# Week 6_Qureshi, Nahid

Question1
Considering the same example solved in the previous assignment (radiative heat transfer between two parallel plates), how many shields with epsilon = 0.1 should you add in order to have the new heat transfer rate to be 1% of the case without shields ?

Answer

The heat transfer per area without shield

$$\dot{q} = \frac{\dot{Q}}{A} = \frac{\sigma(T_1^4 - T_2^4)}{\frac{1}{\epsilon_1} + \frac{1}{\epsilon_2} - 1}$$

$\sigma = 5.67 * 10^{-8}$

$\mathrm{T}_1 = 800\mathrm{K}$
$\mathrm{T}_2 = 500\mathrm{K}$
$\epsilon_1 = .2$
$\epsilon_2 = .7$

$$\dot{q} = \frac{\dot{Q}}{A} = \frac{5.67 * 10^{-8}(800^4 - 500^4)}{(\frac{1}{.2} + \frac{1}{.7} - 1)}$$

$$\dot{q} = 3625.4 \frac{W}{m^2}$$

The new heat transfer rate to be 1% of the case without shields

$\dot{q_{new}} = \frac{\dot{Q}}{A}$ x 1%

$$\dot{q_{new}} = 3625.4 \frac{W}{m^2} * \frac{1}{100} = 36.254 \frac{W}{m^2}$$

Number of shields with $\epsilon = 0.1$

$$\dot{q_{new}} = \frac{\dot{Q}}{A} = \frac{\sigma(T_1^4 - T_2^4)}{(N+1)(\frac{1}{\epsilon} + \frac{1}{\epsilon} - 1)}$$

$$36.254 = \frac{5.67 * 10^{-8}(800^4 - 500^4)}{(N+1)(\frac{1}{0.1} + \frac{1}{0.1} - 1)}$$

