Assignment 6

Question 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 ?

ε_1=0.1

ε_2=0.1

σ=5.670*10^{-8}W/m^2K^4

When the ε_1=ε_2=0.1;

$$\dot{Q}_{12} = \frac{A\sigma(T_1^4 - T_2^4)}{\frac{1}{\varepsilon_1}+\frac{1}{\varepsilon_2}-1} = A * 5.67 * 10^{-8} * \frac{800^4 - 500^4}{\frac{1}{0.1}+\frac{1}{0.1}-1} = A * 1035.72\ W/\text{m2}$$

$$\dot{Q}_{\text{N shields}} = \frac{A\sigma(T_1^4 - T_2^4)}{(N+1)\frac{1}{\varepsilon}+\frac{1}{\varepsilon}-1} = \frac{1}{N+1} * \dot{Q}\ no\ shields$$

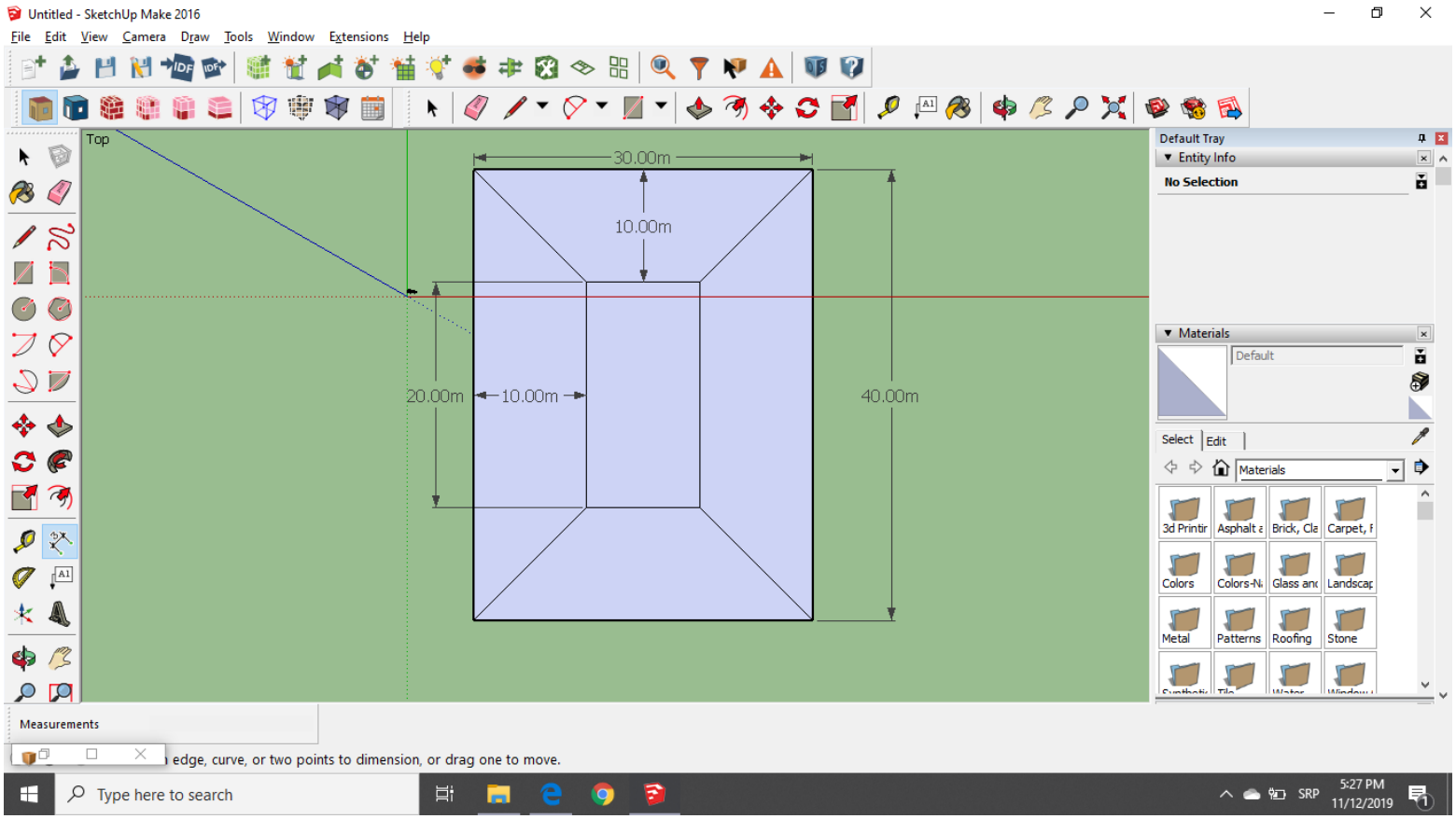
$\dot{Q}_{12}$ from previous case = 1035.72AW/m2

