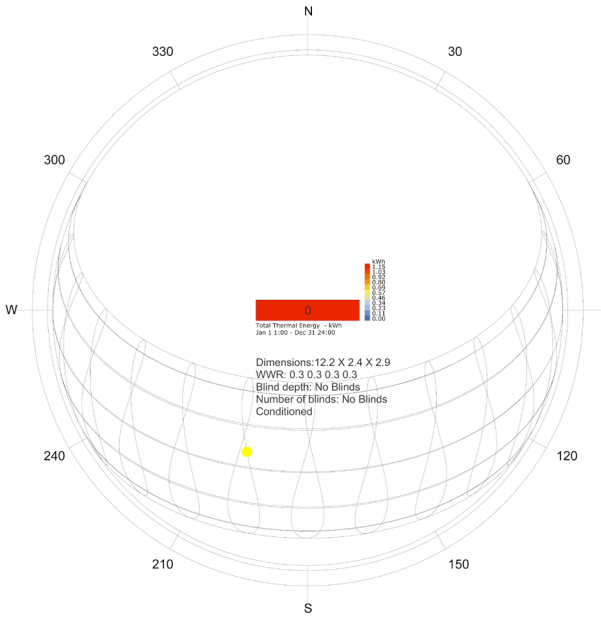
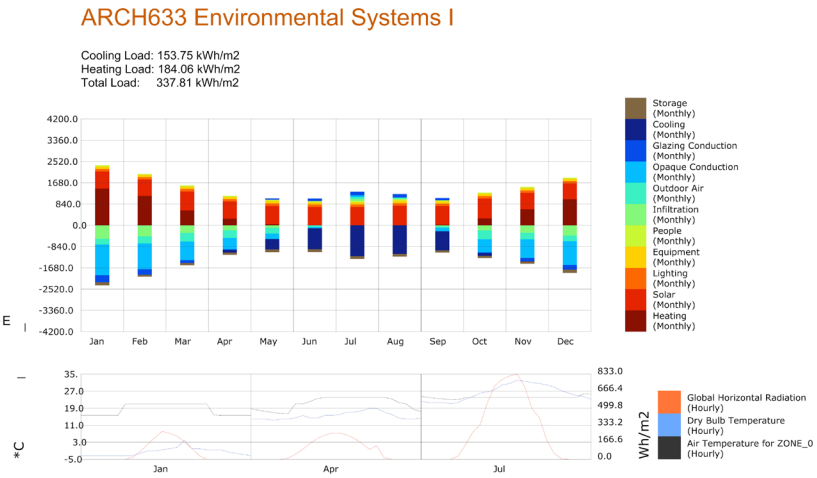
Assignment-
10_Energy_Balance