$$36.254 = \frac{19680.57}{(N+1)(19)}$$

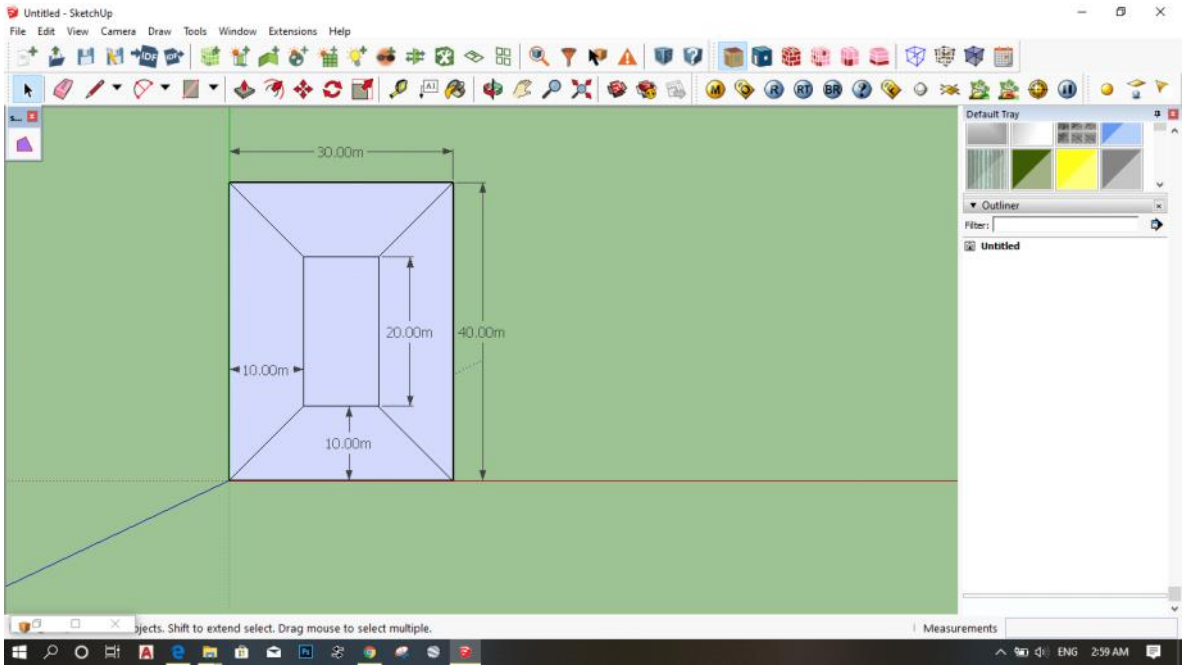
688.826(N+1) = 19680.57

$(N+1) = 28.57$
$N = 28.57 - 1$
$N \approx 28$

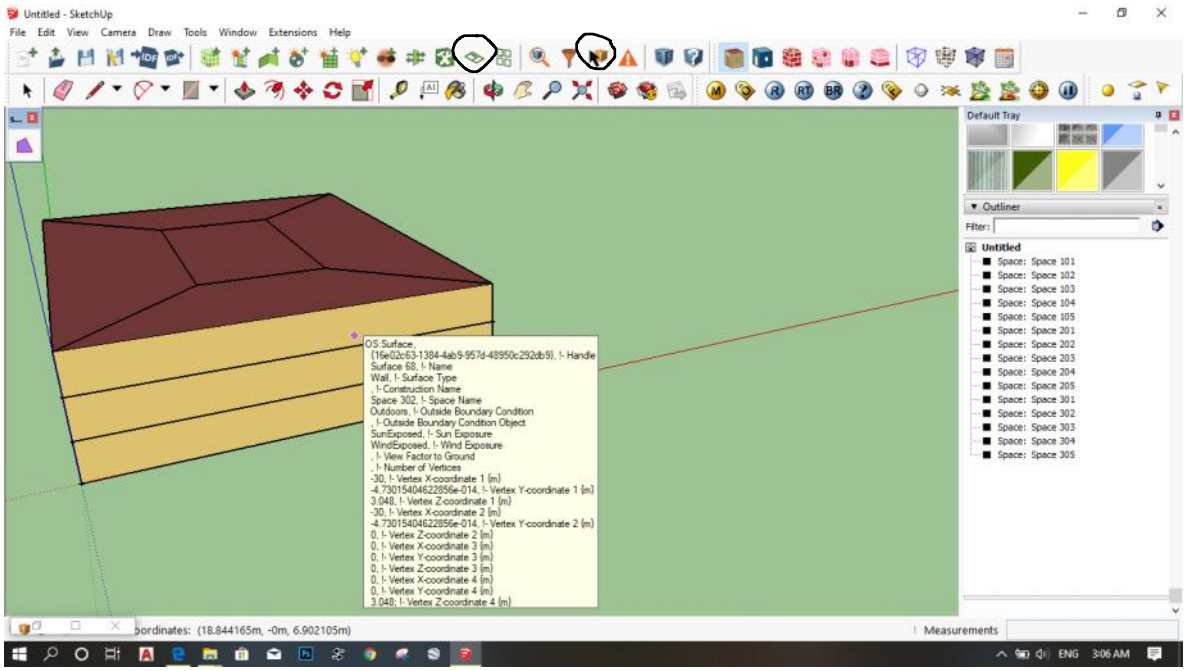
Question 2
You should create a pdf file with screenshots of all of the steps we went through (clearly from your own file) and explain briefly the reason behind the use of each step (in your own words!)

Answer

Step 1 : Draw a rectangle (40mx30m) with the offset 10m (another rectangle) joining the edges with 4 lines.

