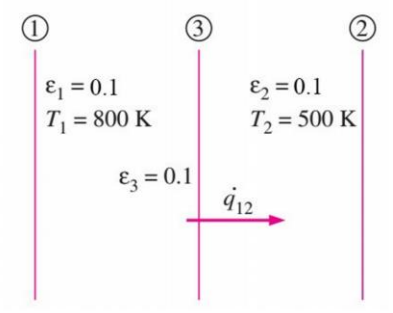
#Week 6

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




$$\dot{q}_{net_{1-2}} = \frac{\dot{Q}_{net_{1-2}}}{A} = \frac{A\sigma\,(T_2^4 - T_1^4)}{\frac{1}{\varepsilon_1} + \frac{1}{\varepsilon_2} - 1} \div A = \frac{\sigma\,(T_2^4 - T_1^4)}{\frac{1}{\varepsilon_1} + \frac{1}{\varepsilon_2} - 1} = \frac{5.67\times10^{-8}\times(800^4 - 500^4)}{\frac{1}{0.1} + \frac{1}{0.1} - 1}\frac{W}{m^2} \approx 1035.82\frac{W}{m^2}$$

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

$$i.e., \dot{q}_{net_{1-2}} = \dot{q}_{net_{1-2},nshields} = \frac{1}{100}\times \dot{q}_{net_{1-2}},$$

$$\dot{q}_{net_{1-2},nshields} = \frac{\dot{Q}_{net_{1-2},nshields}}{A} = \frac{A\sigma(T_2^4 - T_1^4)}{(\frac{1}{\varepsilon_1} + \frac{1}{\varepsilon_2}\text{-}1) + (\frac{1}{\varepsilon_{3,1}} + \frac{1}{\varepsilon_{3,2}}\text{-}1) + \ldots + (\frac{1}{\varepsilon_{n,1}} + \frac{1}{\varepsilon_{n,2}}\text{-}1)} \div A$$

$$\frac{\sigma(T_2^4 - T_1^4)}{(\frac{1}{\varepsilon_1} + \frac{1}{\varepsilon_2}\text{-}1) + (\frac{1}{\varepsilon_{3,1}} + \frac{1}{\varepsilon_{3,2}}\text{-}1) + \ldots + (\frac{1}{\varepsilon_{n,1}} + \frac{1}{\varepsilon_{n,2}}\text{-}1)}$$

$$Autem, \varepsilon_1 = \varepsilon_2 = \varepsilon_3 = \ldots = \varepsilon_n$$

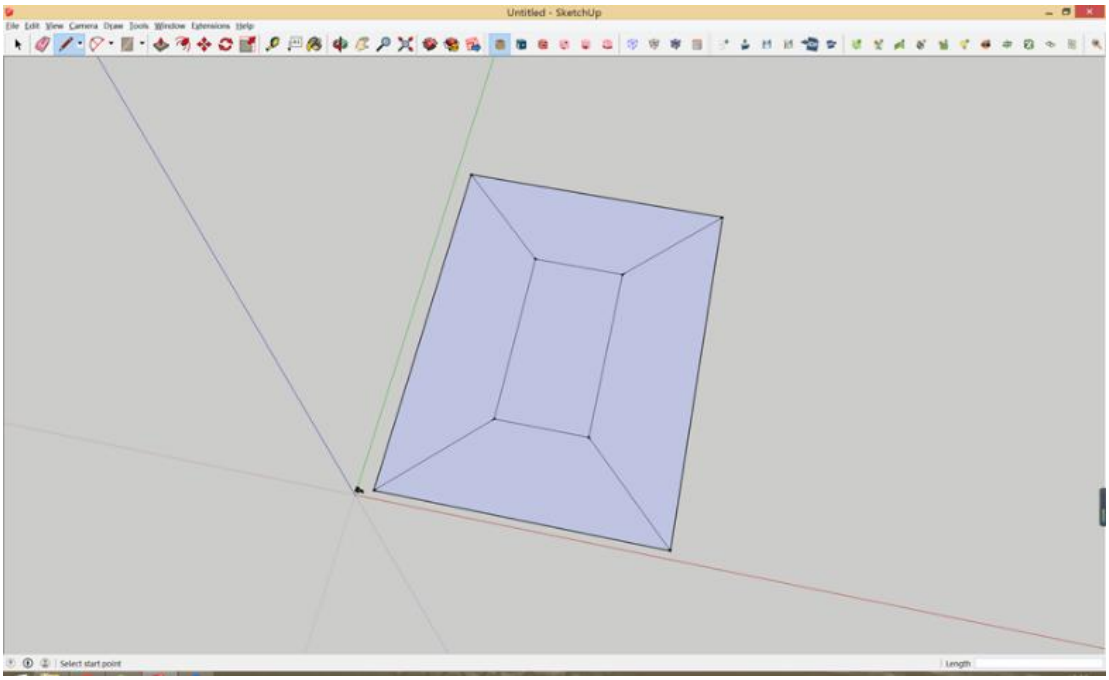
$$substitute \quad \varepsilon_1, \varepsilon_2, \varepsilon_3, \ldots, \varepsilon_n,$$