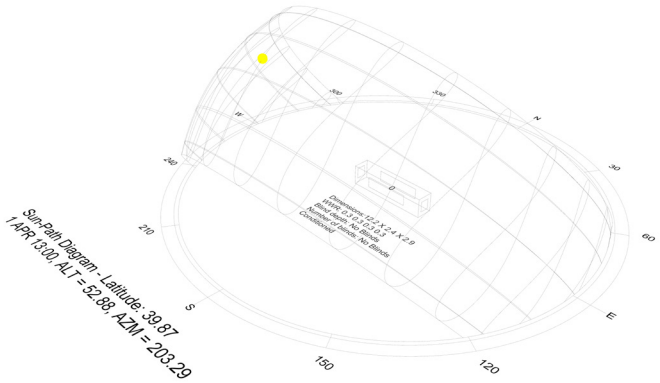
Shih-Kai Lin

Simulation 01



Sun-Path Diagram - Latitude: 39.87
1 APR 13:00, ALT = 52.88, AZM = 203.29

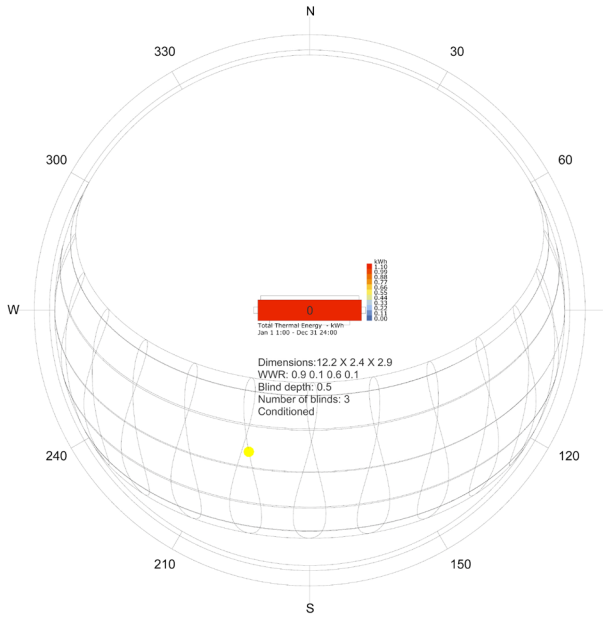




Total Load: 337.81 kWh/m2

Default Setting

Simulation 02



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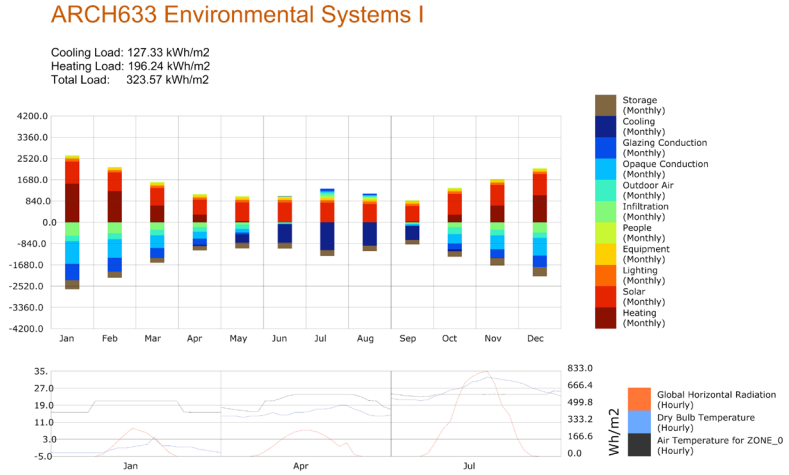
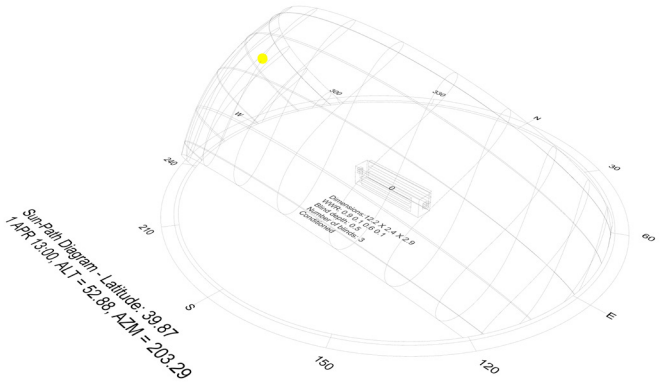
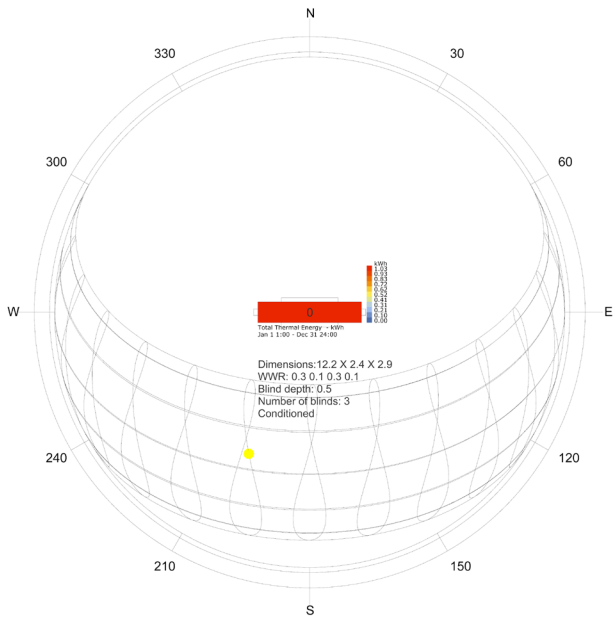




Total Load: 323.57 kWh/m2

By reducing the openings on East and West side, enlarging the openings on North and South side, and adding blinds, the total load slightly reduces.

