6th *WEEK'S* SUBMISSION

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?

A_1 = 1,5 m^2
ϵ_1 = 0.1
ϵ_2 = 0.1
T_1 = 298 K
T_2 = 308 K
σ = 5.67 x 10^{-8} (W/m^2 x K^4)

from the last exercise:

$$\dot{Q} = \frac{\sigma\,(T_1^4 - T_2^4)}{\left(\frac{1-\epsilon_1}{\epsilon_1 A}\right)+\frac{1}{A}+\left(\frac{1-\epsilon_2}{\epsilon_2 A}\right)} = \frac{5.67 \text{ x } 10^{-8}\,(308^4 - 298^4)}{\left(\frac{1-0.1}{0.1 \text{ x } 1.5}\right)+\frac{1}{1.5}+\left(\frac{1-0.1}{0.1 \text{ x } 1.5}\right)} = \frac{63.108}{12.666} = 4.9822 \text{ W/m}^2$$

1% of $\dot{Q}$ = 0.049822 W/m^2

$$\epsilon_{eff} = \frac{63.108}{0.049822} = 1266.669 = \left[\left(\frac{1-0.1}{0.1 \text{ x } 1.5}\right) + \frac{1}{1.5} + \left(\frac{1-0.1}{0.1 \text{ x } 1.5}\right)\right] + 1254$$

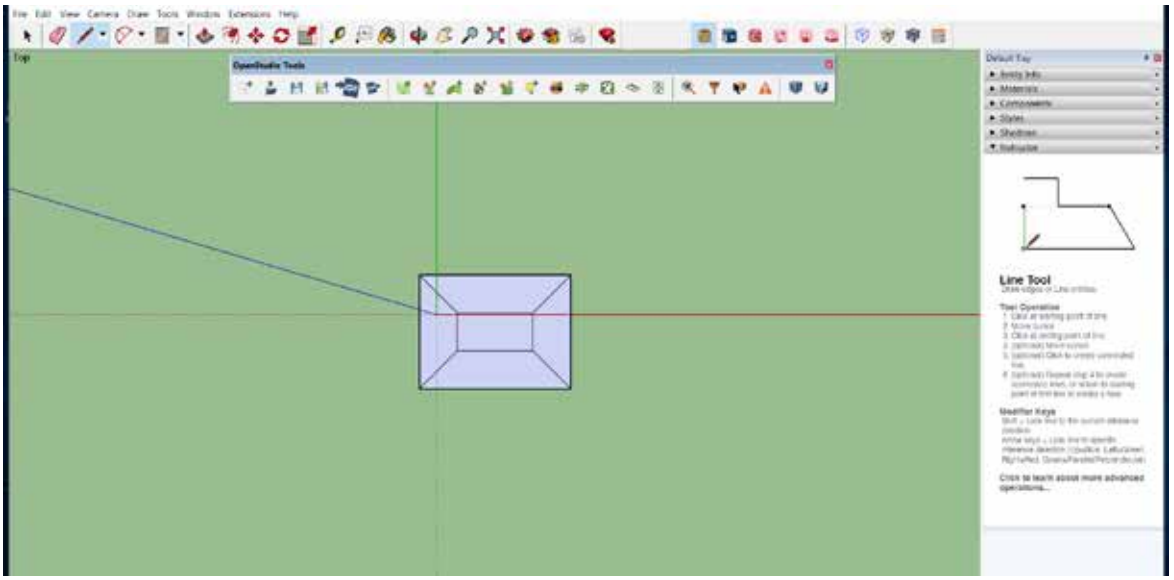
$$\frac{1}{\epsilon_1} + \frac{1}{\epsilon_1} - 1 = \frac{1}{0.1} + \frac{1}{0.1} - 1 = 19$$

1254/19 = 66

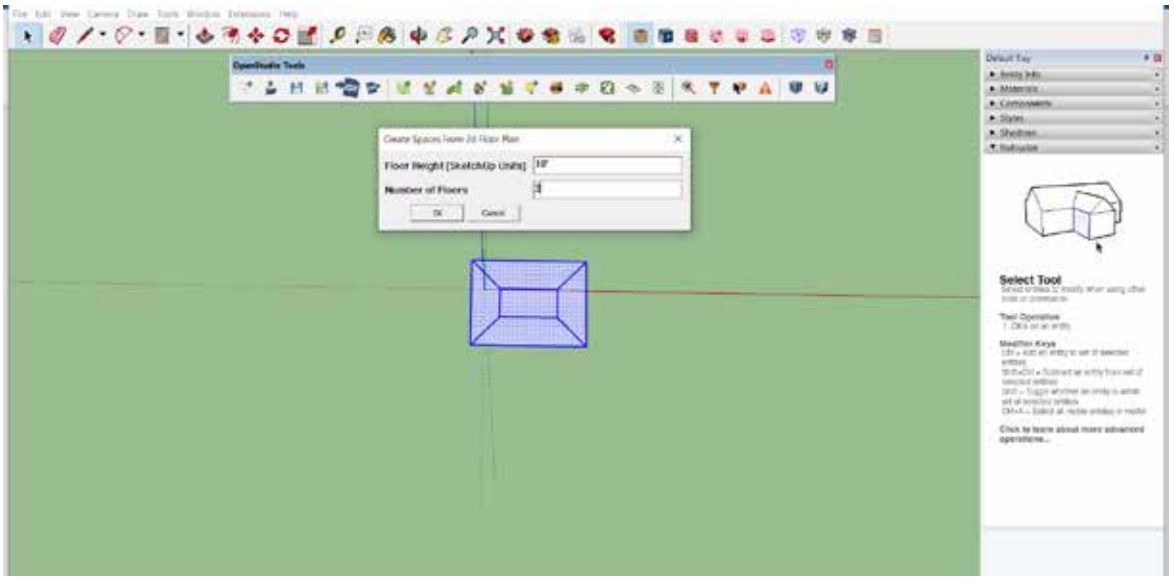
in order to have the new heat transfer rate to be 1%
we should add 66 shields with ϵ = 0.1

