

# **ENERGY MODELLING FOR A ROOM IN PHILADELPHIA**

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# ENERGY MODEL OF THE EXISTING SCENARIO

Existing Design with shading, with updated materials  
(ASHRAE 90.1-2010 EXTWALL MASS CLIMATEZONE 4)

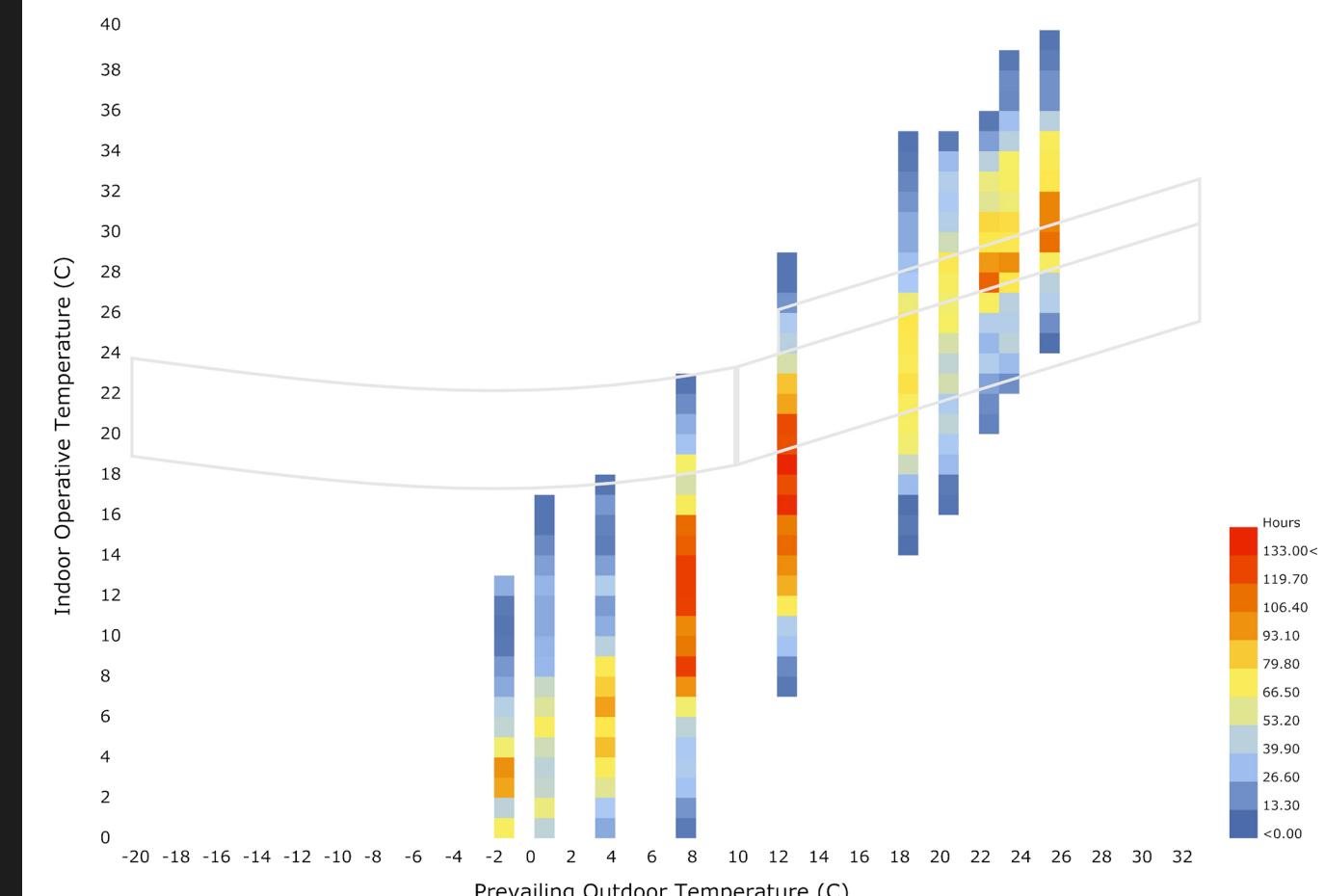
Percentage of time when it is comfortable : 17 %

