Week 6

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<u>Task 1**</u>: 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?

$\varepsilon_1 = 0.1\varepsilon_1 = 0.1$ $\varepsilon_2 = 0.1$ $\sigma = 5.67 \times 10^{-8} W/m^2 K$

$$Q_{12} = \frac{A\sigma(T_1^4 - T_2^4)}{\frac{1}{\varepsilon_1} + \frac{1}{\varepsilon_2} - 1} = $$

$(5.67 \times 10^{-8})\left(\frac{800^4 - 500^4}{\frac{1}{0.1} + \frac{1}{0.1} - 1}\right)$ divided by $A = $
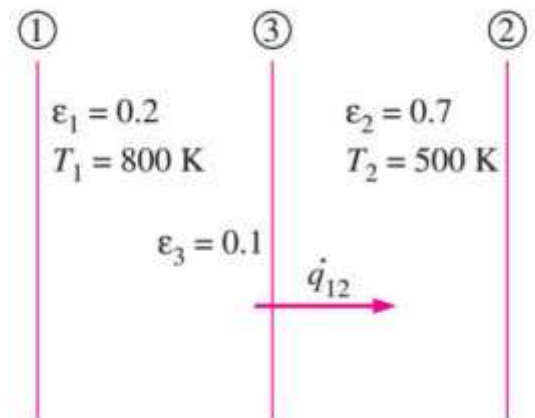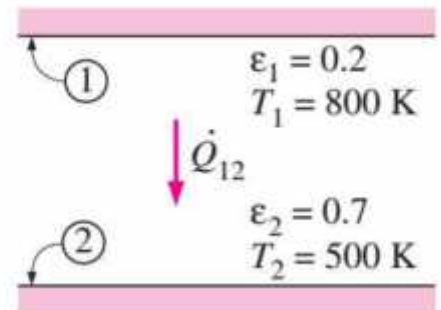
$1035.82 m^2/K$

$Q_{12\,(No.of\,shields)}$ divided by A

$$= \frac{\sigma(T_1^4 - T_2^4)}{(N+1)(\frac{1}{\varepsilon_1} + \frac{1}{\varepsilon_2} - 1)}$$
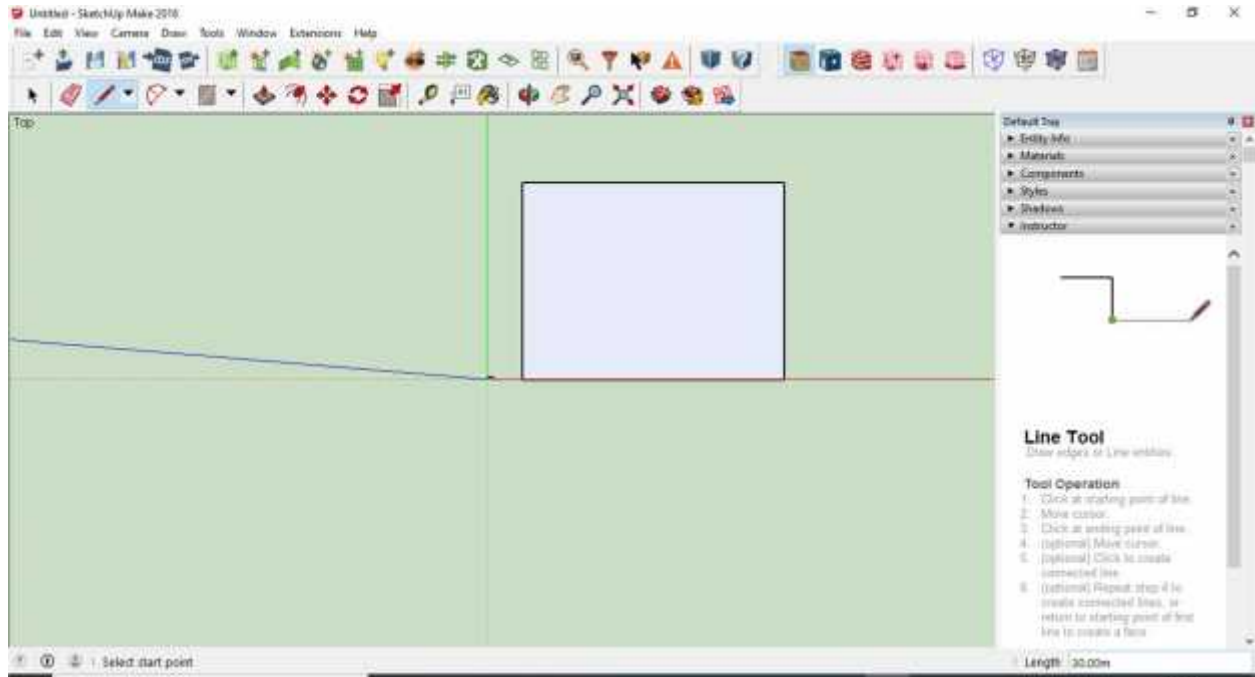
$$= \left(\frac{1}{N+1}\right)(Q.)$$