1% of $\dot{Q}_{12}$ – 36.25AW/m2

10.36 = $\frac{1}{N+1}$ * 1036

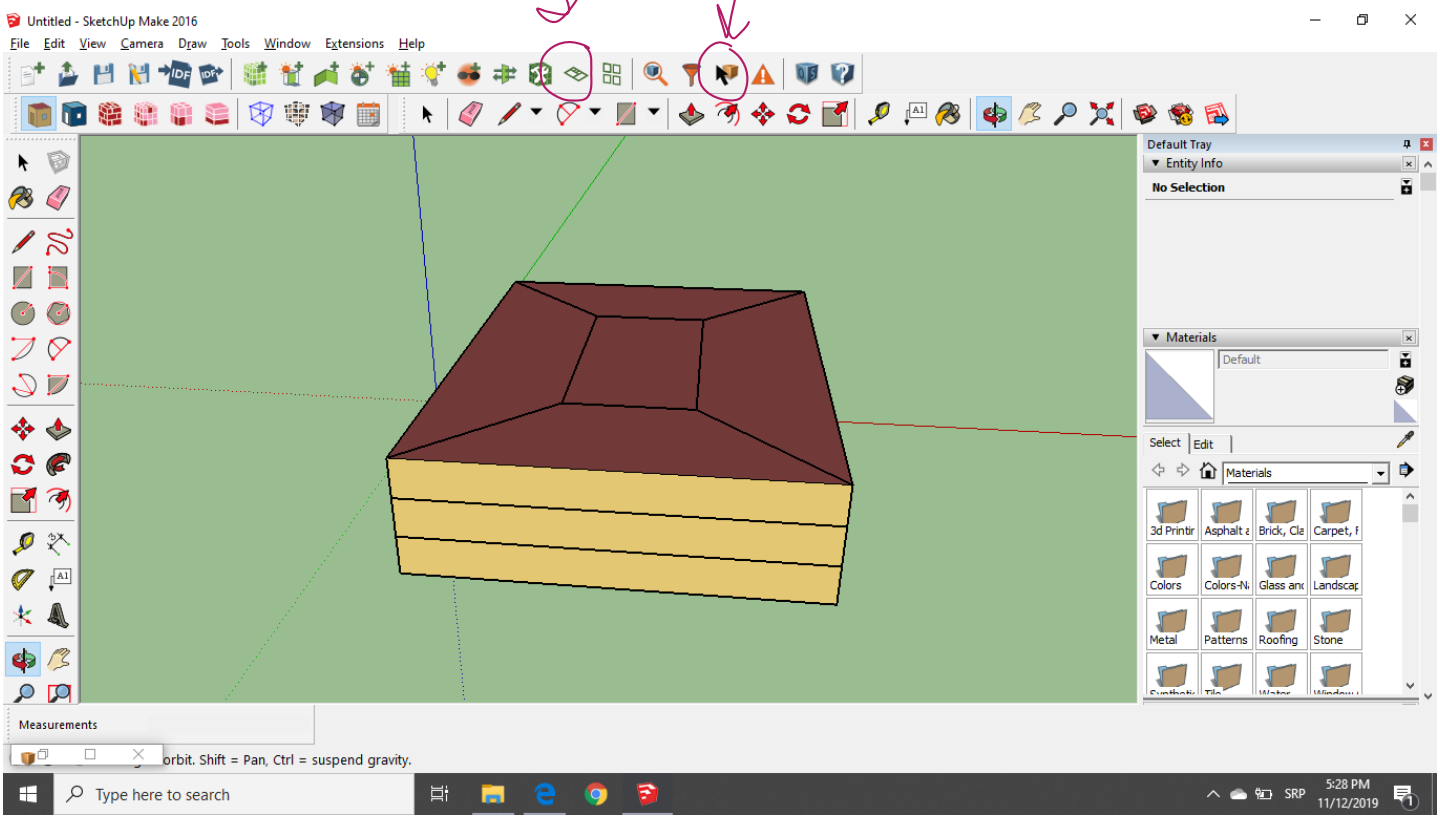
N=99shields

First step is drawing a rectangular shape 40x30 and one smaller (20x10) in the centre, as well as 4 lines connecting edges of the rectangles.

