Task 1:

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

➡ $\varepsilon\_1= 0.2$ $T\_1 = 800$ K
$\varepsilon\_2 = 0.7$ $T\_2= 500$ K
$q= 3625.37$ w/m^2 (without shields)

$$\frac{3625.37}{100} = \frac{\delta(T_1^4 - T_2^4)}{\left(\frac{1}{\varepsilon_1} + \frac{1}{\varepsilon_2} - 1\right) + (\frac{1}{\varepsilon_3} + \frac{1}{\varepsilon_3} - 1)(n \, of \, shields)}$$

$$(\frac{1}{\varepsilon_1} + \frac{1}{\varepsilon_2} - 1) + (\frac{1}{\varepsilon_3} + \frac{1}{\varepsilon_3} - 1)(n \, of \, shields) = \delta(T_1^4 - T_2^4)/36.2537$$

$$\left(\frac{1}{\varepsilon_3} + \frac{1}{\varepsilon_3} - 1\right)(n \, of \, shields) = \frac{\delta(T_1^4 - T_2^4)}{36.2537} - \left(\frac{1}{\varepsilon_1} + \frac{1}{\varepsilon_2} - 1\right)$$

$$n \, of \, shields = \frac{\frac{\delta(T_1^4 - T_2^4)}{36.2537} - \left(\frac{1}{\varepsilon_1} + \frac{1}{\varepsilon_2} - 1\right)}{\left(\frac{1}{\varepsilon_3} + \frac{1}{\varepsilon_3} - 1\right)}$$

$$n \, of \, shields = \frac{5.67 * 10^{-8}(800^4 - 500^4) - \left(\frac{1}{0.2} + \frac{1}{0.7} - 1\right)}{\frac{1}{0.1} + \frac{1}{0.1} - 1} = 28 \, shields$$
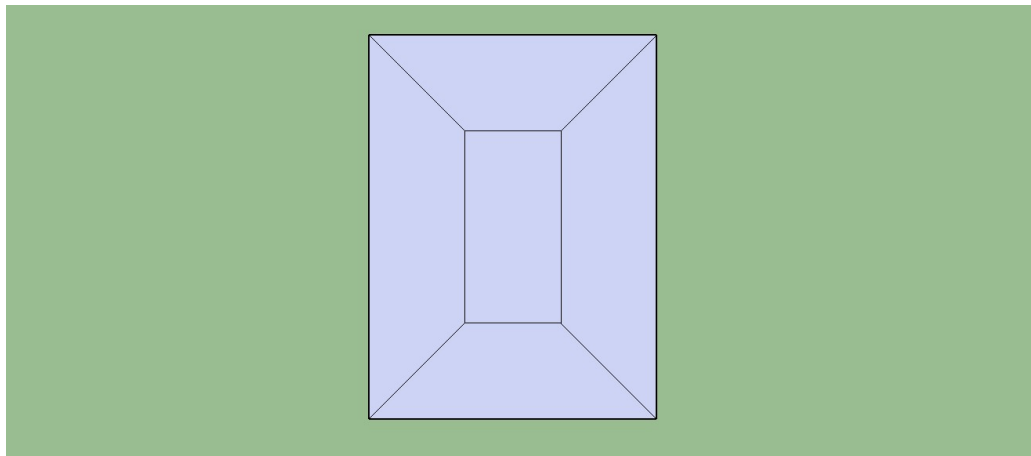
$$q = \frac{\delta(T_1^4 - T_2^4)}{\left(\frac{1}{\varepsilon_3} + \frac{1}{\varepsilon_3} - 1\right)(n \, of \, shields) + \left(\frac{1}{\varepsilon_1} + \frac{1}{\varepsilon_2} - 1\right)} = 5.67 * \frac{10^{-8}(800^4 - 500^4)}{\left(\frac{1}{0.1} + \frac{1}{0.1} - 1\right)*28 + \left(\frac{1}{0.2} + \frac{1}{0.7} - 1\right)} = 36.62 \, w/m^2$$
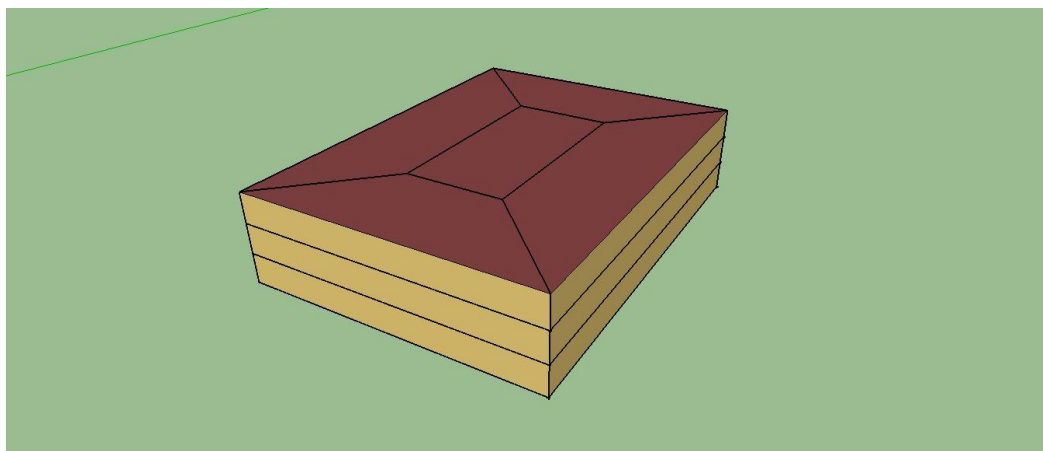
1% of 3625.37

