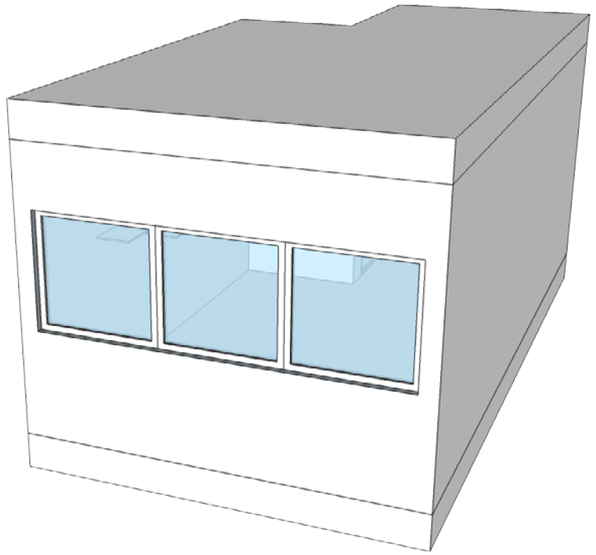
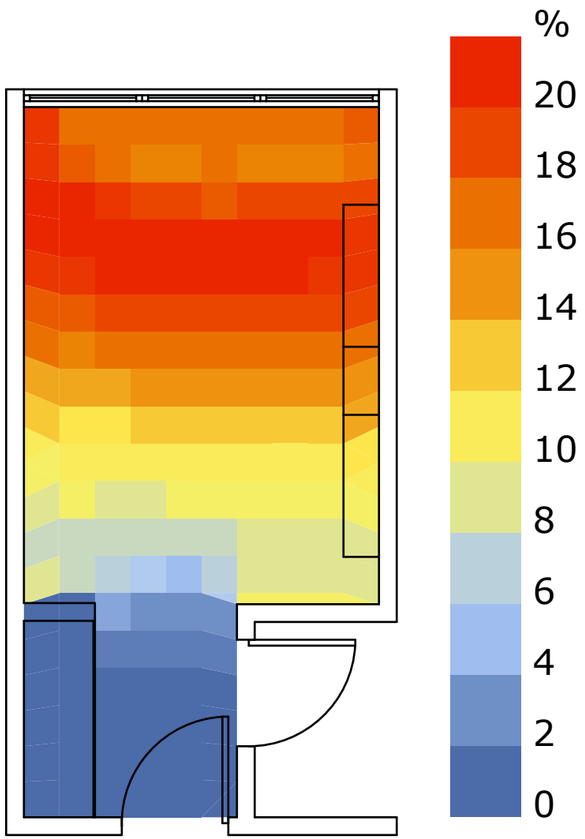


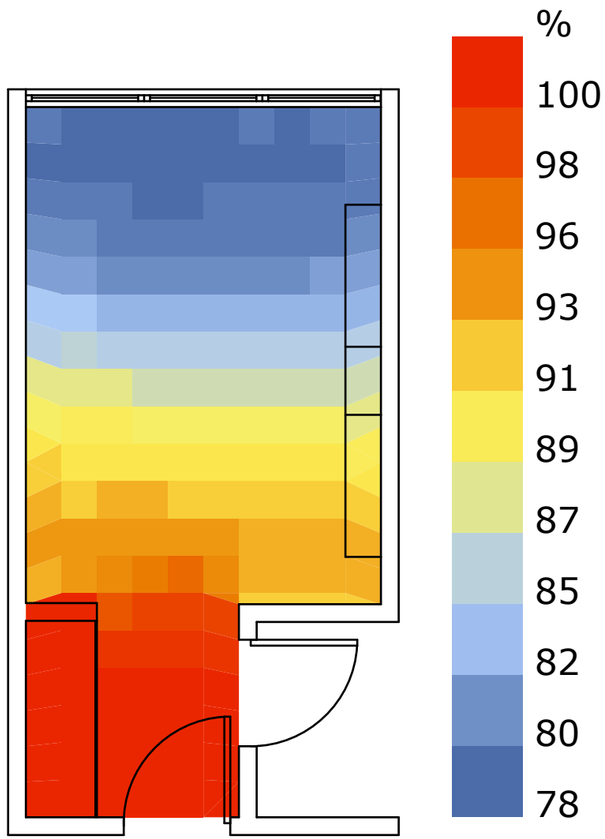
Base Case

The annual daylight analysis on the base case room is performed according to a university student's dormitory occupation period. This means that the room is set to be occupied from August to May, between hours of 4pm to 9am. Thus, when interpreting the daylgiht analysis results it must be considered with the fact that most of the time the room is occupied will be during times when the sun is down.

