

Daylighting Simulation

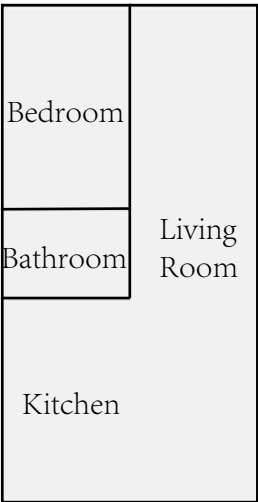
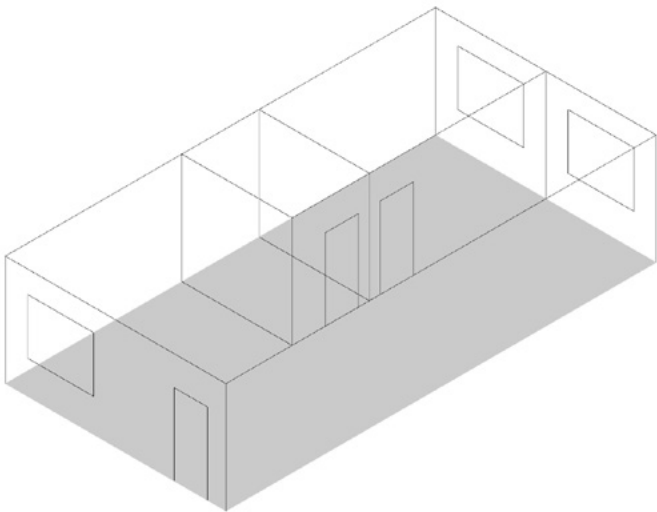
Building Performance Simulation Assignment 4
Yuchi Wang

.epw file information :
Location : Philadelphia International Airport
Data Type : TWY 3