Task 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!)
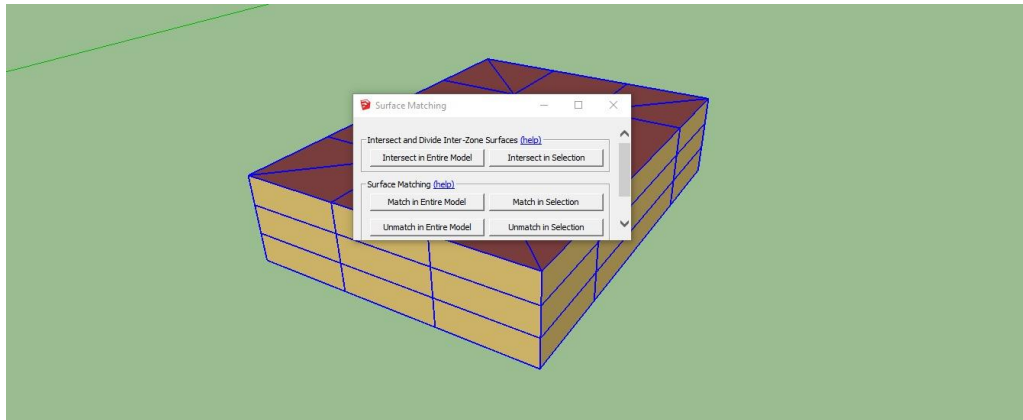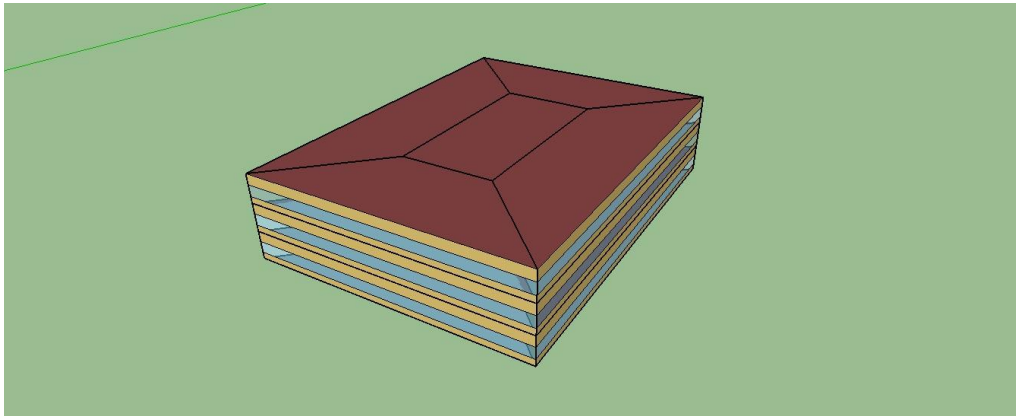
Step 1: build the 30x40 diagram