And introduce to the equation:

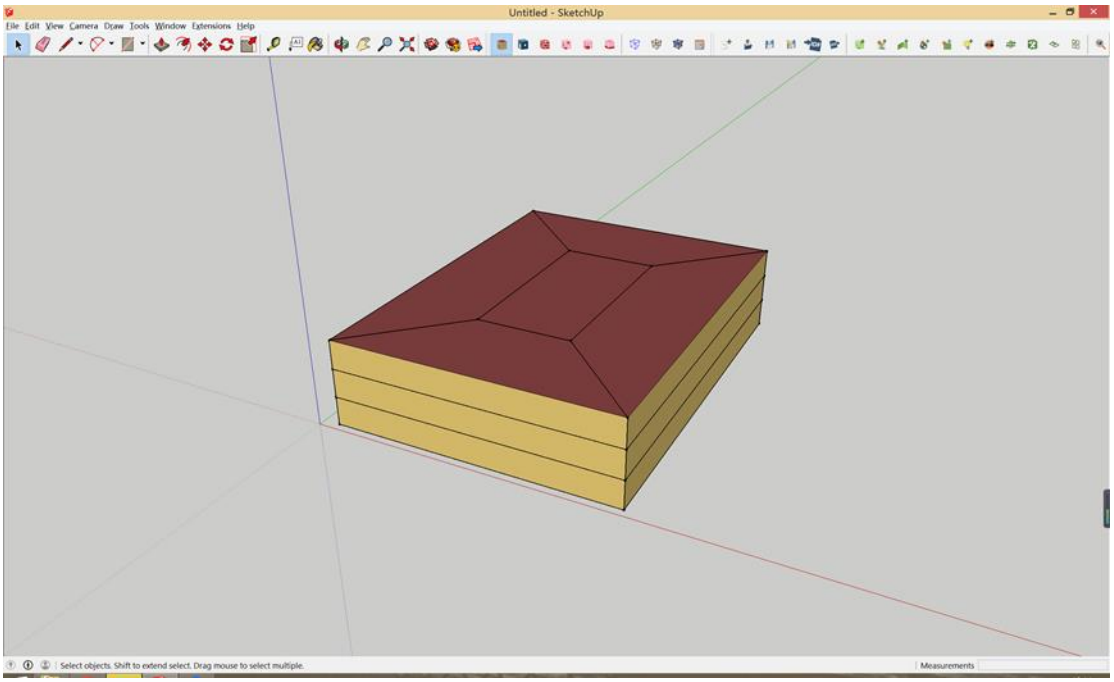
$$\dot{q}_{net_{1-2},n,shields} = \frac{\sigma(T_2^4 - T_1^4)}{(n+1)(\frac{1}{\varepsilon} + \frac{1}{\varepsilon} - 1)} = \frac{1}{n+1}\times\frac{\sigma(T_2^4 - T_1^4)}{\frac{1}{\varepsilon} + \frac{1}{\varepsilon} - 1}$$