Percentage of time when it is hot : 31 %

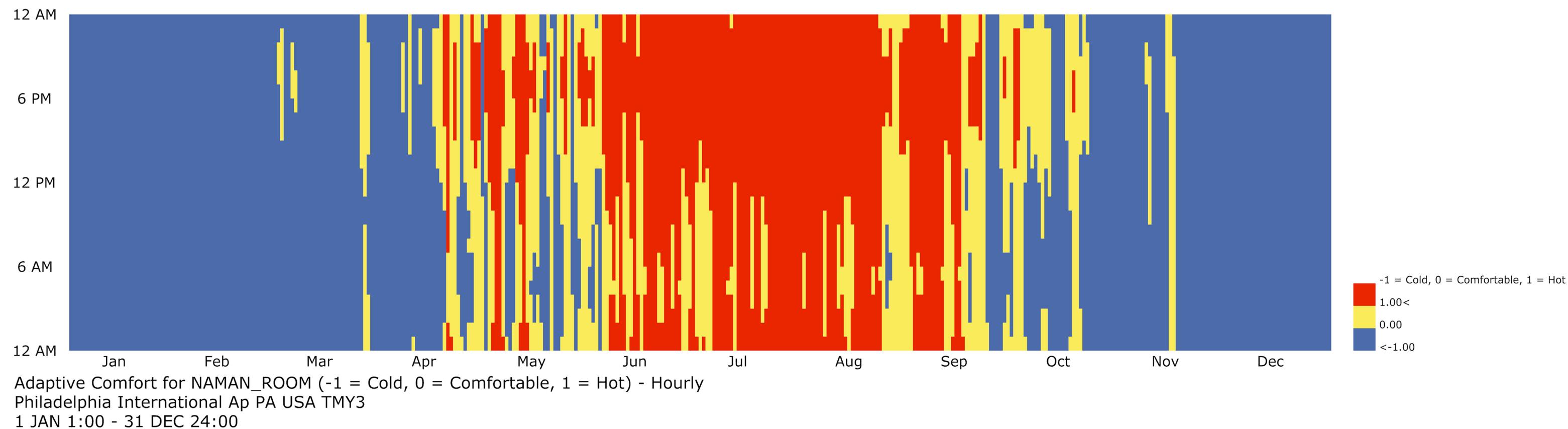
Percentage of time when it is cold : 51 %

We have a higher percent of cold stress. So we can increase the window size and remove the shading.

We can also increase the r value of the material , which will provide a better insulation to the wall making the room comfortable.



**Adaptive Comfort Chart**



**Comfortable time zones for a year in Philadelphia**

# ENERGY MODEL OF PROPOSED SCENARIO

Existing Design with shading, with updated materials  
(ASHRAE 90.1-2010 EXTWALL MASS CLIMATEZONE 4)