Simulation 03



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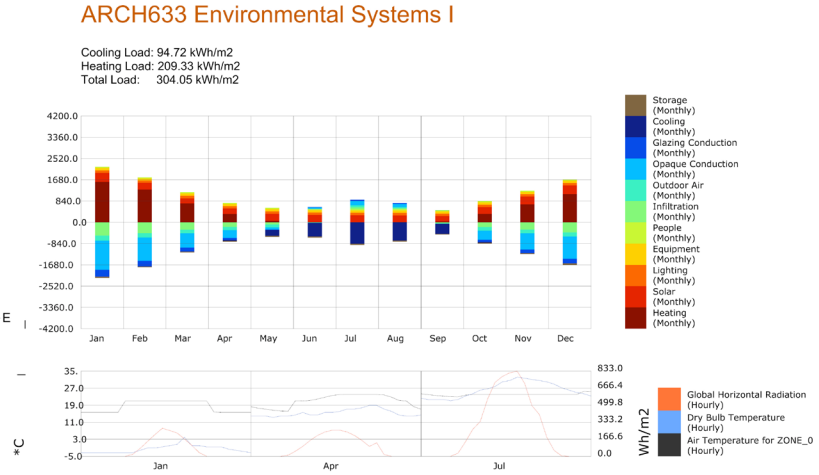
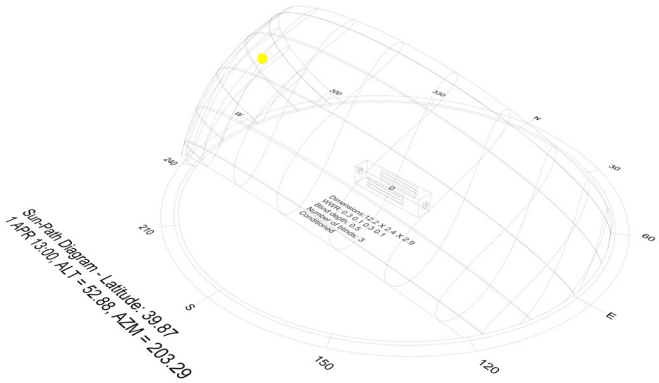
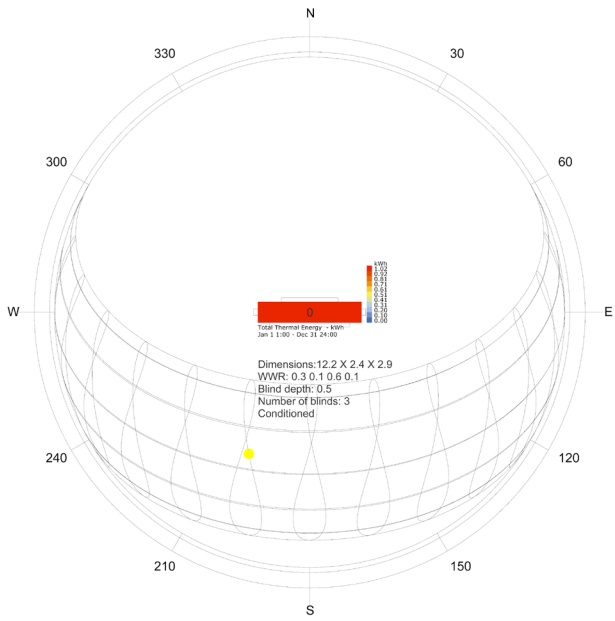




Total Load: 304.05 kWh/m2

Based on the setting for simulation 2, I shrink the opening on both North and South side. The tatal load reduces. However, it creates a huge difference between cooling and heating loads. Minimizing the opening effectively reduces the cooling load but at the same time increace the heating load since the solar radiation in winter through opening is reduced as well.