2. 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

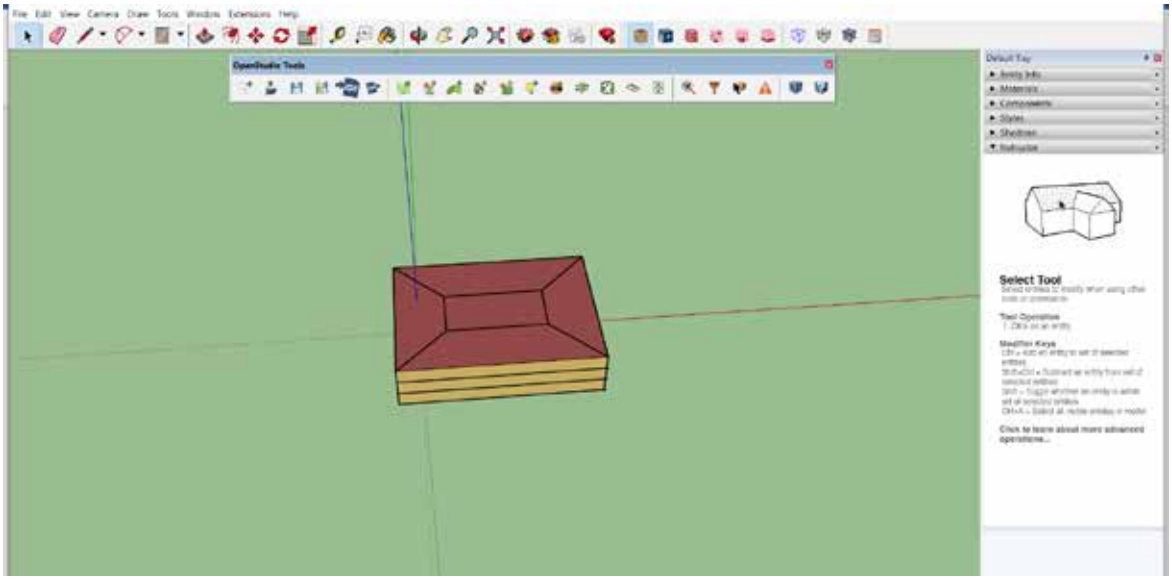
First draw a rectangle of 40 x 30 m with an internal offset of 10 m.
Join the edges of the outer rectangle with those of the inner rectangle.



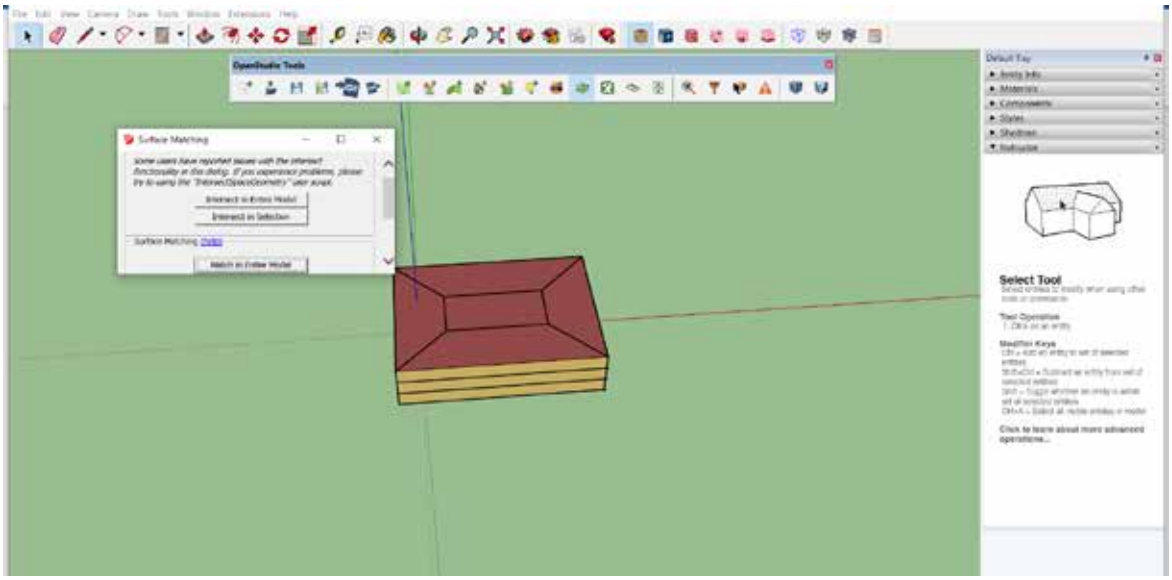
Select all the lines of the drawing and use the command “create space from diagram” and set 3 as the number of planes.



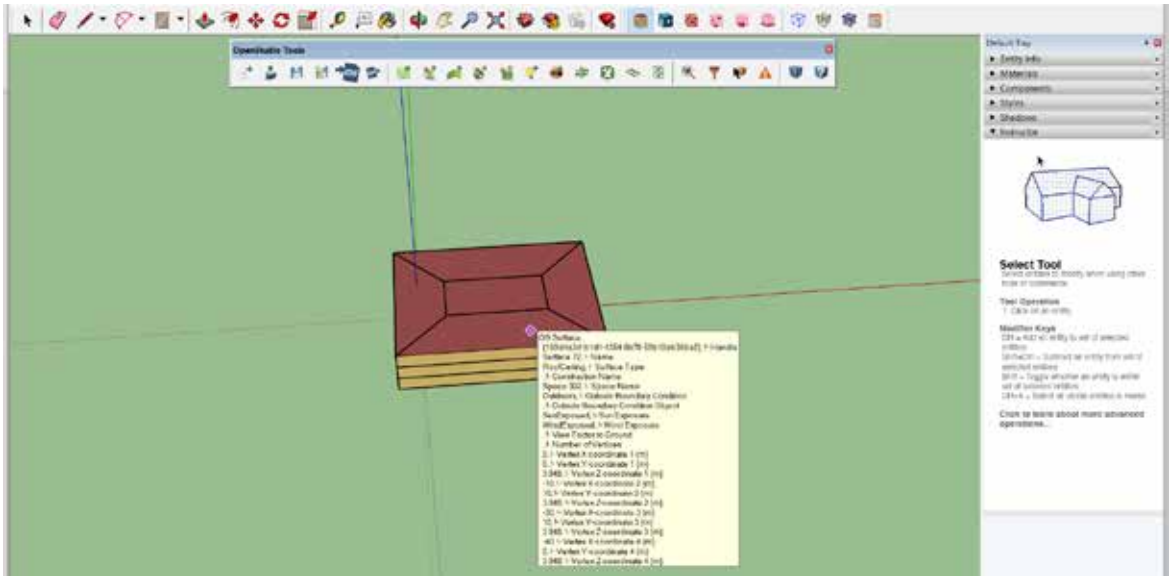
Now we will have our own building where the main components are highlighted