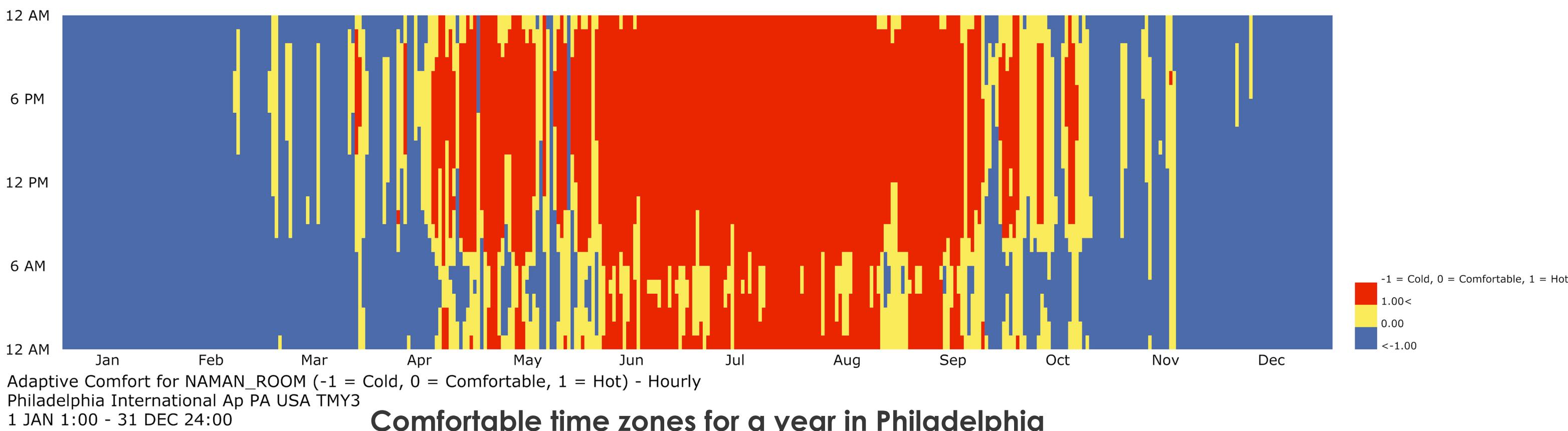
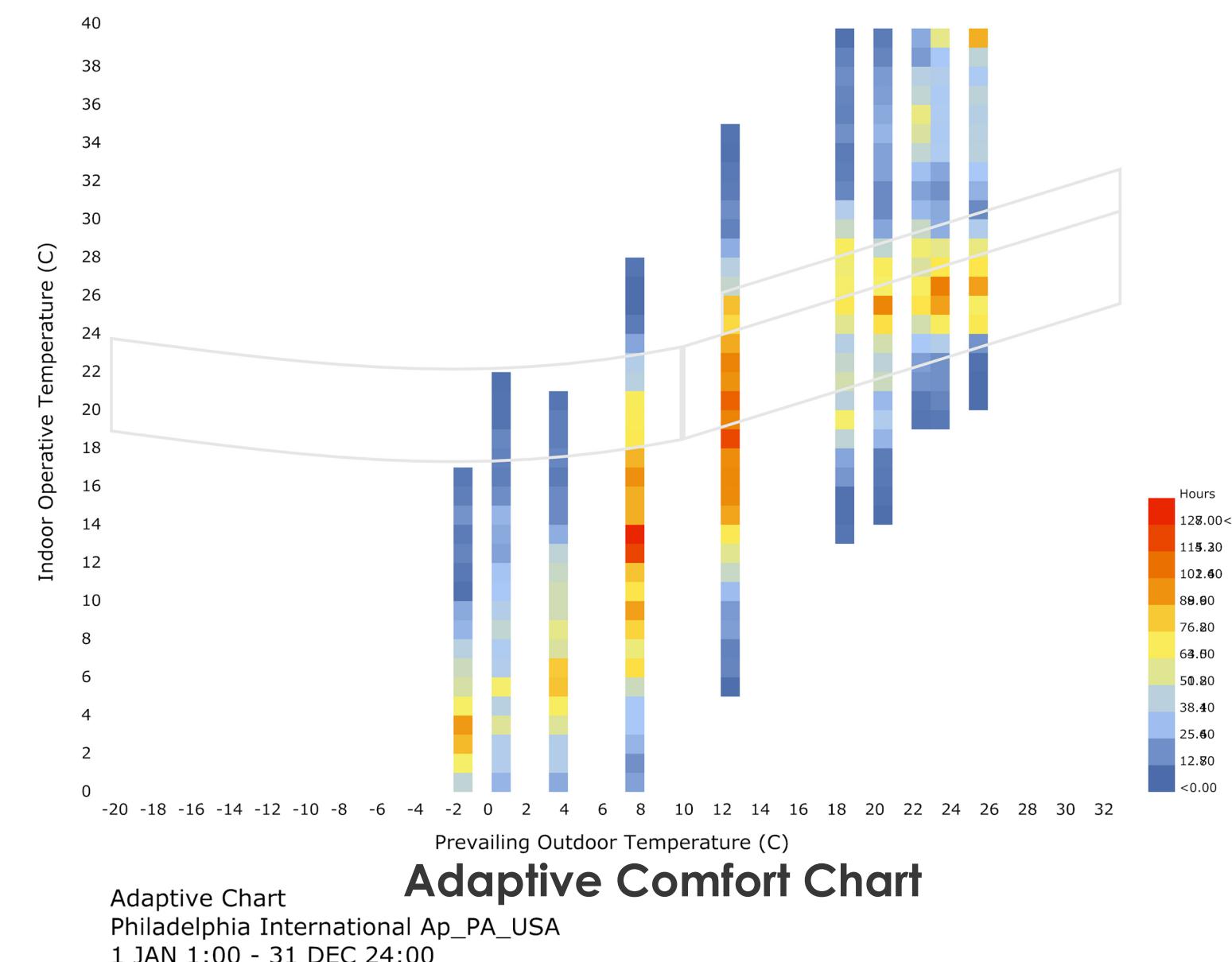
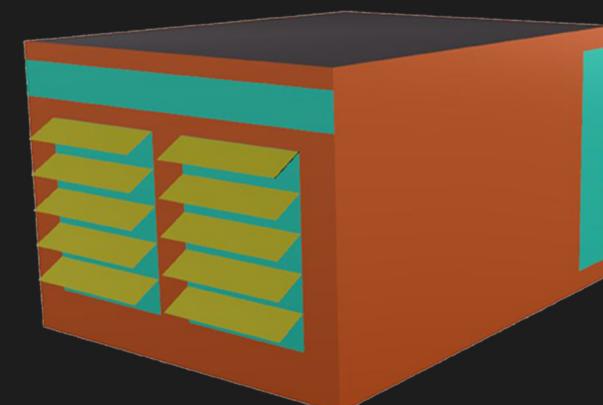
Percentage of time when it is comfortable : 17 %