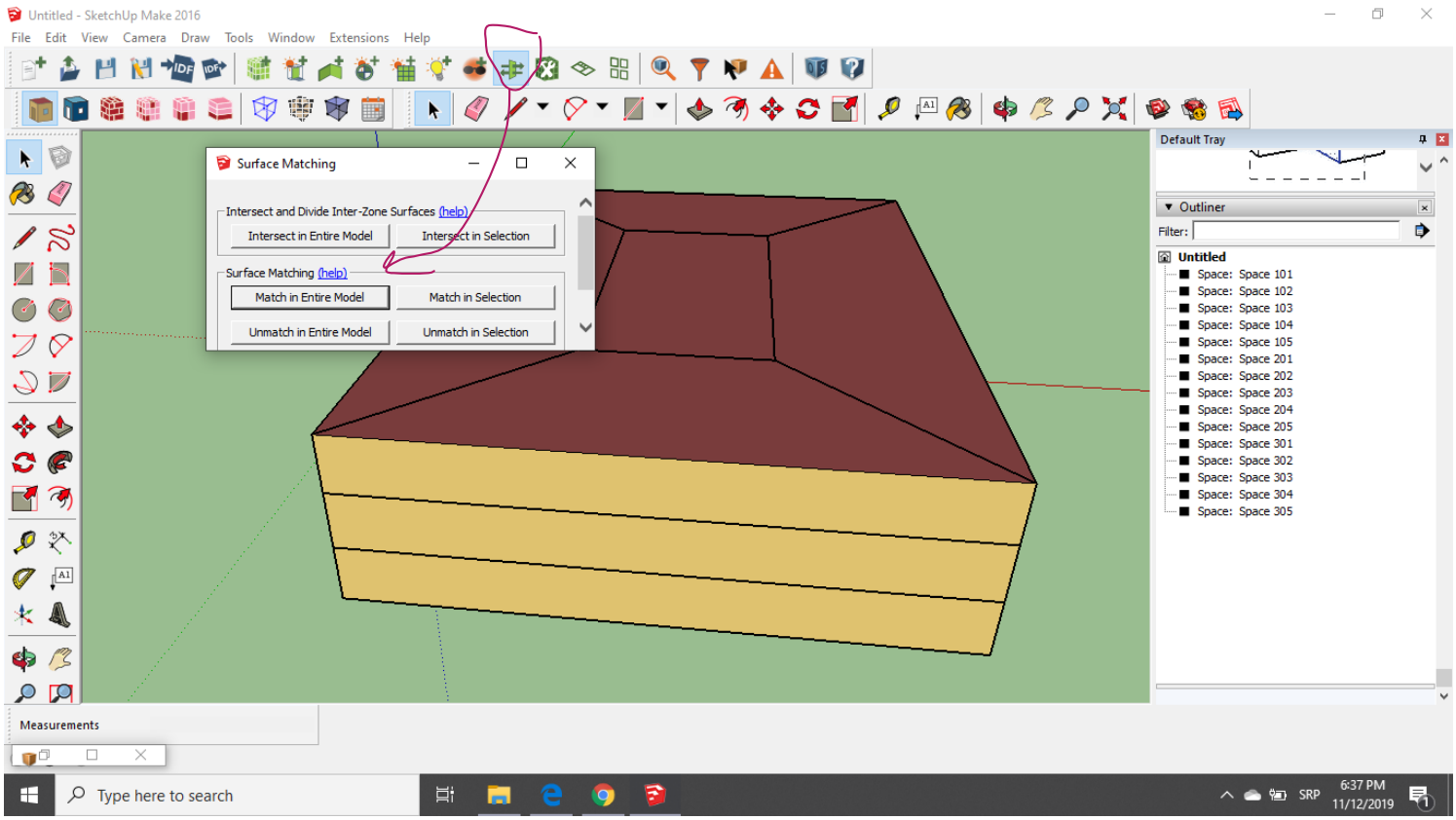


By choosing the option *create spaces from diagram* the building is created.

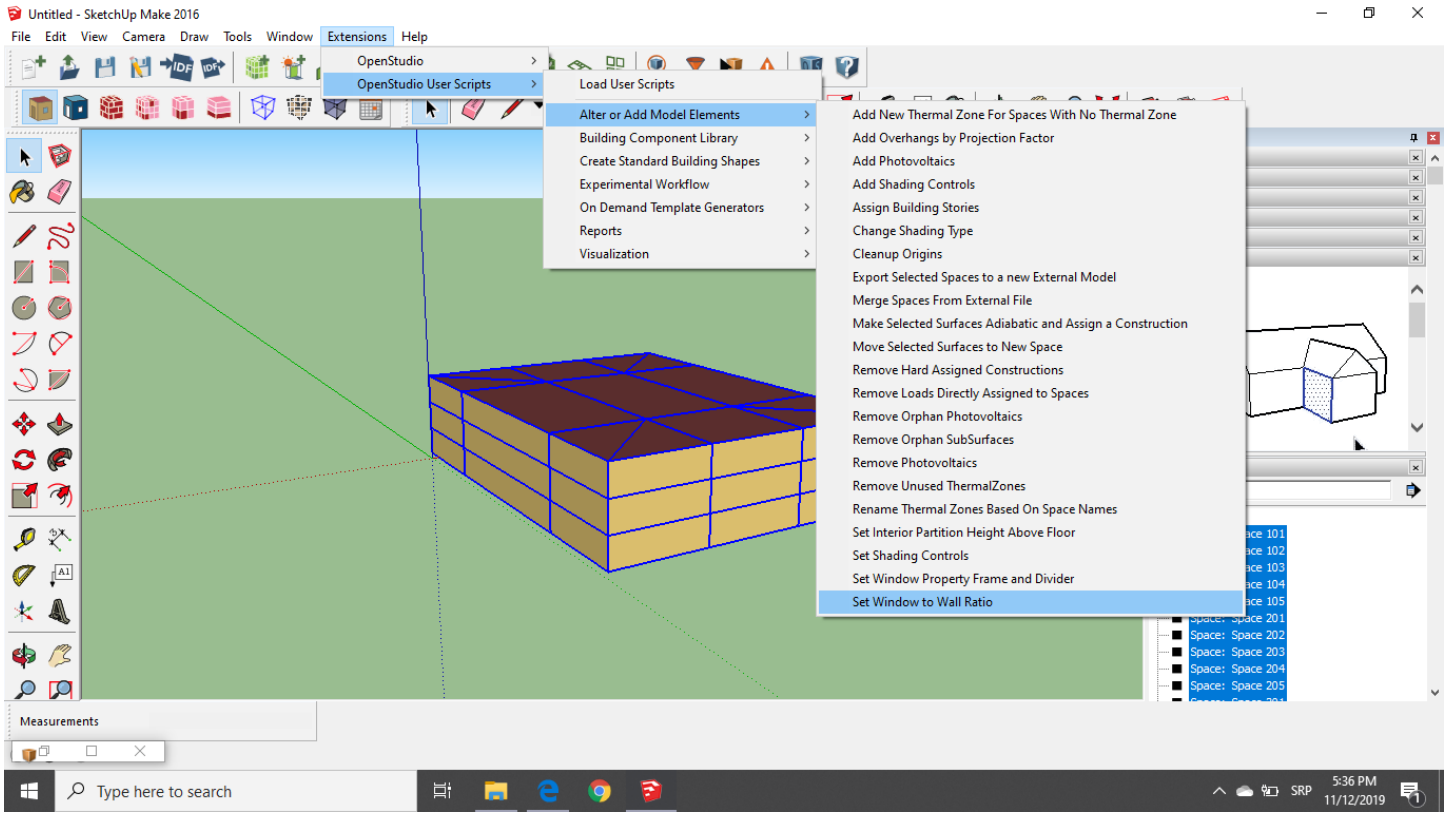
By using *info tool* all necessary information about the building surfaces can be found .