$Q_{12} = 1035.82$ $1\% \ of\ 1035.82 = 10.35$

$10.36 = \frac{1}{N+1} x1035.82$ $N = 99$
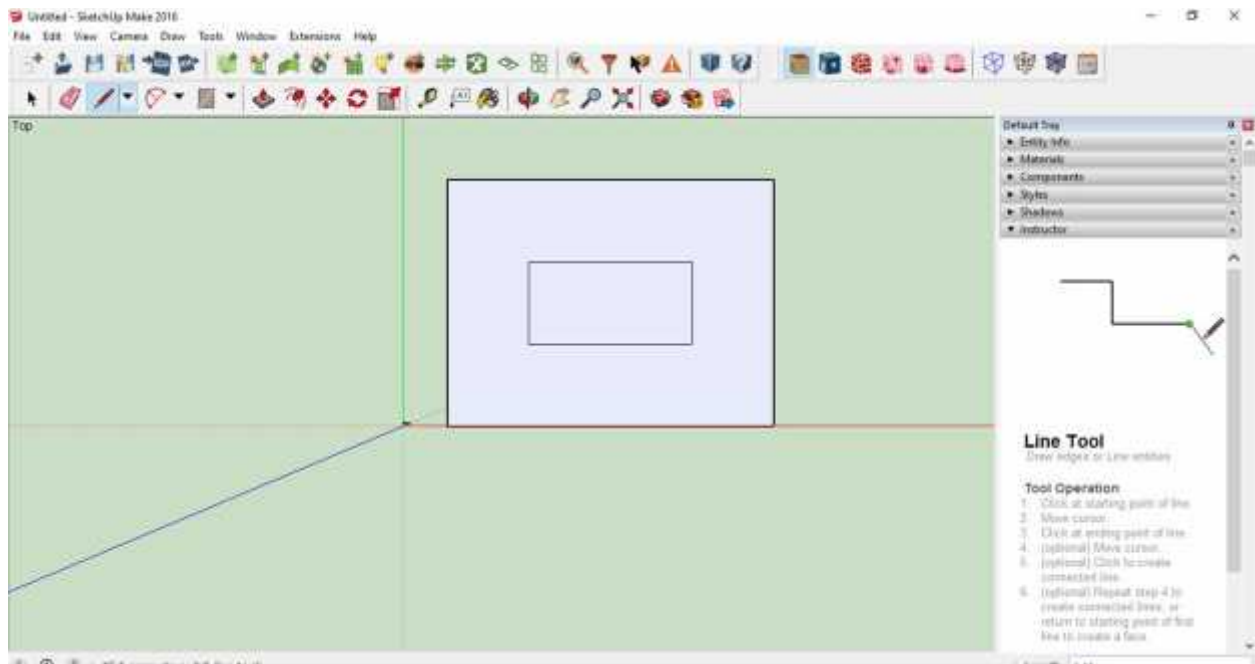
We need 99 shields for Epsilon 0.1

** 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


Open sketchup and from Camera Top with the line tool draw a rectangle 40m x 30m

Then use the offset tool and make an offset of 10m and connect the edges to each other using the line tool.
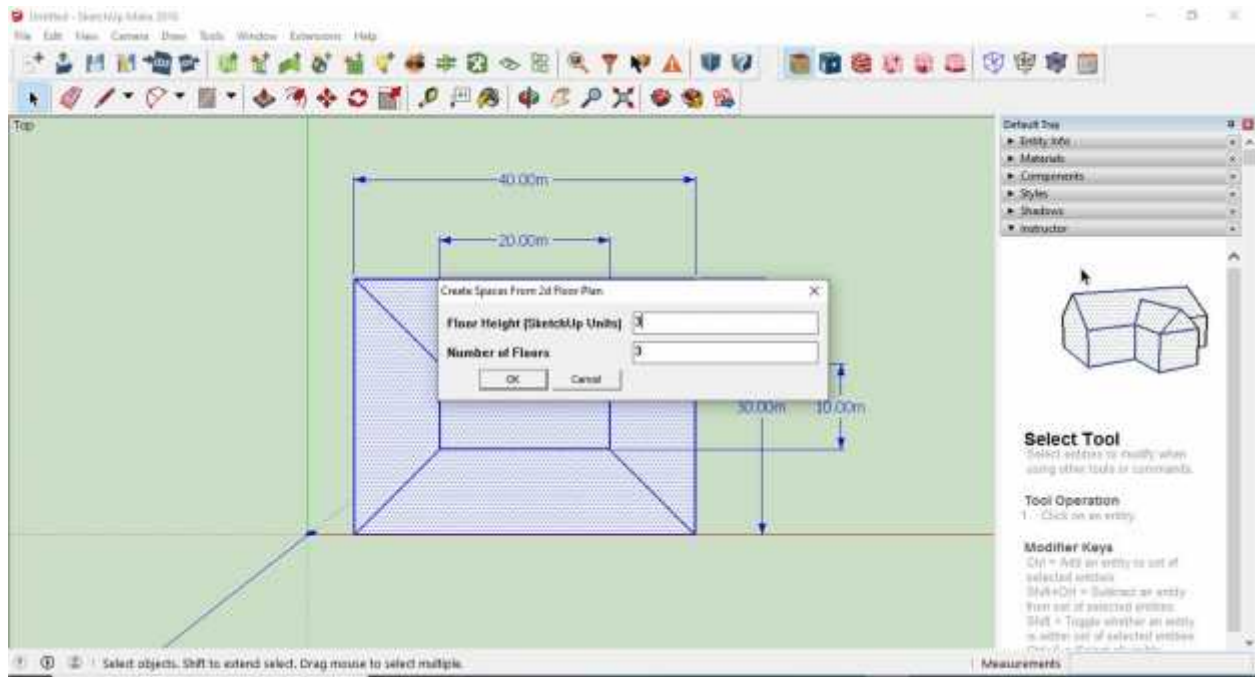