Percentage of time when it is hot : 33.4 %

Percentage of time when it is cold : 49 %

The design proposed earlier  
does not perform that well in terms  
of energy which was performing  
really well in terms of daylighting.

We still have a higher percent of  
cold stress. The next step should  
be to increase the r value of the  
material .

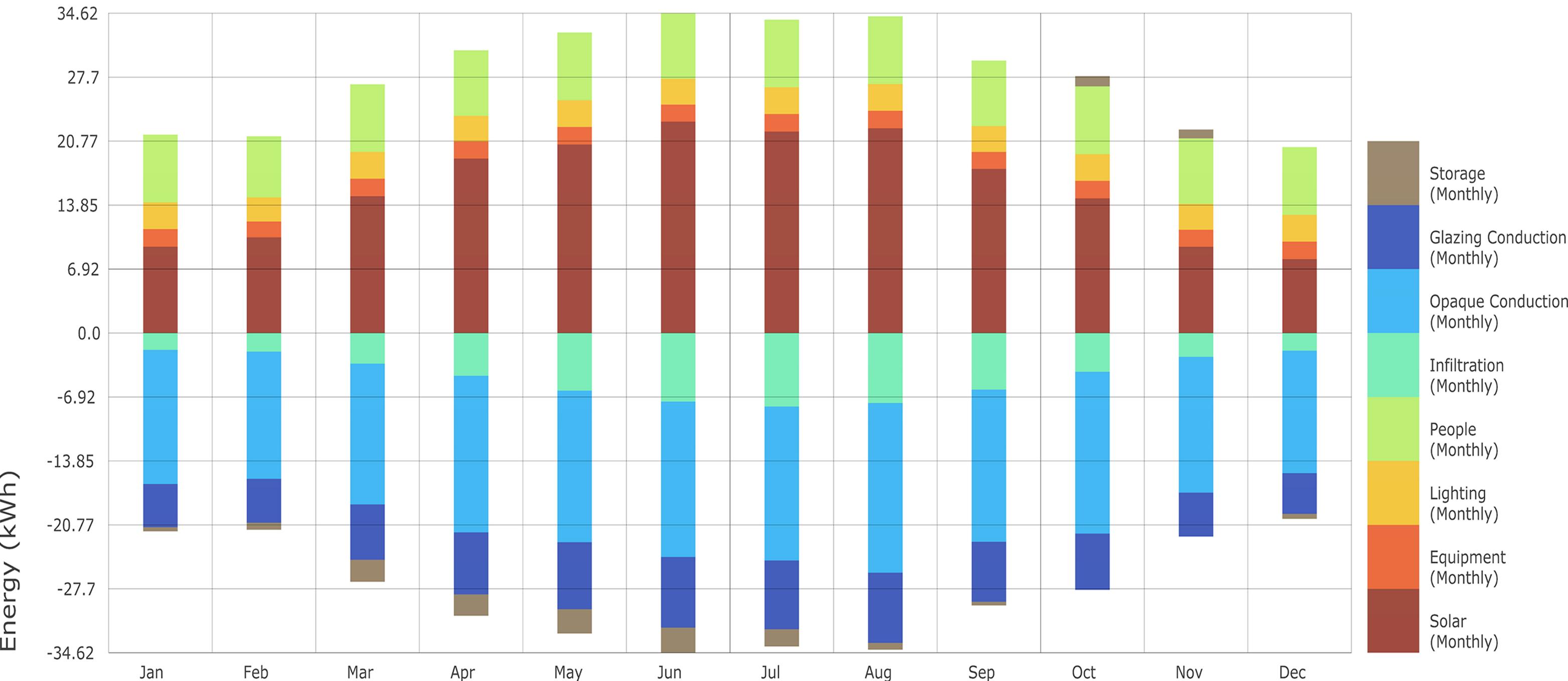


# ENERGY BALANCE OF THE PROPOSED SCENARIO

While studying the following graph we can see that the maximum amount of heat which is being added up in the room is because of the sun and the heat which we are losing is because of glazing material and majorly because of opaque conduction which is the walls.

so we could change the material of the walls and use two or three layered windows we would be able to reduce the amount of heat lost and we will be able to increase the time comfortable.

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# ENERGY MODEL OF THE PROPOSED DESIGN