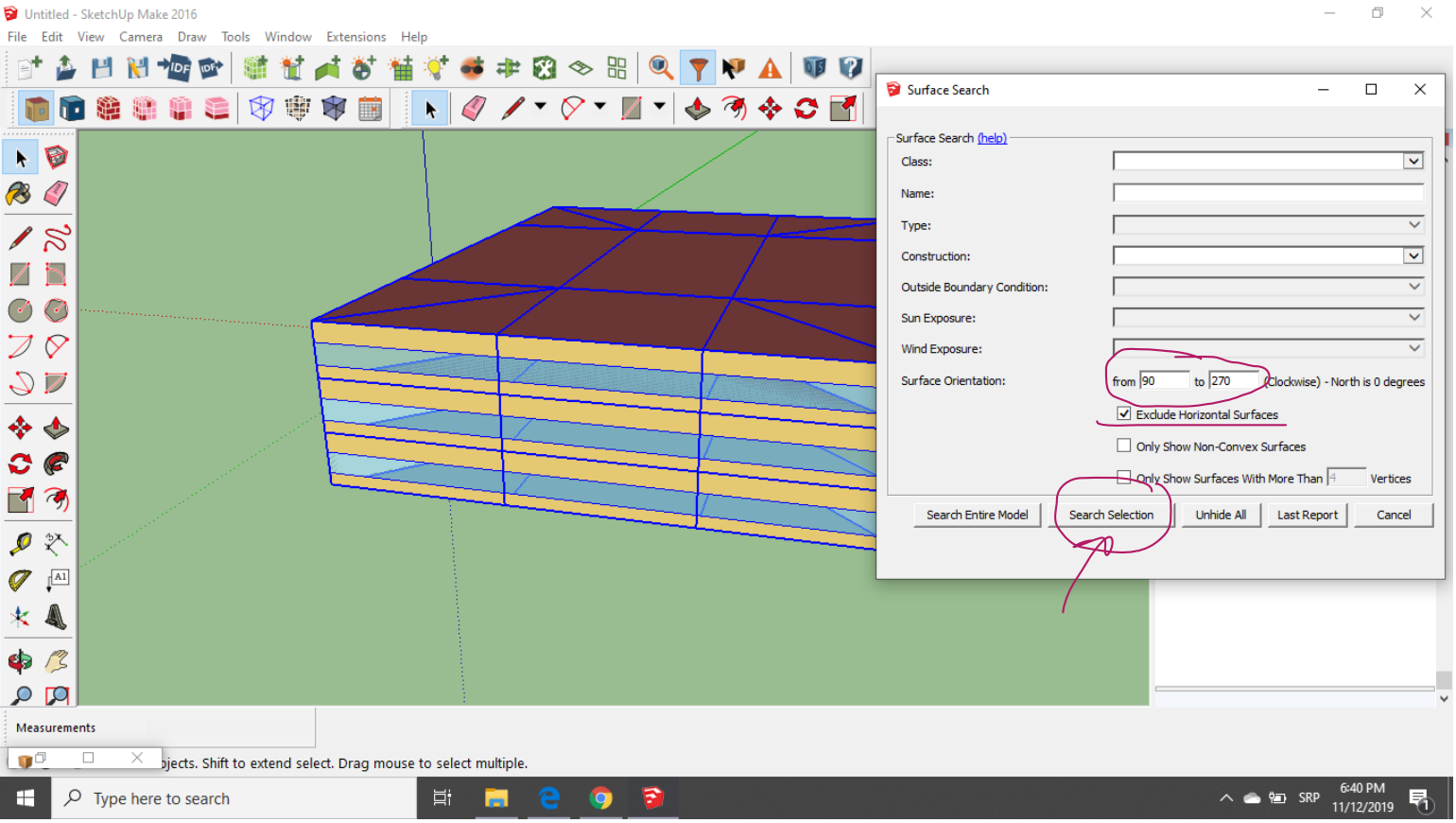
Very important next step is using the surface matching tool so in the later steps the program doesn't place the windows on the inside of the building.



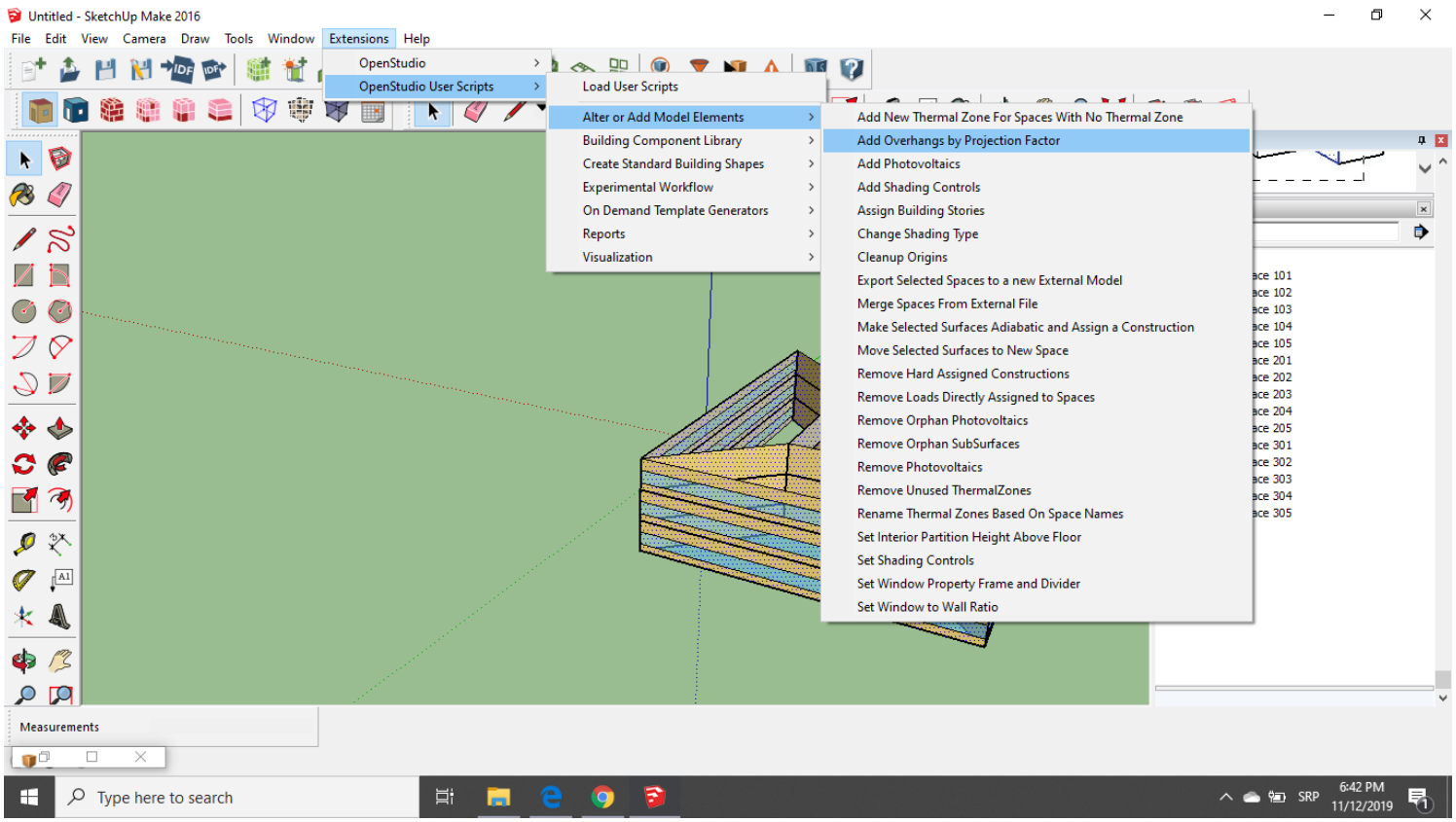
Next step is selecting the building and placing windows on the outer walls of the building



