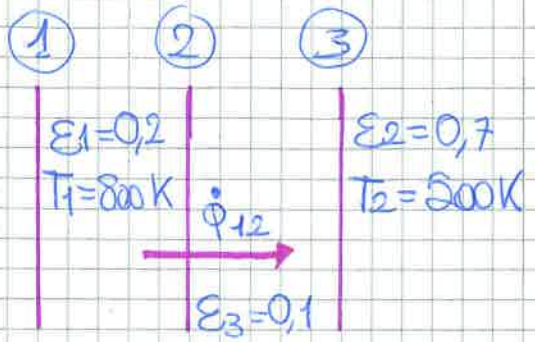
WEEK 6_ POJER

Task 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 add in order to have the new heat transfer rate to be 1% of the case without shields?



$$\dot{q}_{net\,1-2} = \frac{\dot{Q}_{net\,1-2}}{A} = \frac{\sigma A(T_1^4 - T_2^4)}{\frac{1}{\varepsilon_1}+\frac{1}{\varepsilon_2}-1}\cdot\frac{1}{A} = \frac{\sigma(T_1^4 - T_2^4)}{\frac{1}{\varepsilon_1}+\frac{1}{\varepsilon_2}-1}$$

$$= \frac{(5{,}67\cdot 10^{-8})\cdot(800^4 - 500^4)}{\frac{1}{0{,}2}+\frac{1}{0{,}7}-1} = 3625{,}4\ \frac{W}{m^2}$$

The new heat transfer heat should be 1% of the $\dot{q}_{net\,1-2}$

$$\dot{q}_{net\,1-2}\cdot 10\% = \dot{q}_{net\,1-2,\,n\,shields} = 3625{,}4\cdot 1\% = 36{,}254\ \frac{W}{m^2}$$

$$\dot{q}_{net\,1-2,\,n\,shields} = \frac{\dot{Q}_{1-2\,n\,shields}}{A} = \frac{\sigma A(T_1^4 - T_2^4)}{\left(\frac{1}{\varepsilon_1}+\frac{1}{\varepsilon_2}-1\right)+\left(\frac{1}{\varepsilon_{3,1}}+\frac{1}{\varepsilon_{3,2}}-1\right)\cdots\left(\frac{1}{\varepsilon_{n,1}}+\cdots\right)}\cdot\frac{1}{A}$$

$$= \frac{\sigma(T_1^4 - T_2^4)}{\left(\frac{1}{\varepsilon_1}+\frac{1}{\varepsilon_2}-1\right)+\left(\frac{1}{\varepsilon_{3,1}}+\frac{1}{\varepsilon_{3,2}}-1\right)\cdots\left(\frac{1}{\varepsilon_{n,1}}+\frac{1}{\varepsilon_{n,2}}-1\right)}$$

$\varepsilon_1 = 0{,}2\ \&\ \varepsilon_2 = 0{,}7\ \&\ \varepsilon_3 = \varepsilon_4 = \varepsilon_5 = \varepsilon_n = 0{,}1$

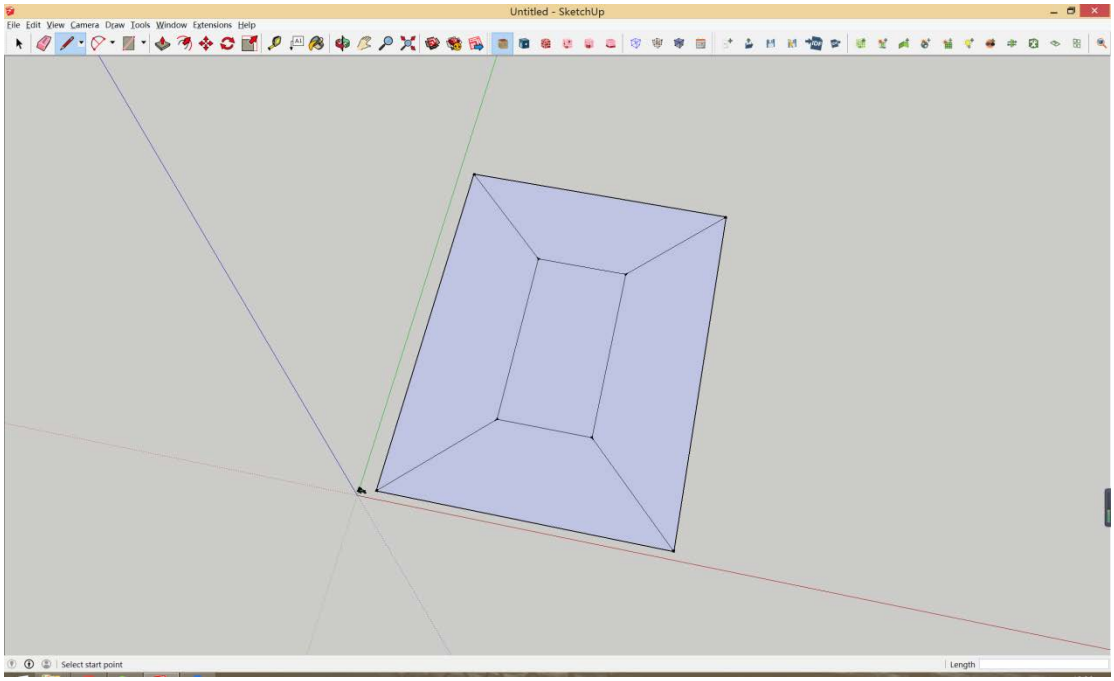
$$36{,}254 = \frac{5{,}67\cdot 10^{-8}(800^4 - 500^4)}{\left(\frac{1}{0{,}2}+\frac{1}{0{,}7}-1\right)+n\left(\frac{1}{0{,}1}+\frac{1}{0{,}1}-1\right)} \qquad n \approx 28$$