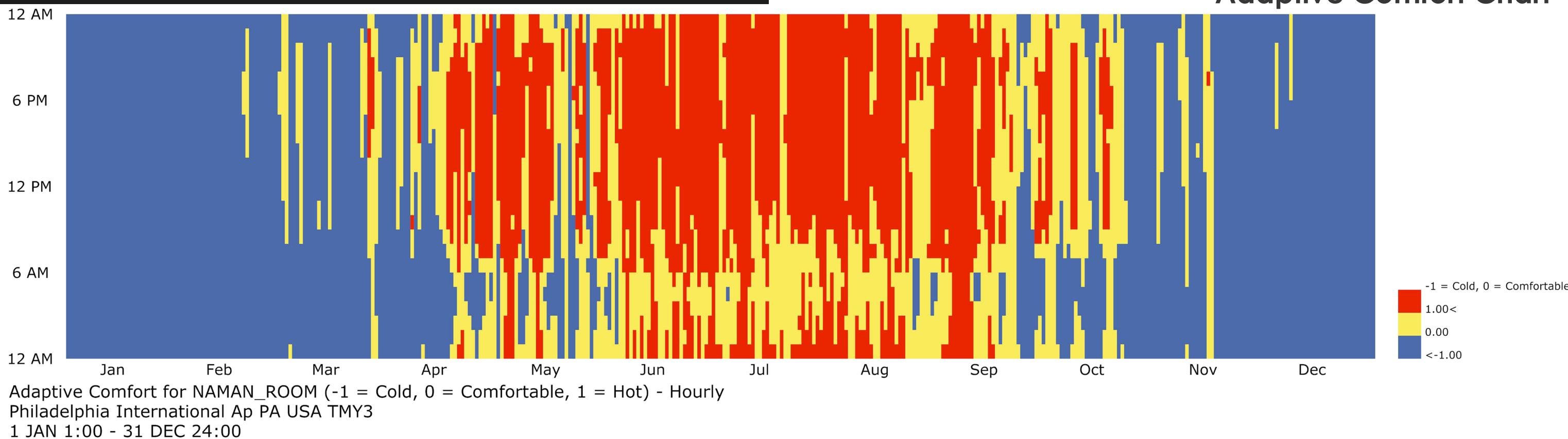
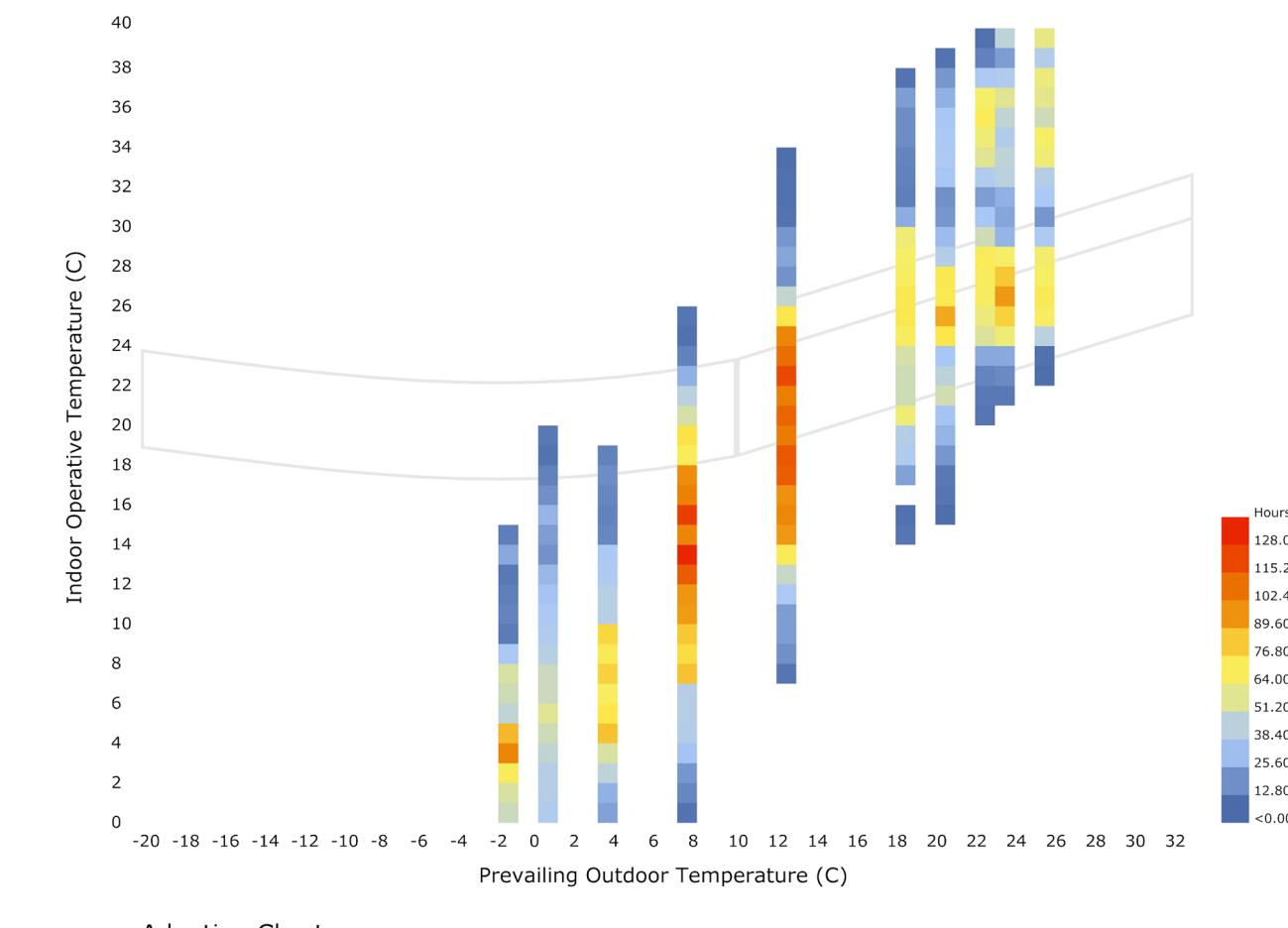
Proposed Design with shading, with updated materials  
(ASHRAE 90.1-2010 EXTWALL MASS CLIMATEZONE 4)