** 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 (in your own words!)

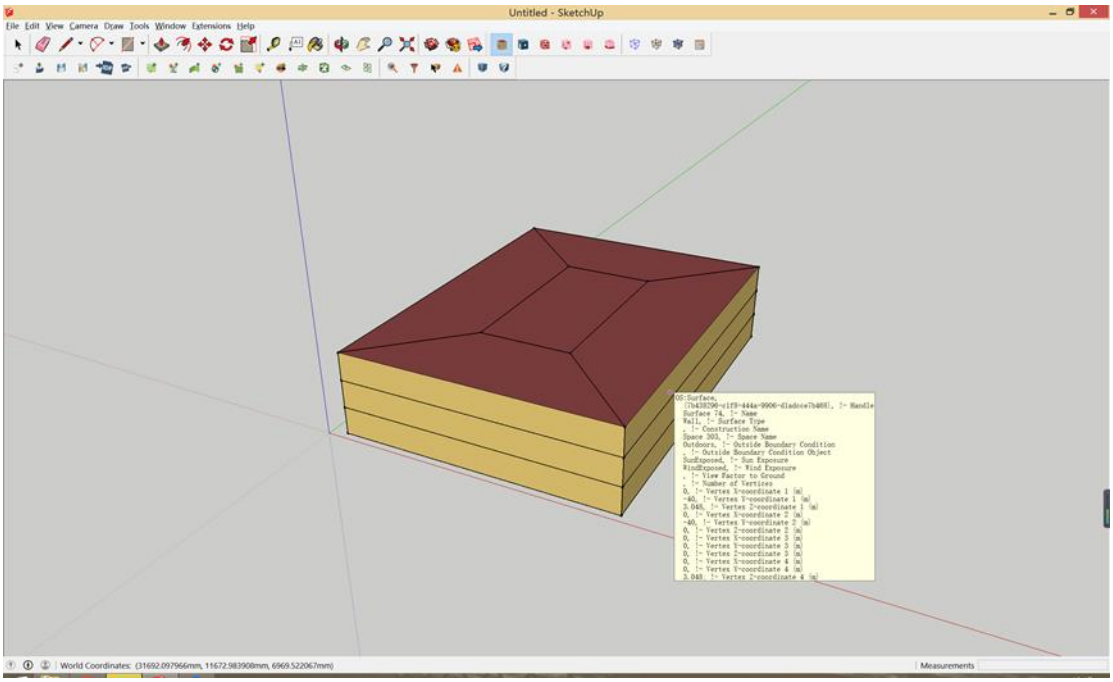
1. Draw the outline and shape of the building in Sketchup.



