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EXAMPLE AND SUMMARY

Example 1

Considering the same example, you 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?

When the $\epsilon_1 = \epsilon_2 = 0.1$,

$$\frac{Q}{A} = \frac{\sigma(T_1^4 - T_2^4)}{\frac{1}{\epsilon_1} + \frac{1}{\epsilon_2} - 1} = \frac{5.67 \times 10^{-8} \times (298^4 - 308^4)}{\frac{1}{0.1} + \frac{1}{0.1} - 1} = \frac{19680.57}{19} = 1035.8 \frac{W}{m^2}$$

1035.8 x 1% = 10.35

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

$$10.35 = \frac{1.5 \times 5.67 \times 10^{-8} \times (800^4 - 500^4)}{\left(\frac{1}{0.1} + \frac{1}{0.1} - 1\right) + n\left(\frac{1}{0.1} + \frac{1}{0.1} - 1\right)} = \frac{19680.57}{(19) + n(19)}$$

10.35 (19 + 19n) = 19680.57
196.65 + 196.65n = 19680.57
196.65n = 19680.57-196.65
$N = \frac{19483.92}{196.65}$
N = 99.07 = 99

99 shields with ϵ=0.1 in order to lover the radiative heat transfer to 1%

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!):


Step 1 : drawing a building plan of 30 m x 40 m with the offset of 10 m inside it and concting the corners of both the rectangles with lines to complete the final shape of the paln.
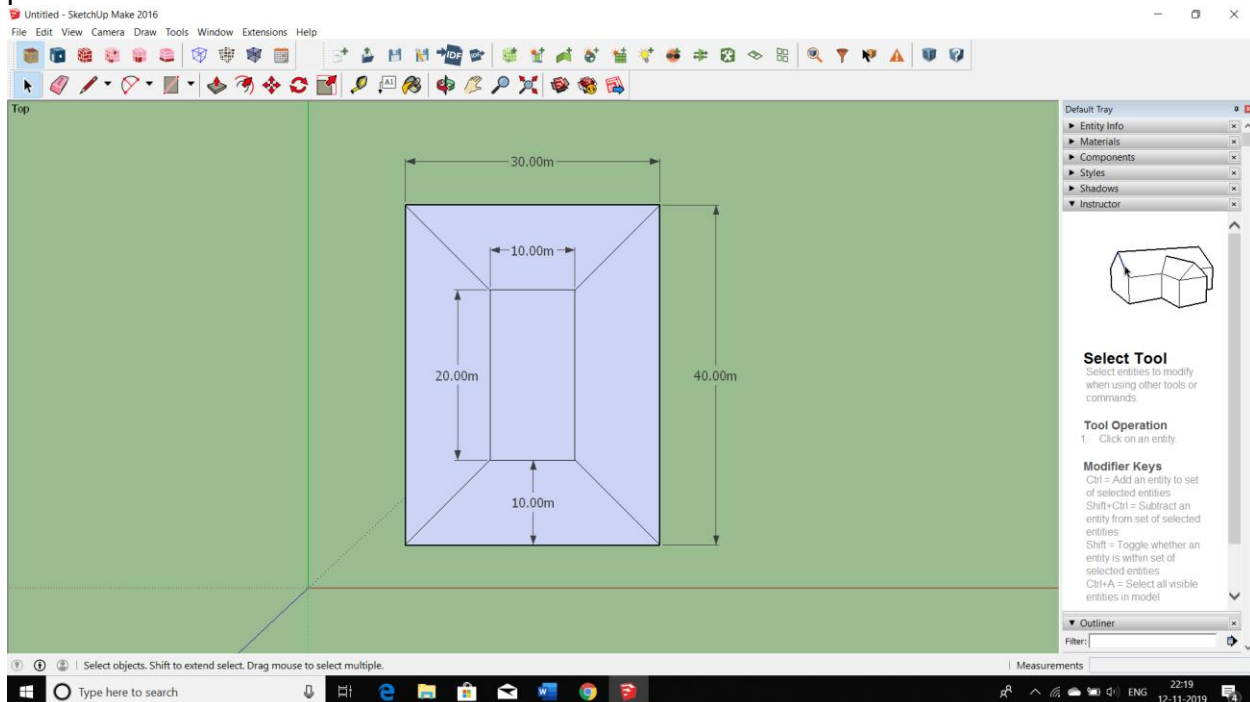

