BUILDING PERFORMANCE SIMULATION
ARCH-753 Fall 2017

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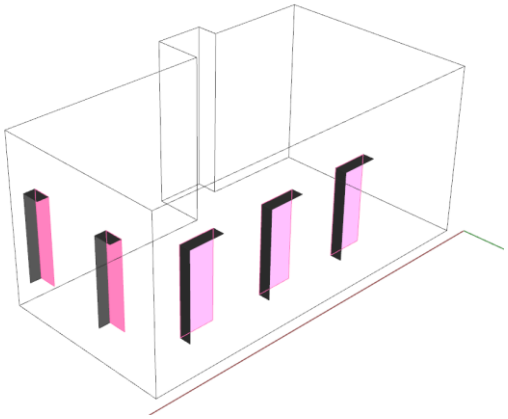
ASSIGNMENT 6

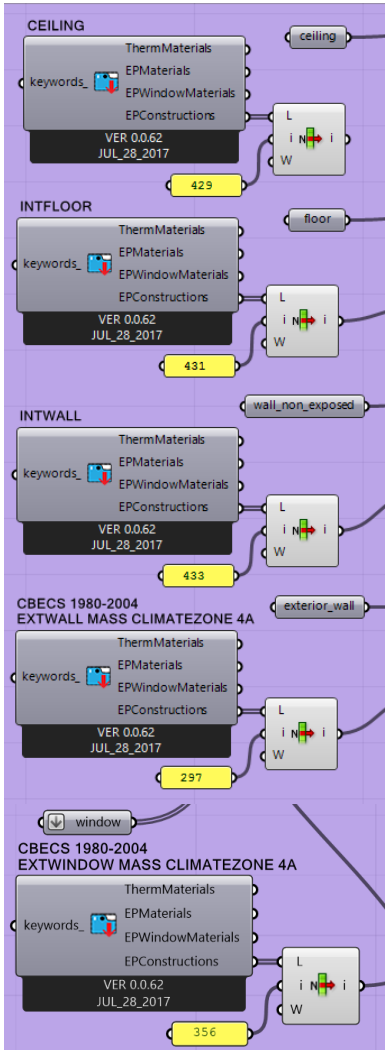
Hwang, Youngjin

Energy Model for My Room

Construction Properties

Since I can not know exact construction detail of my building, I use default HB Constructions, especially for exterior wall and windows, I have used CBECS 1980-2004 code for climate zone 4A because the building was built in around the early 1980s in Philadelphia.





M11 100mm lightweight concrete
F05 Ceiling air space resistance
F16 Acoustic tile

U-VALUE : 1.45 W/m2K

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1. 19mm gypsum board
2. Wall air space resistance
3. 19mm gypsum board

U-VALUE : 2.58 W/m2K

1. 1" Stucco
2. 8" concrete HW RefBldg
3. Mass non-res wall insulation-1.47
4. ½" gypsum board