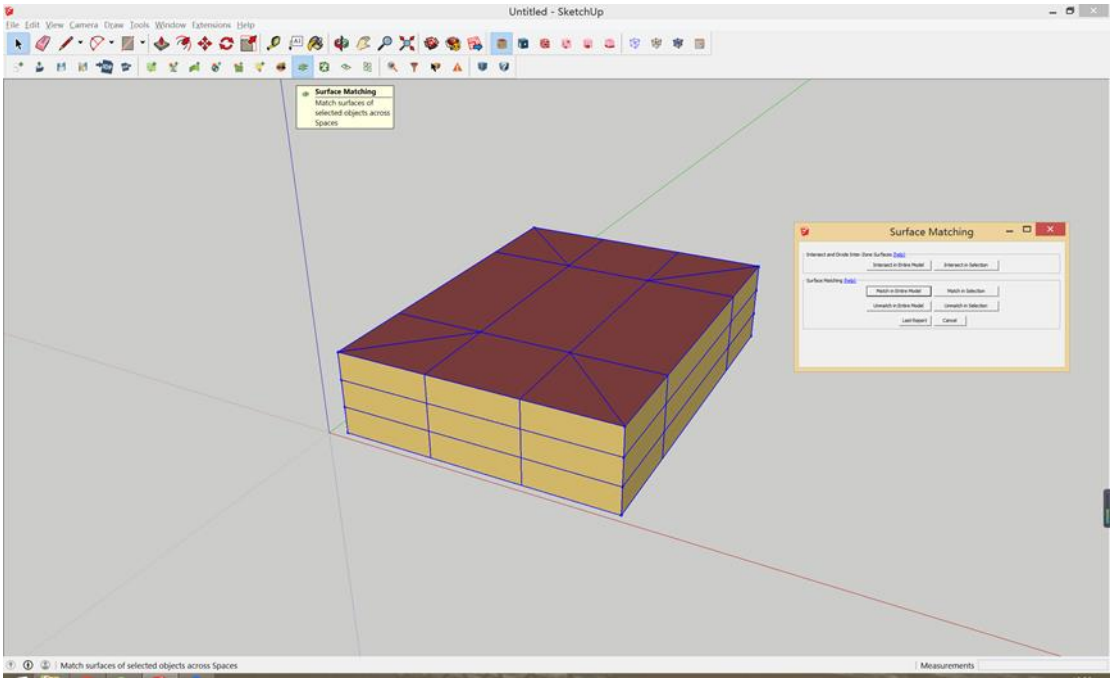

2. Use “Creat spaces from diagram”creat a 3 floor building.



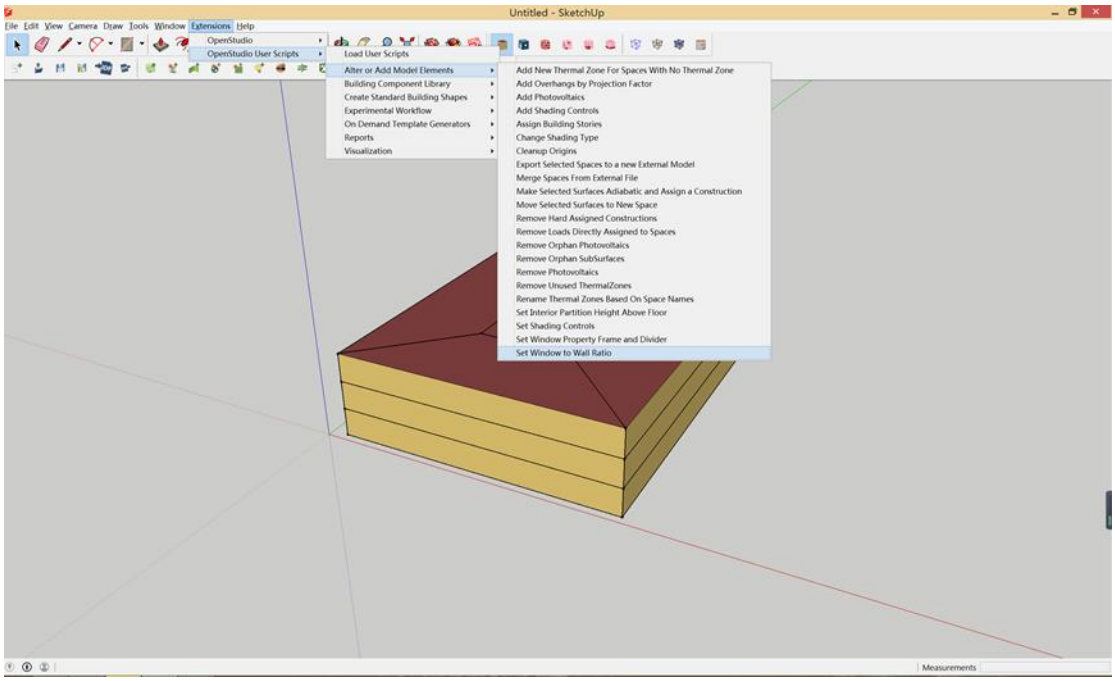