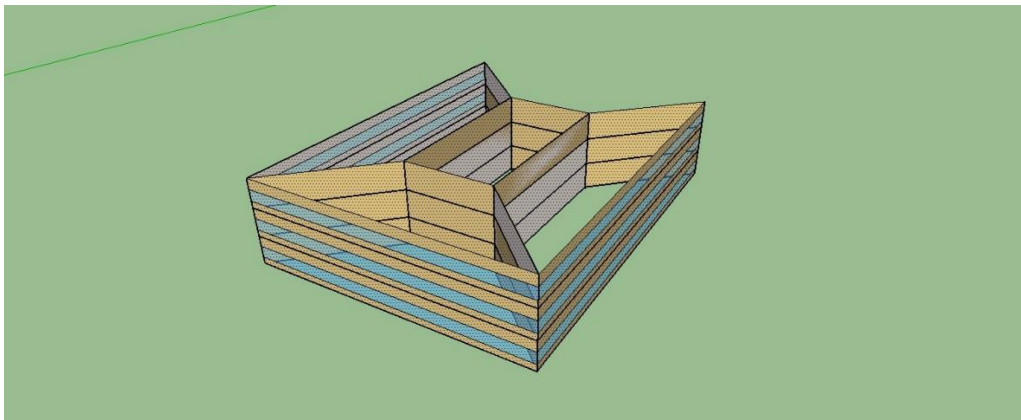Step 2: Create a building composed of 3 floors from the initial diagram

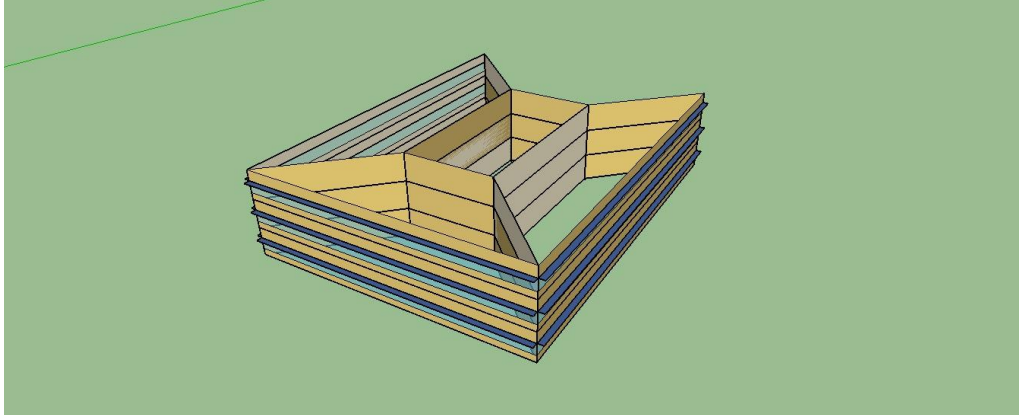Step 3: distinct between the interior and exterior walls by selecting surface matching
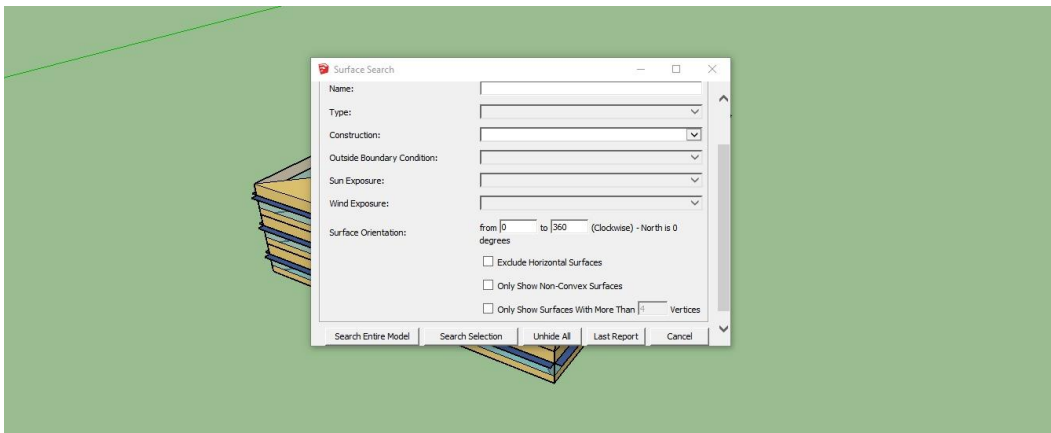