I then put dimensions. And then should select the whole rectangle and click on Create spaces from the toolbar; this will make spaces of the lines we drew in the layout and will become spaces when we give number of floors and heights. In number of floors=3 and height of floor is 3m
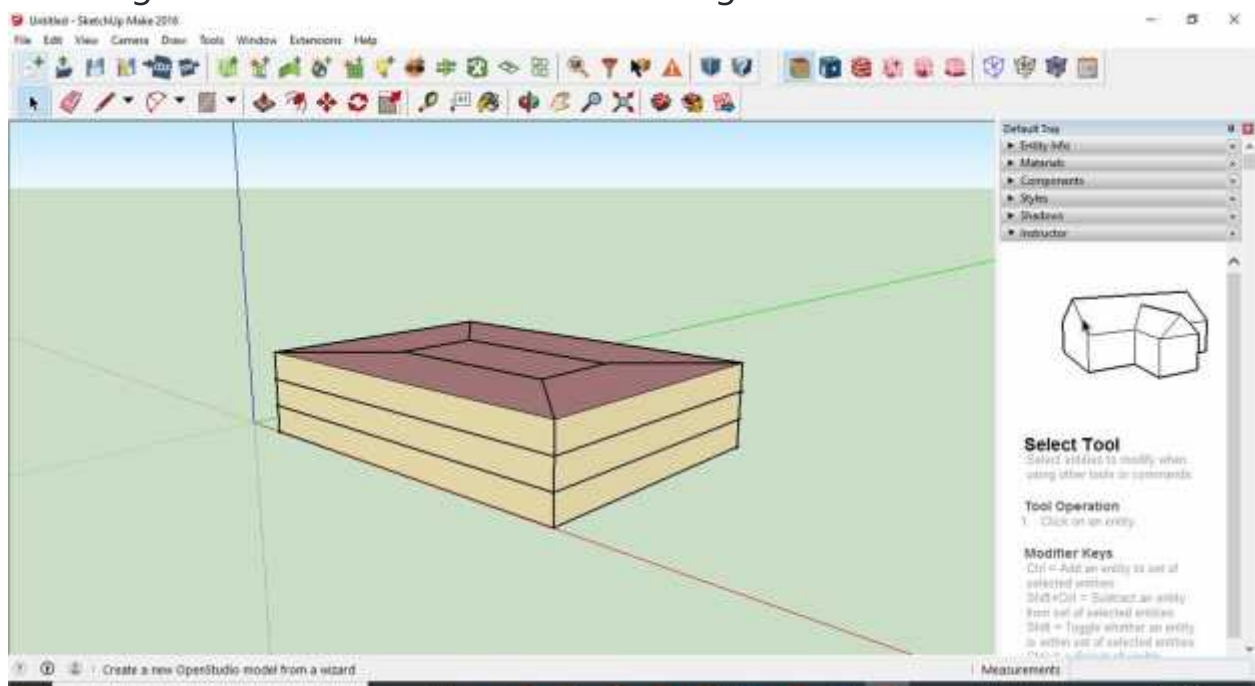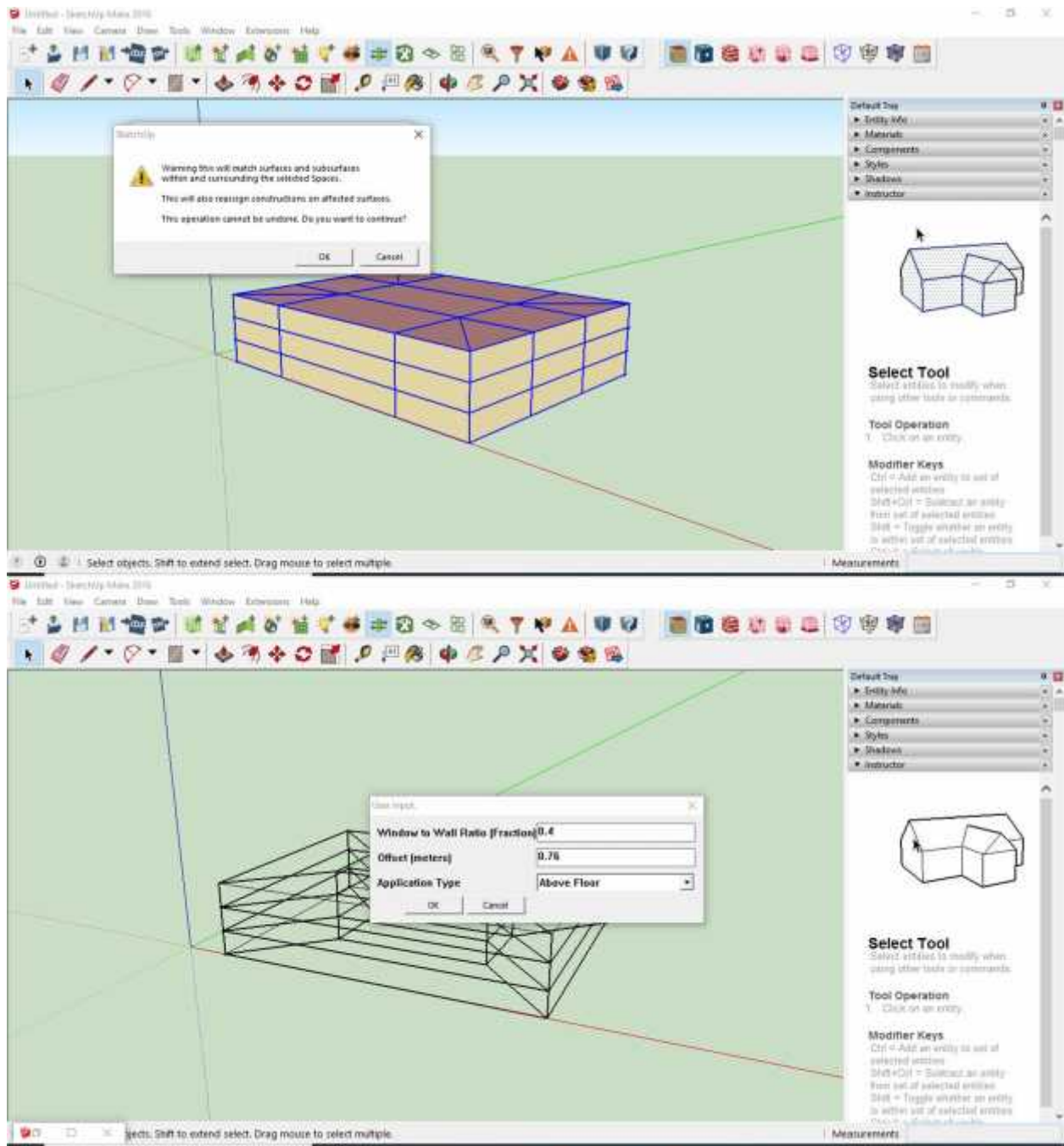