WEEK6_POJER

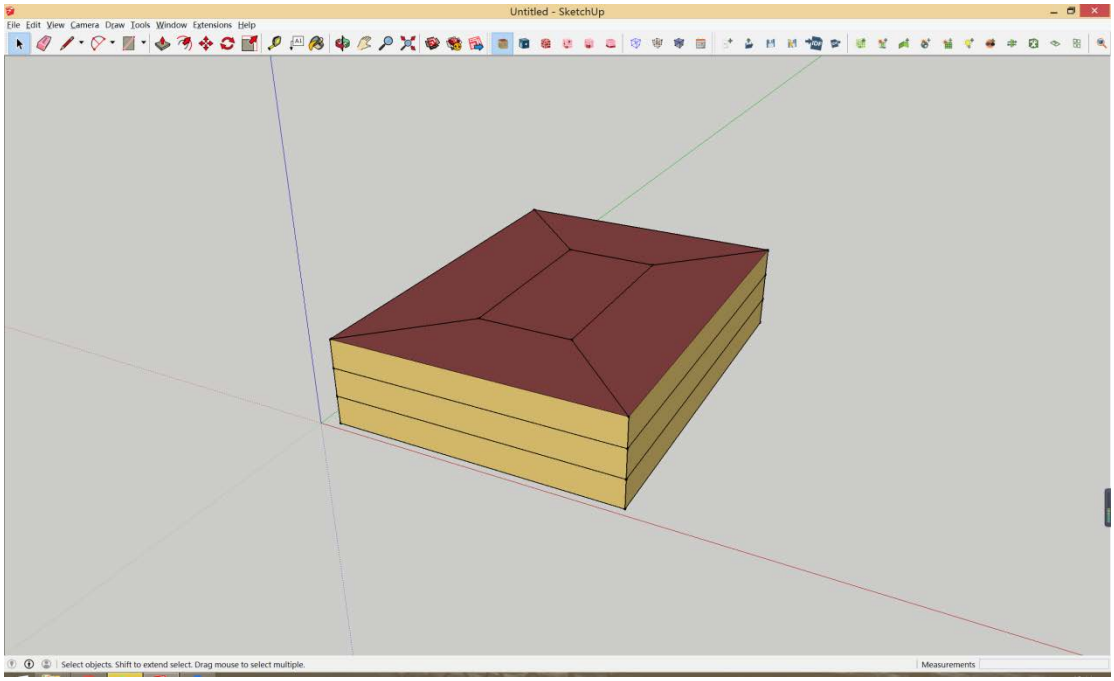
Task 2

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!)

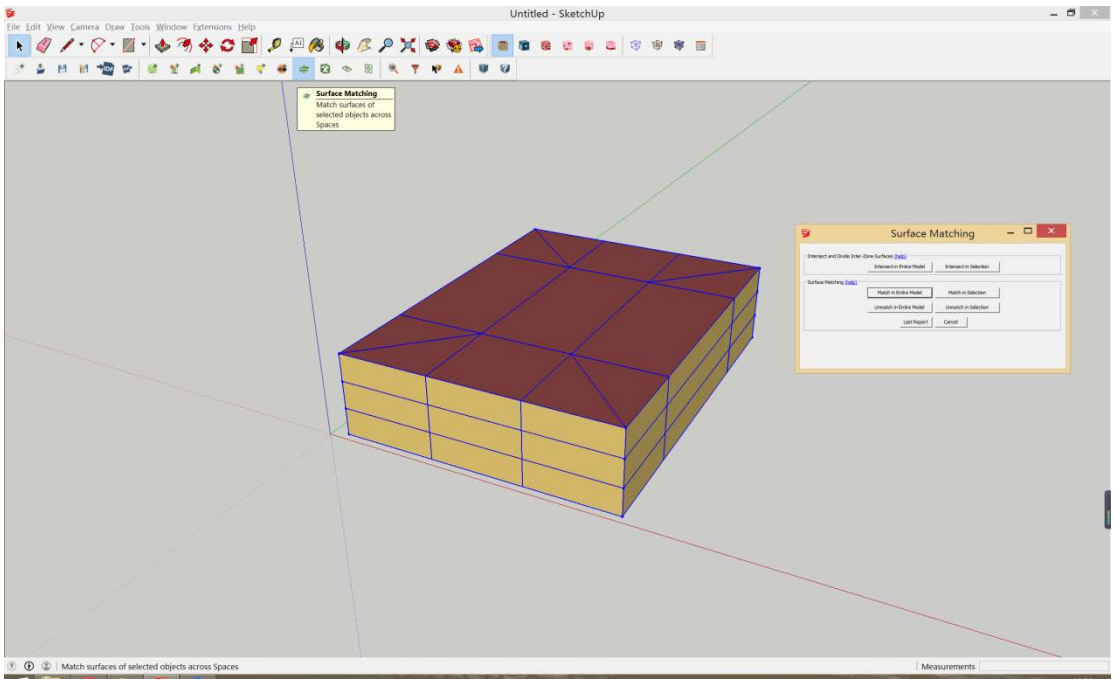
Open a Sketchup file and draw the shape of the building