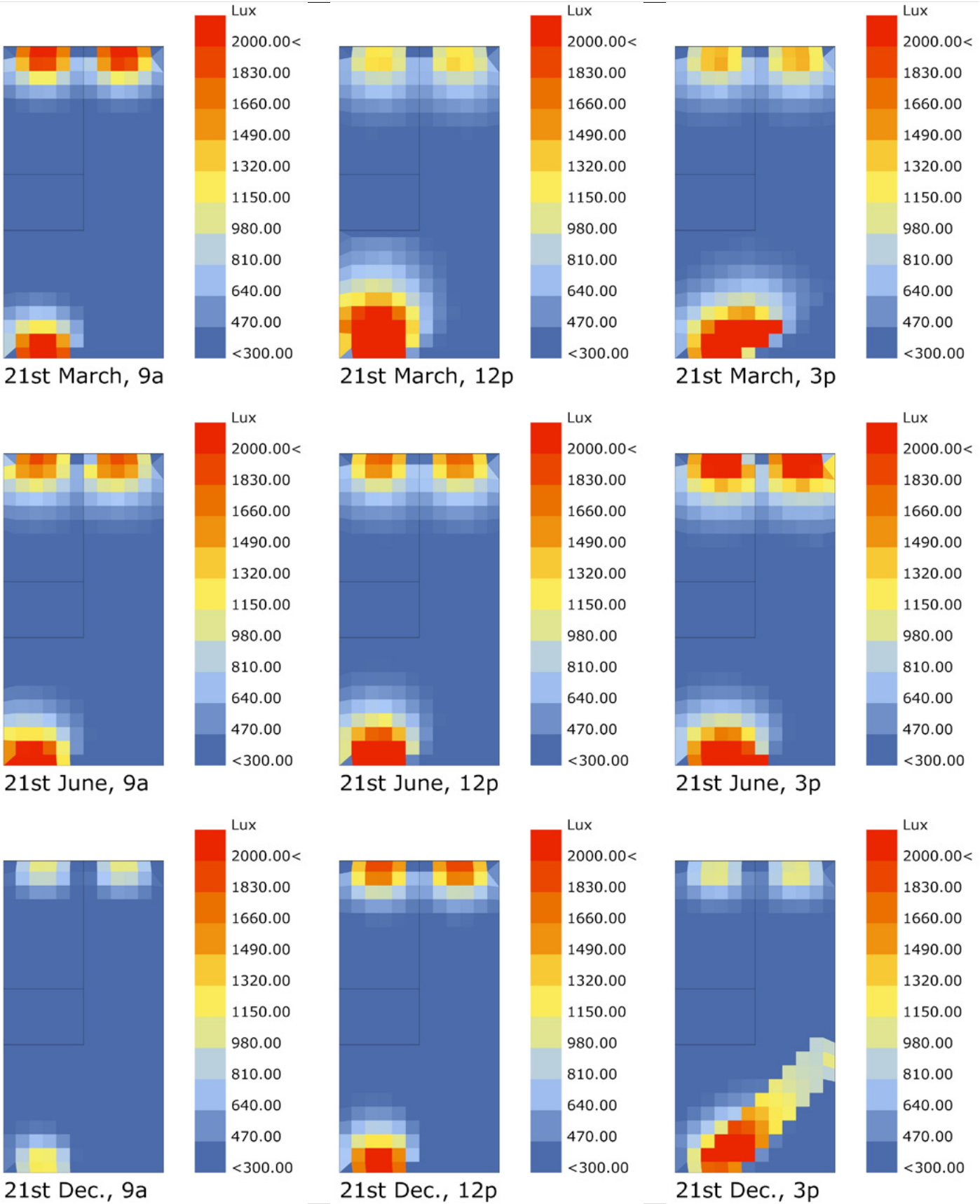
Base Case Analysis

To start, I run the simulation using the present condition model to figure out the base condition. From the result on the right, we can find that the bedroom have enough daylight near the window, but not enough light in deeper areas. Also, the living room cannot get enough sunlight during the daytime throughout the year. Moreover, we can find that the south window are quite easily to go beyond the 2000lux during day time, which may cause glare.

To improve the situation, I firstly change the proportion of the window, from the large opening to several arrayed linear window to reduce the glare. Then, to top points of the window are moved up to improve the inner daylight condition.



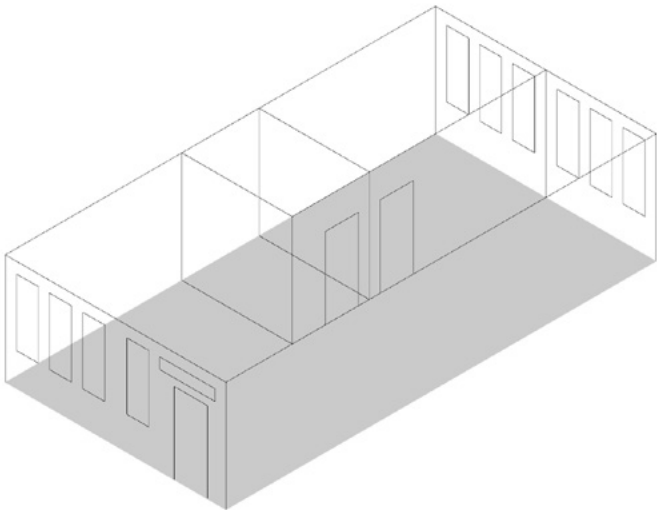
.epw file information :
Location : Philadelphia International Airport
Data Type : TWY 3



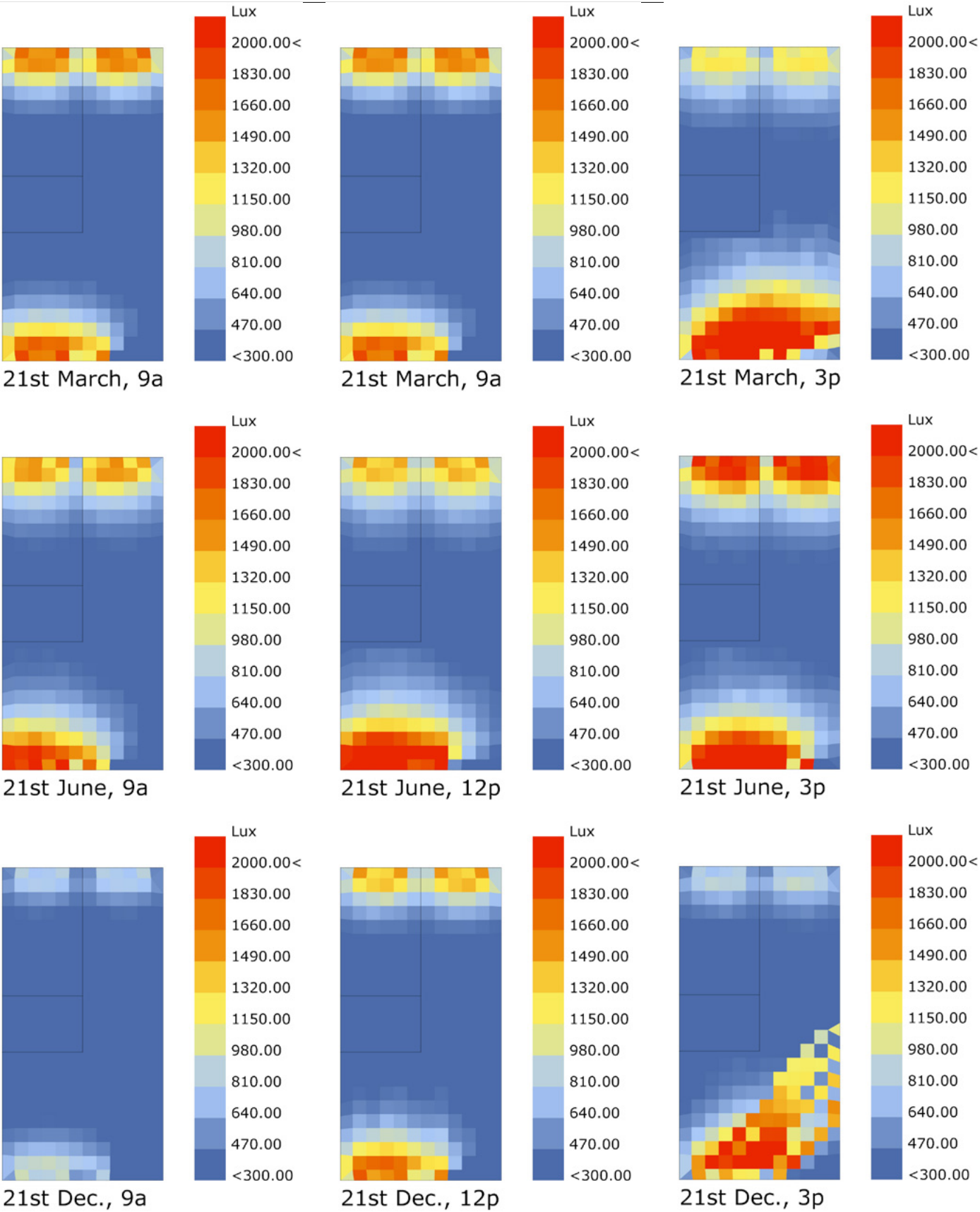
Change Window Proportion, Quantity and Height