Then we need windows so we go to Extensions→Openstudio User scripts→alter→set windows to wall ratio and then adjust the dimensions of the windows. This will now create windows so we could study how the building interacts with the weather and calculate the energy.
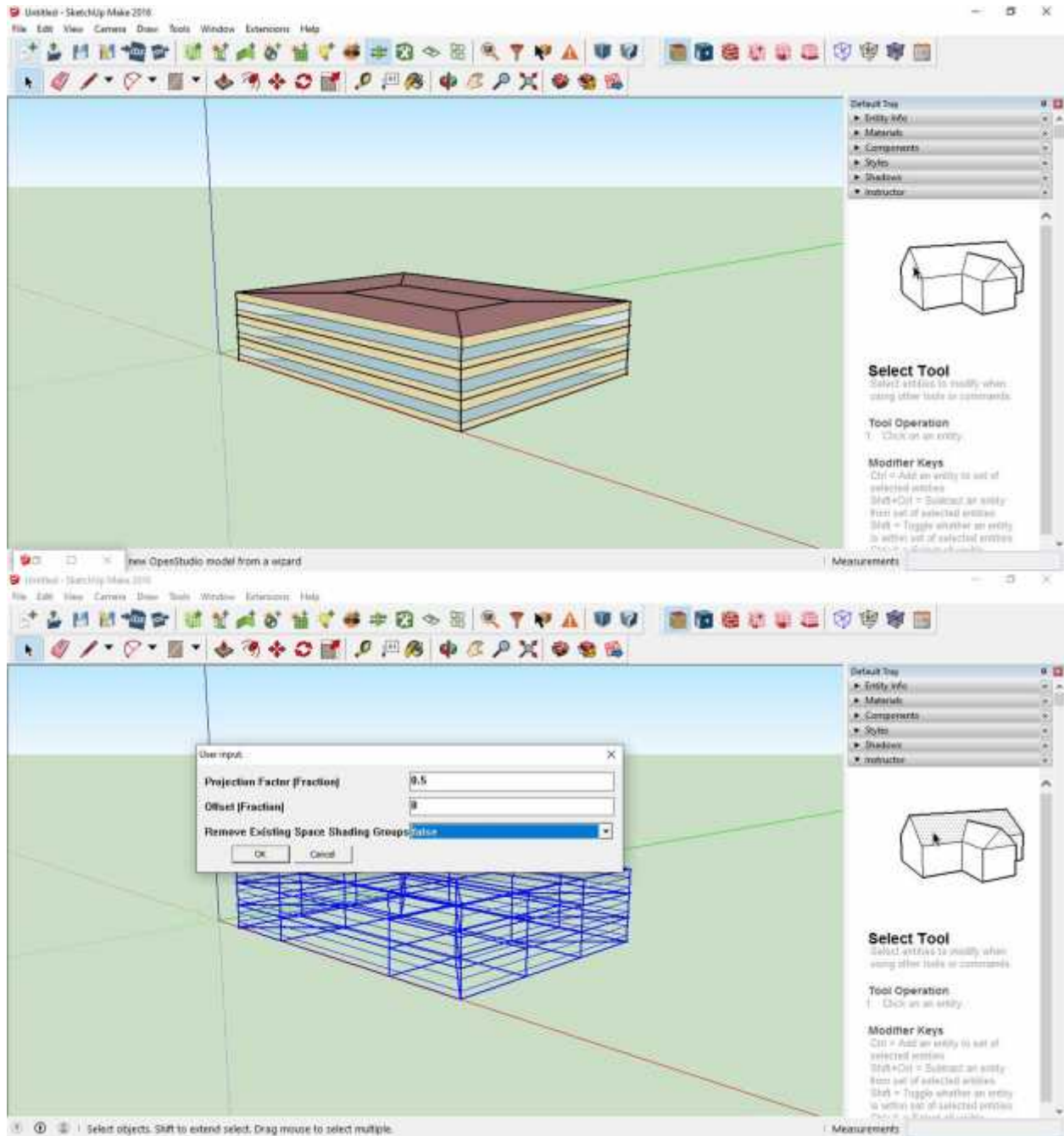