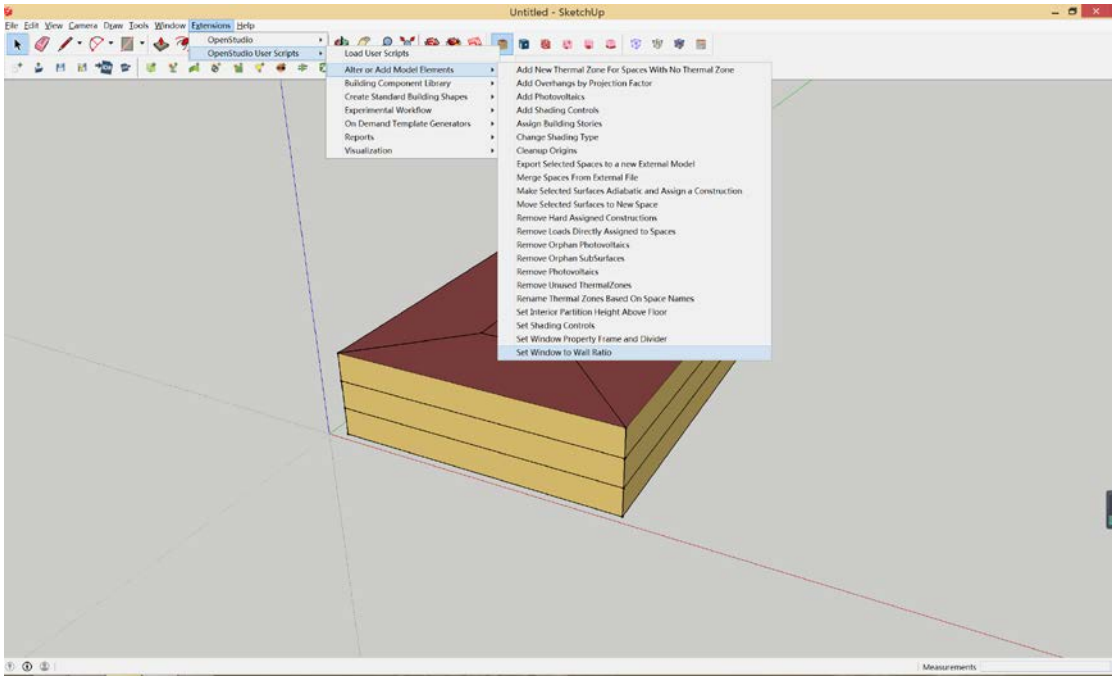
Then create a 3 floor building, using “Creat spaces from diagram”

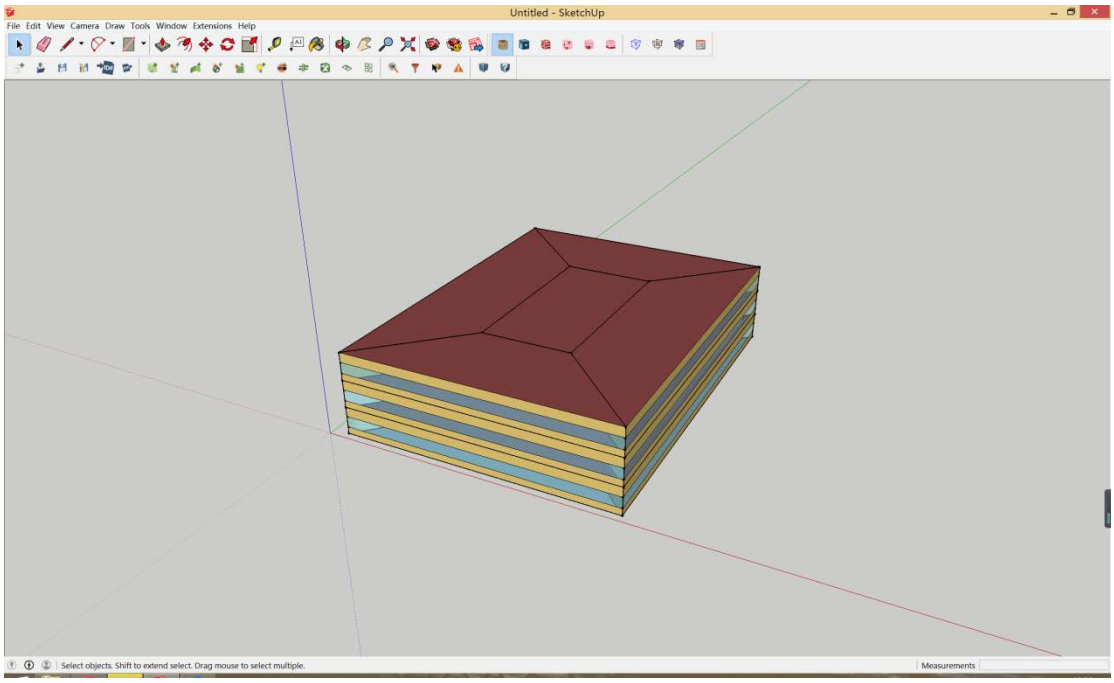


Click ”Surface matching”.