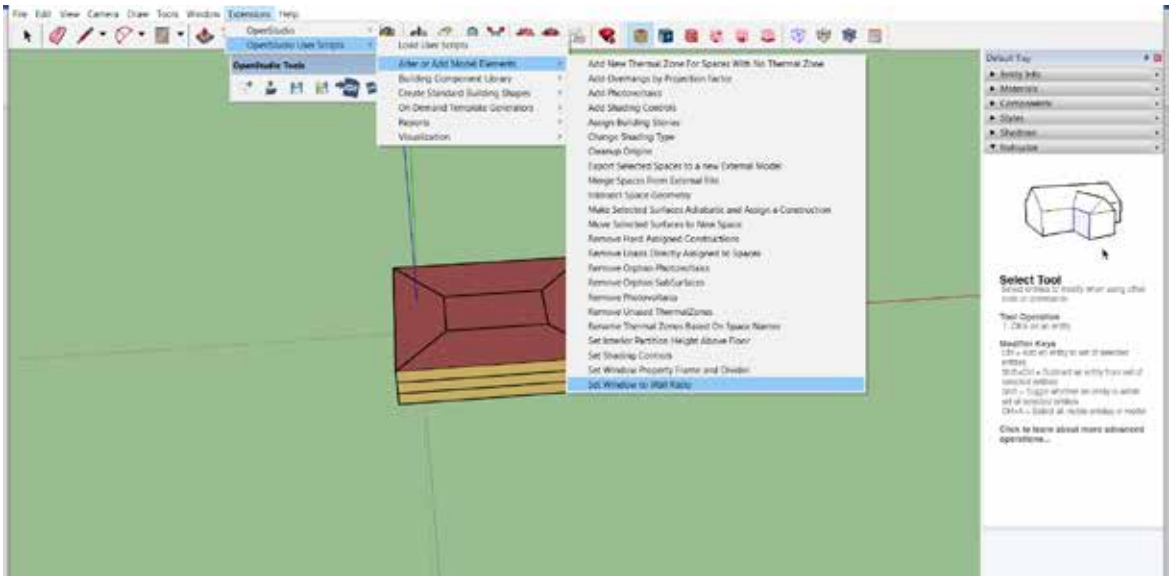
Now using the command “Surface matching” we go to better define the properties of each surface, so that each has information that identifies it with respect to the other.



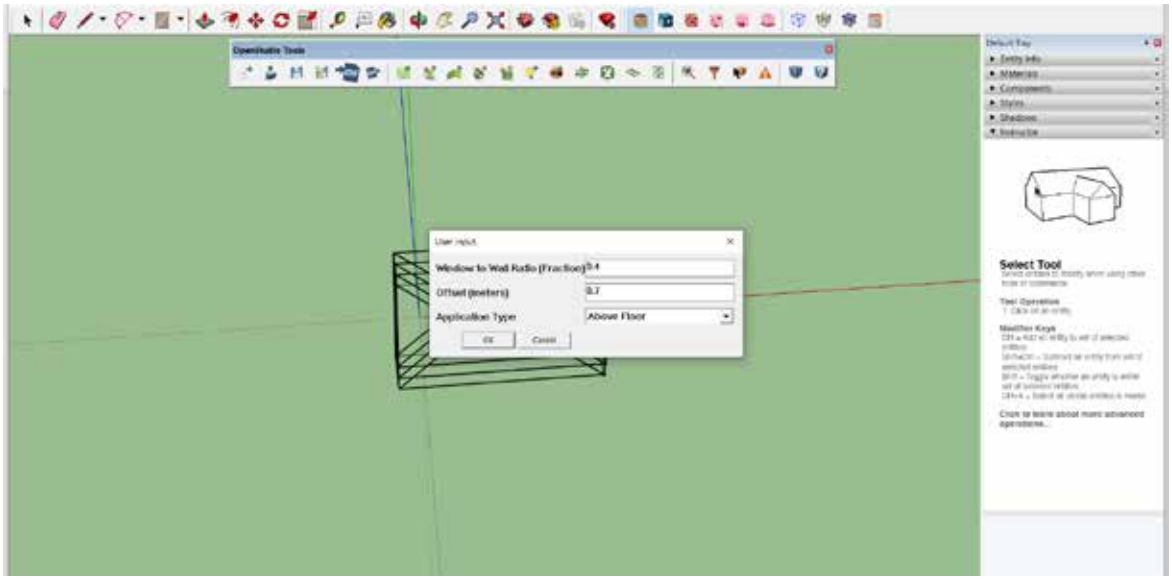
We can verify the success of this command through the “Info tool”, approaching with the mouse to any surface of the drawing shows us what are its properties.