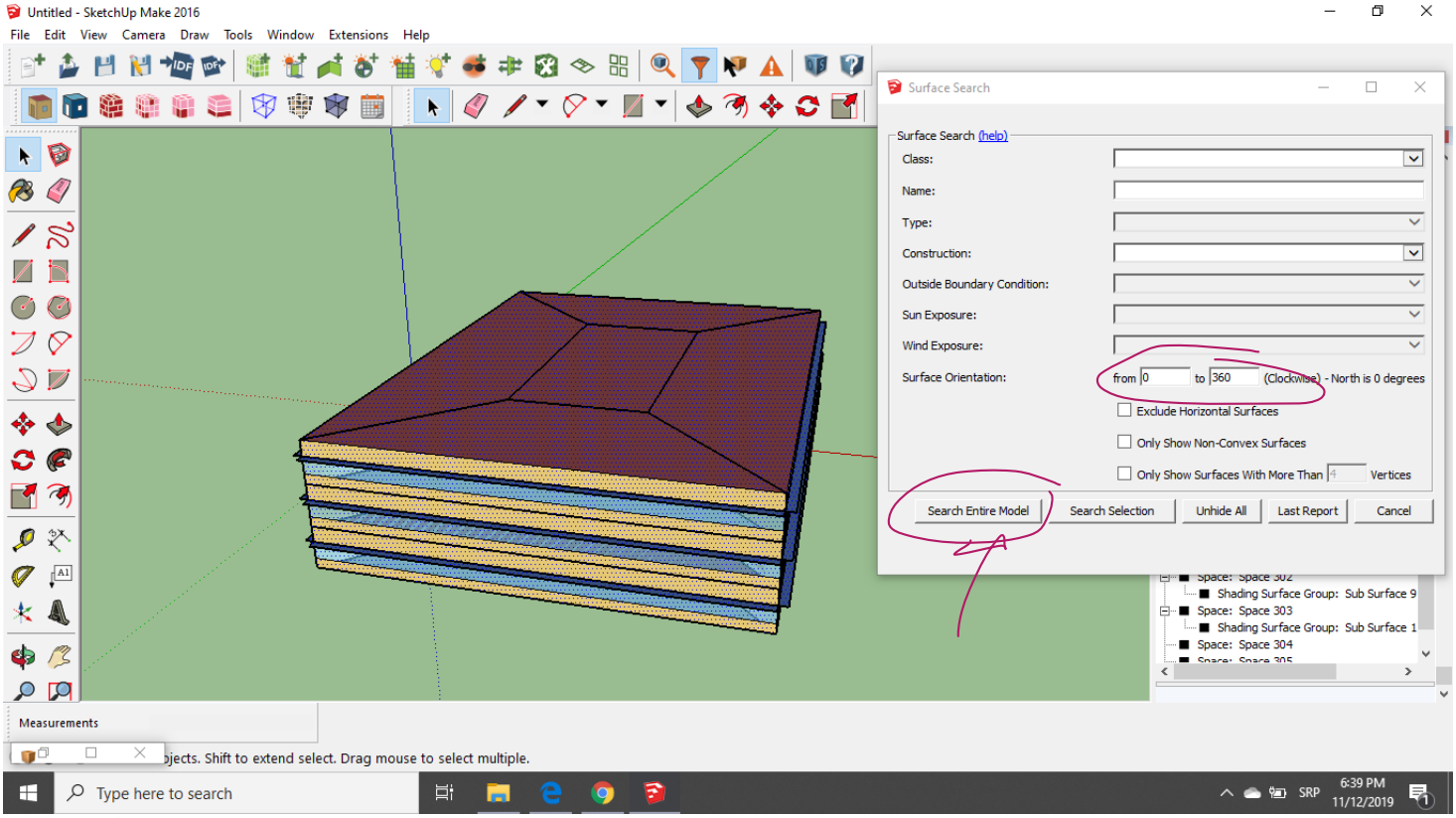
In surface search tool it is important to select all surfaces except the North to create external shading.