From the result, we can find that the arrayed narrow window can reduce the over-light efficiently without adding extra sun shader, which works well for north windows. However, the south window is still over-light. And now we still cannot get enough light for the middle part of the living room.

To improve this situation, south windows again become more narrow, trying to reduce the glare, and become denser to insure enough light in. For the middle part of the living room, we add some eastern window as an extra light source.



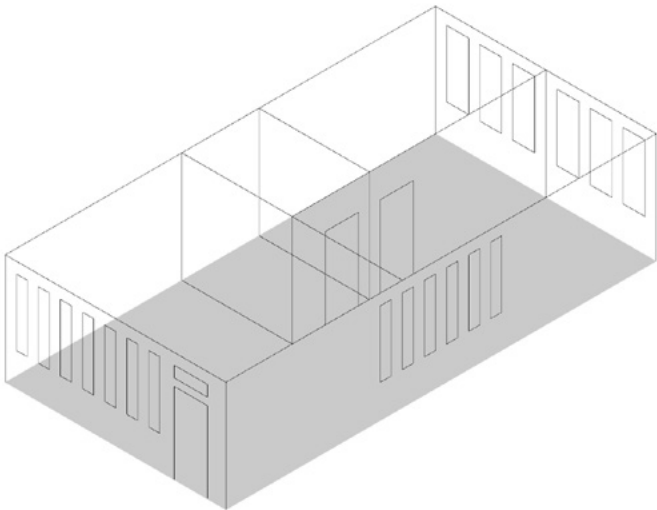
.epw file information :
Location : Philadelphia International Airport
Data Type : TWY 3