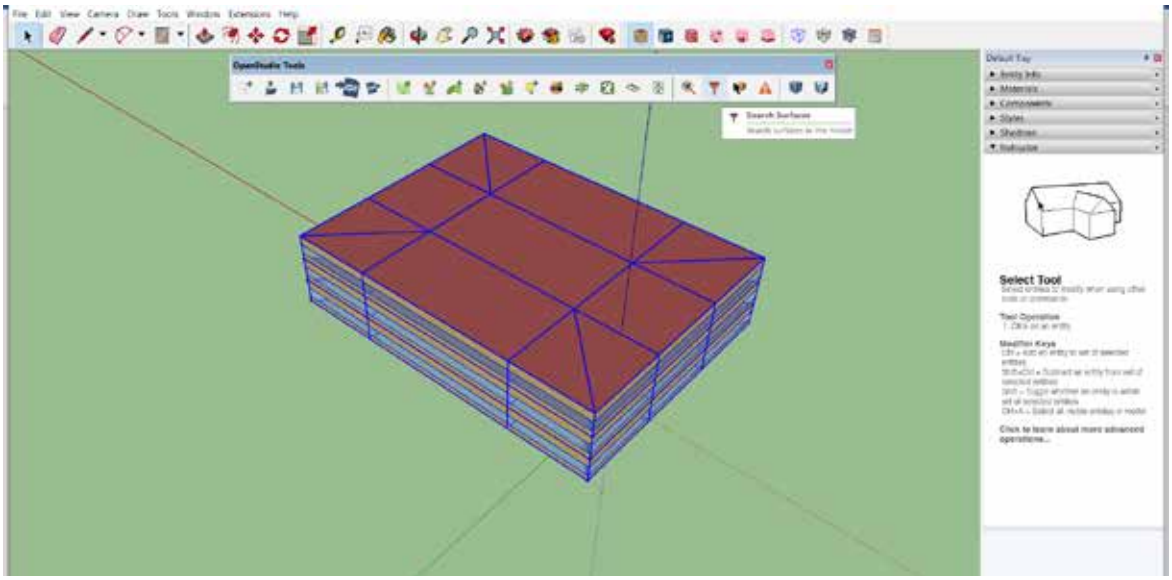
After selecting the entire building, we follow the instructions on the screen below, to create the windows on the outer walls.



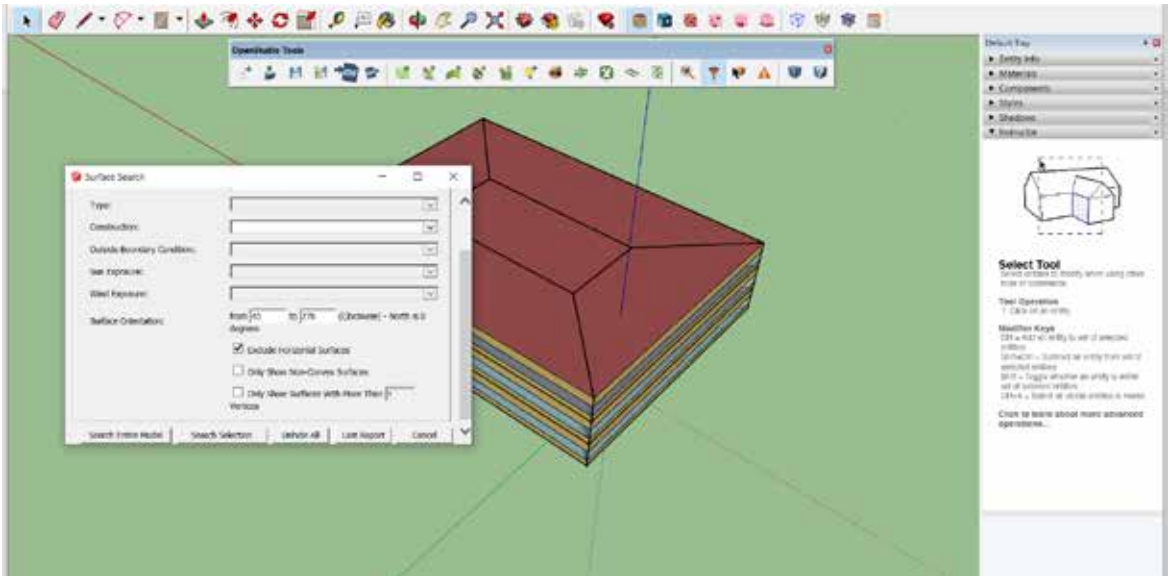
Set the offset value to 0.7 instead of 0.76.



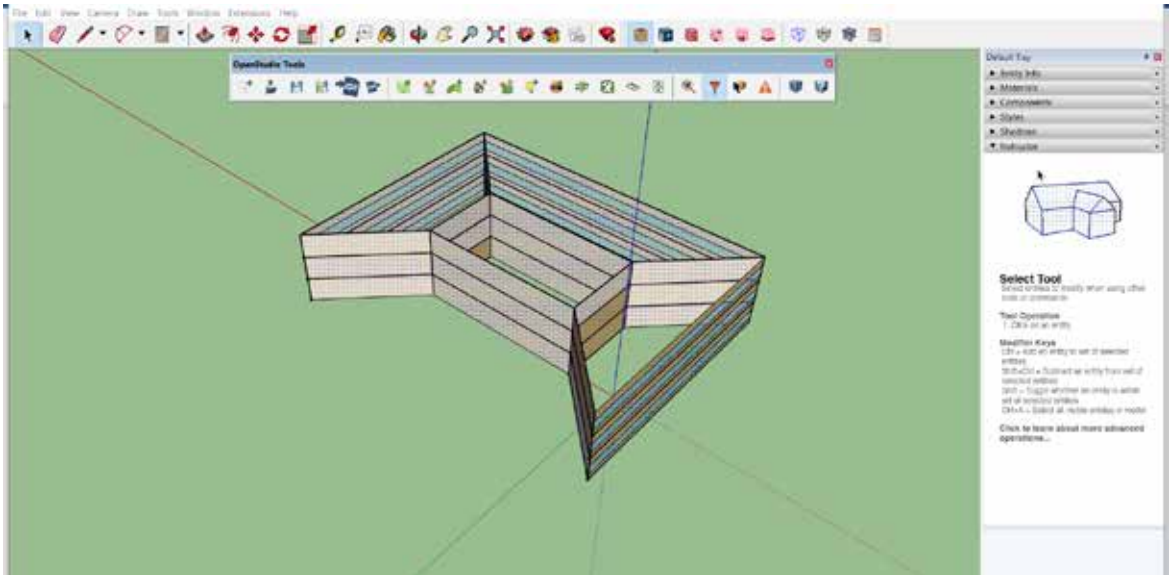
The result will be the one shown on the screen.