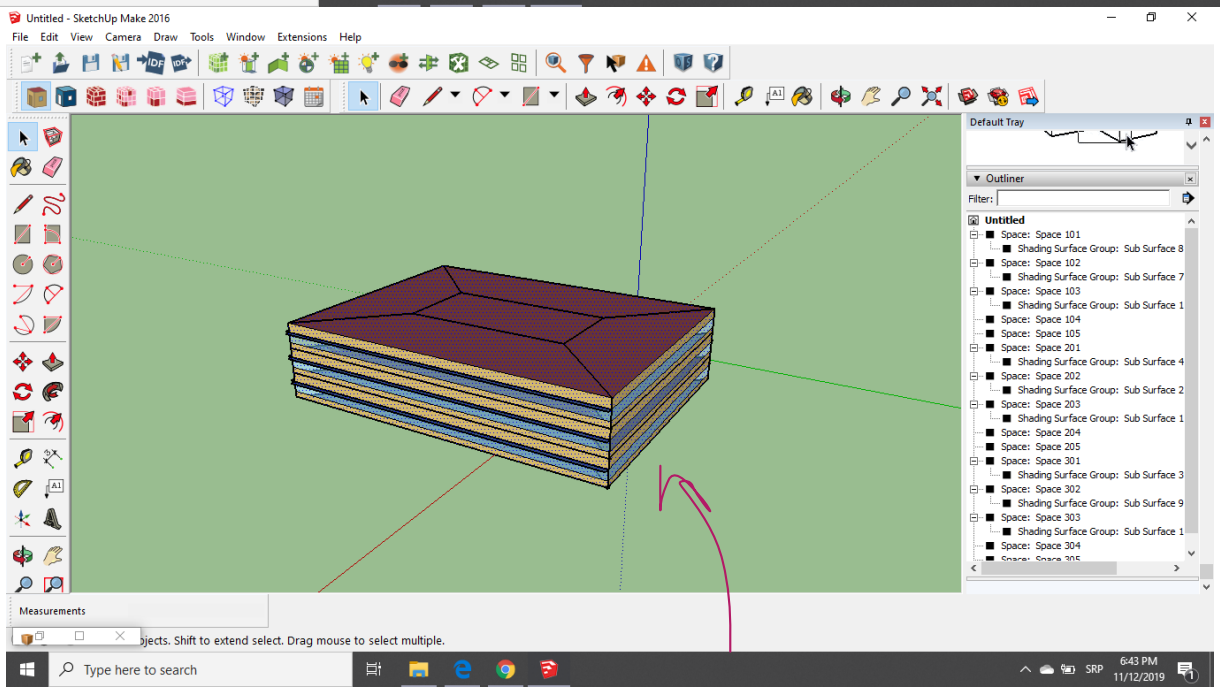


Another step is adding shading through Open Studio Extensions.