And then we add shading devices to the windows from Extensions→Openstudio User scripts→alter→add overhangs
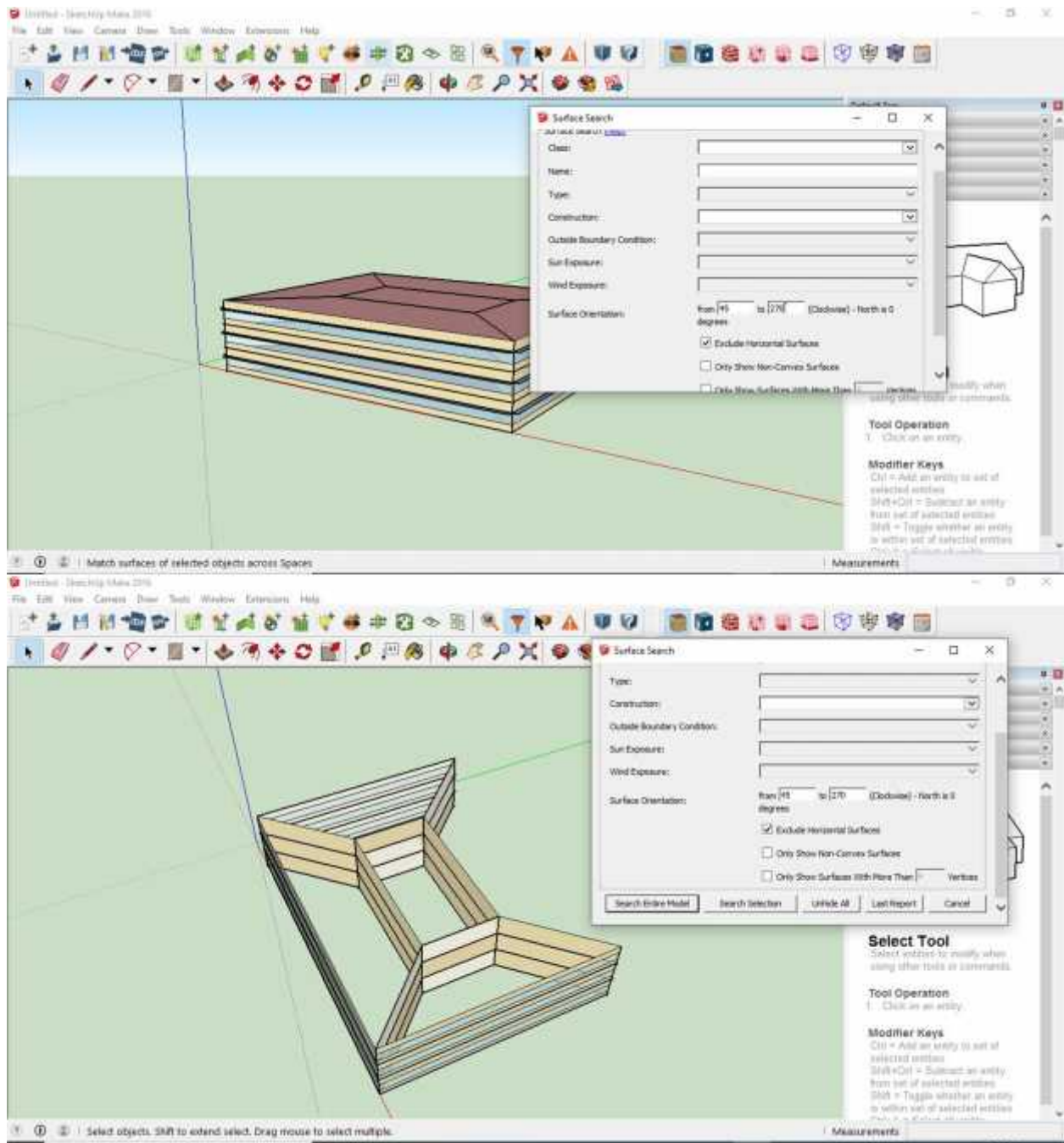
Then in Surface Search justify the surface orientation from 45 degrees to 270 degrees in order to exclude the North from the search since we don't need it as there is no direct sunlight. And we also Exclude horizontal
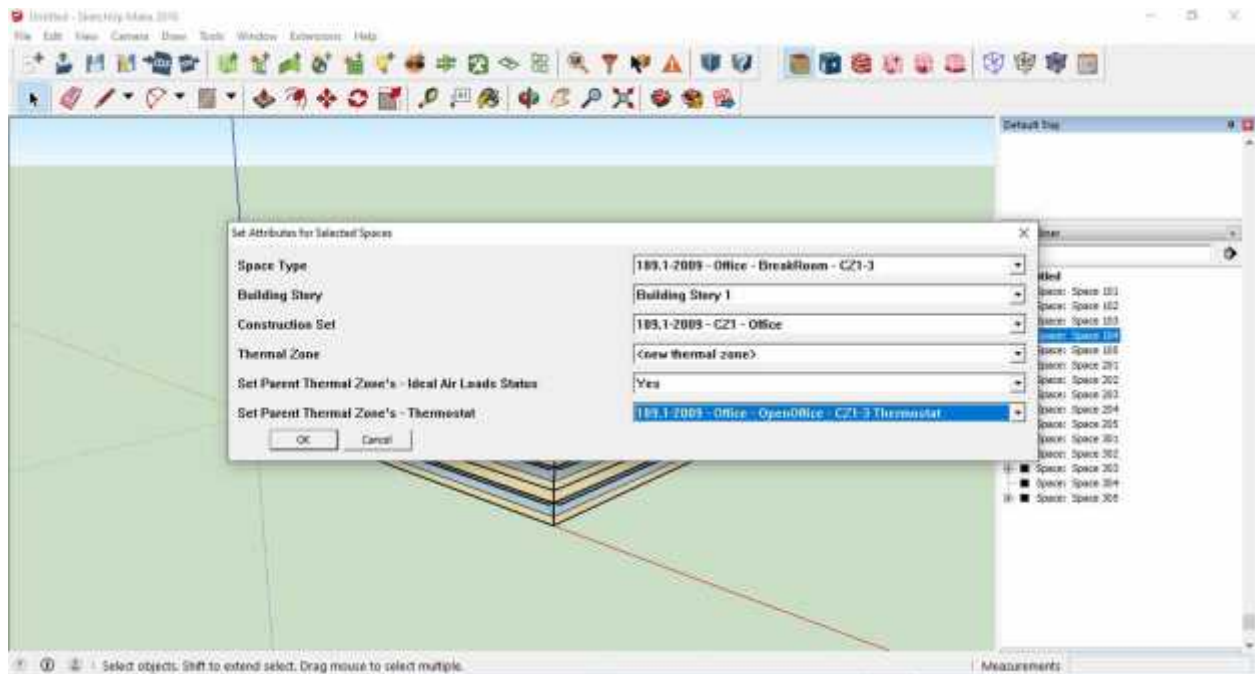