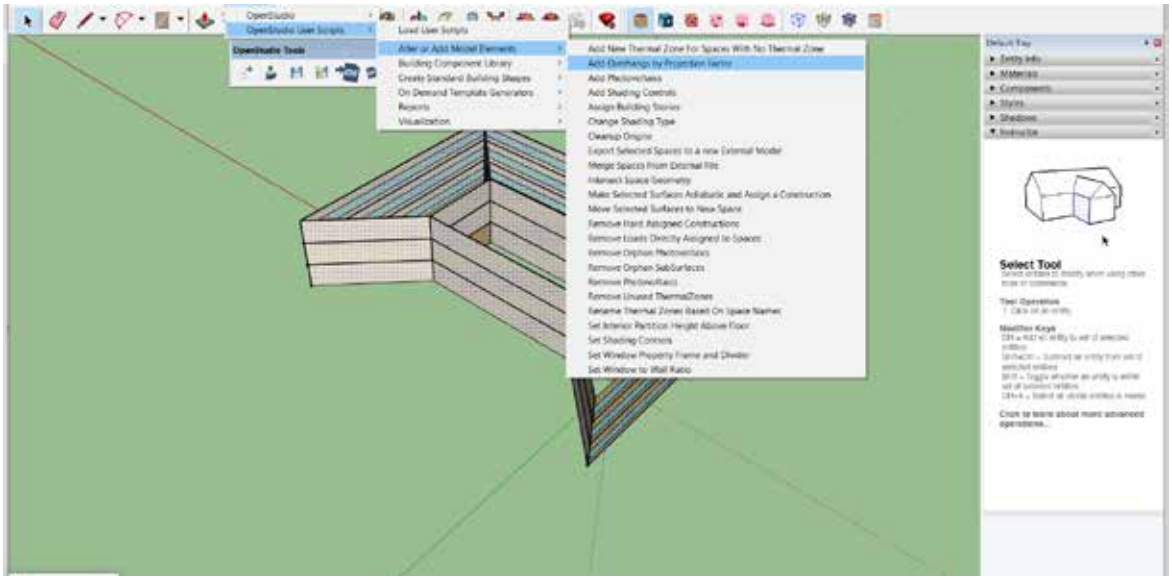
Now we move on to create solar shading on the windows, of course the windows to the north will be excluded from the selection, and for this we use the command “Search surface” and set the search angle between 45 and 270 degrees by putting the thick to “Exclude horizontal surfaces”.



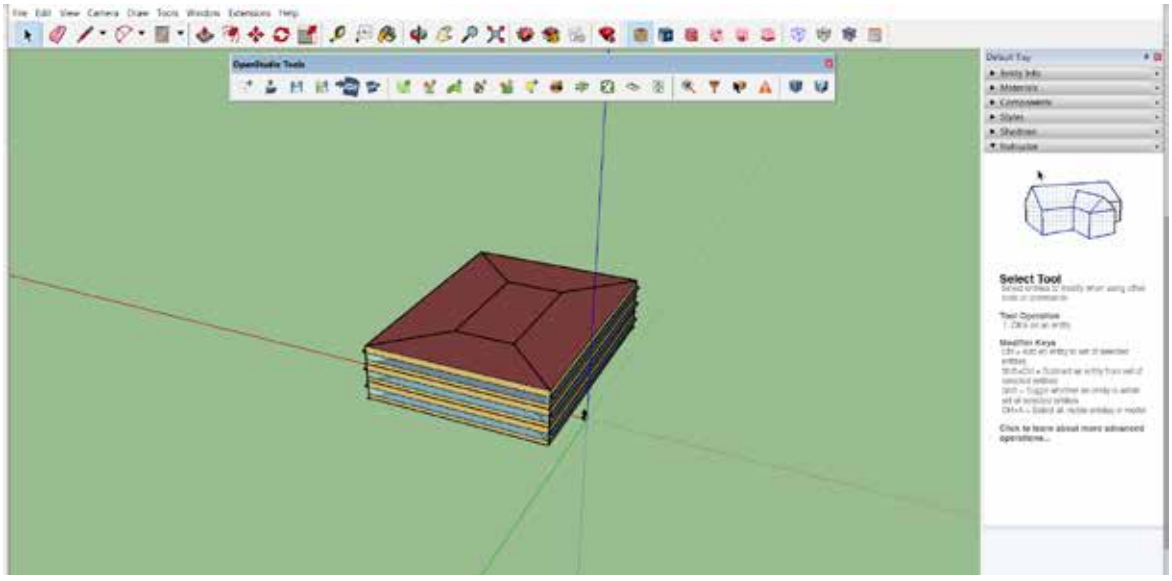
In this way the surfaces to the north will be excluded from the selection to create the sun shading.