Step 4: use alter/add model elemnts to add the windows

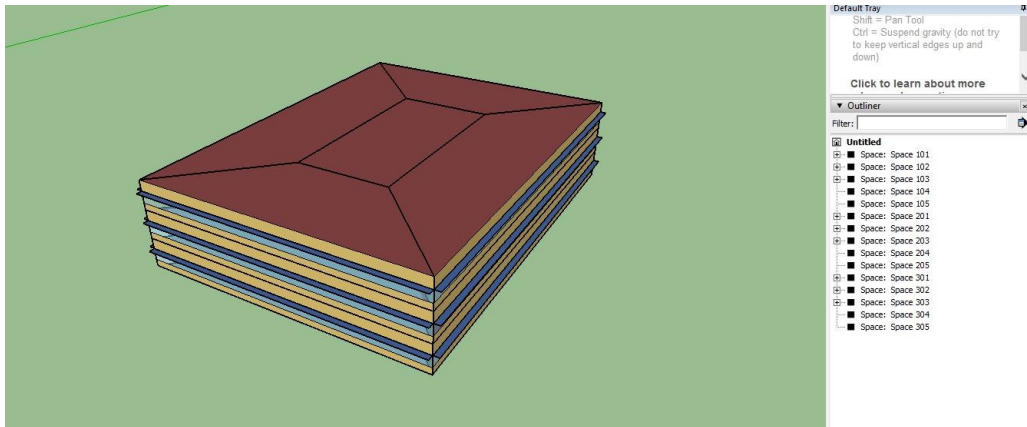Step 5: use surface search to select all of the façade surfaces except for the north side

Step 6: use alter/add model element to add external shading to your elements
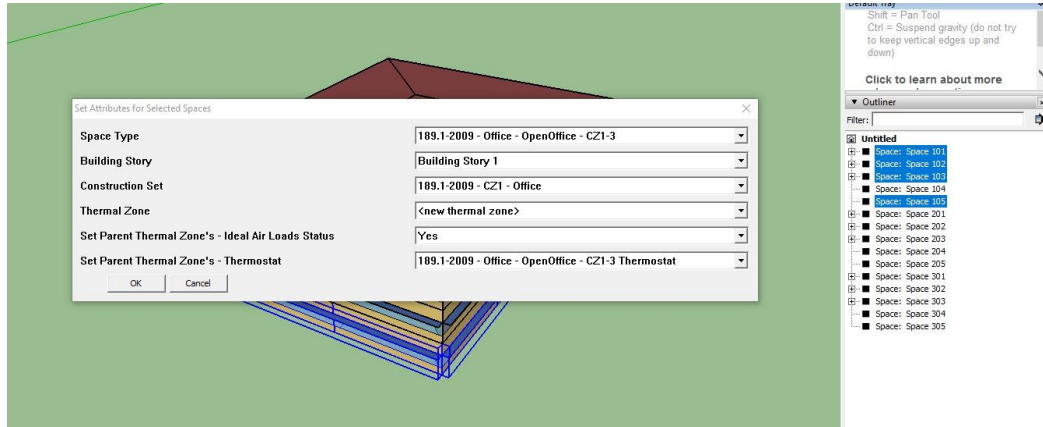