Simulation 04



Sun-Path Diagram - Latitude: 39.87
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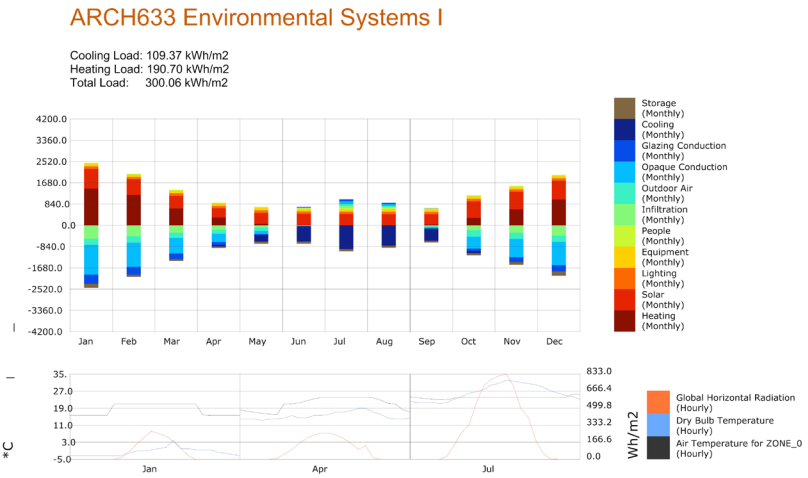
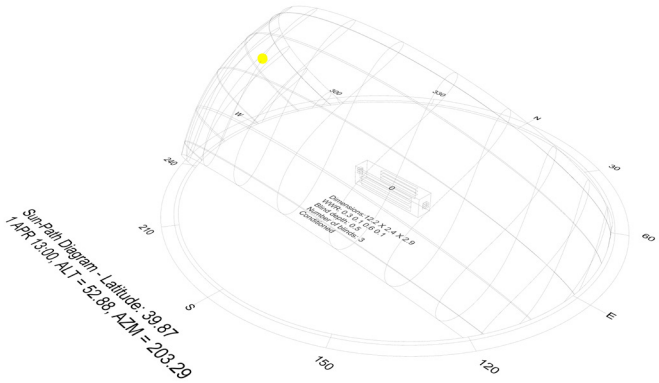
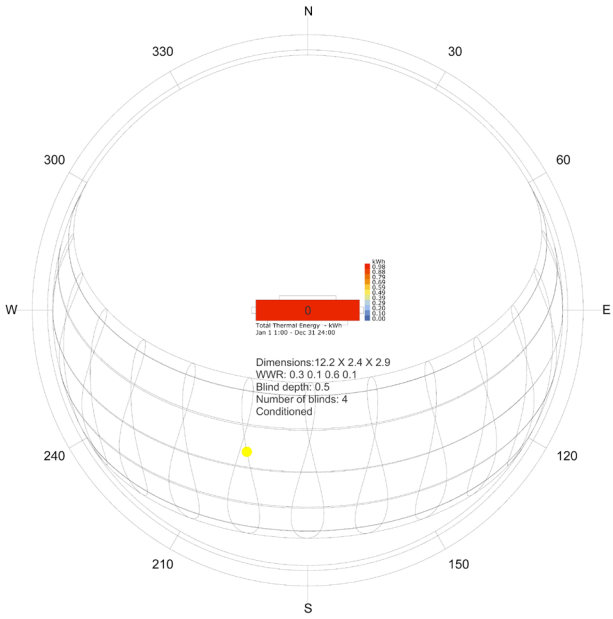




Total Load: 300.06 kWh/m2

Based on the setting for simulation 3, I enlarge the onpening on the South side in order to get solar radiation in winter and reduce the heating load. As a result, the difference between cooling and heating load is balanced and further reduced the total load slightly.