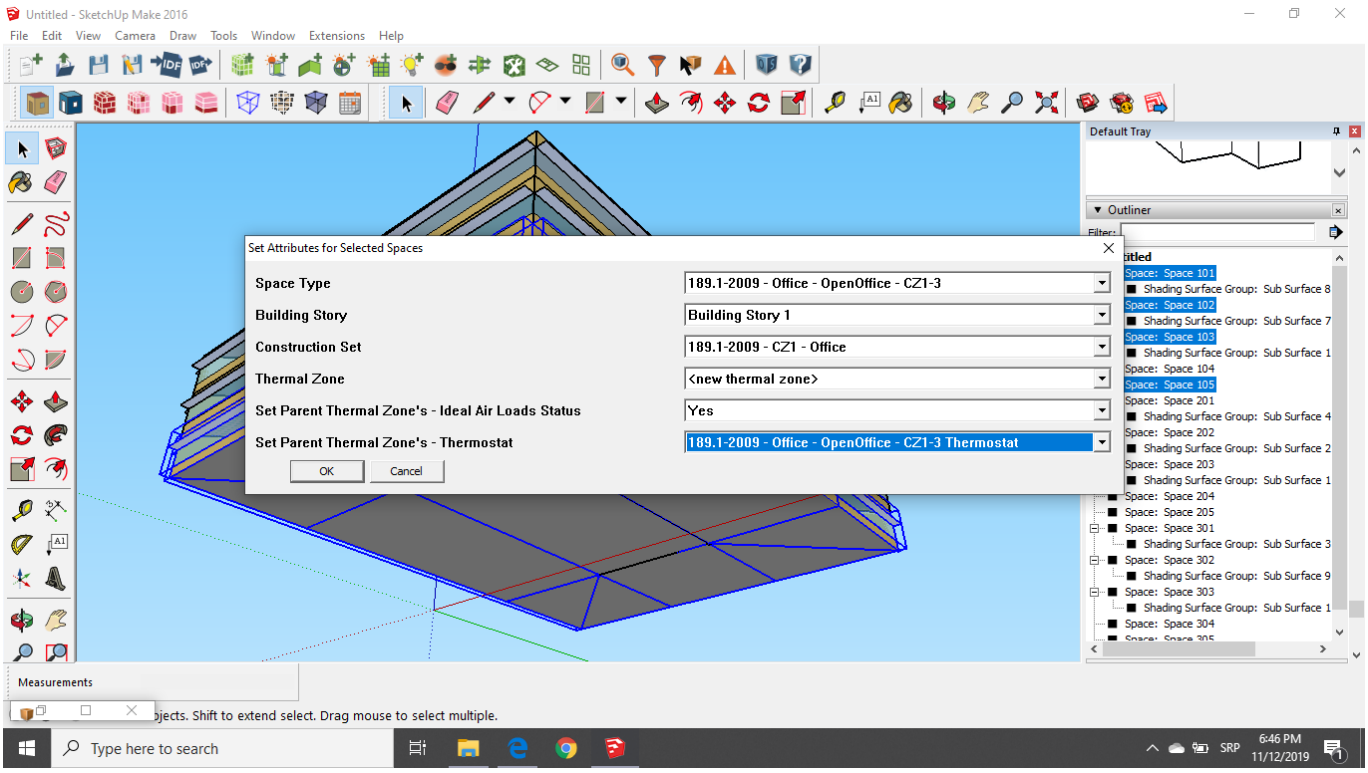


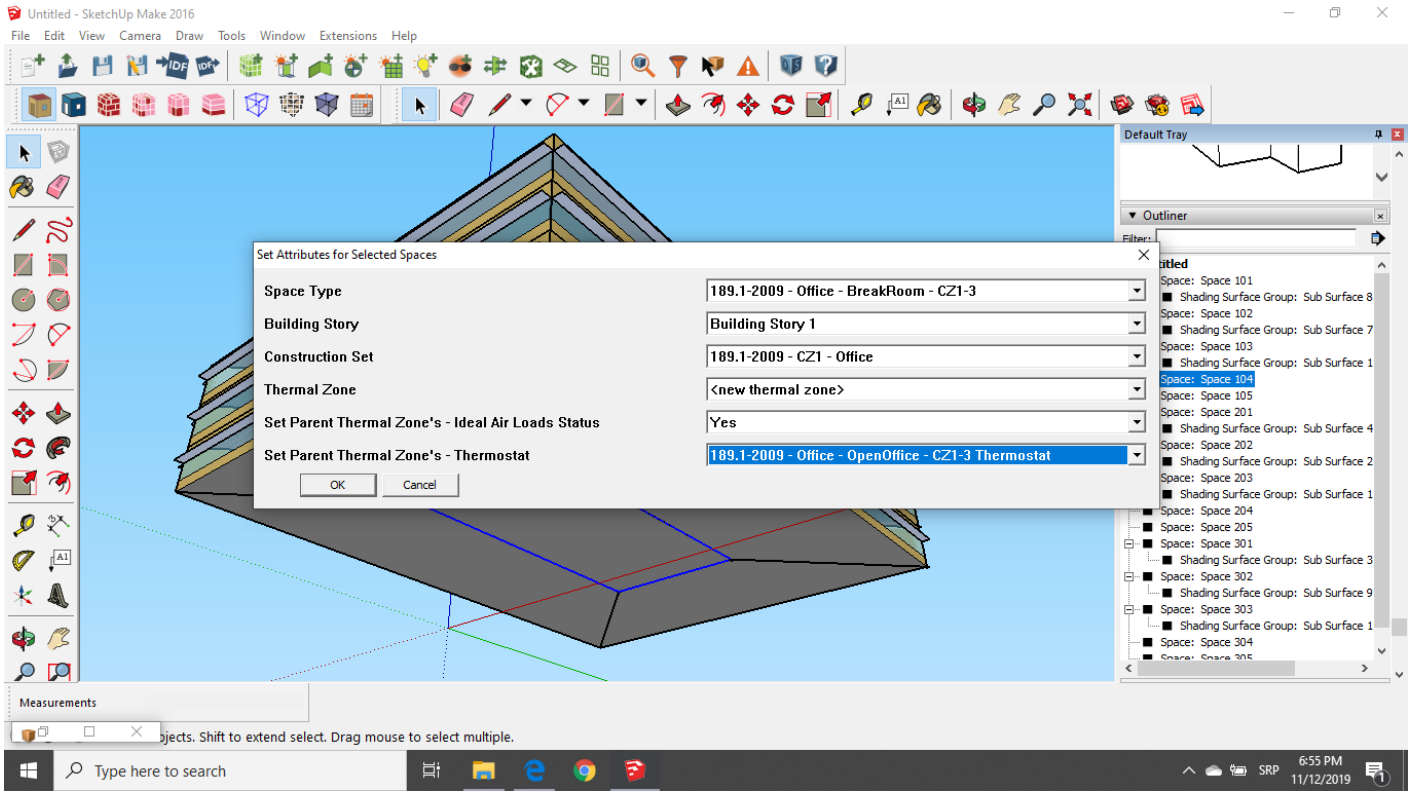
Then again like the step before in *Surface Search* 0 and 360 surfaces need to be chosen. All surfaces have shading except the North.





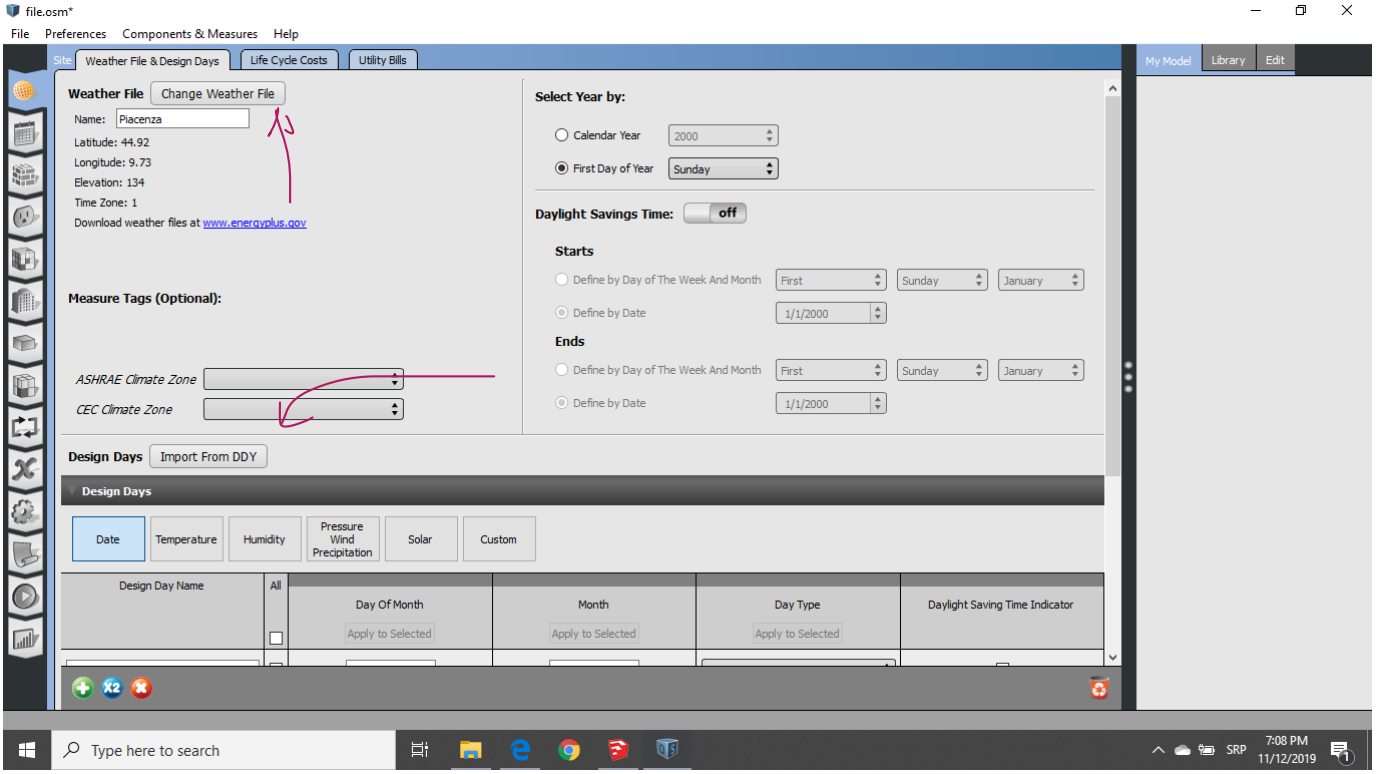
For spaces and thermal zone certain specifications are made.