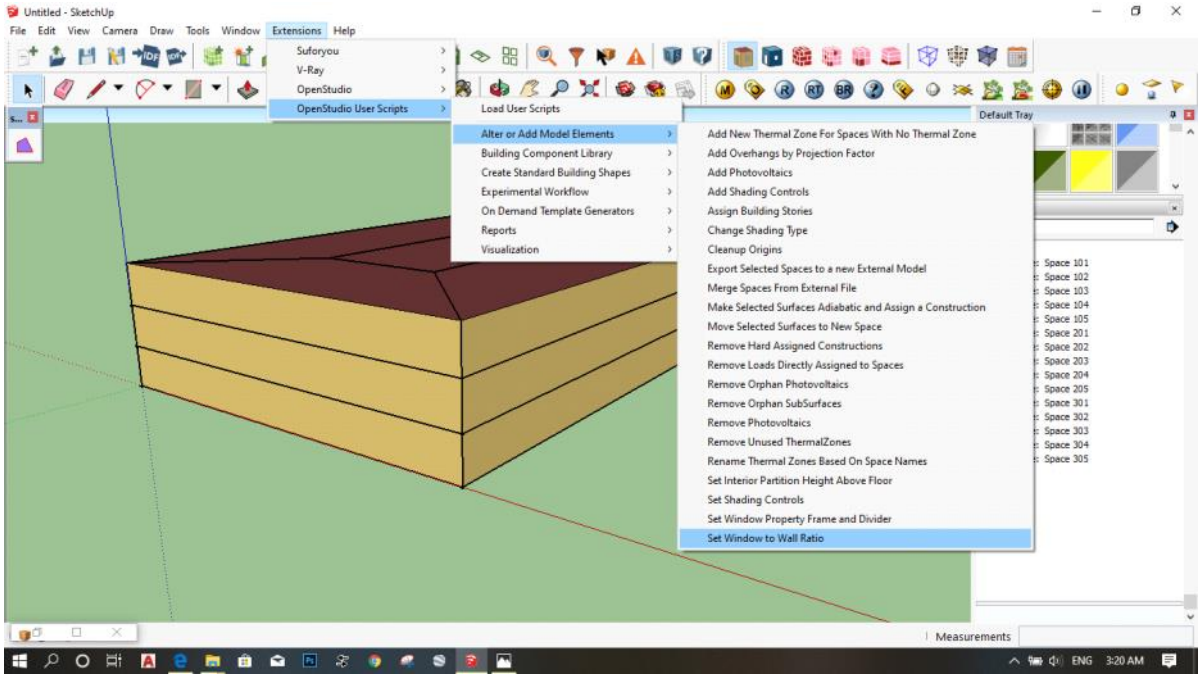


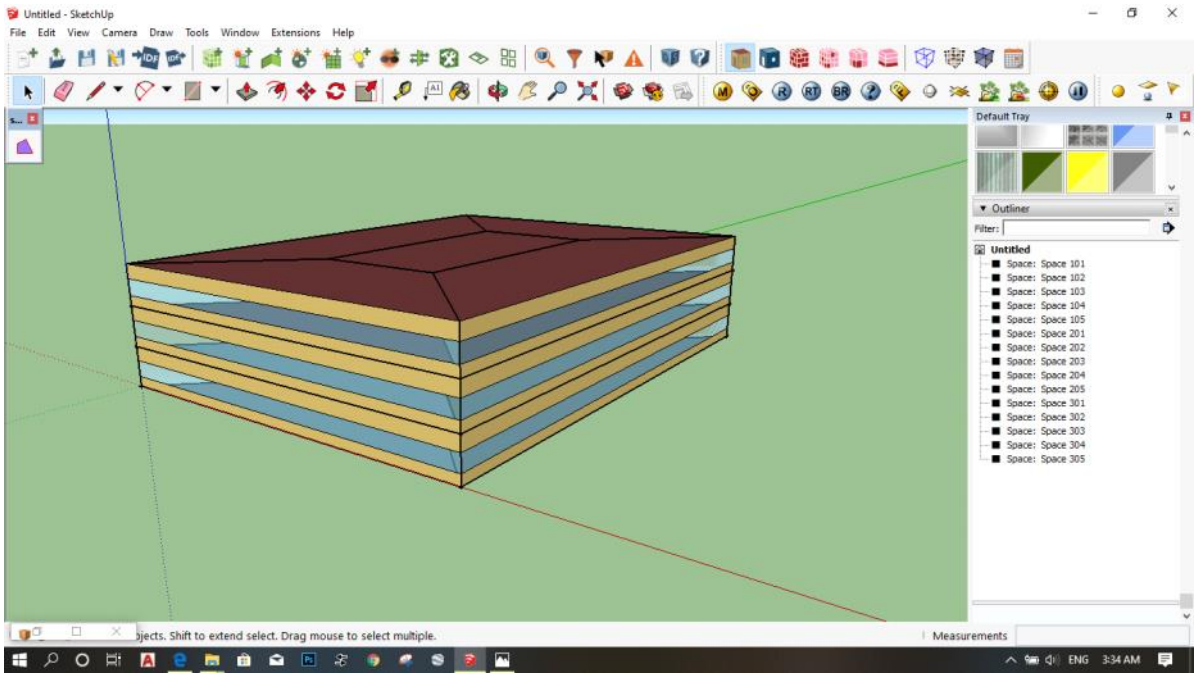

Step 2 : Select Create spaces from diagram option to extrude the plan - option used in open studio because it extrude in colors showing properties of individual layers.
Info tool is used to see the properties of each surface and the boundary conditions have been automatically assigned.