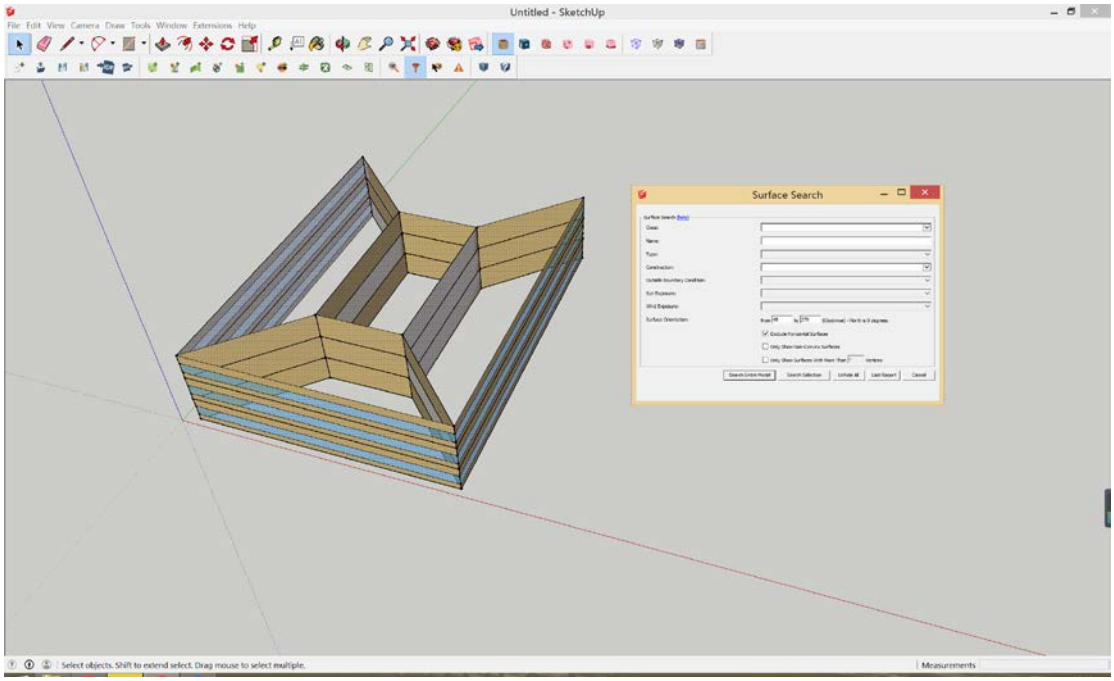


Now we build the windows, using ”Set Window to Wall Ratio”

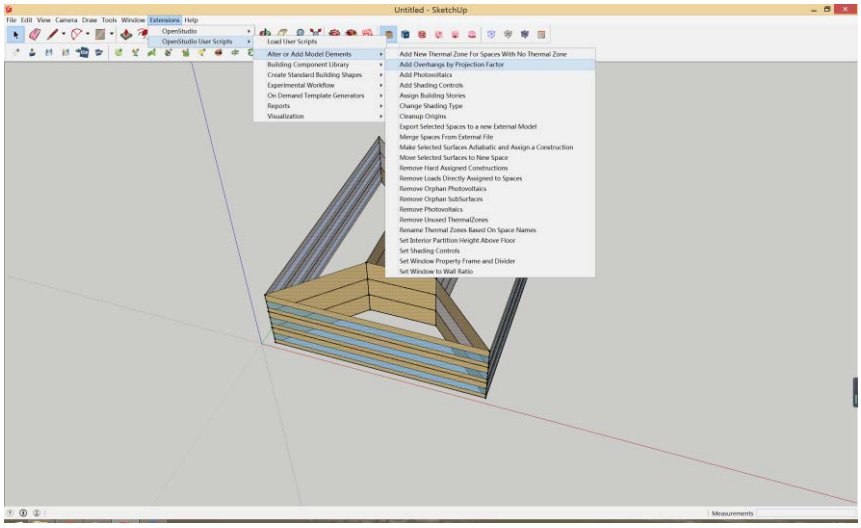


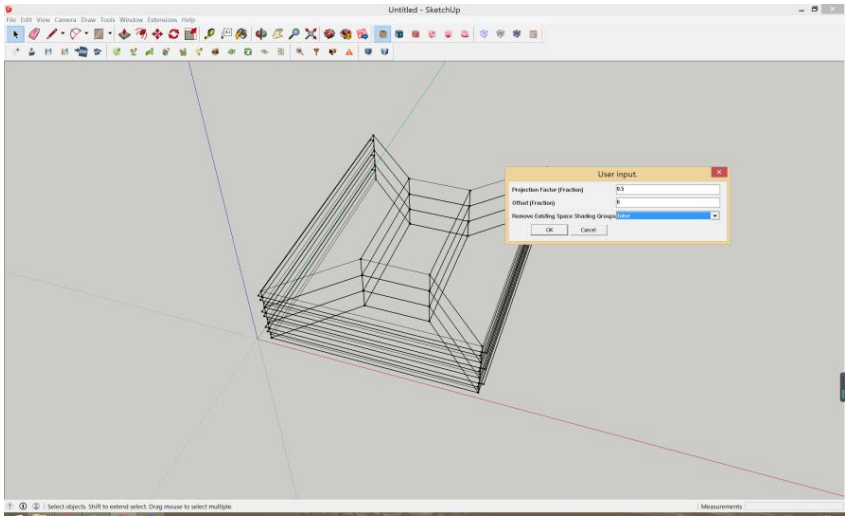


Check other directions besides the north.