For this base case room, the useful daylight illuminance maximizes at around 20% of the time for the year during the occupied hours. The band receiving the most useful daylight takes up about a third of the room around the northern-middle part of the room. The area immediately under the window receives too much sunlight for about 6% of the occupied time, while the far end of the room where the door is located doesn't receive enough useful daylight for the entirety of the occupied time. The southern half of the room also does not receive enough daylight for more than 90% of the occupied time. Any design proposal for the improvement of daylighting in this room should try to increase useful daylight levels in this part of the room.



UDI - 100<2000 lux



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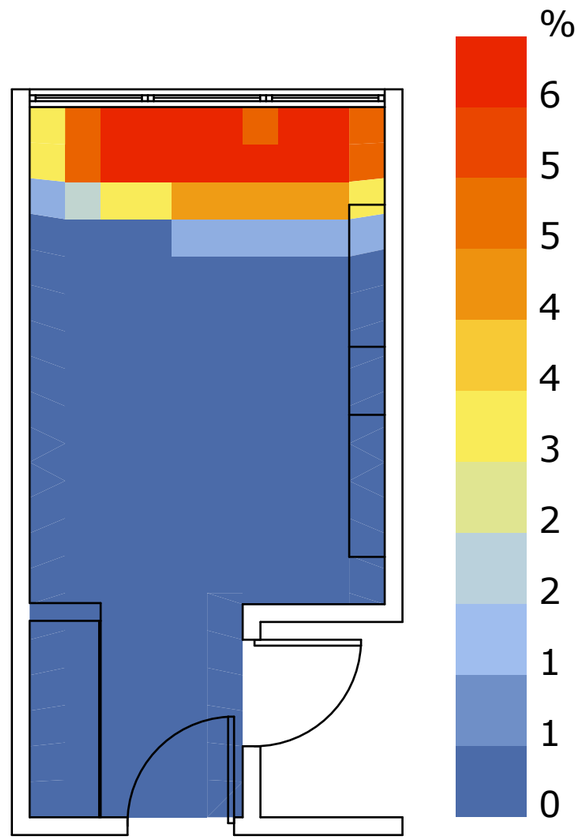
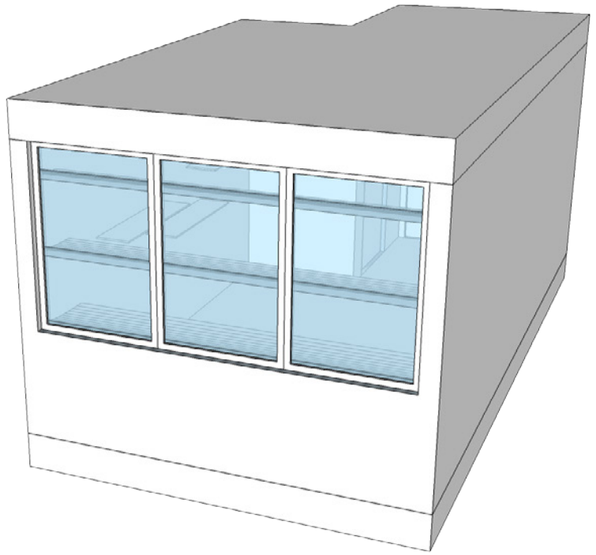