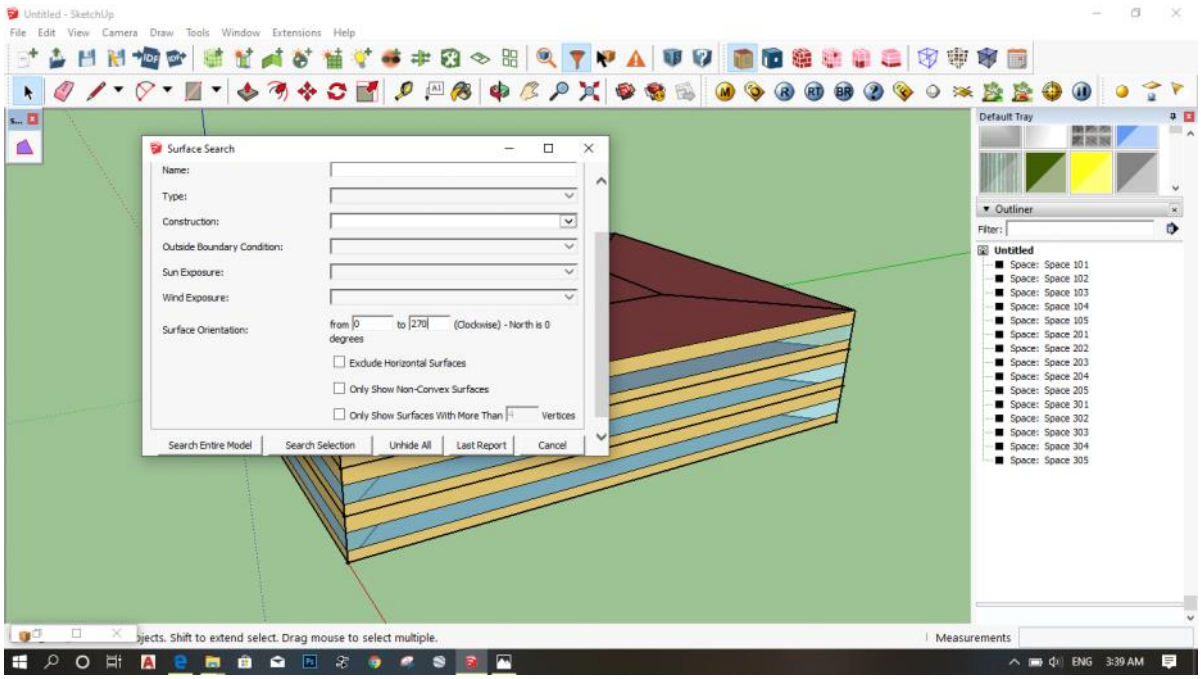

Step 3 : Select Surface Matching tool, it is used to automatically set outside boundary conditions for space surfaces and assign the appropriate outside boundary object in adjacent spaces when "surface" is the outside boundary condition.

Step 4 : select set window to wall ratio to add windows to wall.