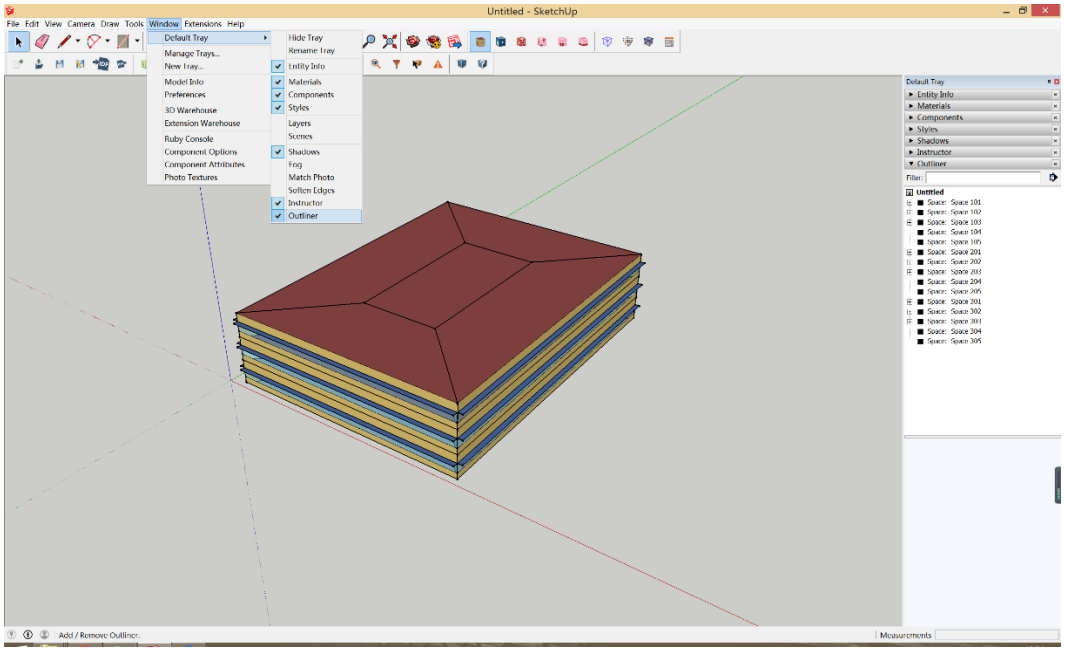


We can build overhangs, using ”Add Overhanges by Projection Factor”

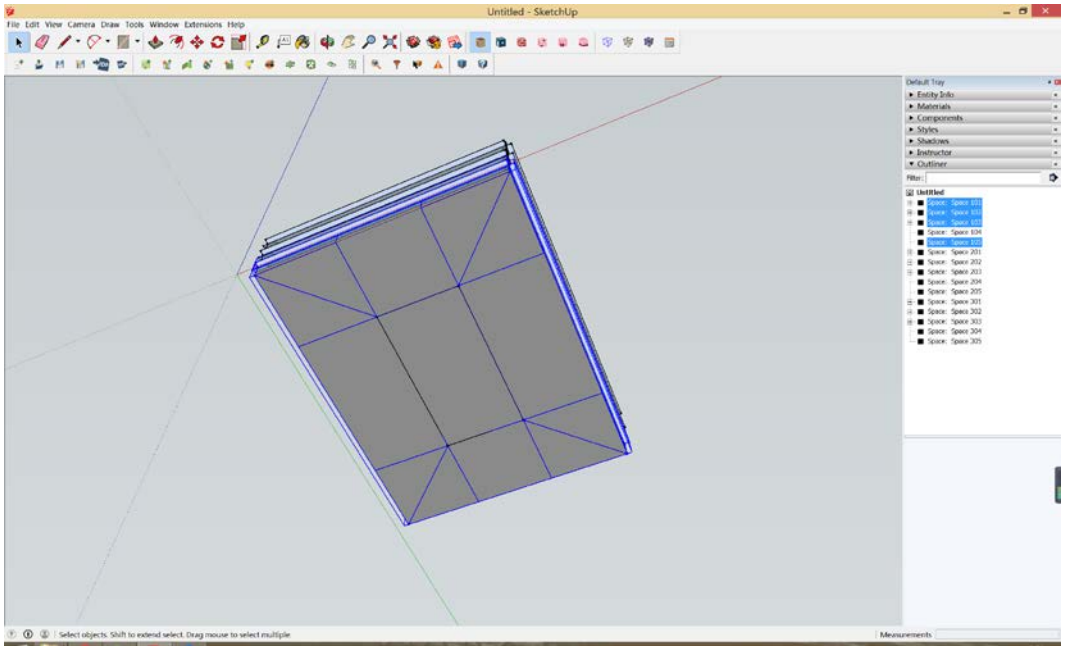




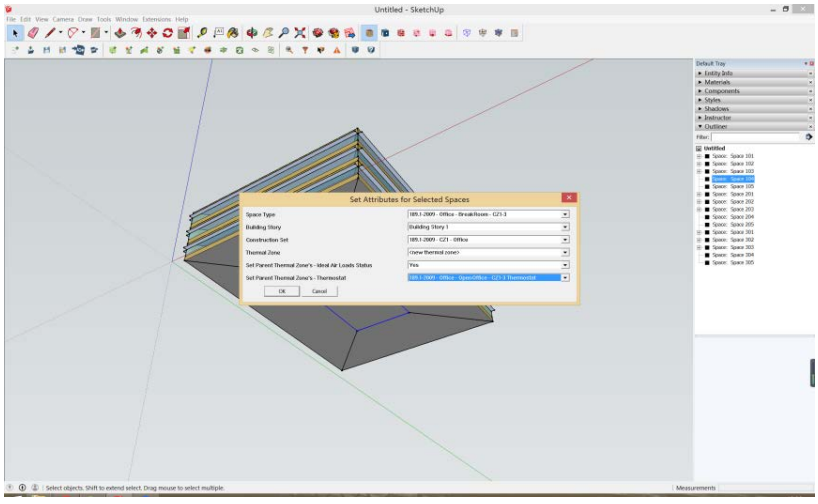
Open the ”Outliner”