Step 7: select all the surfaces of the building with the surface search

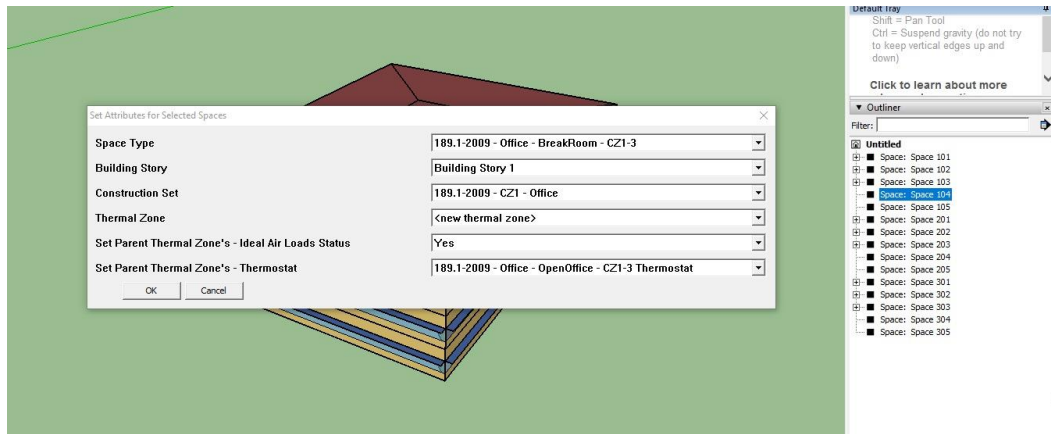## Step 8: in the window menu select outliner tray

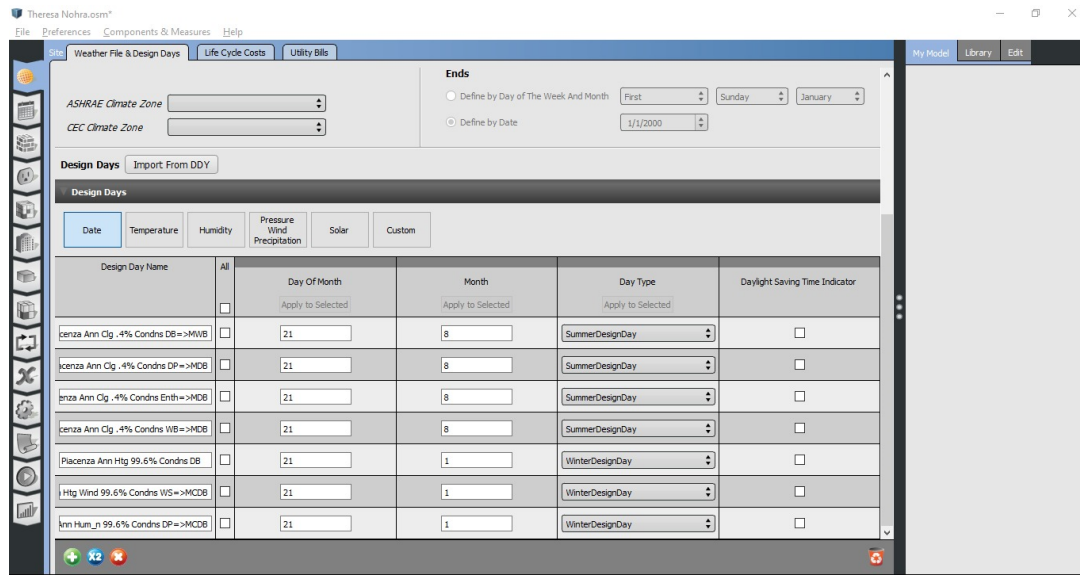Step 9: pick the outer spaces of floor 1 and give it the specifications