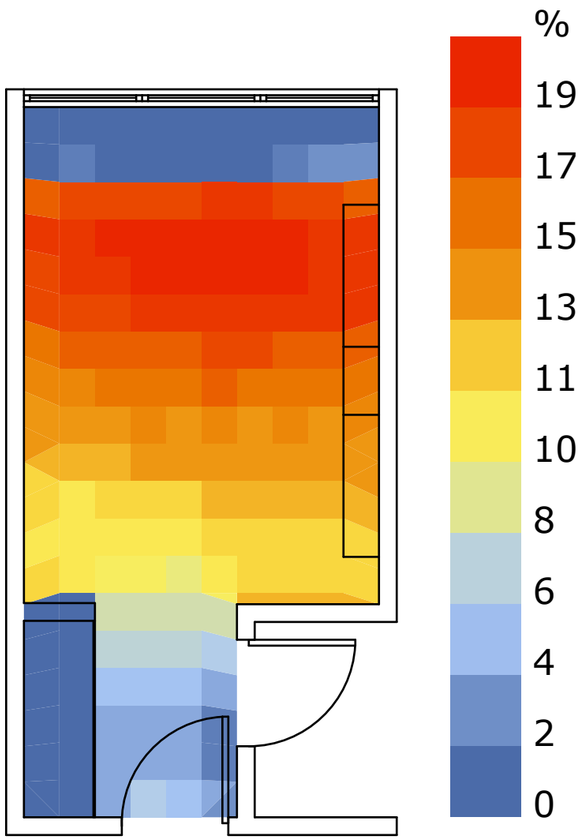
UDI - >2000 lux



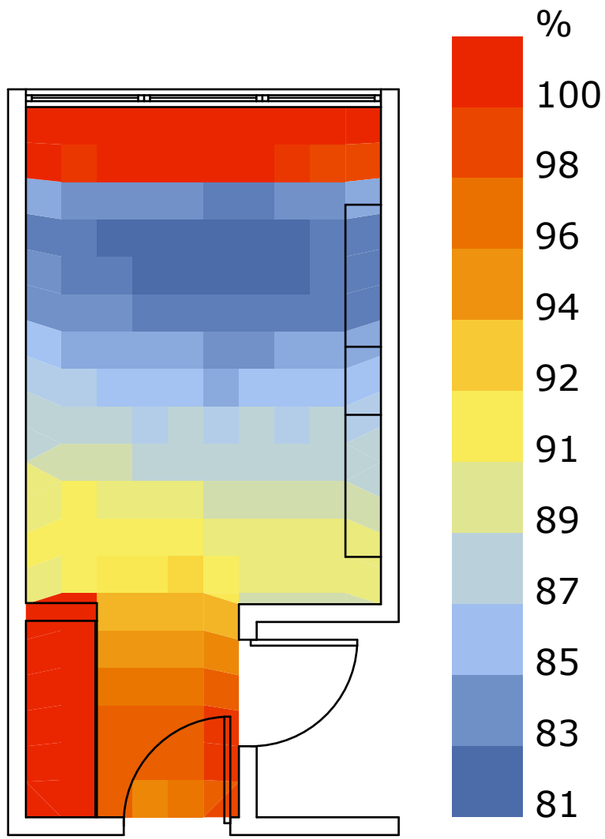
Design proposal from point-in-time analysis

This is the design of using three light shelves with glazing increased to reach the ceiling level that was proposed after doing a 9 point-in-time analysis of the room. This design does help increase useful daylight illuminance into the farther end of the room, raising the useful daylight levels there to around 11% from the previous 6-8%, and in the very end of the room where the door is located, to about 4% of the time compared to the 0% of the base case. However, this improvement is not significant, and the bottom light shelf casts a shadow on the area immediately under the window so that it does not receive enough daylight for the entirety of the occupied time.

One thing to note about this design is that there is no part of the room that receives too much daylighting in the entire occupied time. As consistent with the 9 point-in-time analysis, this design completely eliminates the problem of having too much sunlight and glare. The next step in a design improvement to this room would look at trying to significantly increase daylighting levels in the used areas of the room while minimizing the shadow cast by the light shelf.



UDI - 100<2000 lux



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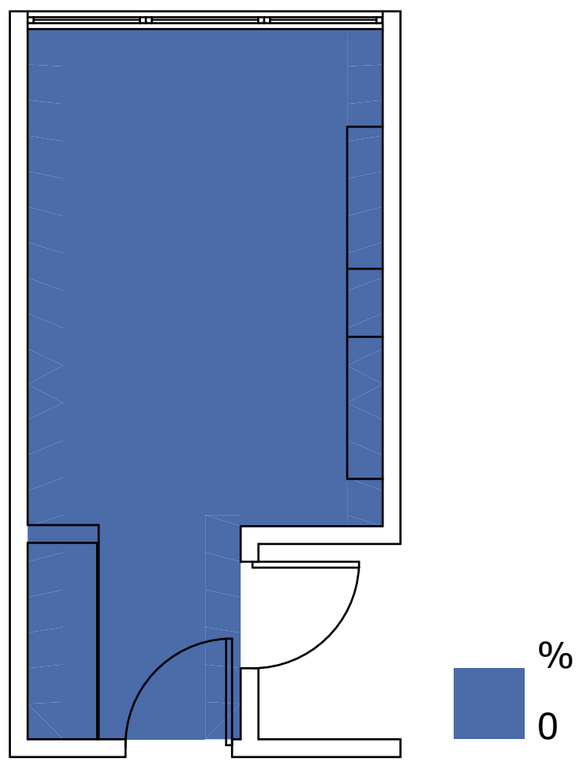

