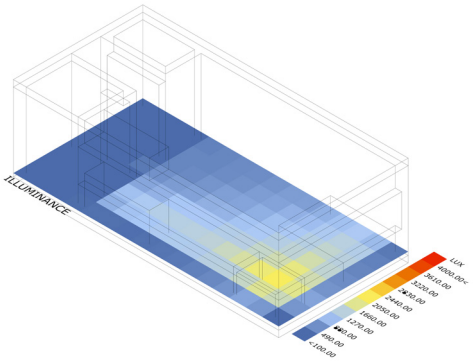
Even though I enlarged the size of the window upward, it has limitation to bring the natural light deeply. Thus, I need to consider the other strategy.



REMODELLED TYPE 2.

Maintaing the height of the window,
I created a window facing South.





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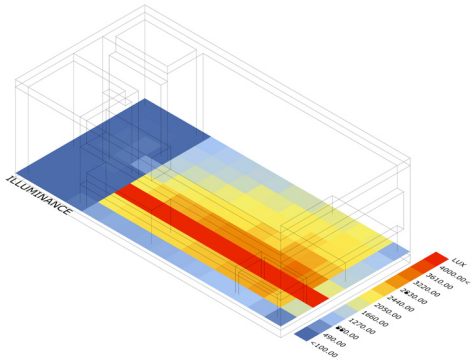

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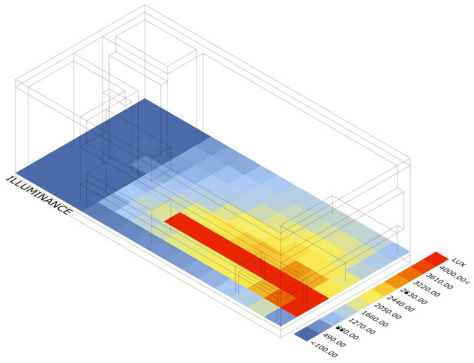

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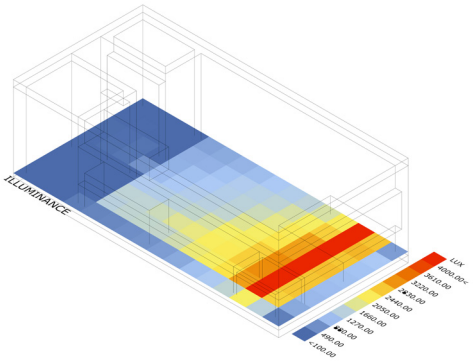

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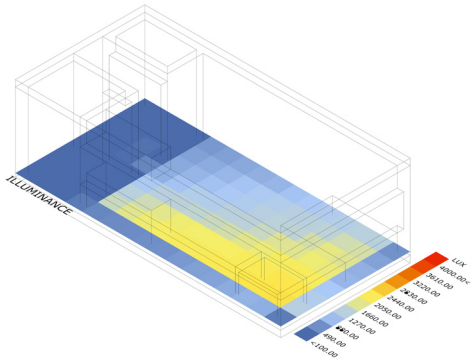

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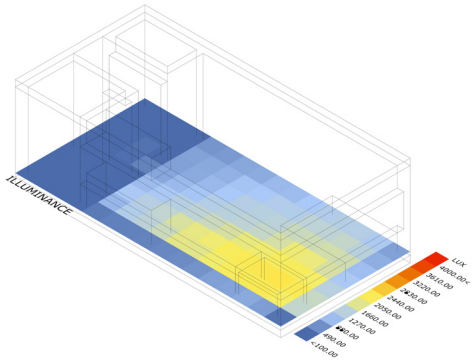

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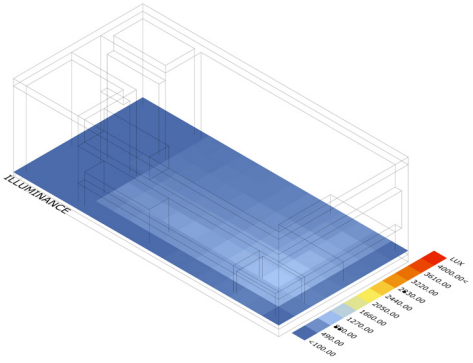

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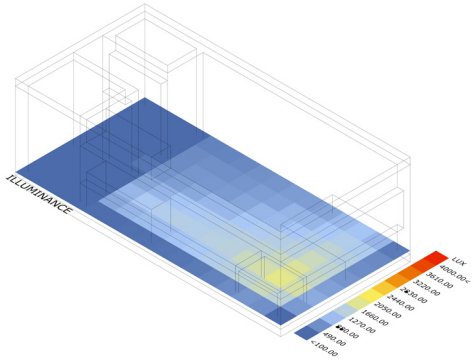