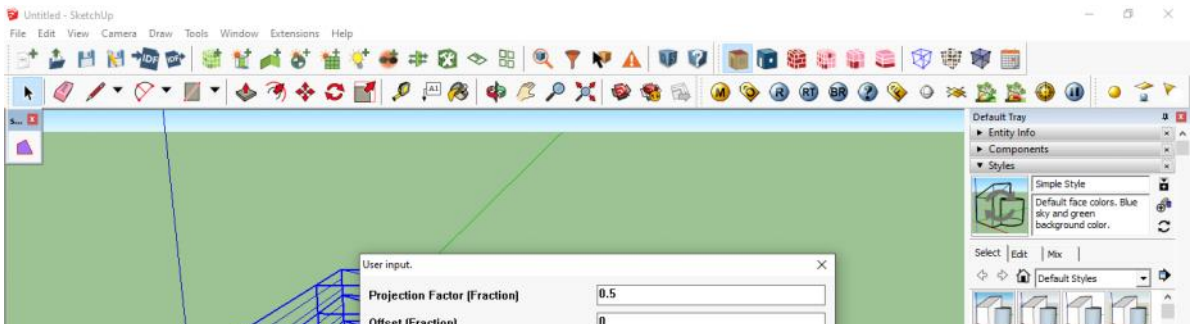


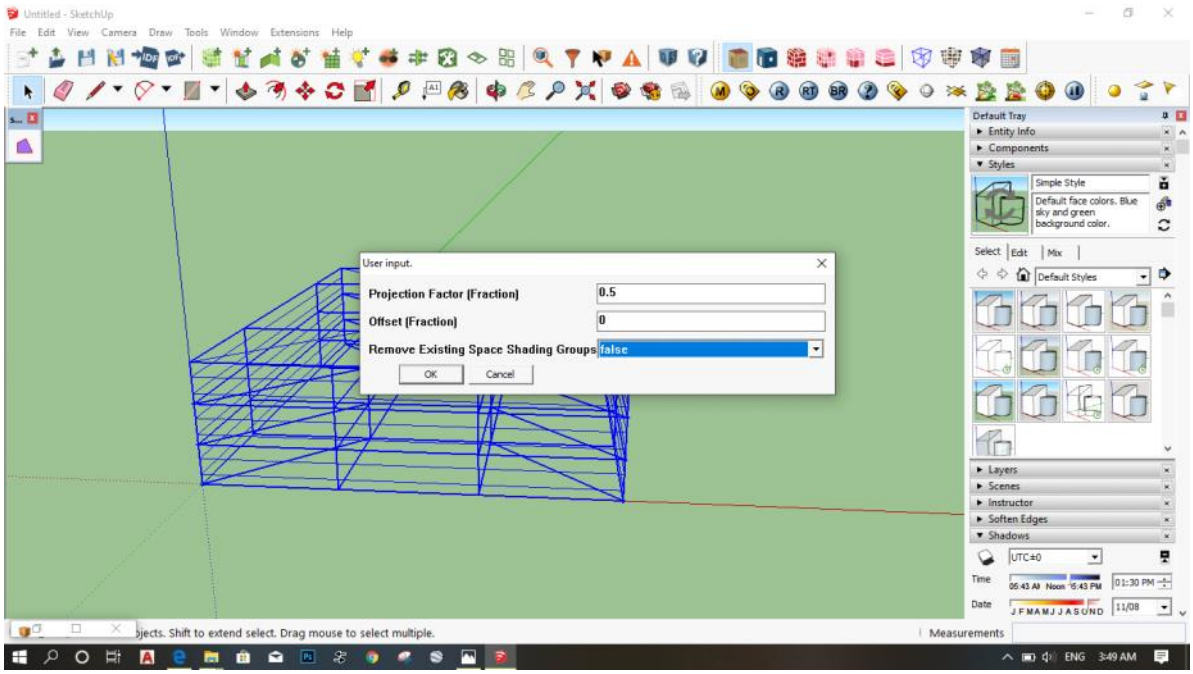


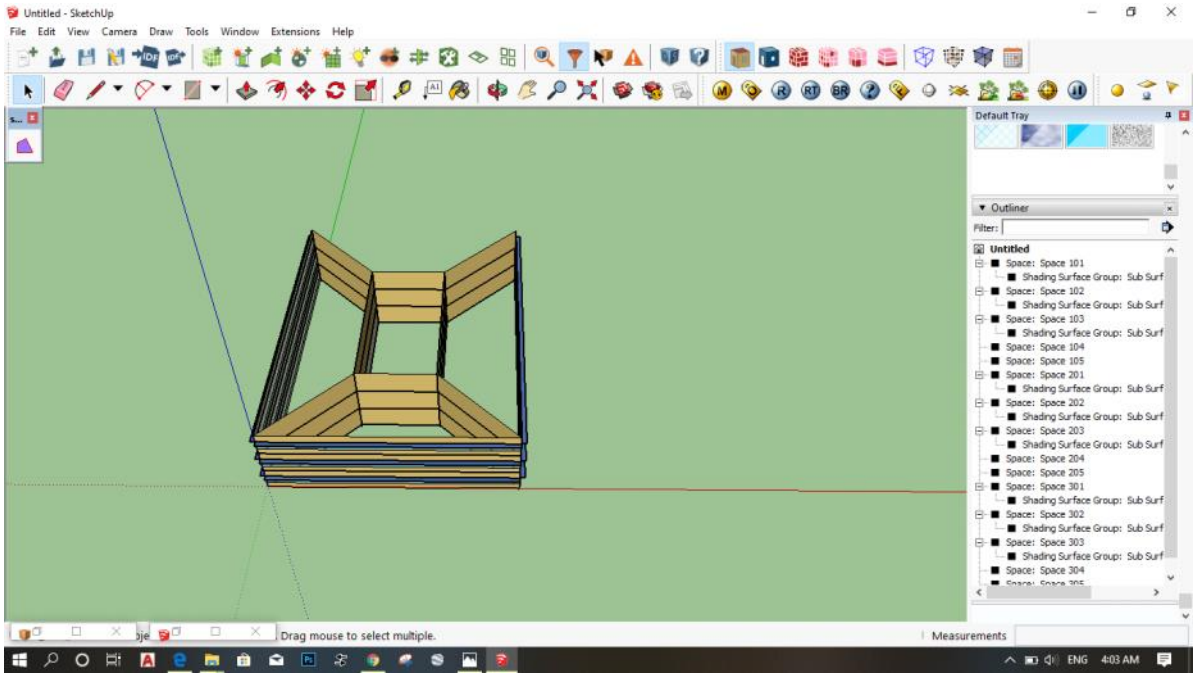
Step 5 : Surface search tool is used in which u want to add projection on the window. Selected all surface except north as shown.