surfaces since we want the walls not the floors And then unhide all.
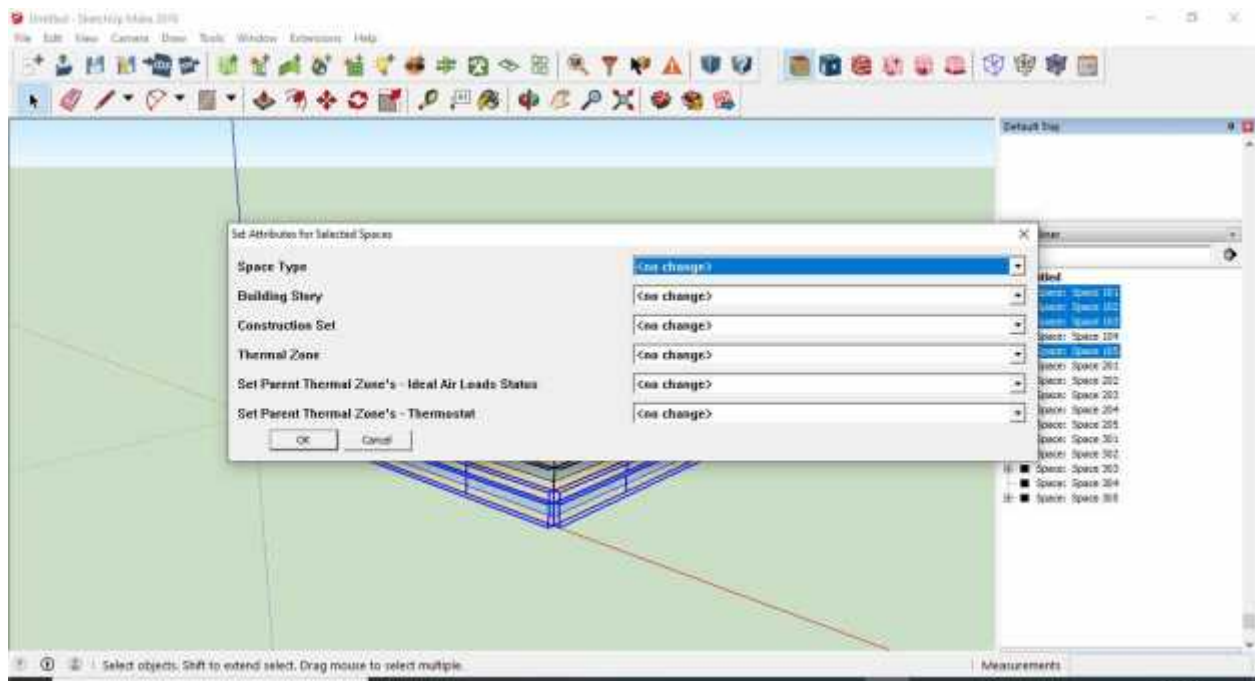
Default tray→Outliner where we can define the characteristics of every space in every floor
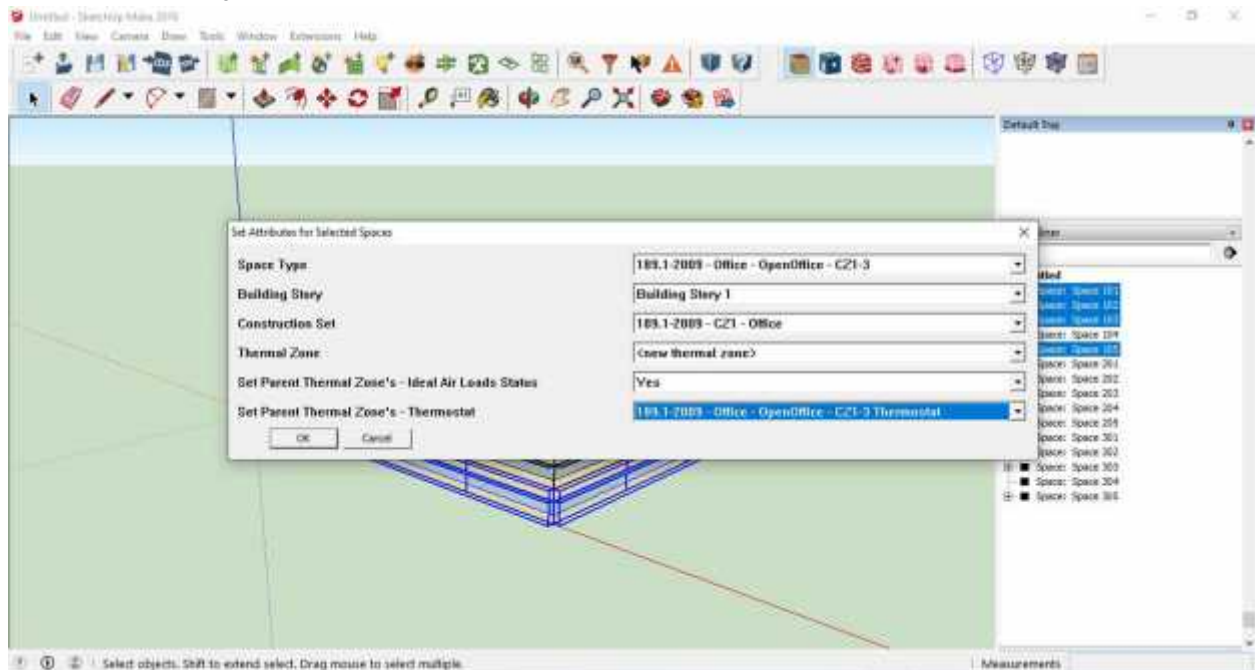
For 101,102,103,105 we choose Open office and also the same for the rest of the floors.