Percentage of time when it is comfortable : 23.7 %

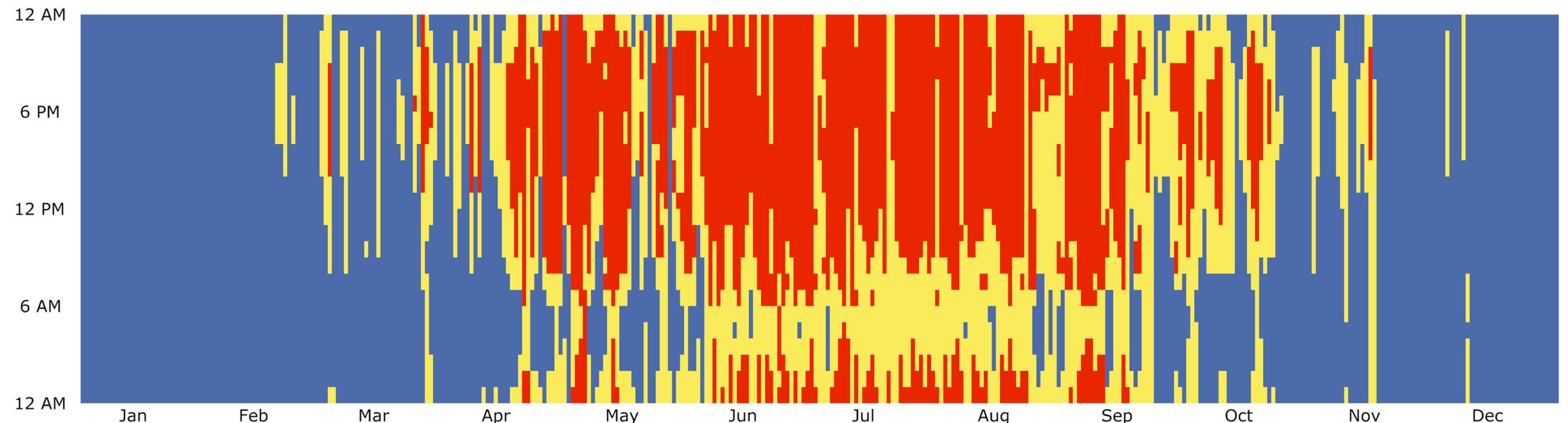
Percentage of time when it is hot : 27.1%