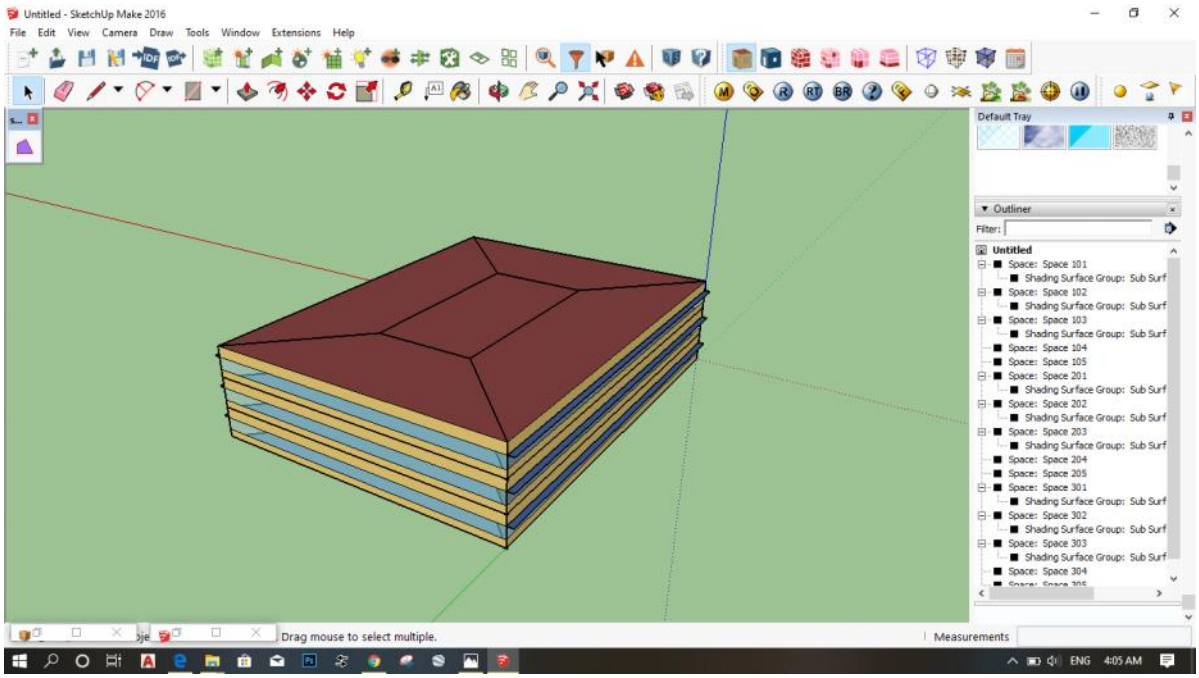

Step 6 : Select add Overhang by projection factor to add shading on the windows.