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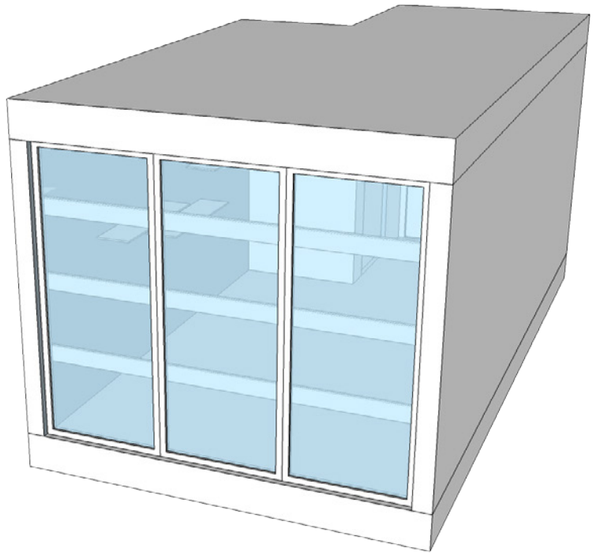
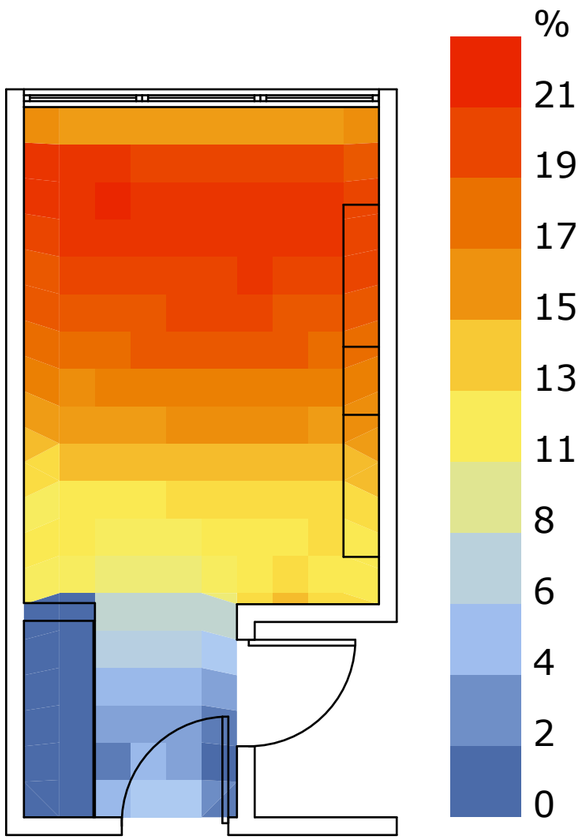