Step 2: creating 3 story structure by using "create spaces for diagram" tool. And after this info tool can be used to see the information regarding different materials andfunction of the building.
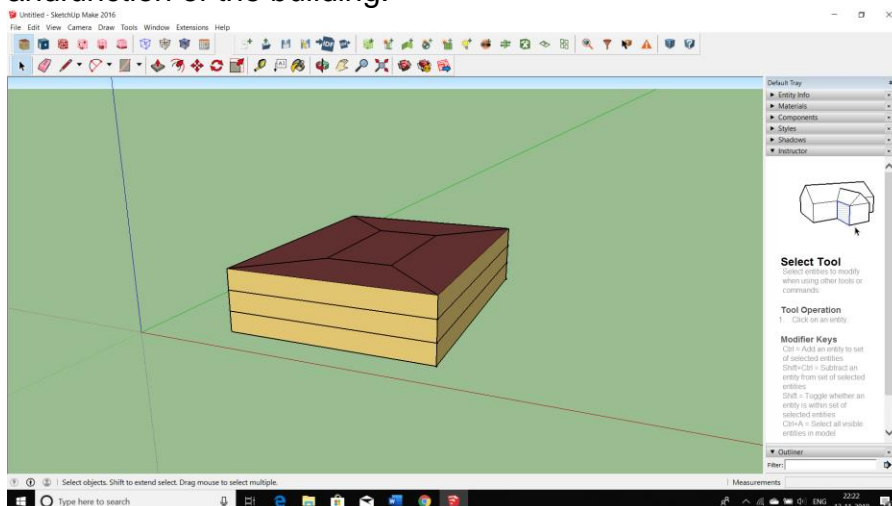