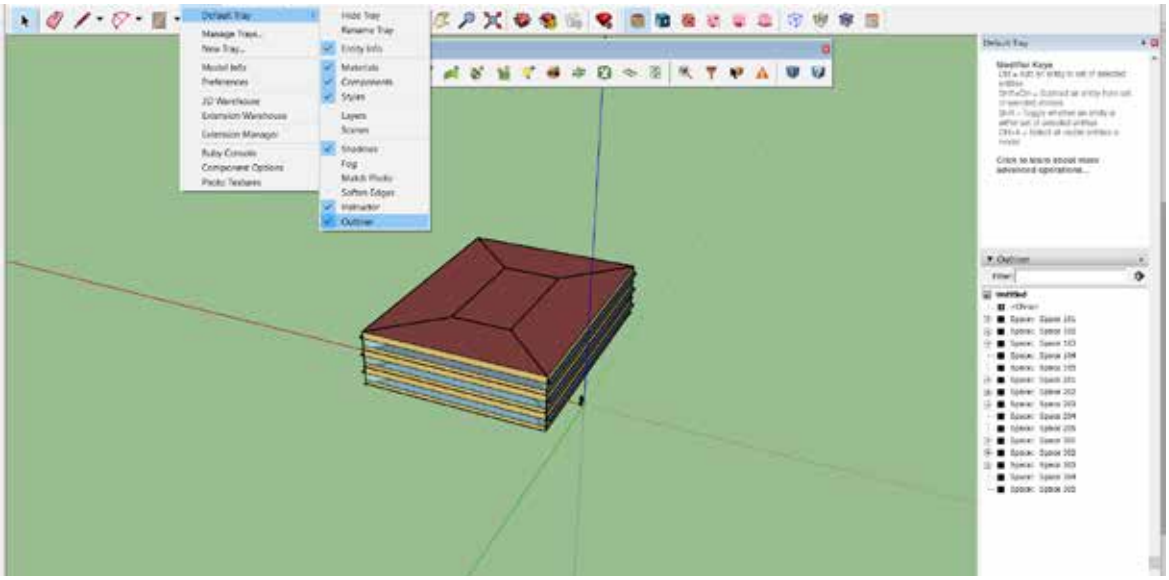
Through the command “add overhangs by projection factor” we create the solar diagrams



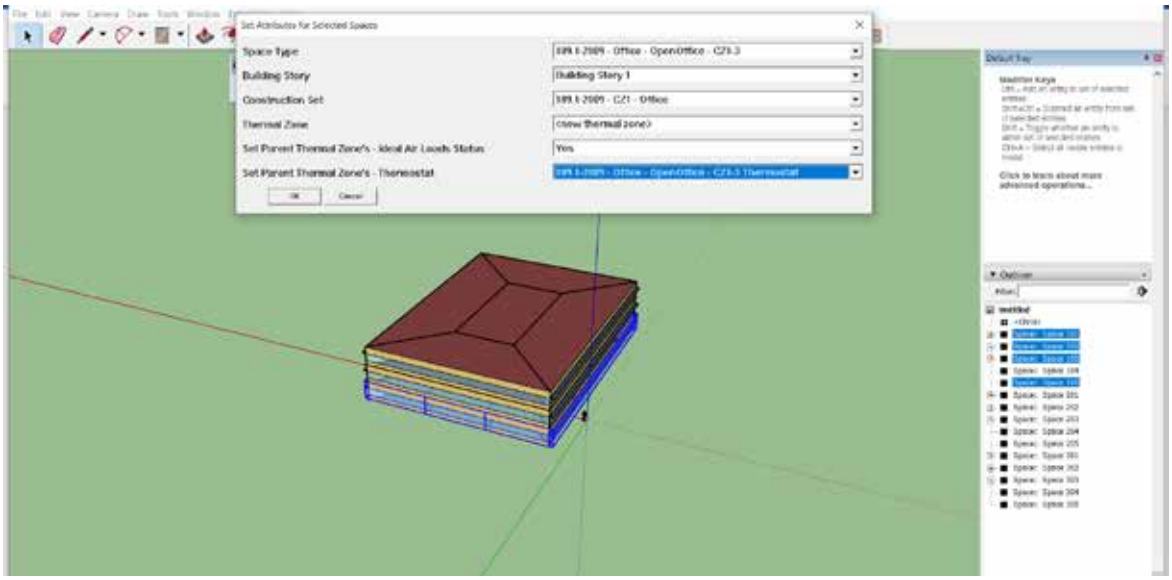
After having also rehabilitated the North walls through the comamdo “Search surface” the result will be the one reported by the screen.



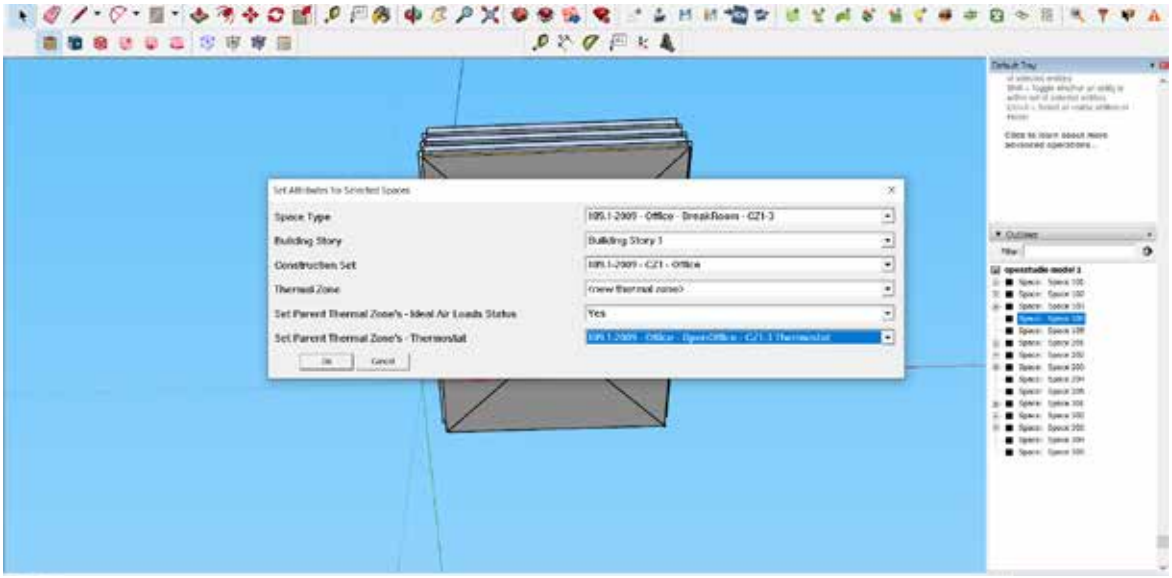
Select the “Outliner” command from the “Default tray” to display and change the thermal gaps of each area of the building.