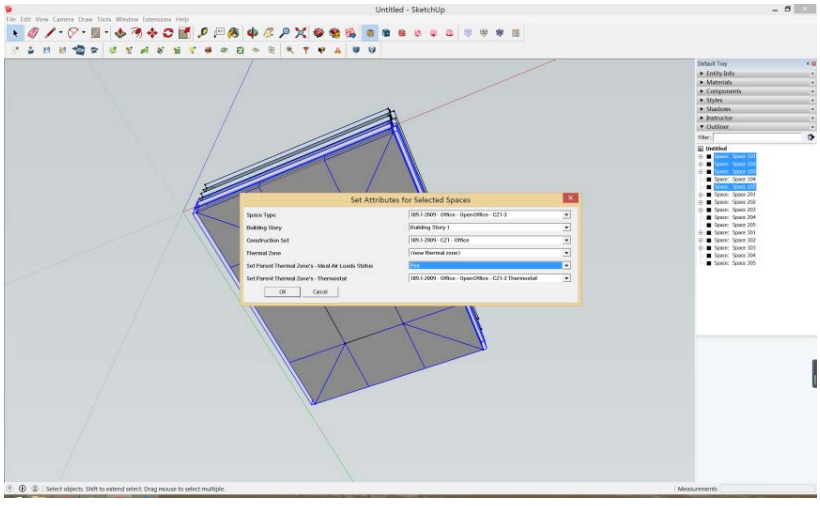


We choose the space of each thermal zone.

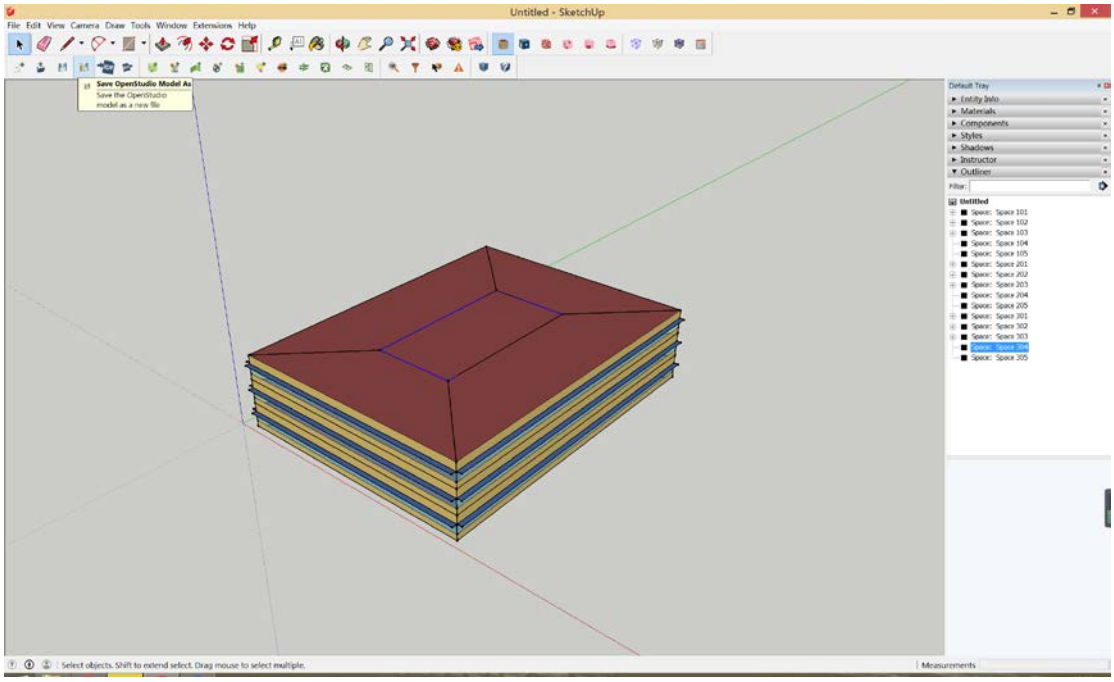


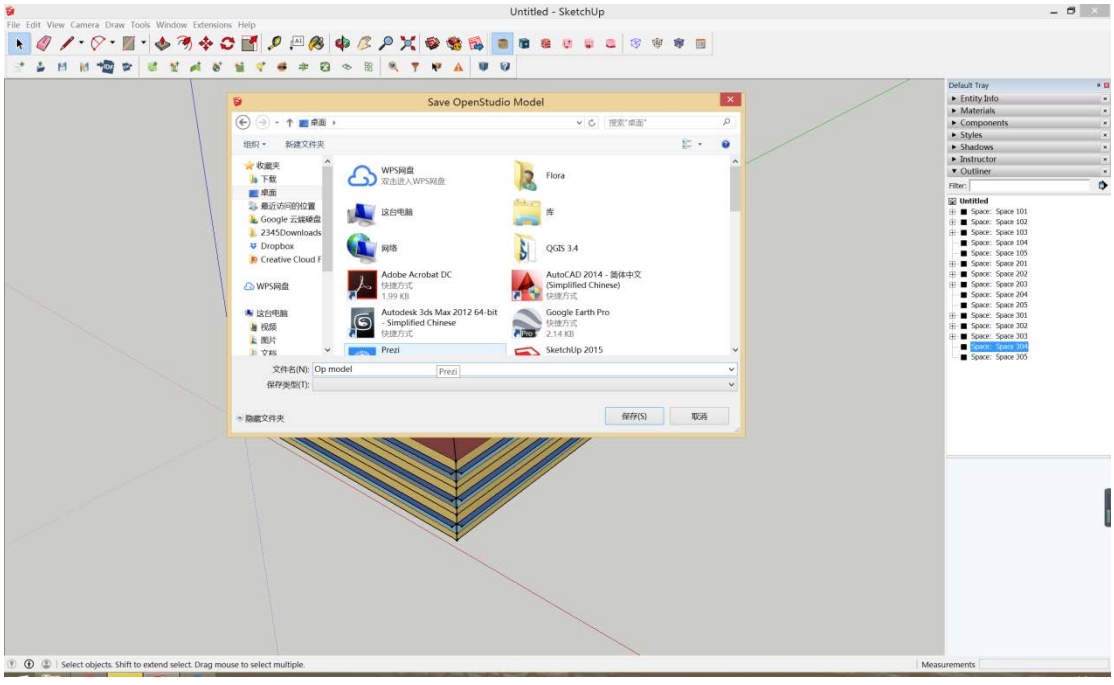
We set parameters, using “Set Attributes for Selected Space”