Step 3: to match the surface of the building by using "match surface tool" in order to have a proper door window placement on the building surface.
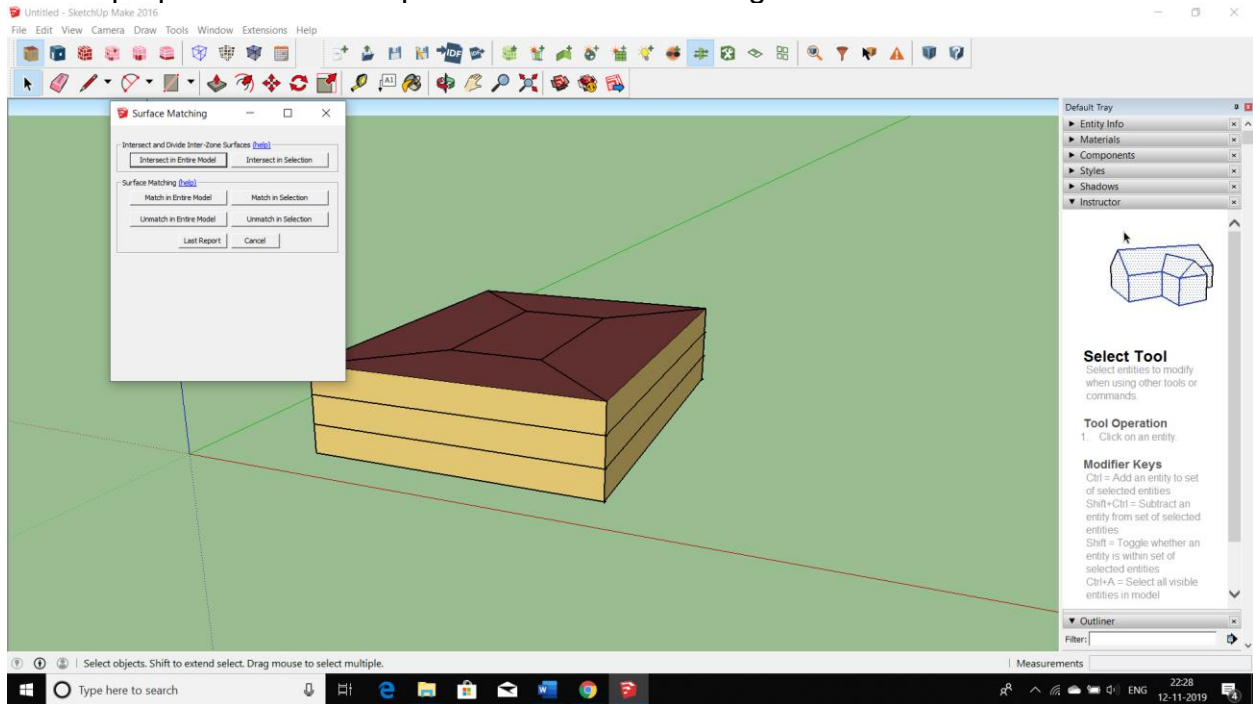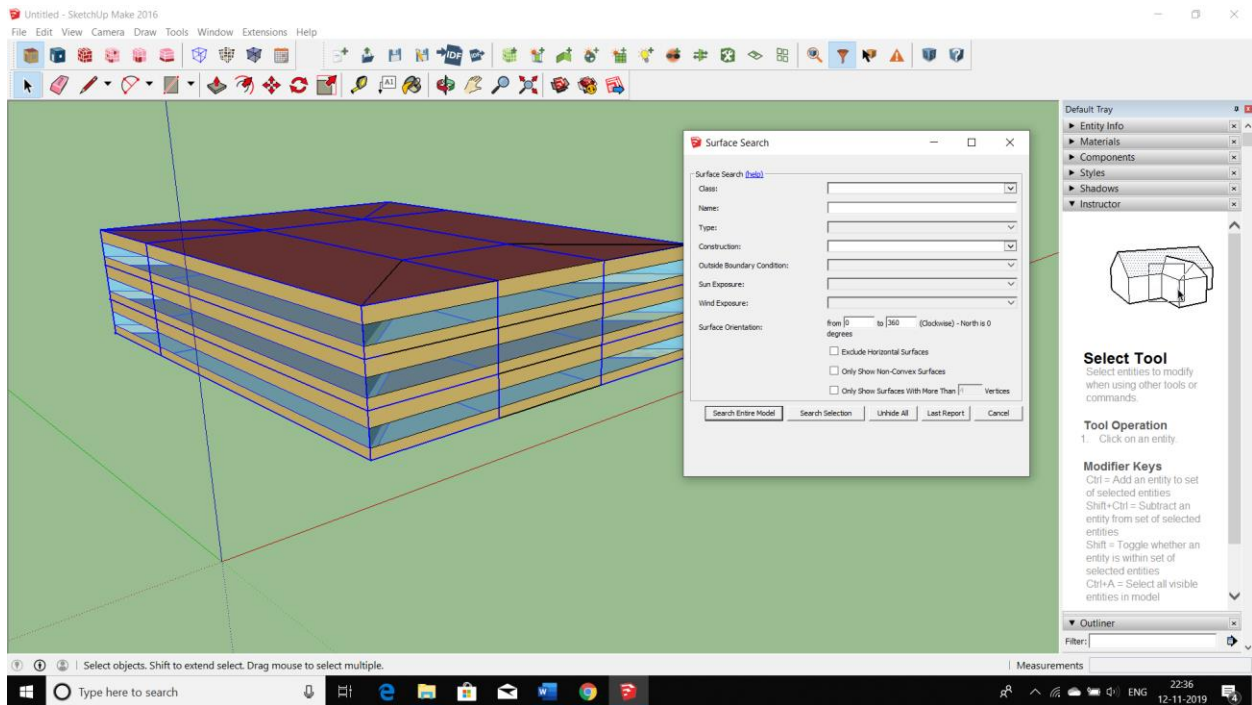