Percentage of time when it is cold : 50 %

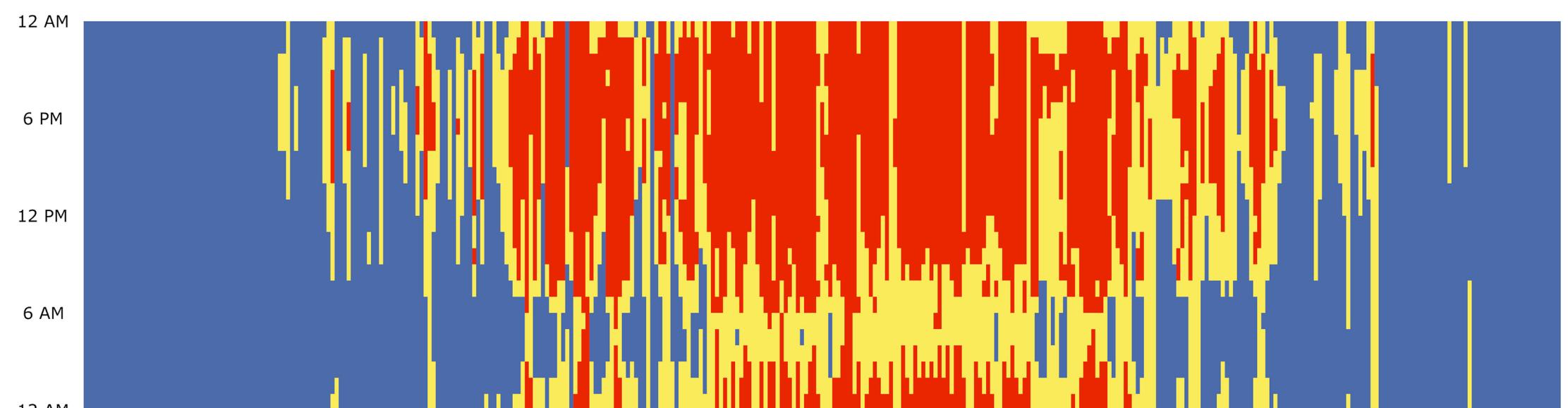
By adding ventilation, we are able to increase the percentage of comfort time significantly and reduce the number of hot hours, but we are not able to reduce the cold stress. We need to increase the massing of the walls to reduce the cold stress.



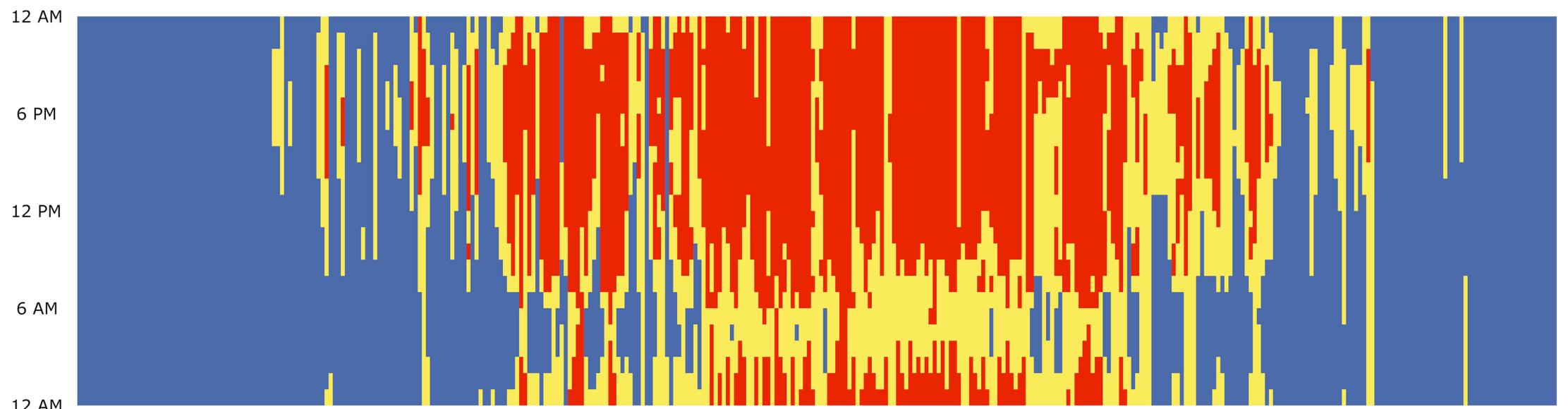
Comfortable time zones for a year in Philadelphia



CHANGED MATERIAL WHICH HIGHER R VALUE (ASHRAE 90.1-2010 EXT WALL STEEL FRAME CLIMATEZONE ALT-RES 2-6)  
Comfortable : 24.8%  
Hot: 25%  
Cold 49.8



WITH ADDED INFILTRATION AT A RATE OF .0001  
Comfortable : 24.8%  
Hot: 27%  
Cold 48 %



WITH ADDED INFILTRATION AT A RATE OF .0003  
Comfortable : 26%  
Hot: 24%  
Cold : 50 %  
Although we are able to increase the comfortable time but there are leaks in the building