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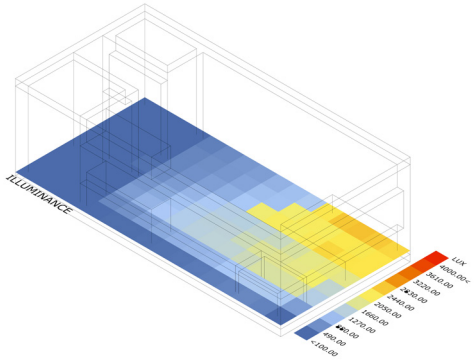
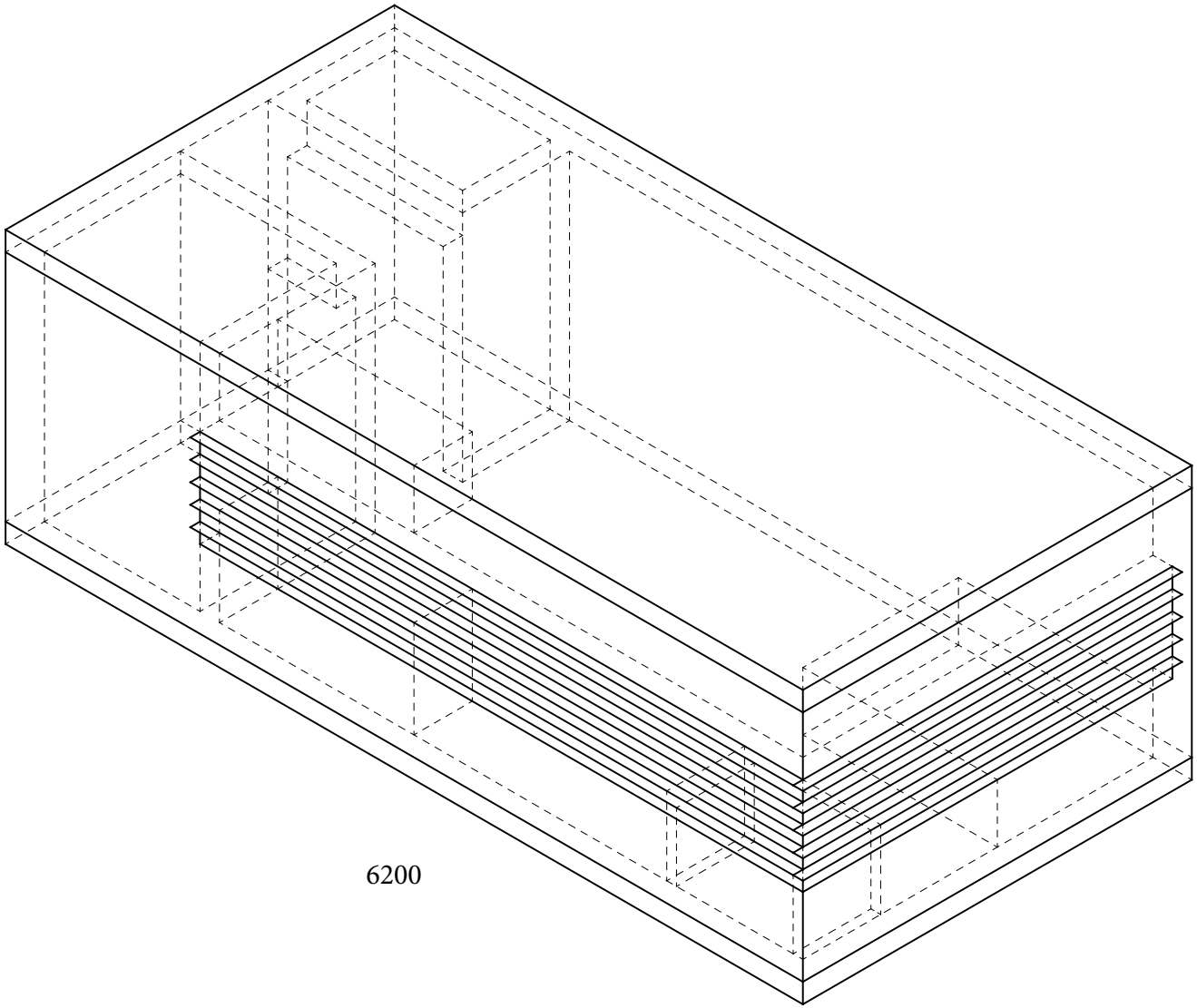


December 21, 15 pm

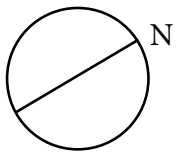
Overall, my room becomes bright enough. Yet, in the afternoon of Spring and Fall and in the morning of Summer, glare is expectied.

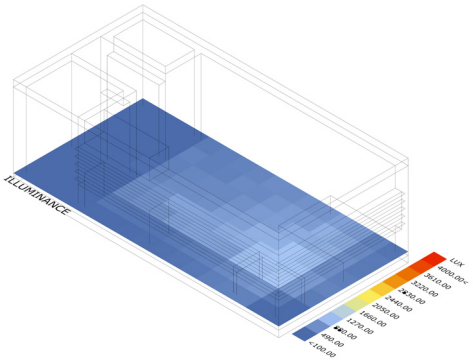


Shading Depth: 100mm
Shading Gap: 200mm

REMODELLED TYPE 3.