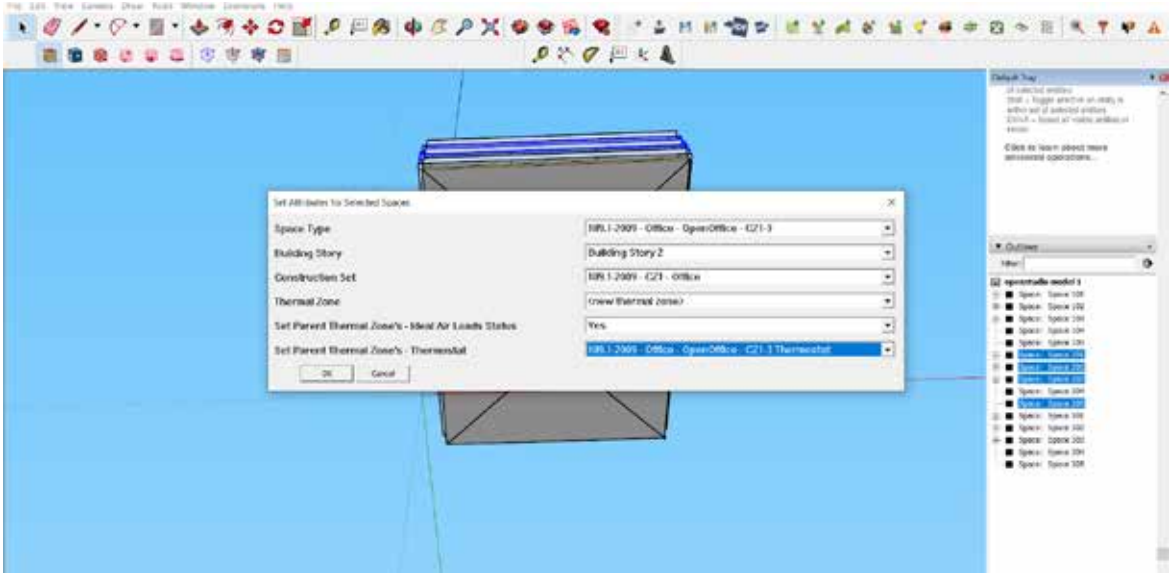
Now we choose the spaces of each thermal zone and we add specifications, follow all the steps for each area of the building.



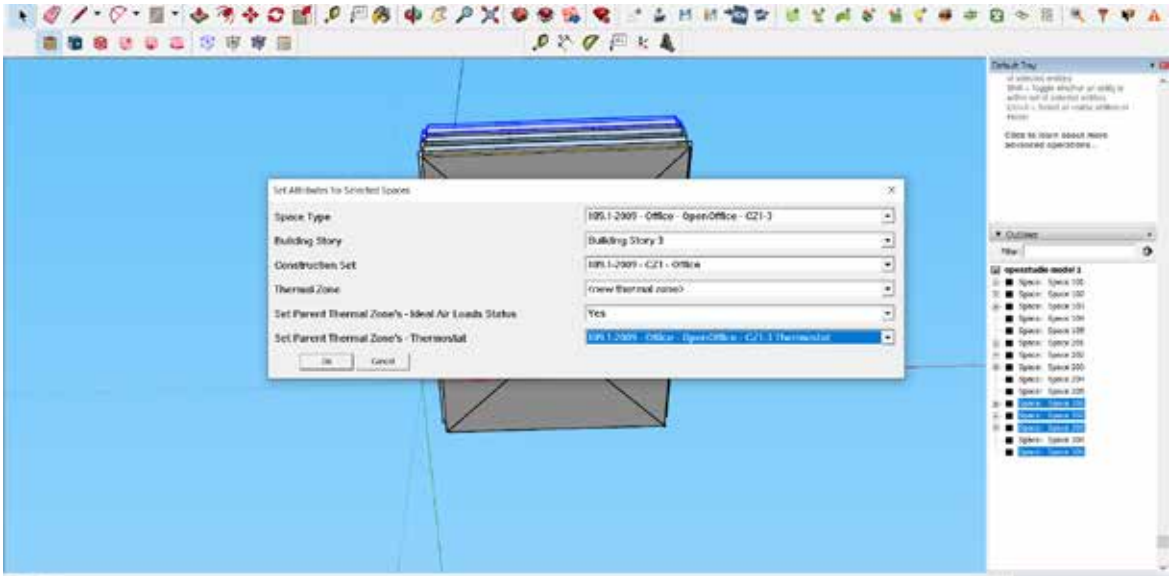
2.


Space Type
Building Story
Construction Set
Thermal Zone
Set Parent Thermal Zone's - Ideal Air Loads Status
Set Parent Thermal Zone's - Thermostat
Yes
OK
Cancel

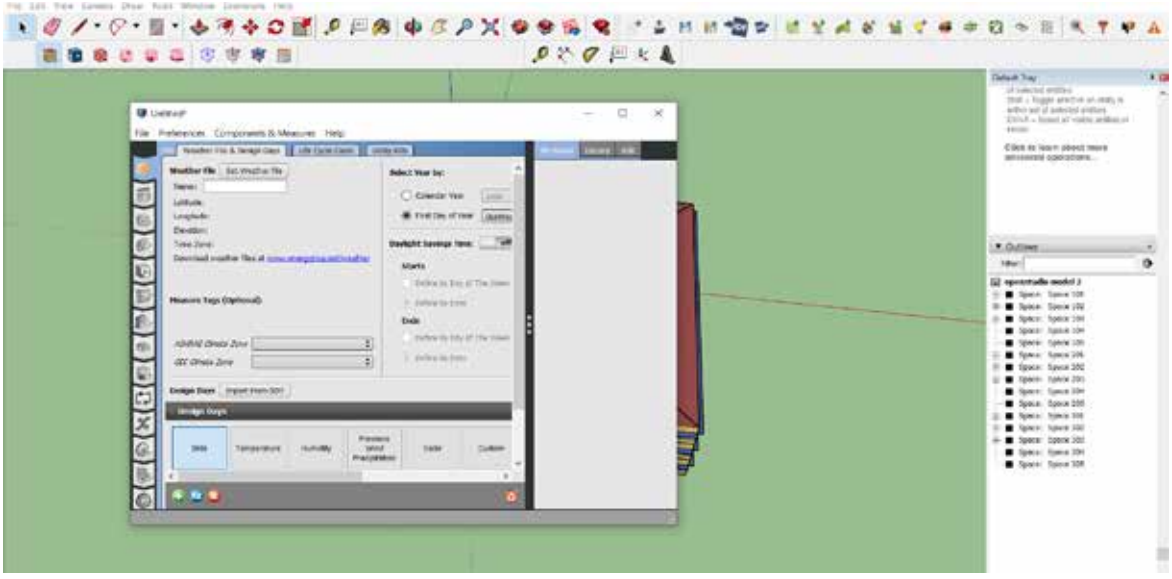
3.