3. We can see the material information using the "Info tool".

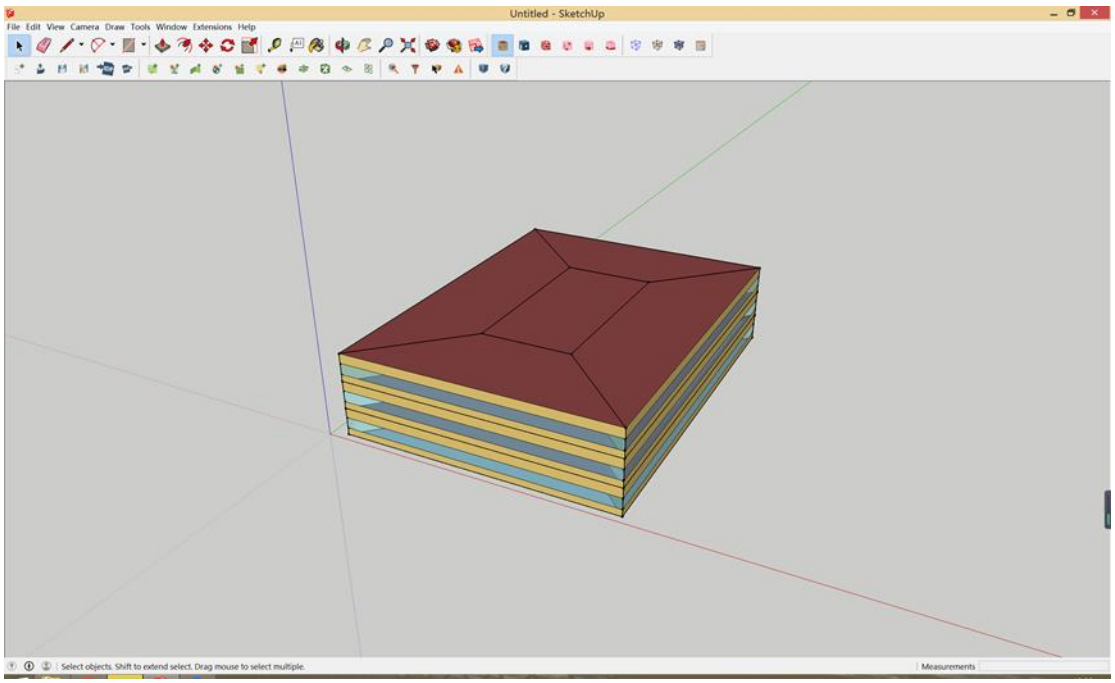



4. Click"Surface matching".

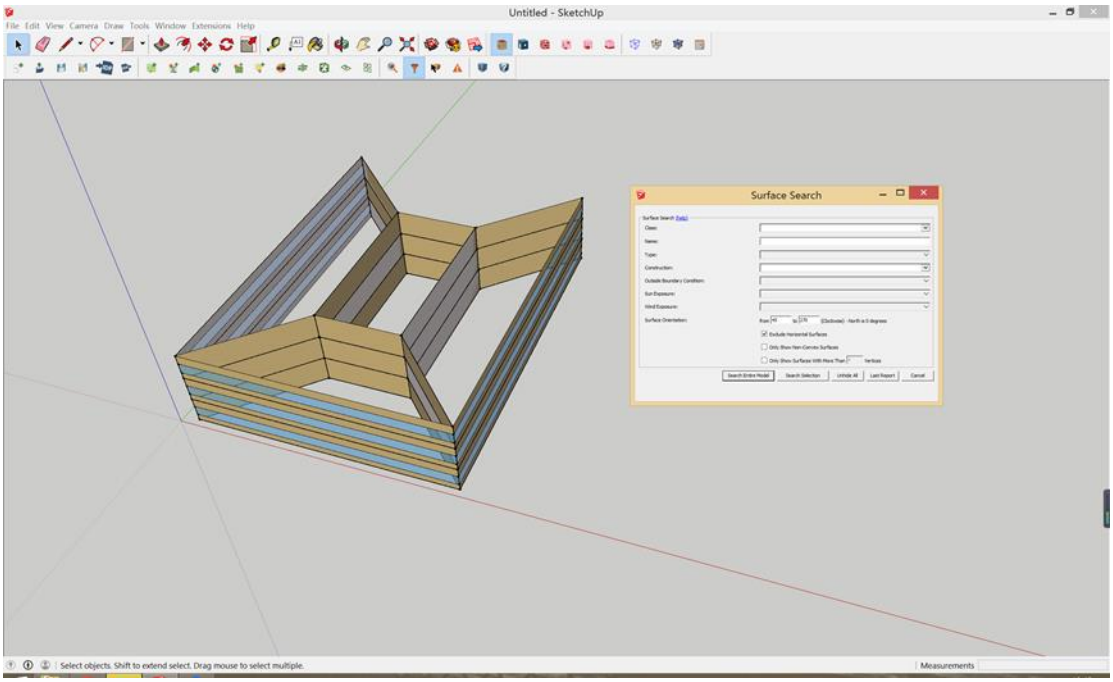