U-VALUE : 0.76 W/m2K

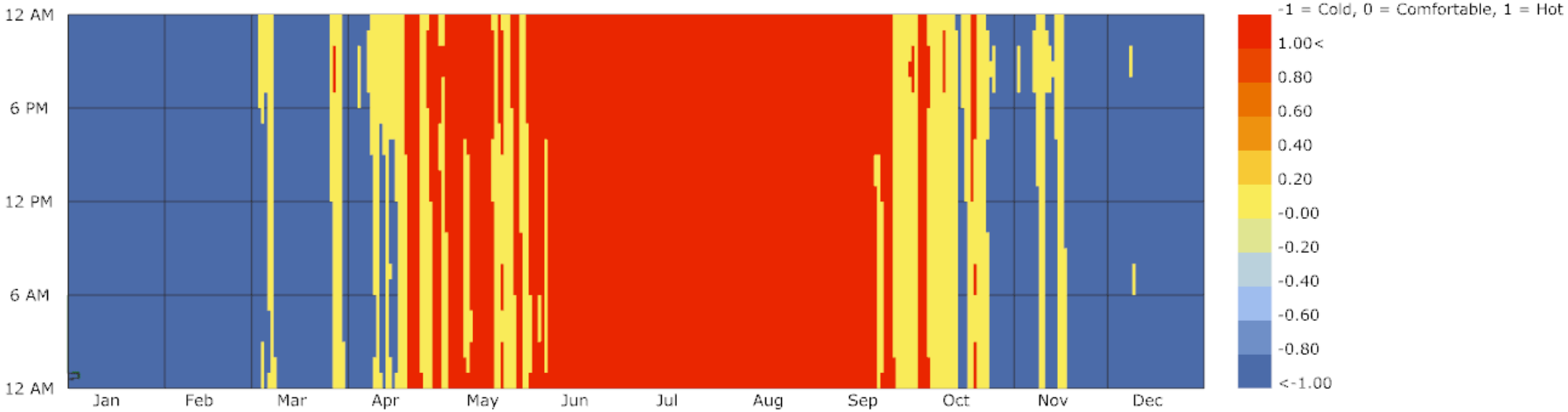
1. Simple glazing system

U-VALUE : 3.35 W/m2K

Energy Model for My Room

Indoor Adaptive Comfort Analysis

This is the indoor adaptive comfort analysis without HVAC system. As you see the result, the room is dominated by seasons during winter and summer.



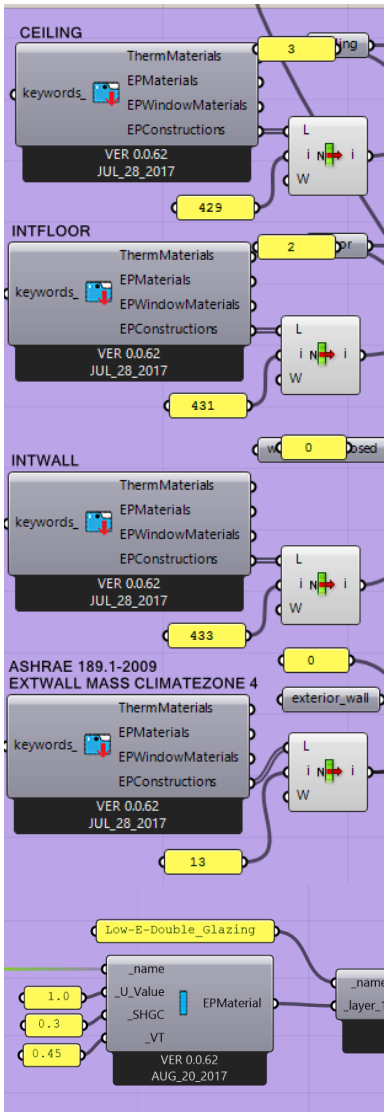
Adaptive Comfort for MY_ROOM (-1 = Cold, 0 = Comfortable, 1 = Hot) - Hourly
Philadelphia International Ap PA USA TMY3
1 JAN 1:00 - 31 DEC 24:00

Percentage of time in comfortable condition	16%
Percentage of time in hot stress	40%
Percentage of time in cold stress	44%

Energy Model for My Room

The Change of Construction Properties

To improve the result, the properties of exterior wall and window are changed. The reference values are ASHRAE 189.1-2009 criterion and high performance low-e double glazing.