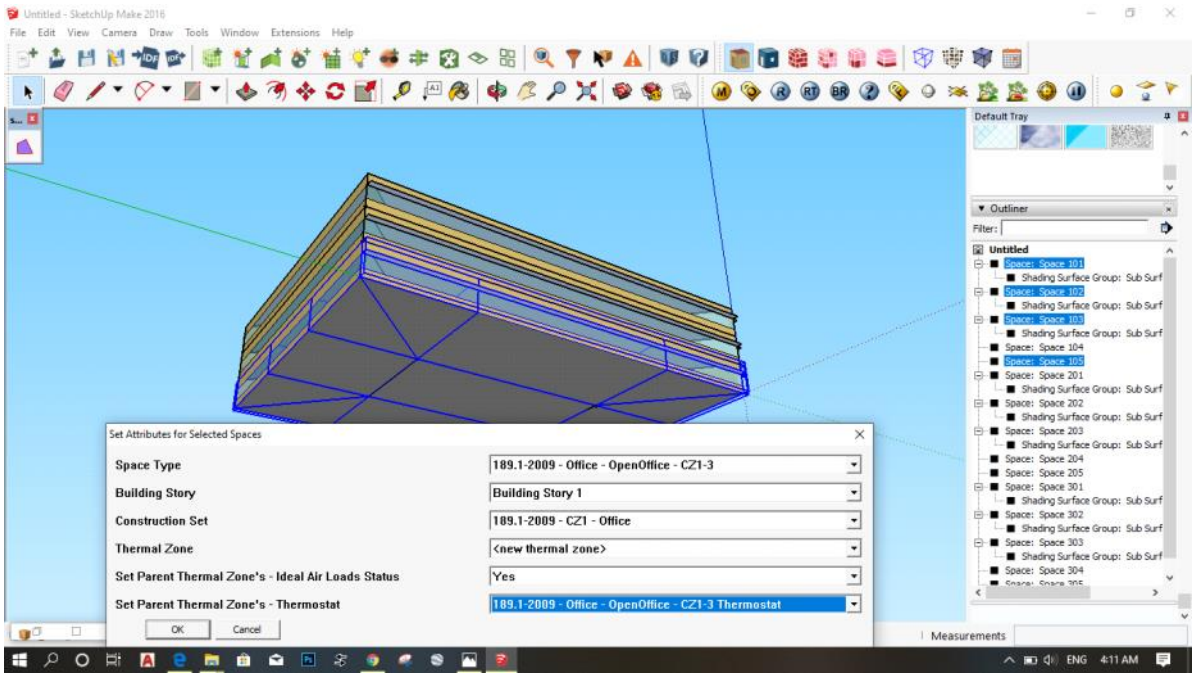


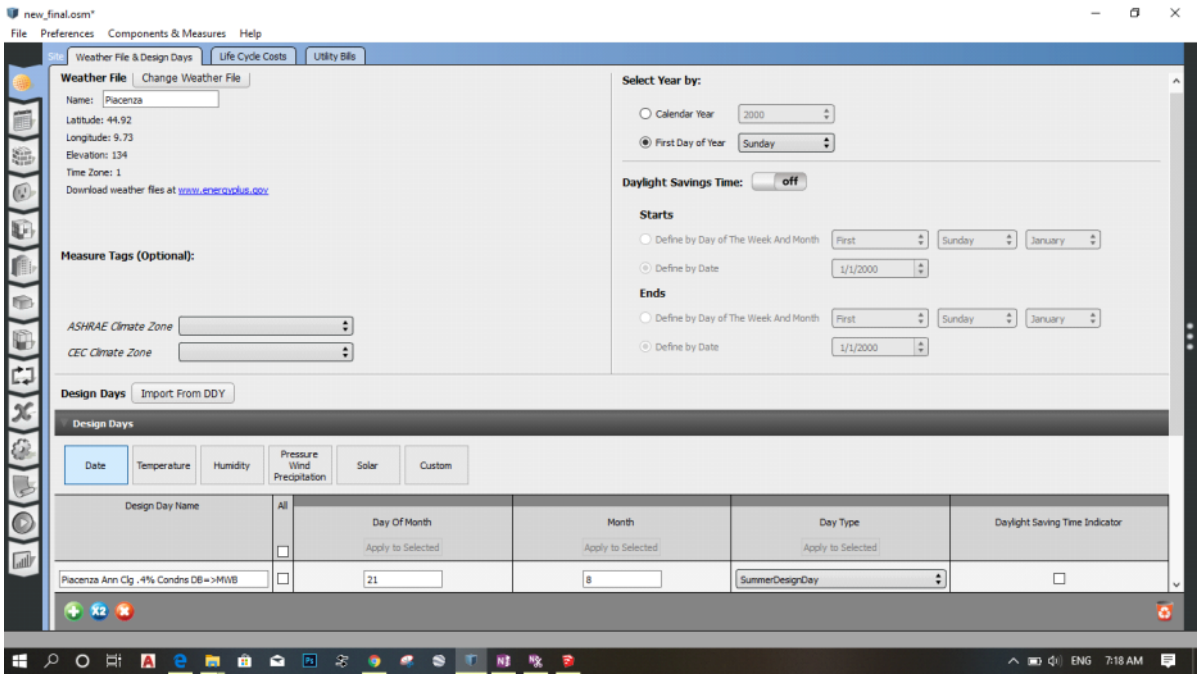

Step 7 : overhang shade on the windows except on the north façade.
Again select surface search tool choose surface 0-360, to go to previous selection.