For 104 and also the same space in the rest of the floors we choose Breakroom since it is a space in the middle.

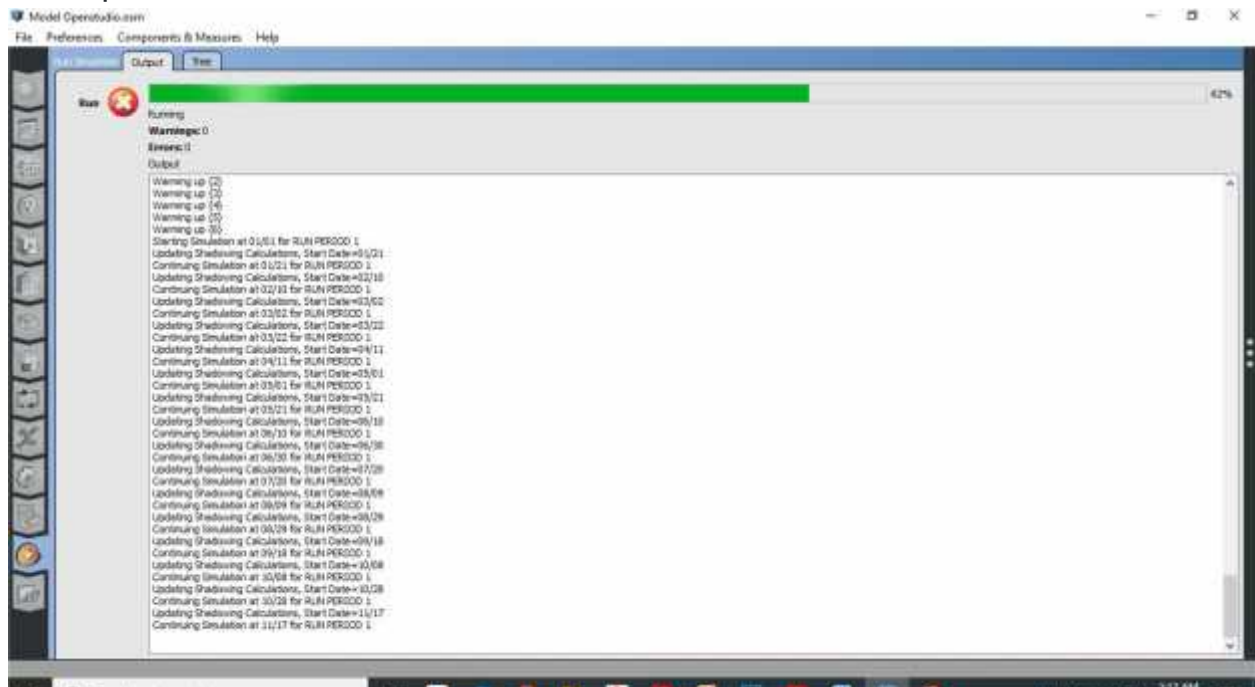After this, we save the file as Openstudio model and give the file a name.
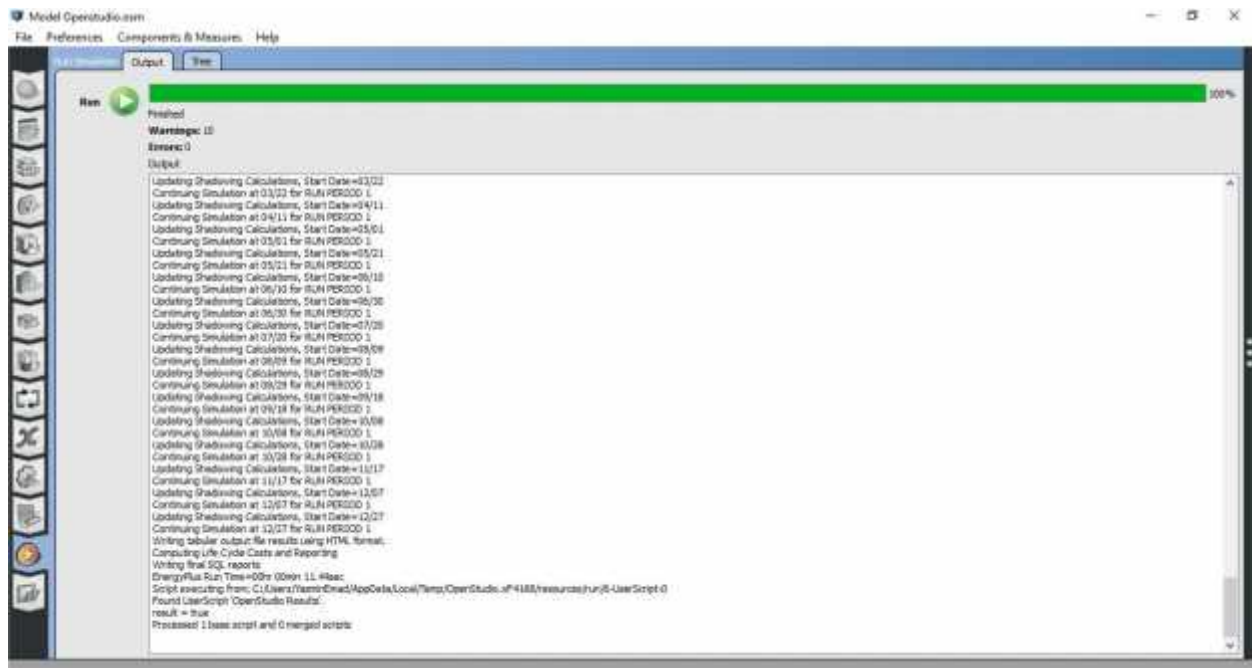
We open this file in Openstudio program
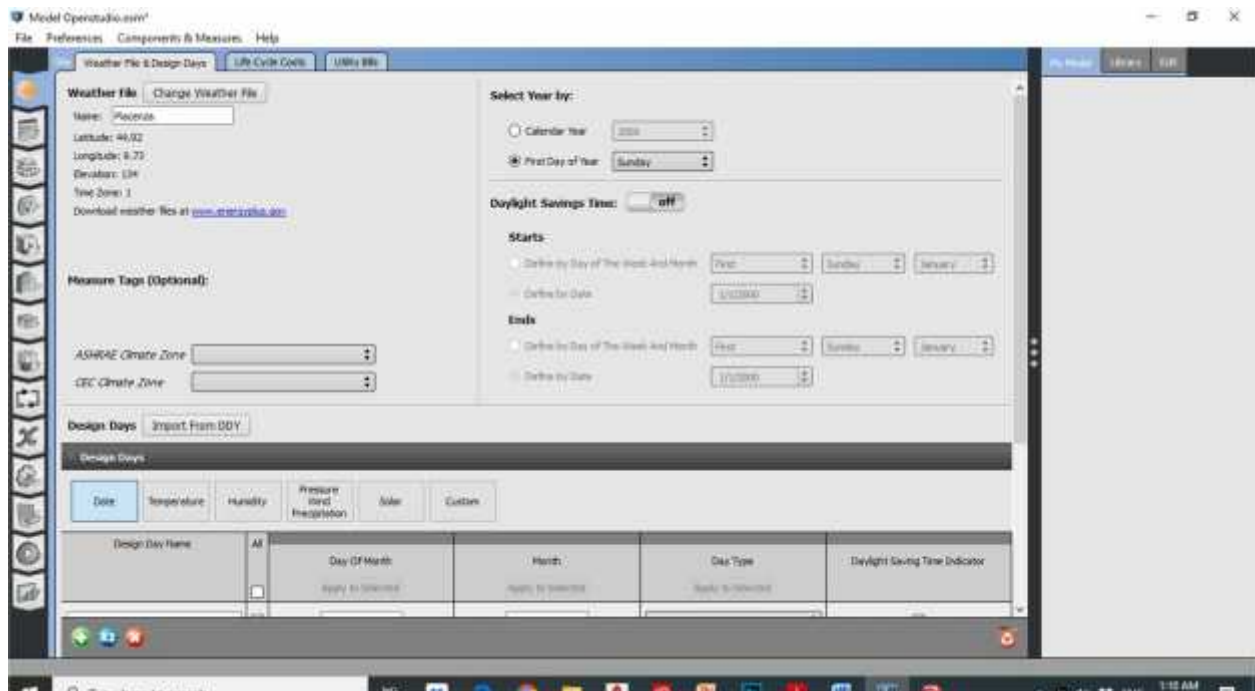
We put the Piacenza weather formats ddy and epw in the slots and the go