Simulation 05



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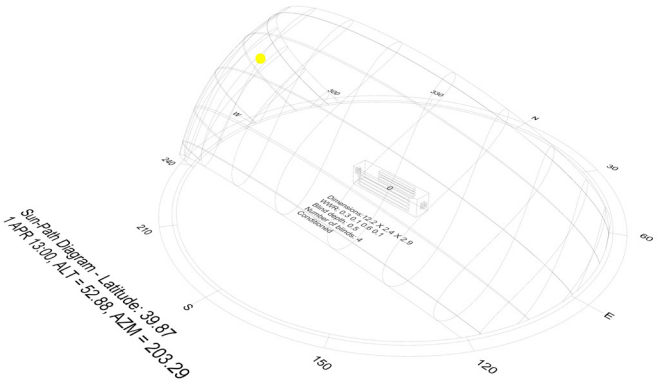
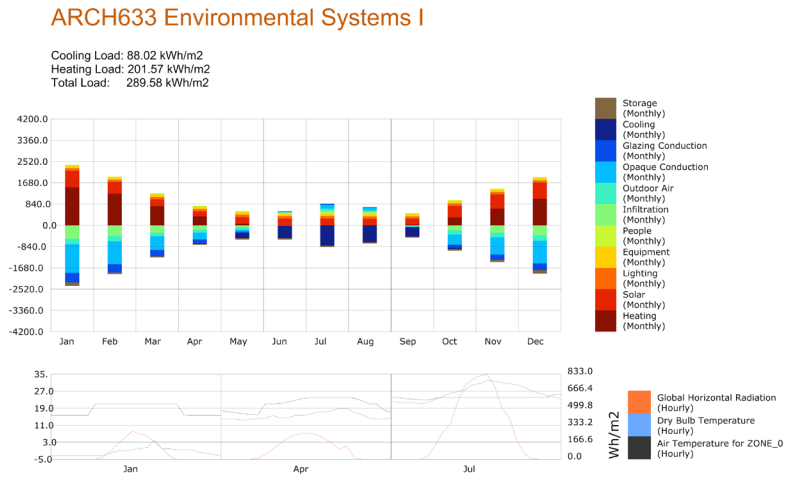
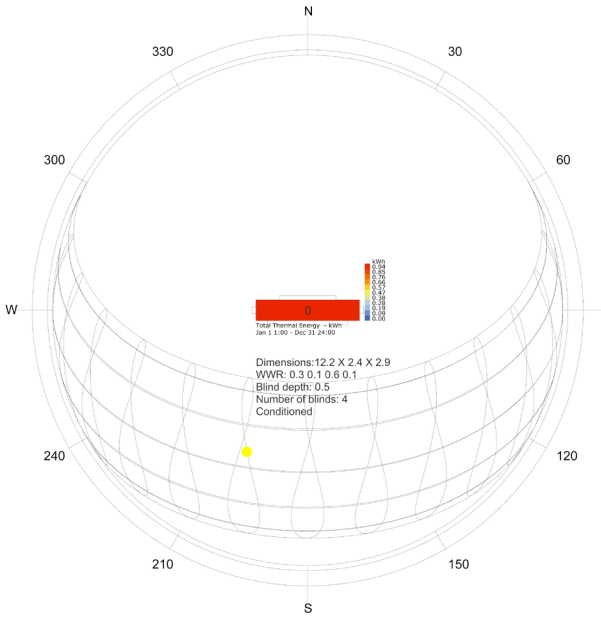