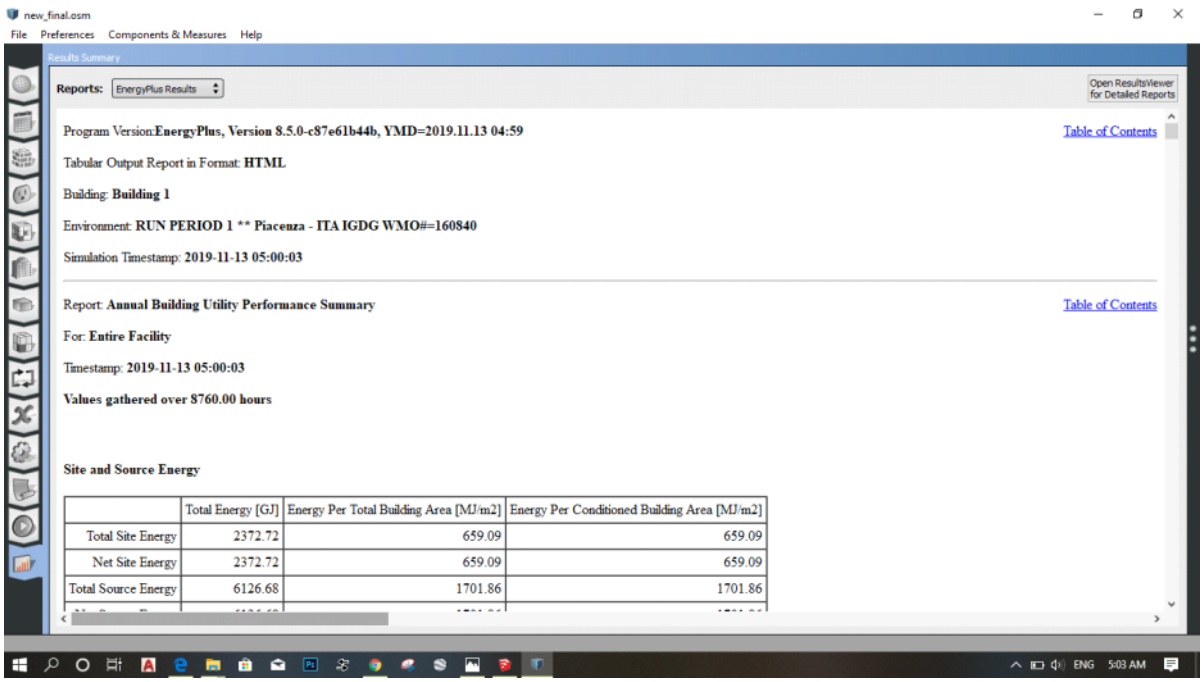

Step 8 : we choose the spaces of each thermal zone and we add specifications as shown.
After doing it for all the spaces we save the file.

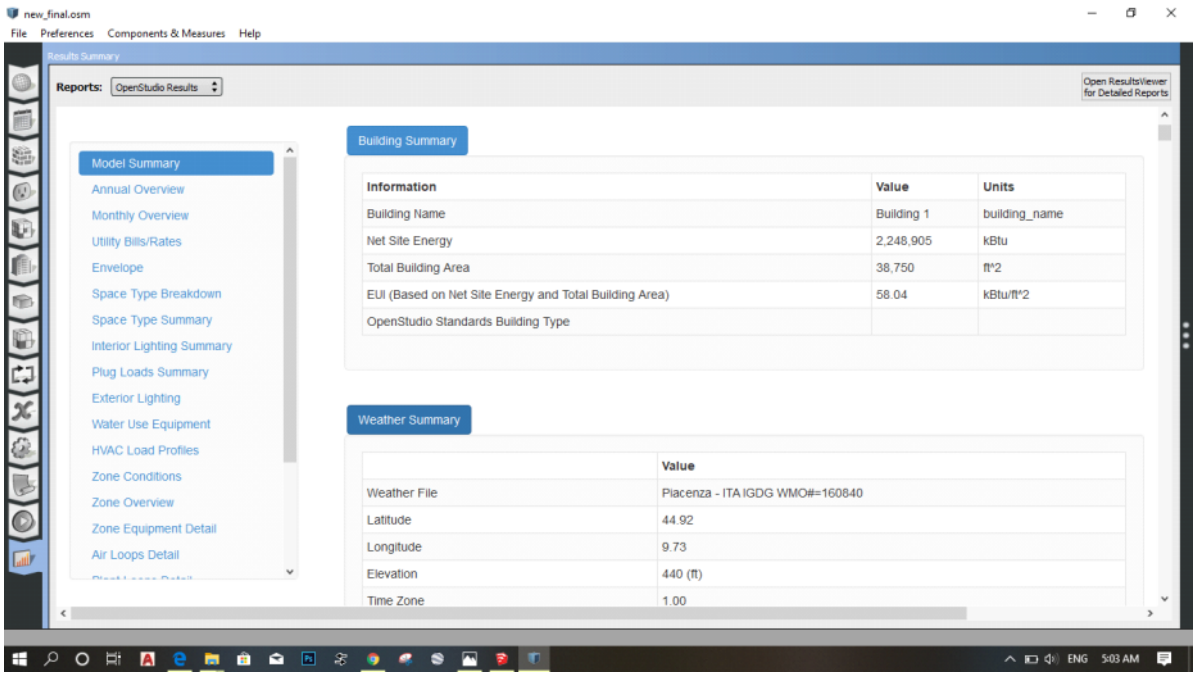



Step 9 : open 'Open studio' and add weather data




Step 10 : select Run Simulation to run the model.
Then u can see the summary of your results




new_final.osm
File Preferences Components & Measures Help
Results Summary
Reports: OpenStudio Results
Open ResultsViewer for Detailed Reports
Model Summary
Annual Overview
Monthly Overview
Utility Bills/Rates
Envelope
Space Type Breakdown
Space Type Summary
Interior Lighting Summary
Plug Loads Summary
Exterior Lighting
Water Use Equipment
HVAC Load Profiles
Zone Conditions
Zone Overview
Zone Equipment Detail
Air Loops Detail
Building Summary
Information | Value | Units
Building Name | Building 1 | building_name
Net Site Energy | 2,248,905 | kBtu
Total Building Area | 38,750 | ft^2
EUI (Based on Net Site Energy and Total Building Area) | 58.04 | kBtu/ft^2
OpenStudio Standards Building Type
Weather Summary
Value
Weather File | Piacenza - ITA IGDG WMO#=160840
Latitude | 44.92
Longitude | 9.73
Elevation | 440 (ft)
Time Zone | 1.00
ENG 5:03 AM