New design to increase daylight

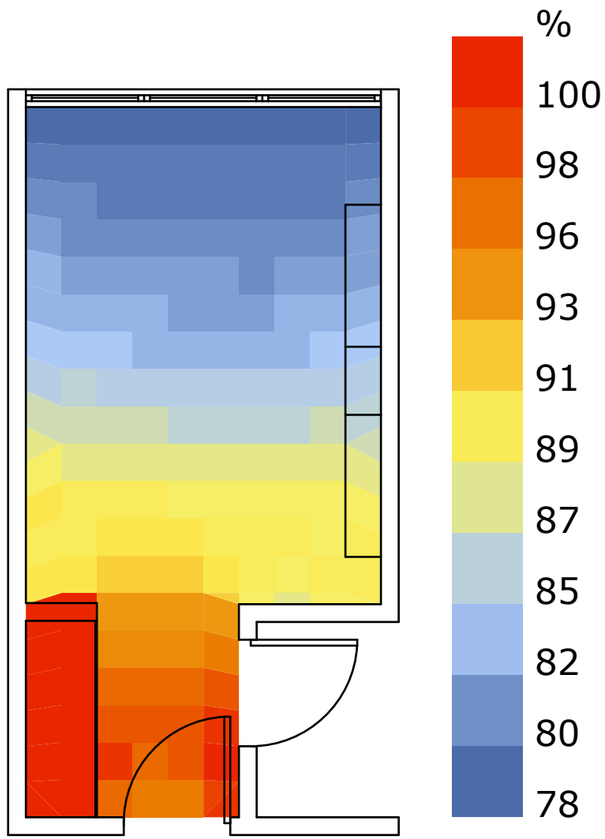
Firstly, to introduce more useful daylight into the room, the glazing has now been increased to reach full floor-to-ceiling height. This helped increase the useful daylight levels in the room up to 21% of occupied time, and the middle part of the room where it is occupied the most receives useful daylight for 15-17% of the time, compared to the 13-15% of the time of the previous design.

Secondly, the light shelves are placed so that they do not cast a hard shadow on the area immediately under the window. This does increase the daylight levels received in this area so that it receives too much sunlight for about 8% of the time, but note that the area is a much smaller band compared to the base case where a large area receives too much sunlight.

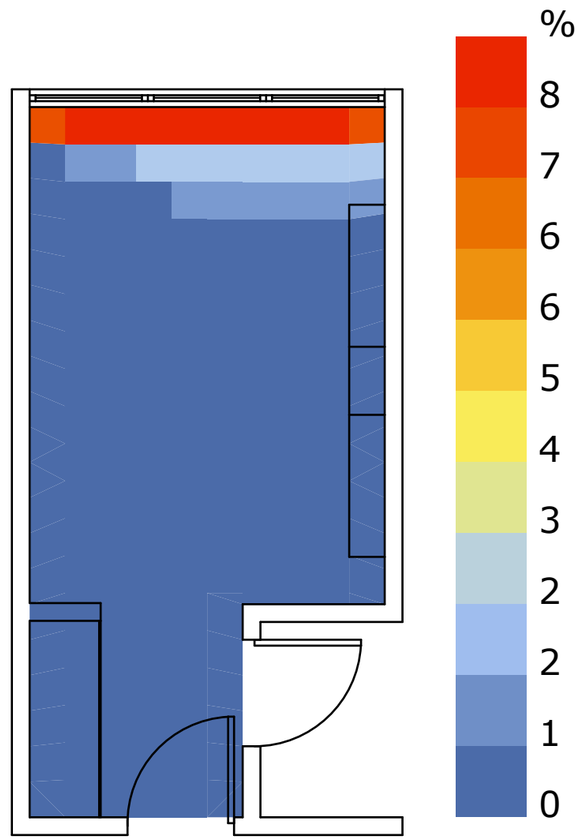
Overall, this design increases the amount of time that the middle and southern half of the room receives useful daylight while reducing the area that receives too much sunlight under the window as compared to the base case.