Step 4: adding window by going through the open studio extension drop down menu as following.
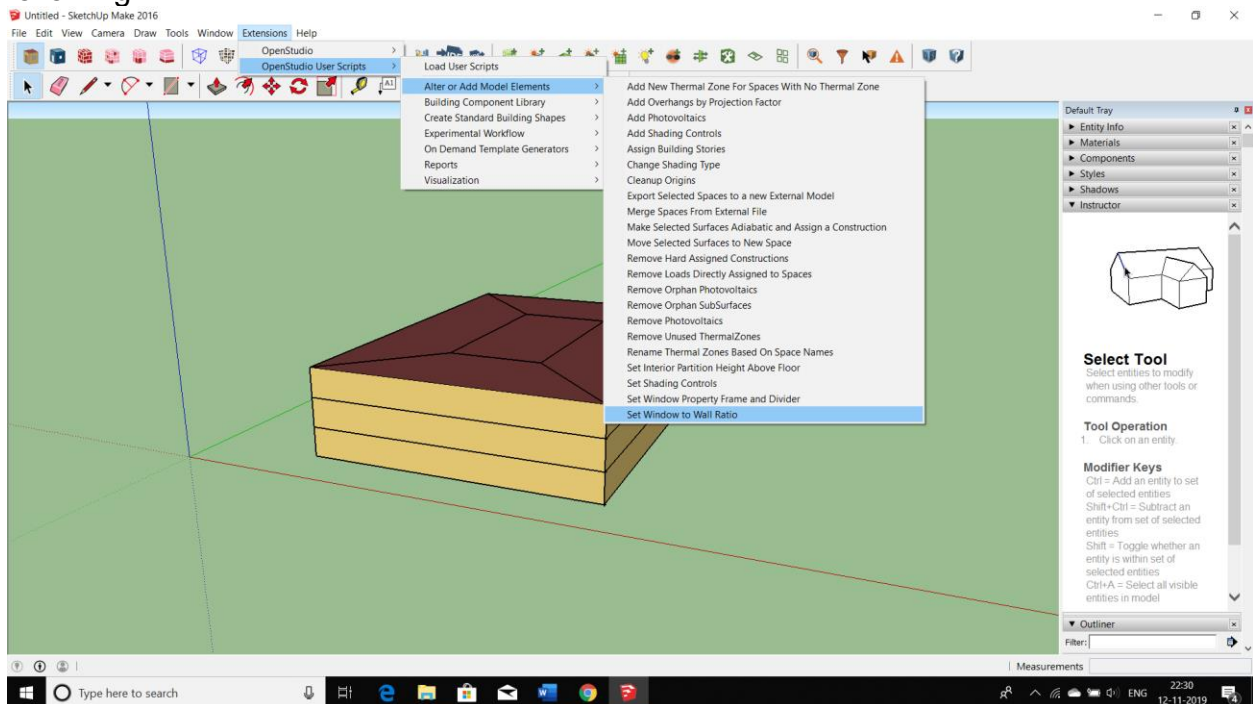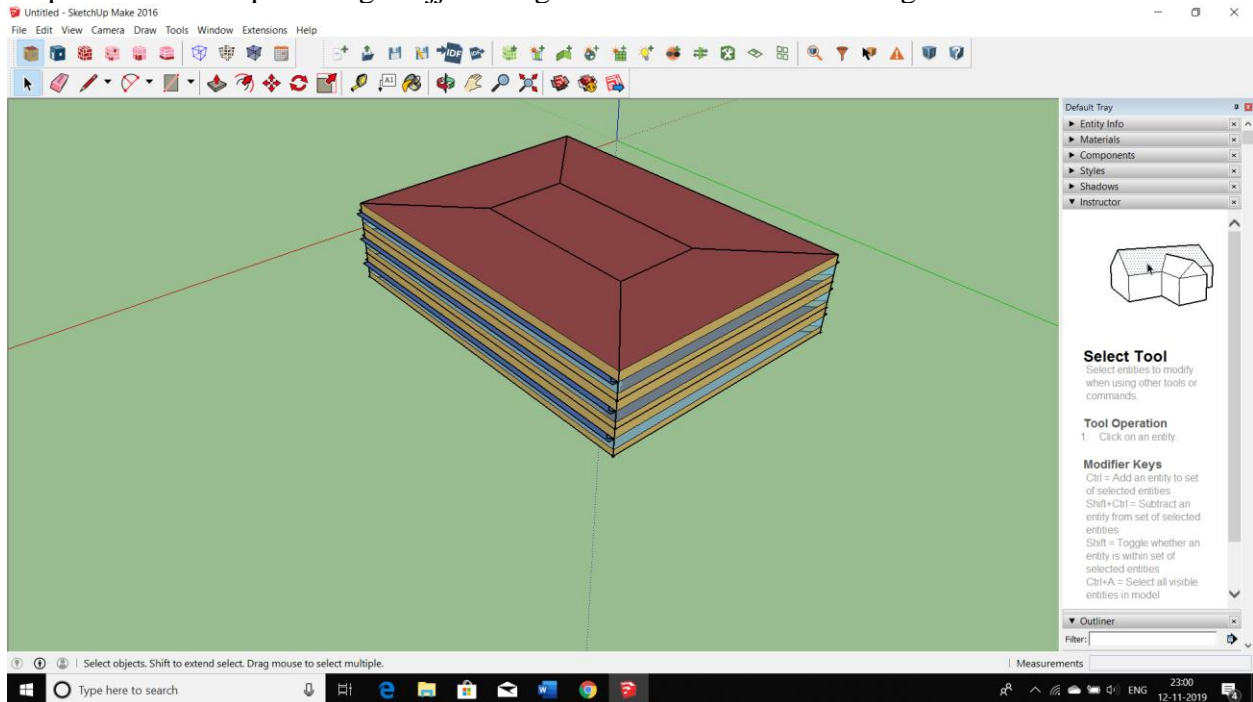