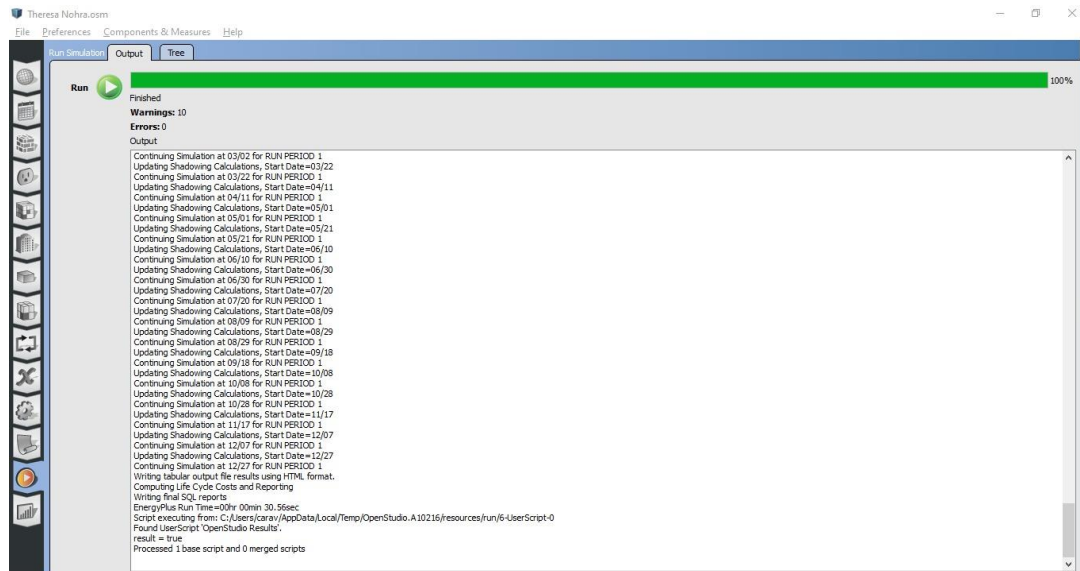Step 10: pick the internal space of the floor 1 and add specifications

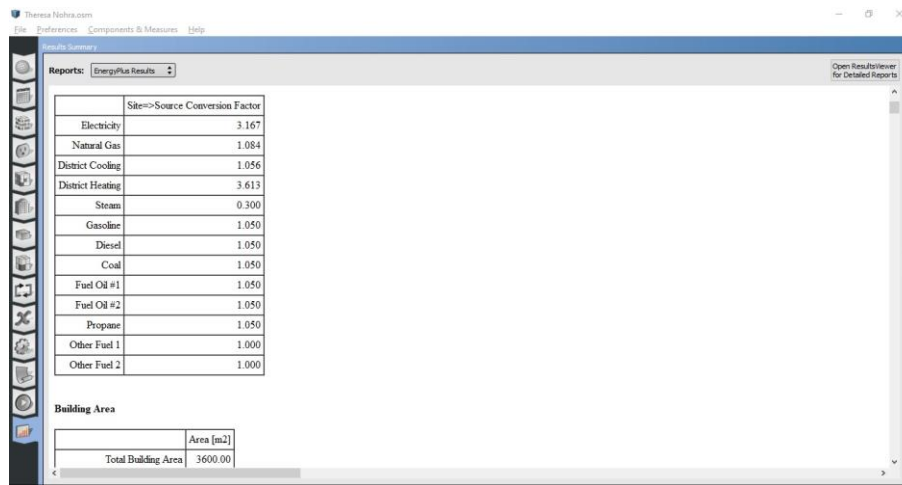Step 11: repeat the steps 9 and 10 to the rest of the building

Step 12: add Piacenza weather data on open design studio file

Step 13: run the model

Step 14: review the results

NOTE: ctrl+z doesn't work with this program, therefore it is best to save the progress all along the way, otherwise you'll have to repeat all the steps after each mistake.