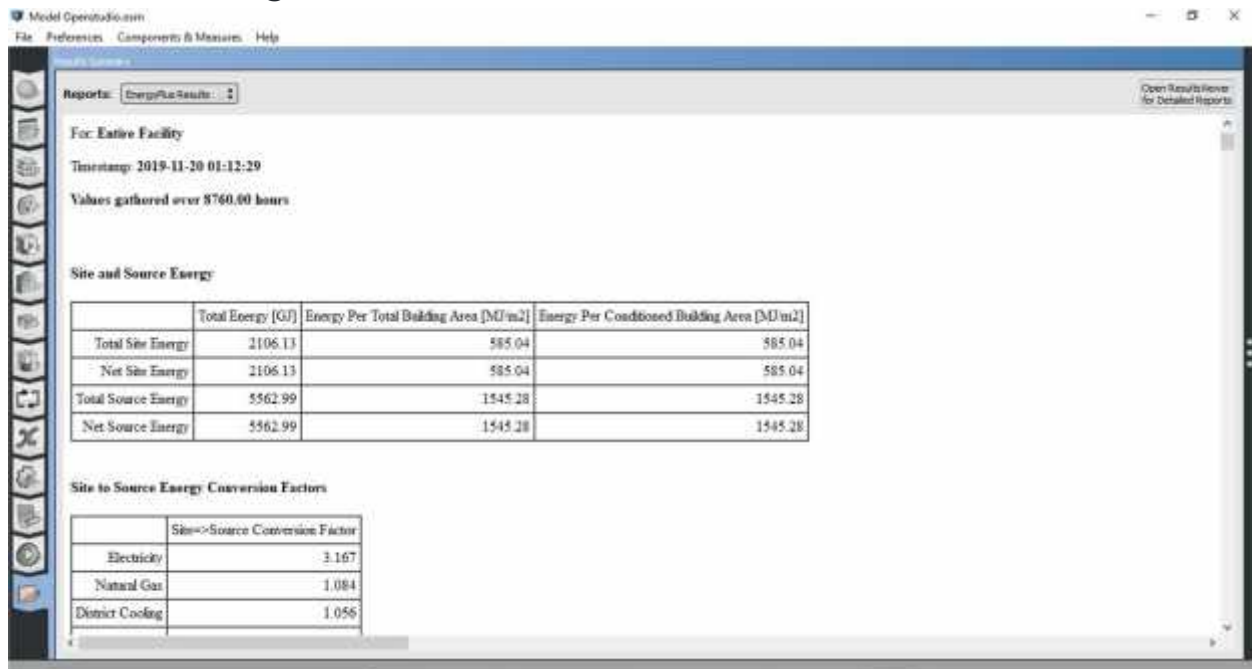to Run simulation
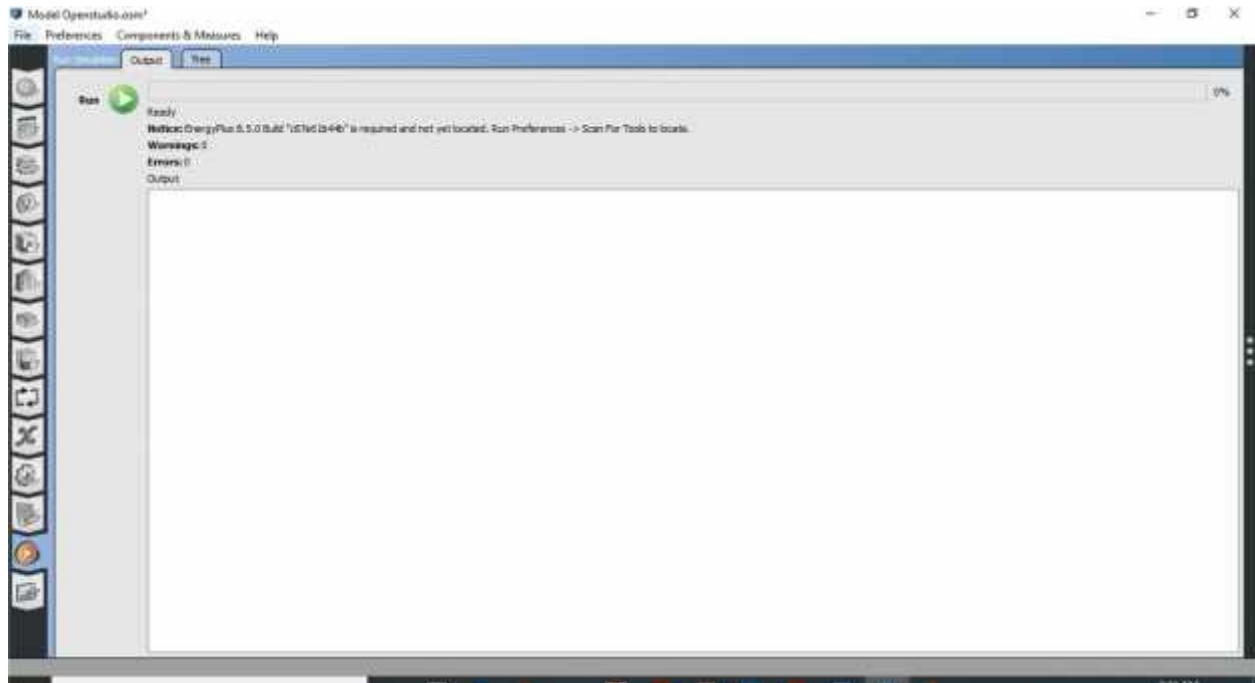
Then press on the Run button and wait for the simulation to finish

After it finishes go to Results tab and view the results of the simulation.

Change the Reports type to Energyplus results and all the energy consumption data, results and info will be shown.