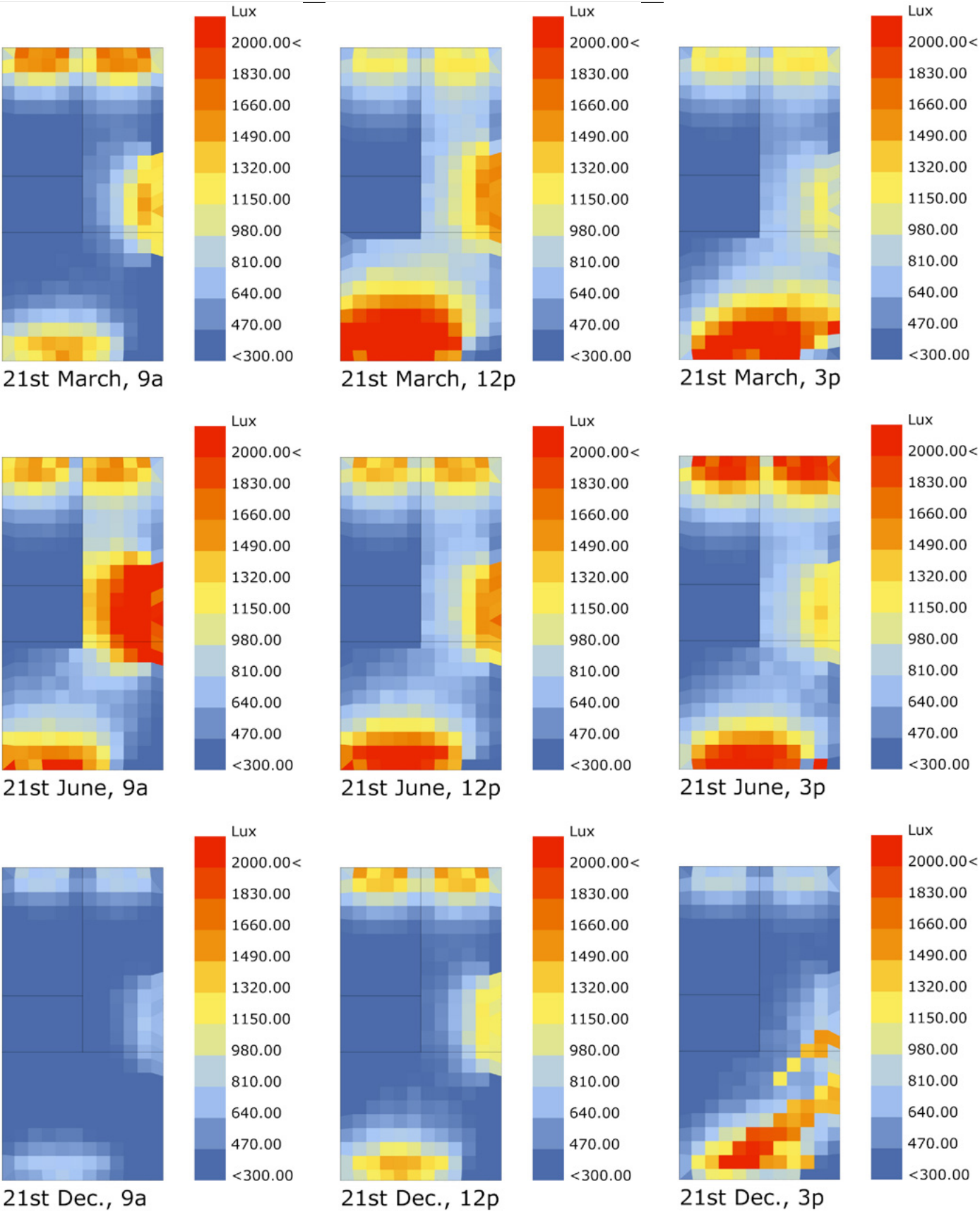
Add Eastern Window

From the result, we can find the eastern windows work pretty good!
However, the south window still have over-light situation for most of time throughout the year.

As it is a south window, a horizontal sun shader is added to block extra sunlight. For the north windows, they have already work good enough, which almost won't cause over-light throughout the year. So we can get rid of the north sun shader.

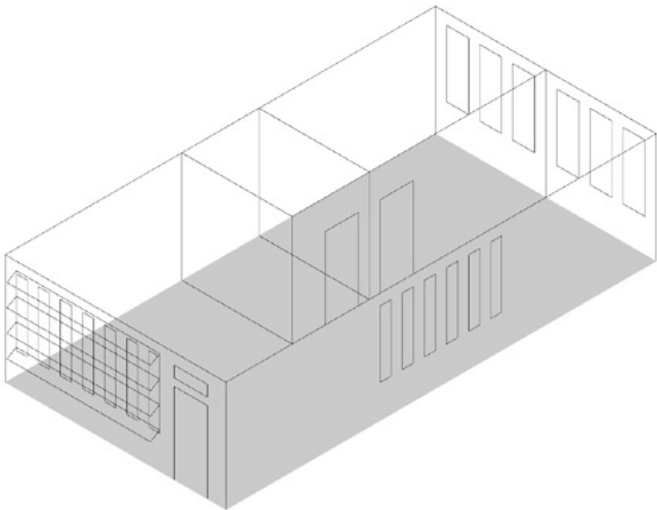


.epw file information :
Location : Philadelphia International Airport
Data Type : TWY 3



Add South Sun Shader

From this simulation result, we can find that for most of time during the year, the daylight situation are suitable - not too much over-light and most of time have enough daylight to light up the space. We can find that at 9a on 21st June, there are sitll over-light situation around eastern window, but such over-light soon disappear after only 3 hours. If a sun shader is added, it will block the light and causing not enough light for the rest of time. Taking everything into consideration, we can treat this as a proper solution for interior daylight.



.epw file information :
Location : Philadelphia International Airport
Data Type : TWY 3