Step 5: after adding windows by giving value 0.4 as window to wall ratio and 0.75 is the offset above floor, following is the result.
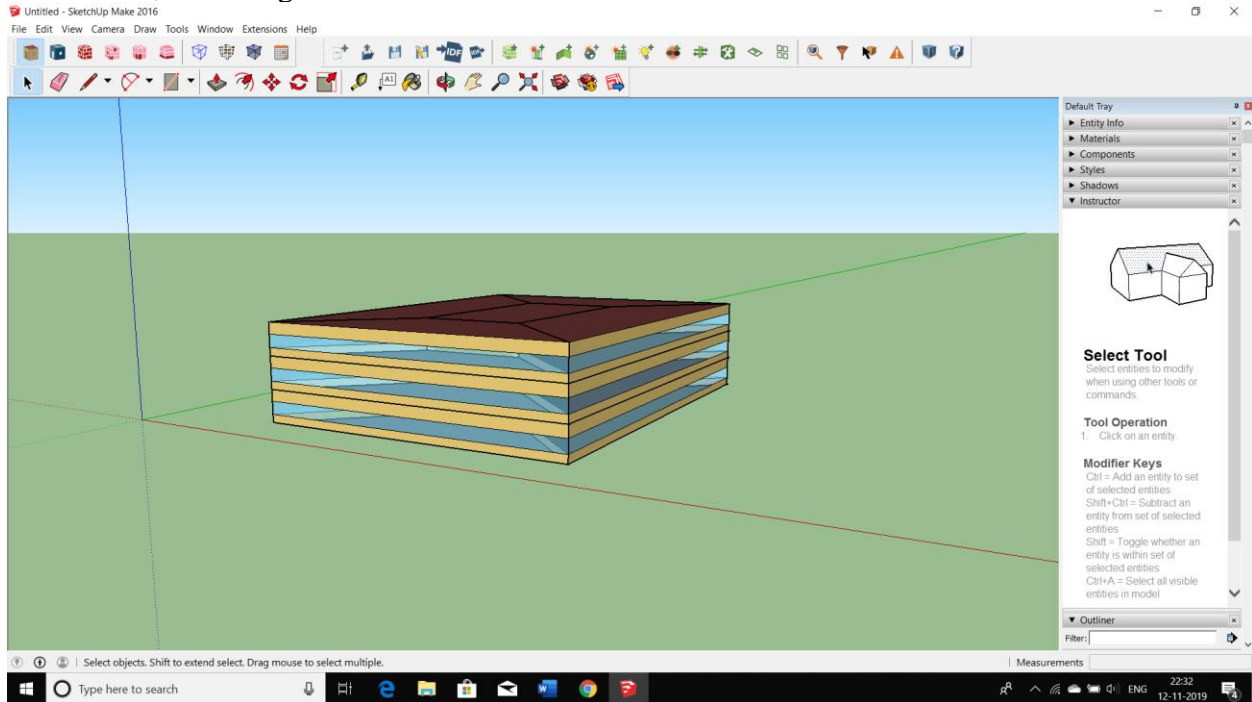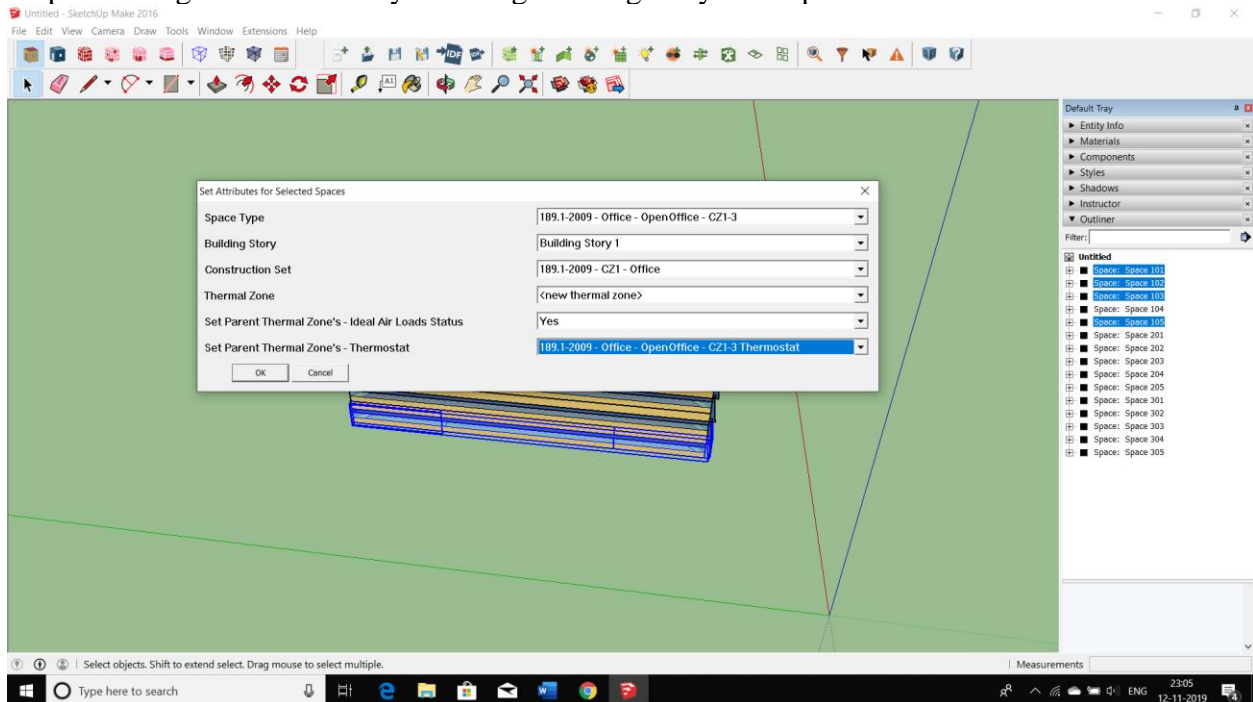