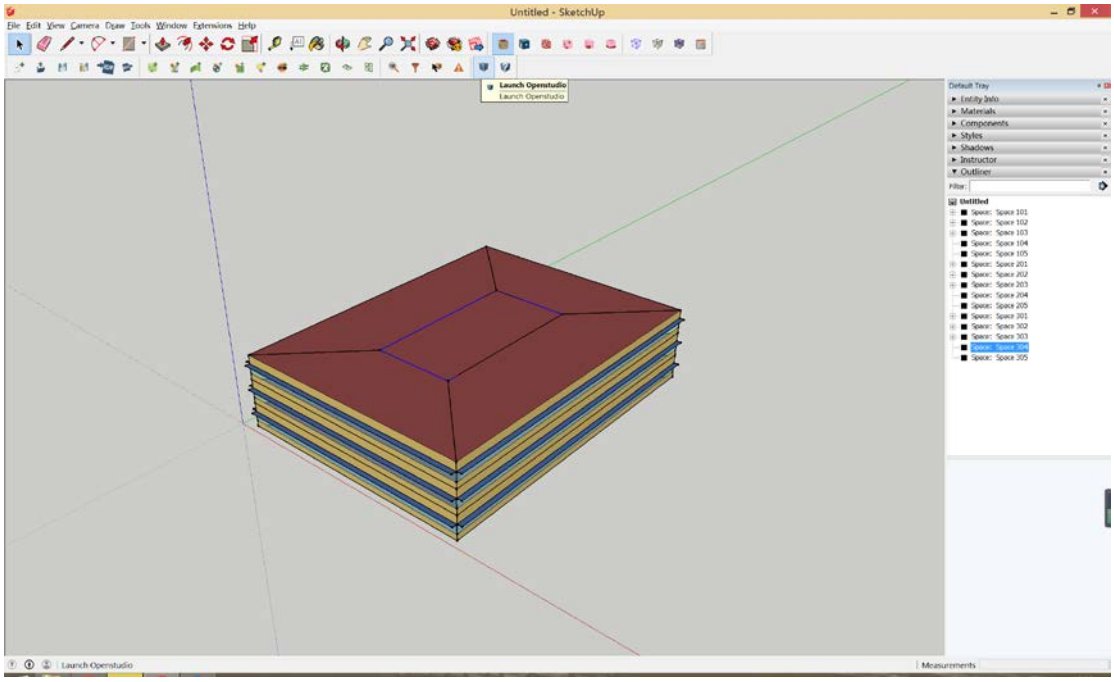


At the and we save the model.