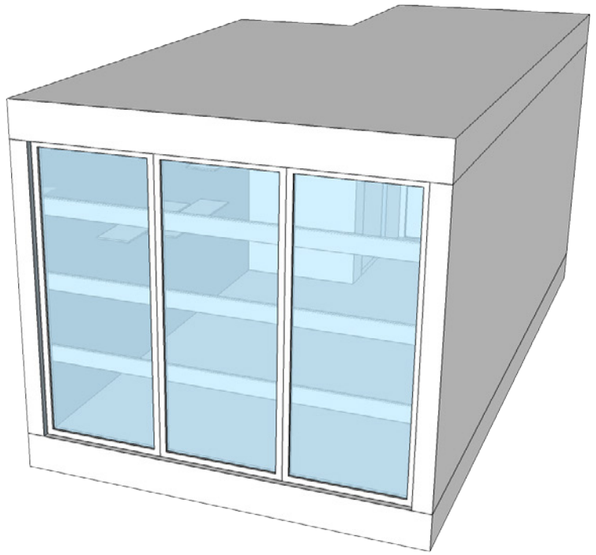
UDI - 100<2000 lux



UDI - <100 lux



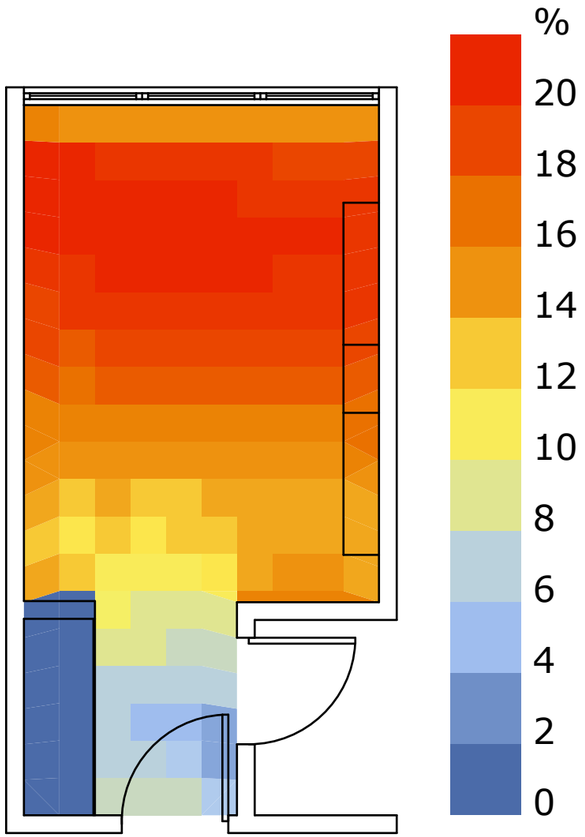
UDI - >2000 lux



New design - with 80% reflectance material

Finally, just to test the same design with a different material parameter, the walls of the room are set to have a reflectane of 80% while the floor is set to have 60% reflectance. This new parameter helped to improve useful daylight illuminance in the deeper parts of the room. Although useful daylight illuminance now maximizes at 20%, the same as the base case, the middle part of the room, where it is occupied the most, receives useful daylight for about 16-18% of the time, up from the 12-14% of the base case and the 15% of the previous design. The amount of time that the southern half of the room does not receive enough daylight also decreases to 87% of the time as compared to the more than 90% of the base case. At the same time, the area under the window that receives too much sunlight (for about 8% of the time) does not increase too much. It is still a small band of area compared to the base case.

To conclude, increasing glazing area and material reflectance of the room helps increase the amount of time the overall area of the room receives useful daylight, while placing light shelves strategically reduces the area of glare potential under the window.



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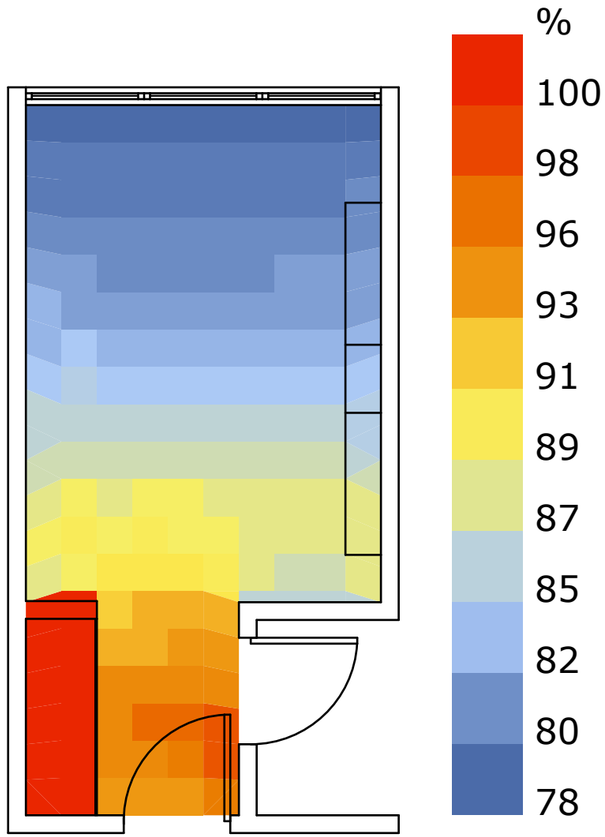