Step 6: choosing all the surface except north and by using surface search tool, changes can be made in the selection of surface orientation.

Step 7: result after providing chajja through surface search tool leaving north side unselected.
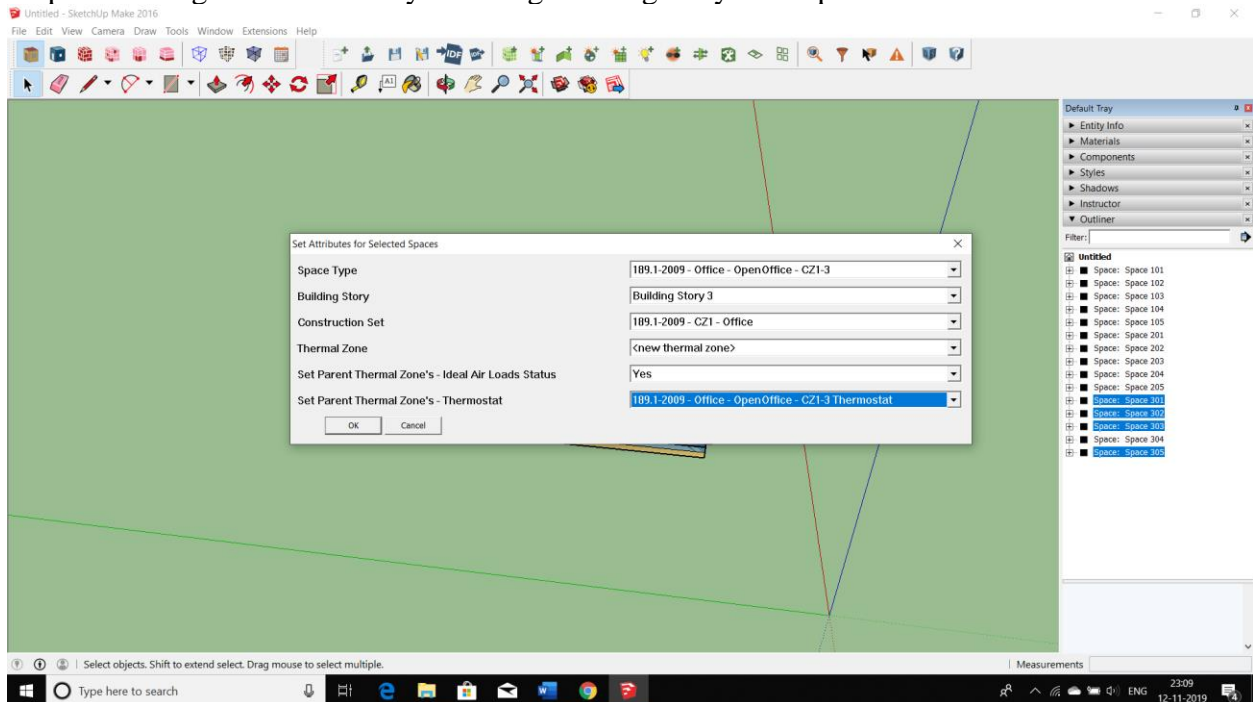