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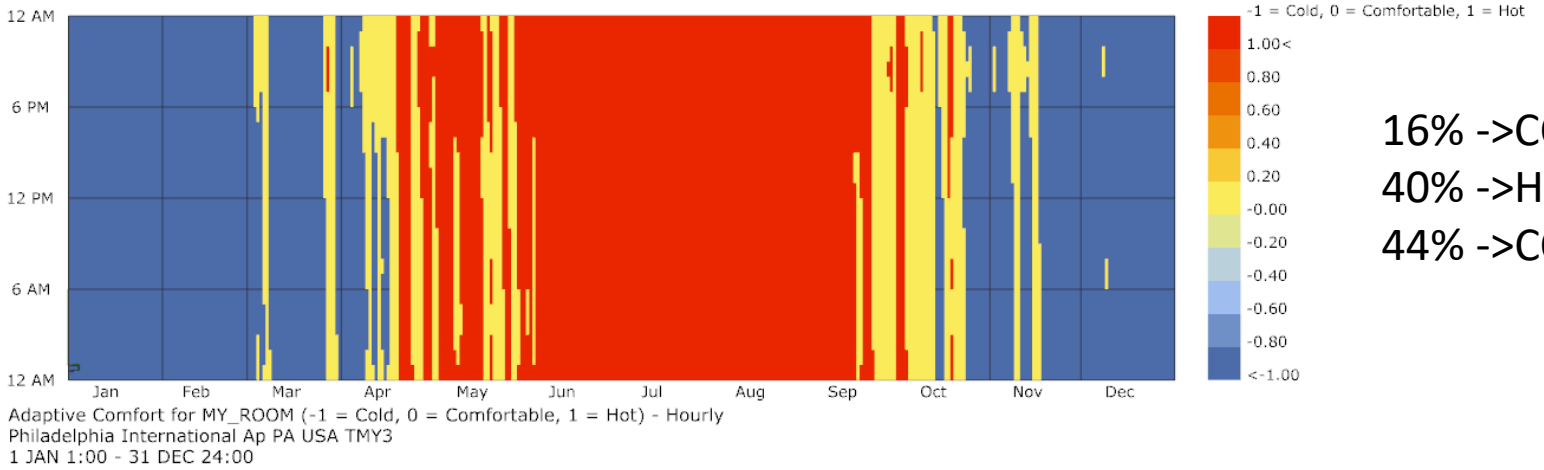
1. 19mm gypsum board 2. Wall air space resistance 3. 19mm gypsum board	U-VALUE : 2.58 W/m2K
*Apply the criteria of the coldest region in USA	U-VALUE : 0.55 W/m2K
*Low-E Double Glazing	U-VALUE : 1.0 W/m2K SHGC: 0.3 VT: 0.45 LSG:1.5

Energy Model for My Room

Indoor Adaptive Comfort Analysis

In this process, I did not change any room geometry or shading to know how much building materials affect an indoor comfort without HVAC. As properties of exterior wall and windows are changed, comfort during winter has improved while comfort during summer has worsened because improved insulating value also affect heat emission to outdoor during summer. Finally, even though this room design had optimized illuminance level from the original design, but it doesn't meet well indoor comfort.



Adaptive Comfort for MY_ROOM (-1 = Cold, 0 = Comfortable, 1 = Hot) - Hourly
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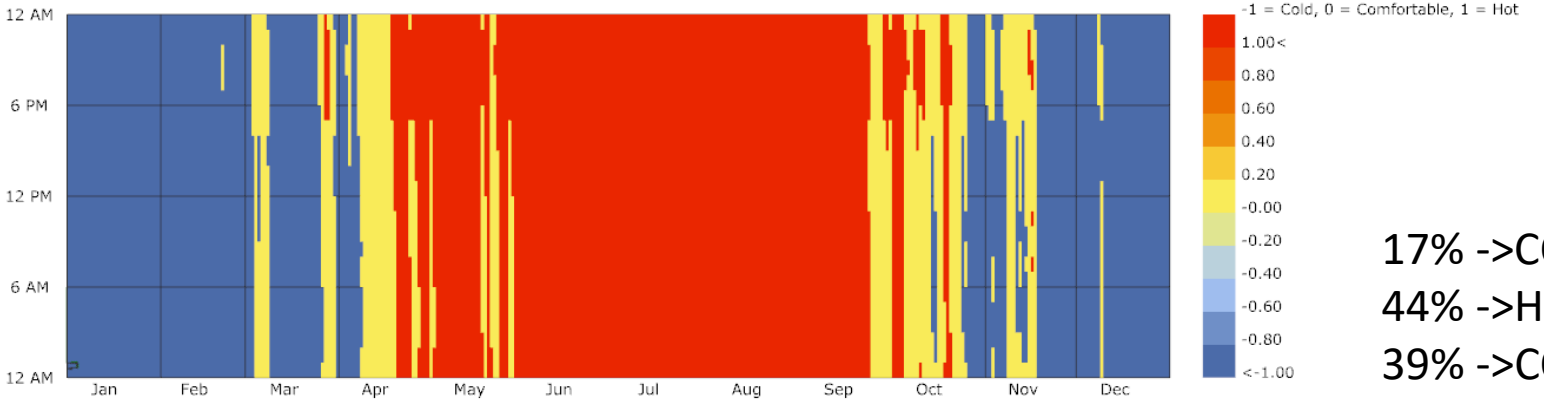
16% ->COMFORT
40% ->HOT
44% ->COLD



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17% ->COMFORT
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39% ->COLD