Space Type
Building Story
Construction Set
Thermal Zone
Set Parent Thermal Zone's - Ideal Air Loads Status
Set Parent Thermal Zone's - Thermostat
Yes
OK
Cancel

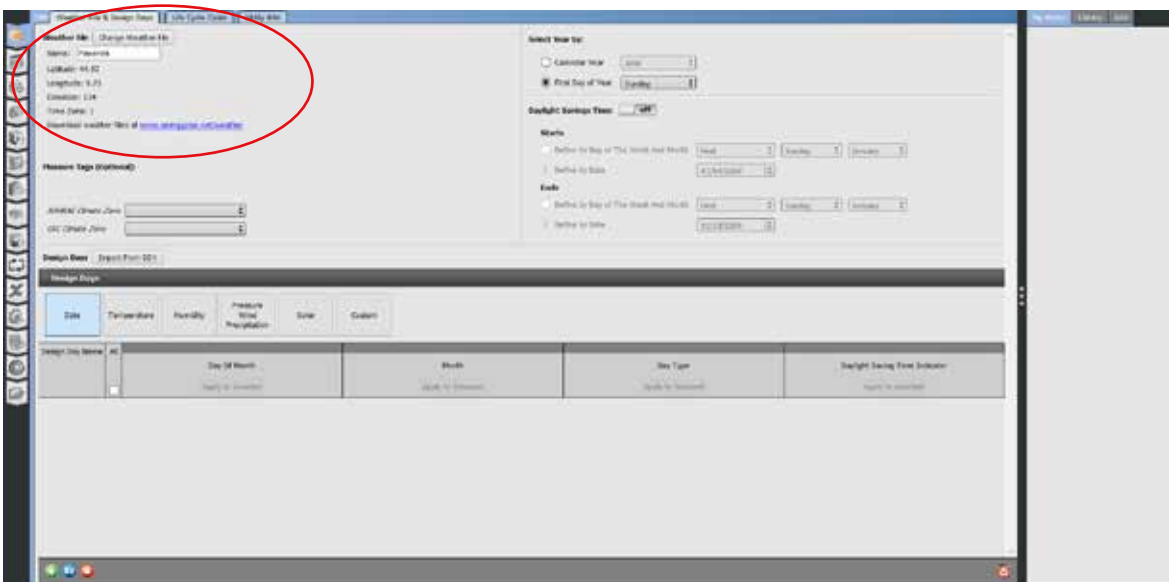
4.



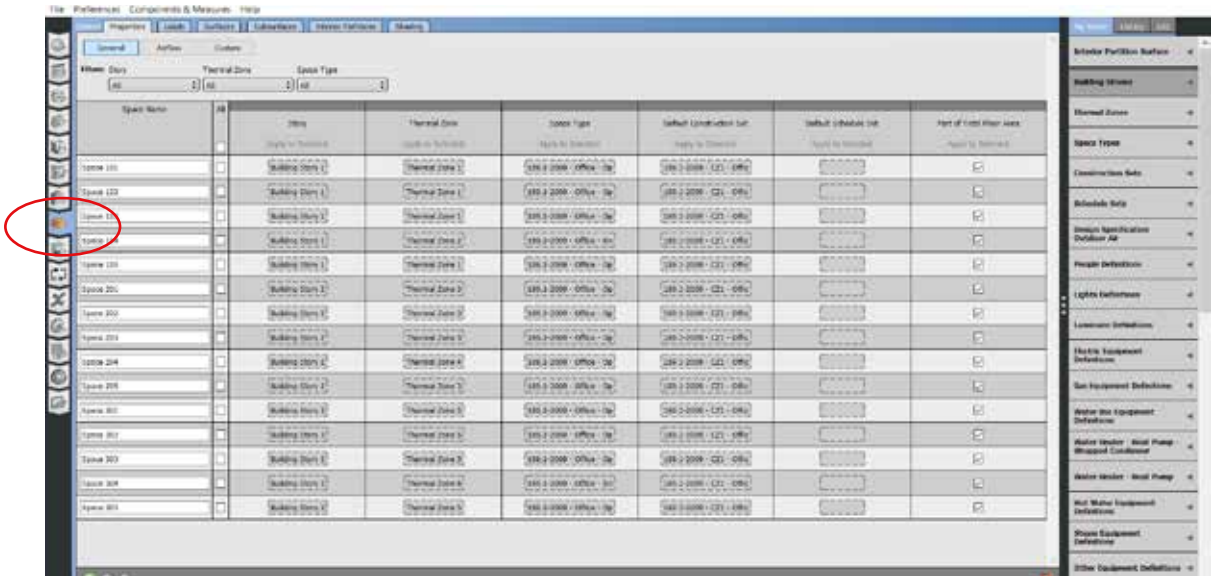
Save the sketckup file using the “Save” command in the Openstudio section. Search the “Openstudio” program bar and open the sketchup file with the opensudio extension. Import climate data from Piacenza.



Now we can also display them in OpenStudio



With this command you can view the data previously assigned to our model Sketchup



After starting the simulation here you can see the result with respect to the parameters set.