Step 8: adding thermal zone by selecting building story 1 components.

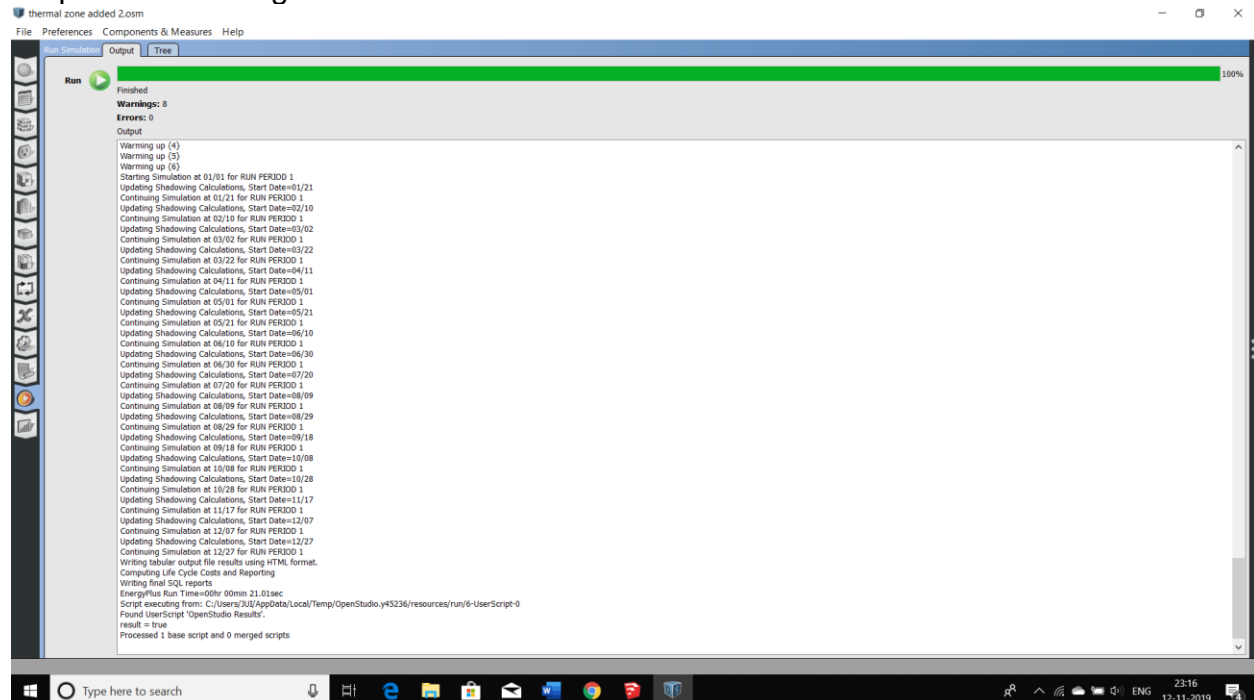Step 9: adding thermal zone by selecting building story 2 components.
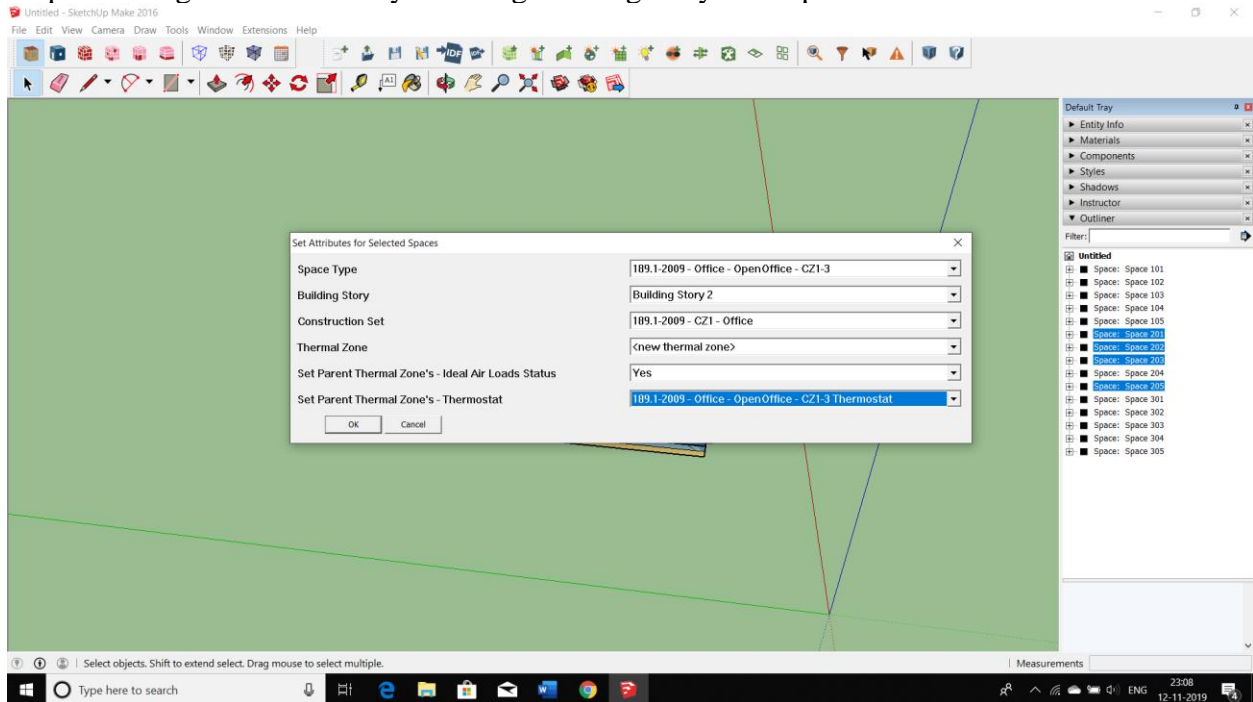
Step 10: adding thermal zone by selecting building story 3 components.