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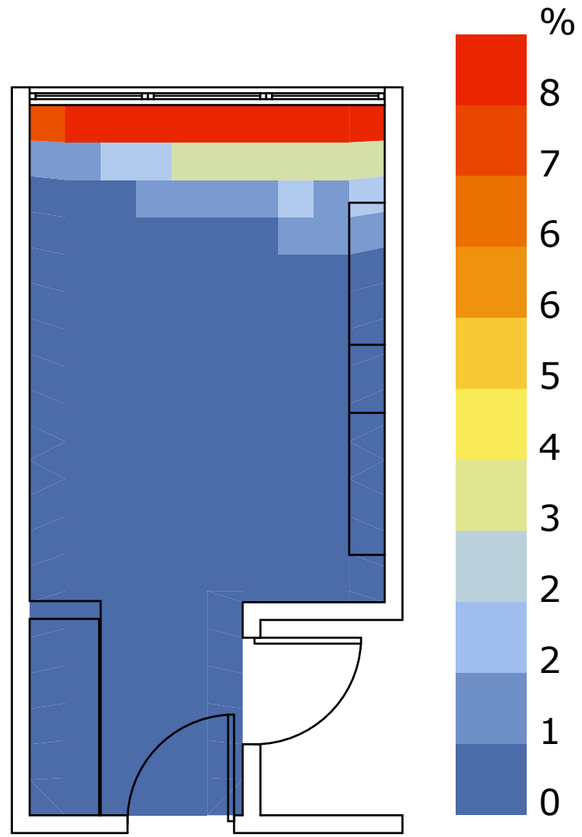

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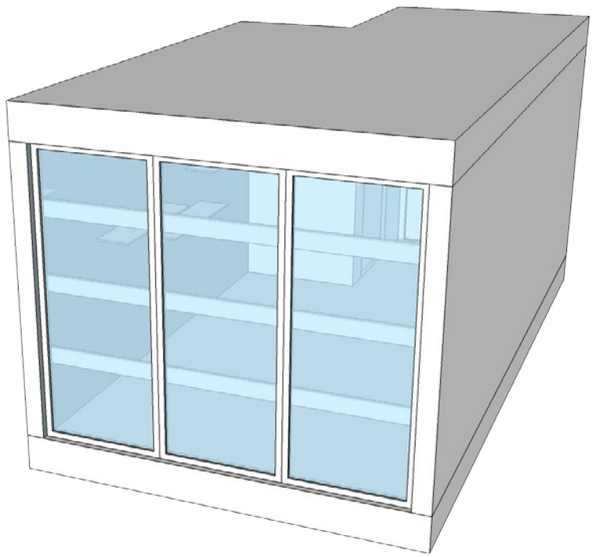
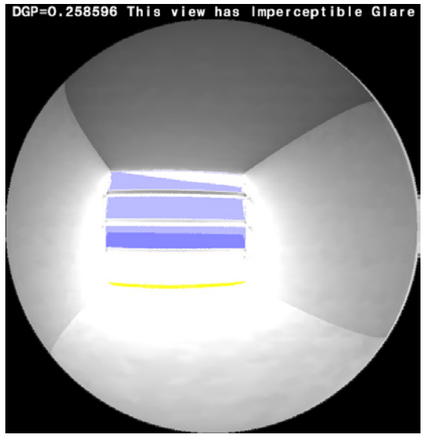
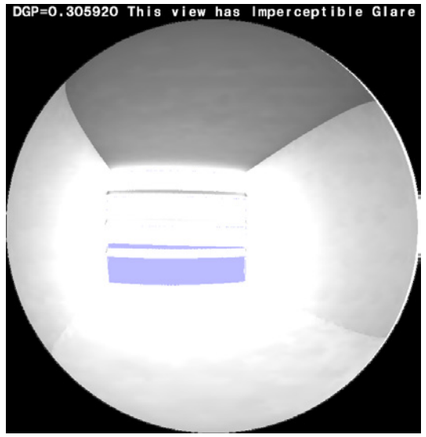


Glare analysis

For the analyzed view of this room, the glare is imperceptible for all 9 points-in-time. The day-light glare potential maximizes at about 0.3245 at noon on March 21, and reaches a minimum of 0.2347 on the morning of December 21. This is consistent with the annual daylight analysis of this design showing that really only a small strip of area under the window receives too much sunlight. Otherwise for most parts of the room there should be imperceptible glare.

	09:00	12:00	15:00
Mar 21			
Jun 21			
Dec 21