To deal with expected glare, I considered shading. Overall daylight is not so much, so I tried to optimize shading by minizing shading depth and maximizing shading gap.





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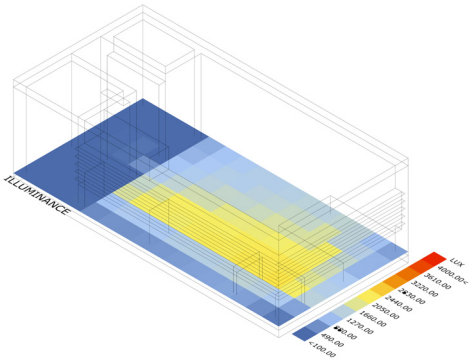

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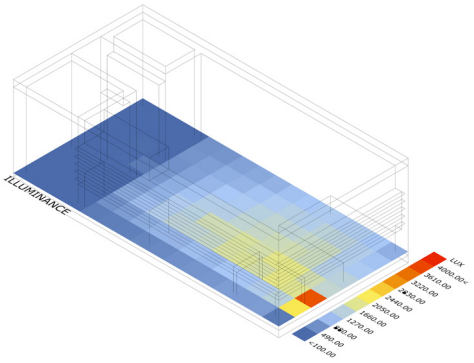

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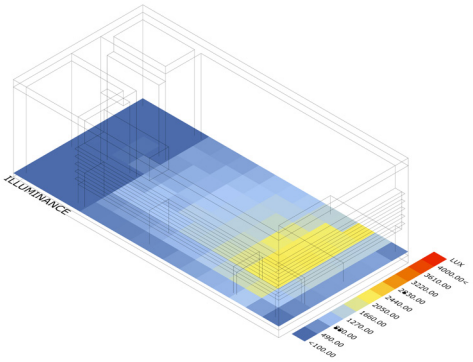
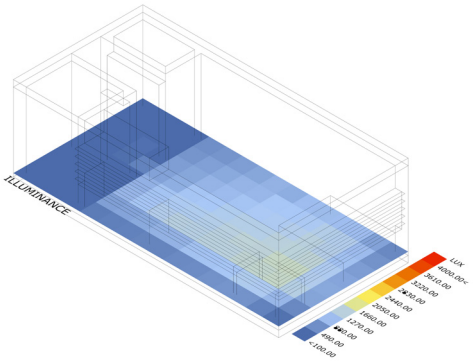


June 21, 09 am



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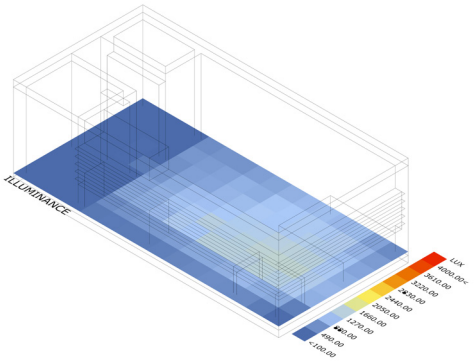

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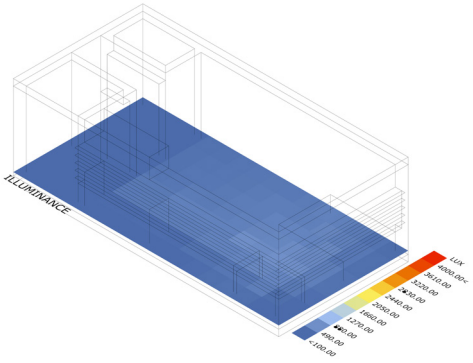

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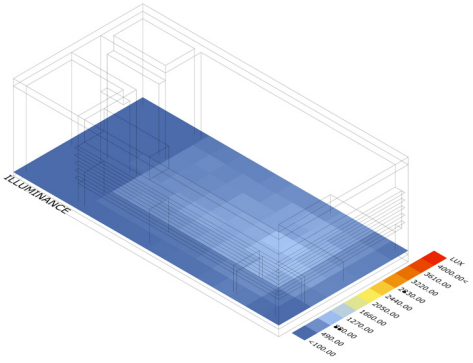

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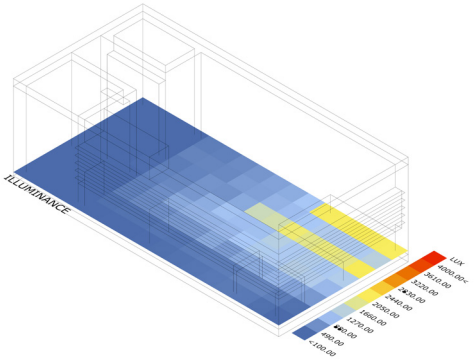

December 21, 15 pm

After the shading strategy is applied, overall daylight is in the range of porper degree. Simultaneously, the most intense light is less than 3600 lux.