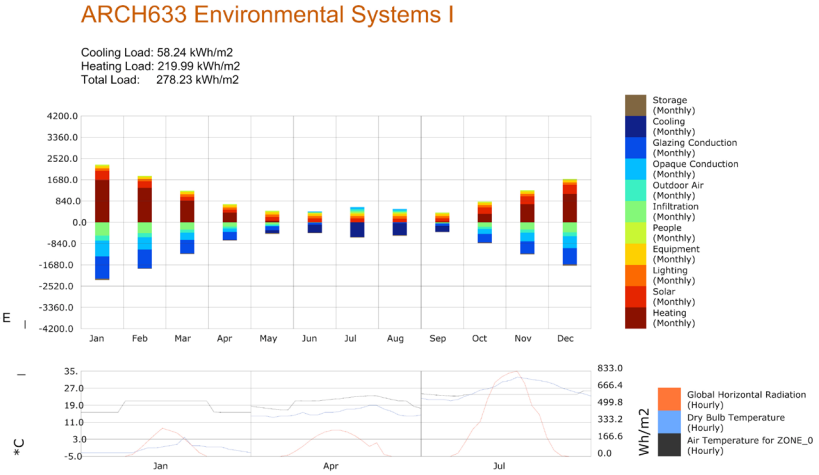
Total Load: 289.58 kWh/m2

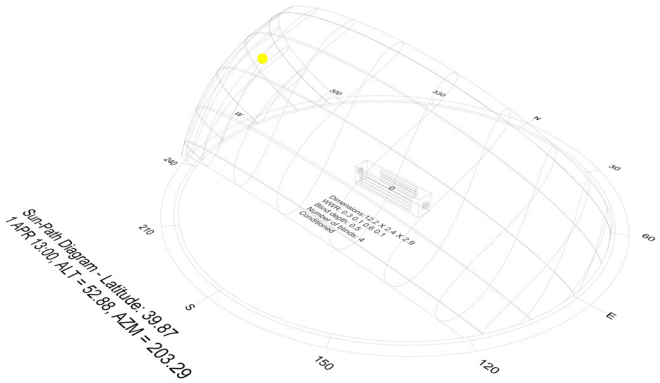
Based on simulation 4, I increase the number of bilnds, which further reduces cooling load and results in a lower toal load. But, still, the heating load is increasing by doing that.

Simulation 06



Sun-Path Diagram - Latitude: 39.87
1 APR 13:00, ALT = 52.88, AZM = 203.29

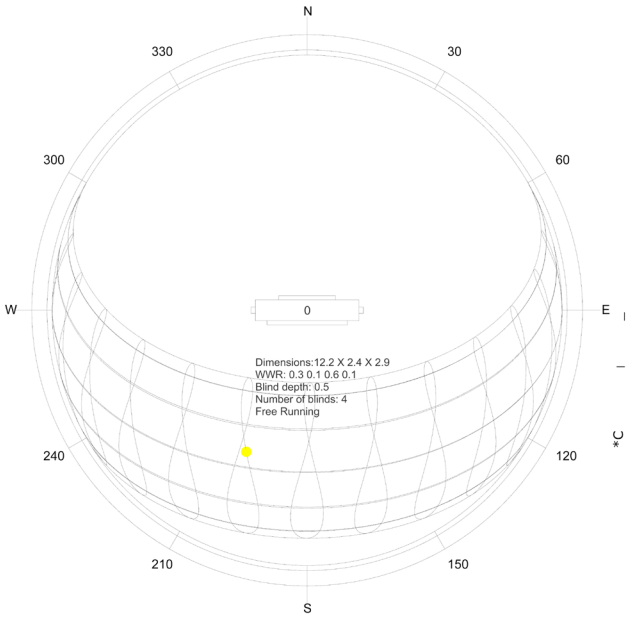




Total Load: 278.23 kWh/m2

Based on simulation 4, I optimize the performance of the wall, window and roof by using the material with better R-value, which reduces the cooling load a lot but slight increases the heating load.

Simulation 06 - No System



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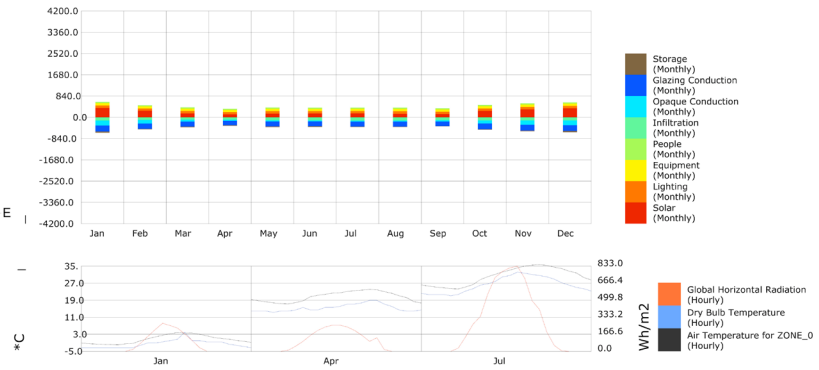

- In my simulation, the most effective parameters would be the wall to window ratio and the blinds, especially on effecting the cooling load in Summer.

-The temperature range inside the container with no systems after applying all the changes would be -1 to 4 *C in Winter and 25 to 36 *C in Summer.