Step 11: after adding thermal zones file needs to be saved as open studio file and then load it into open studio software to calculate the building energy data according to the climate of Piacenza.
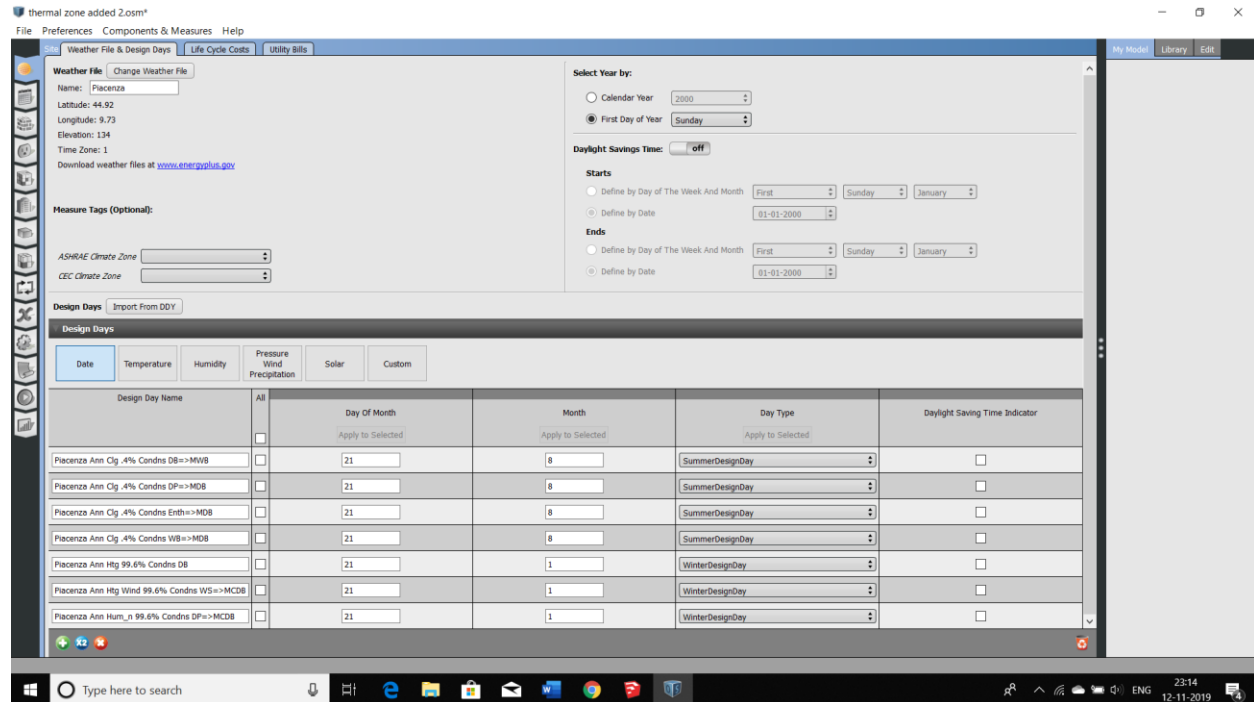
Step 12: data being calculated.

Step 13: final result.