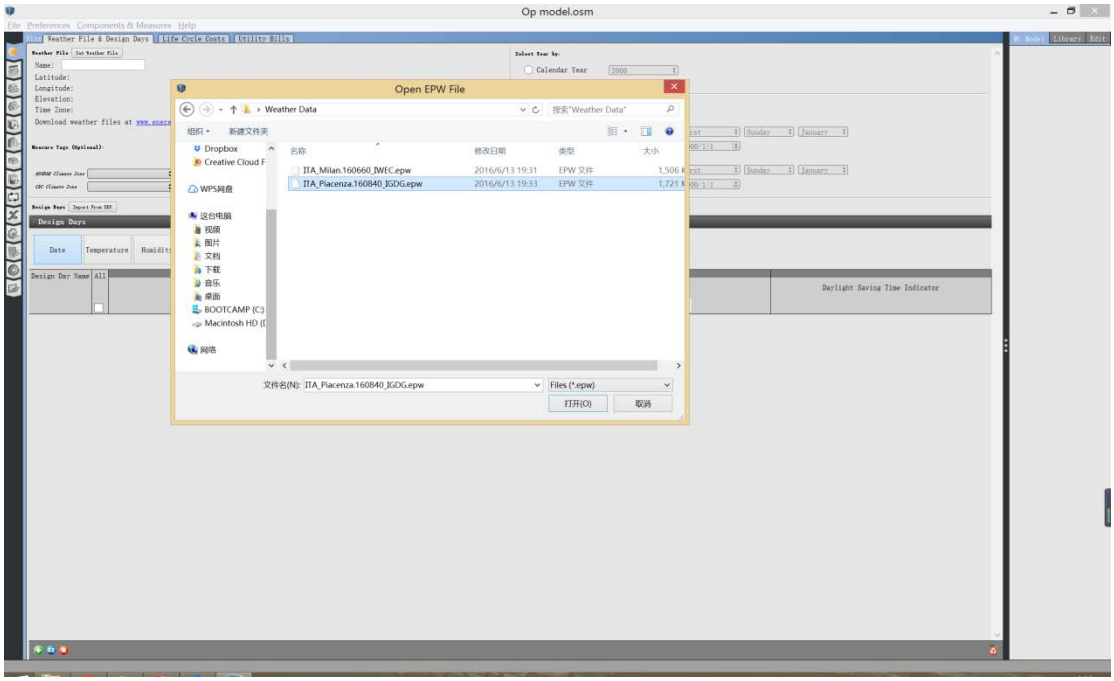




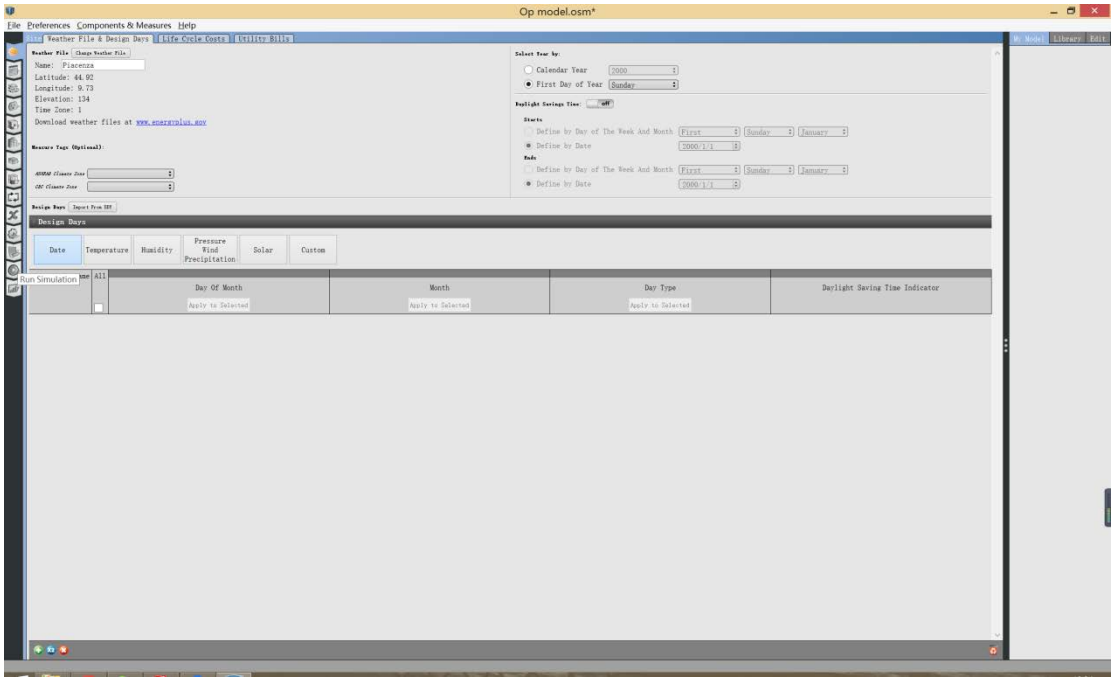
Use Open studio.

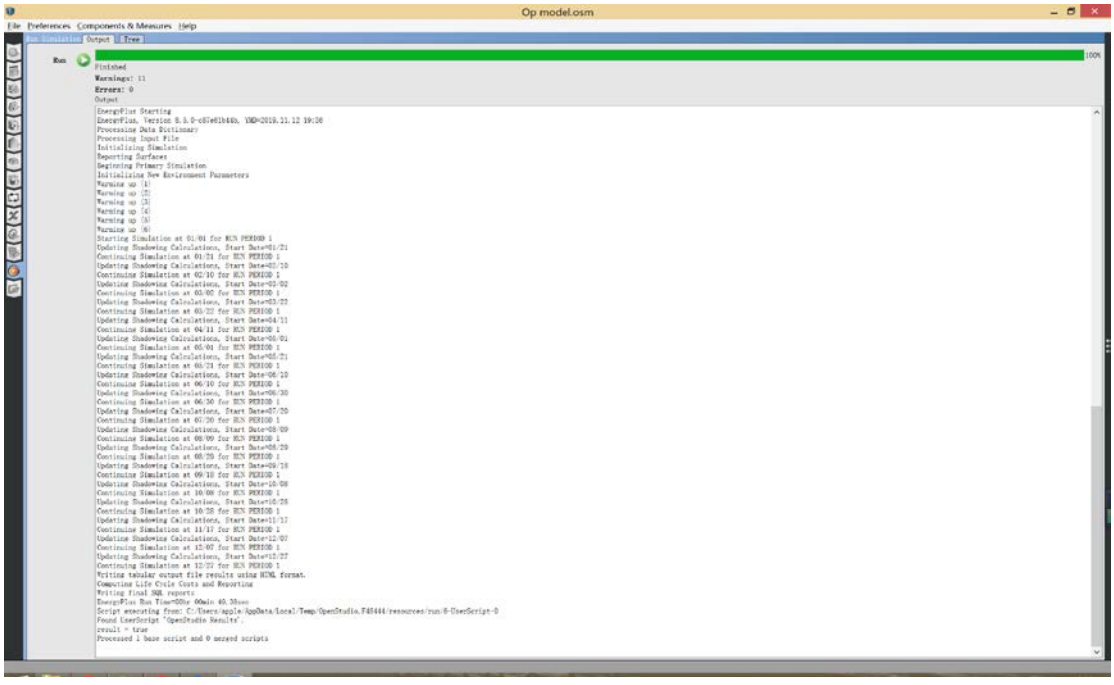


Add the weather data.



Run the analysis.





Show the result.