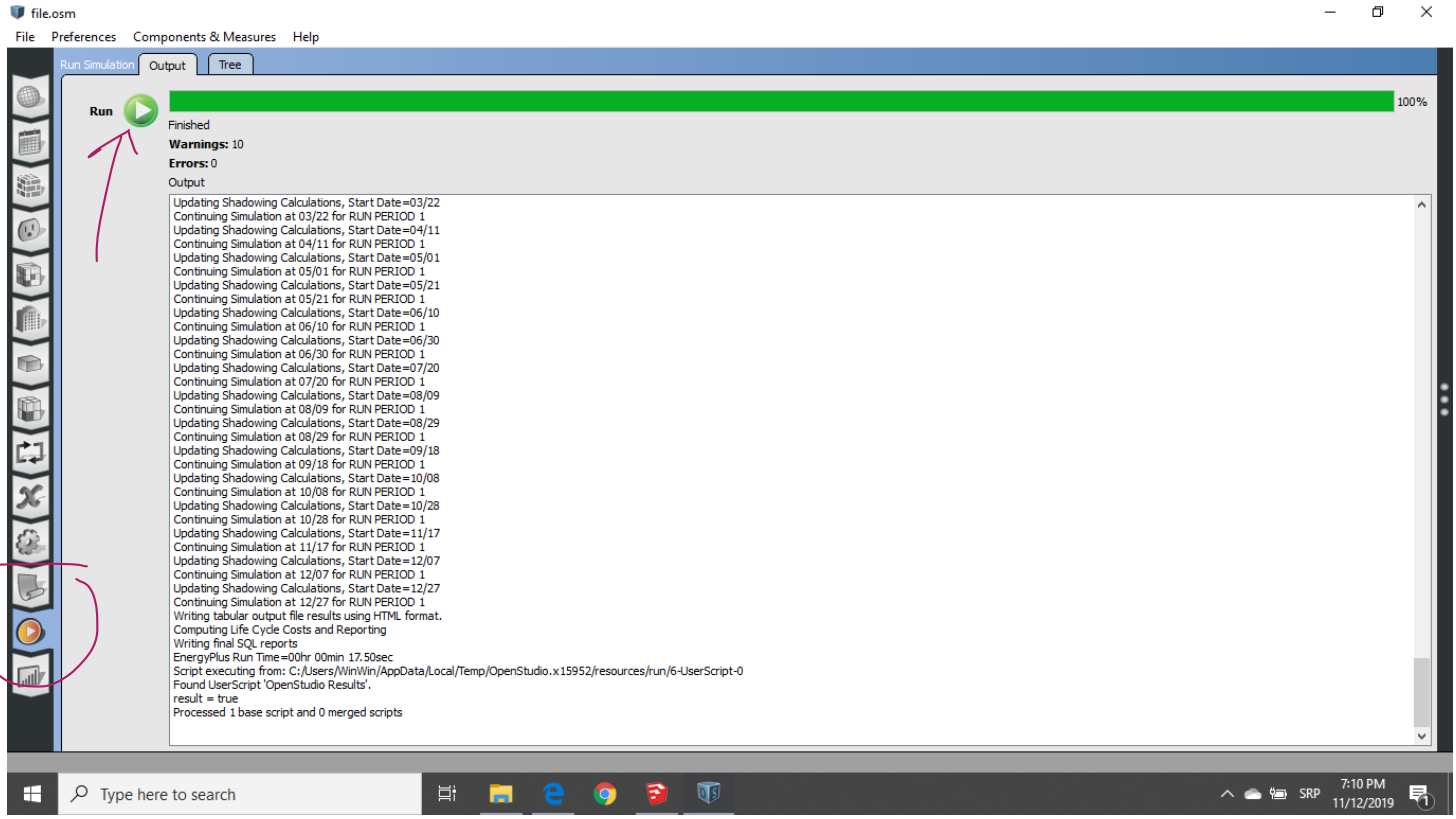


After saving the model, it needs to be uploaded in OpenStudio program.

After that, it is important to add weather information for further calculations.



Then run the model.



The final results can be reviewed on the last tab.