5. Click"Set Window to Wall Ratio"to built the windows.

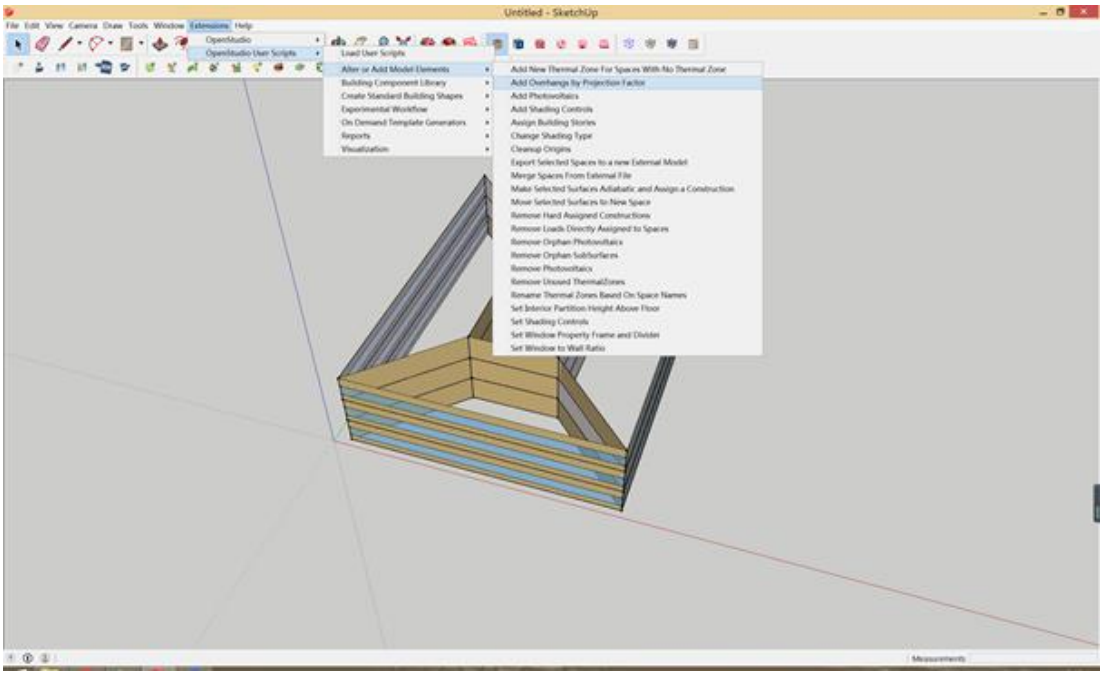


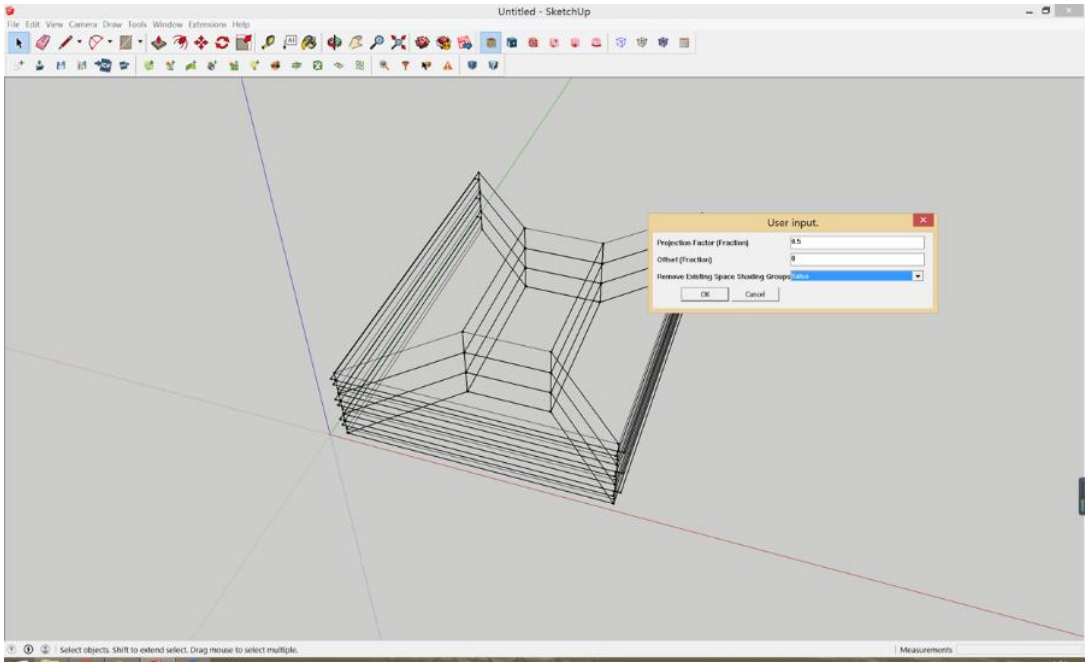




6. Check other directions besides the north.

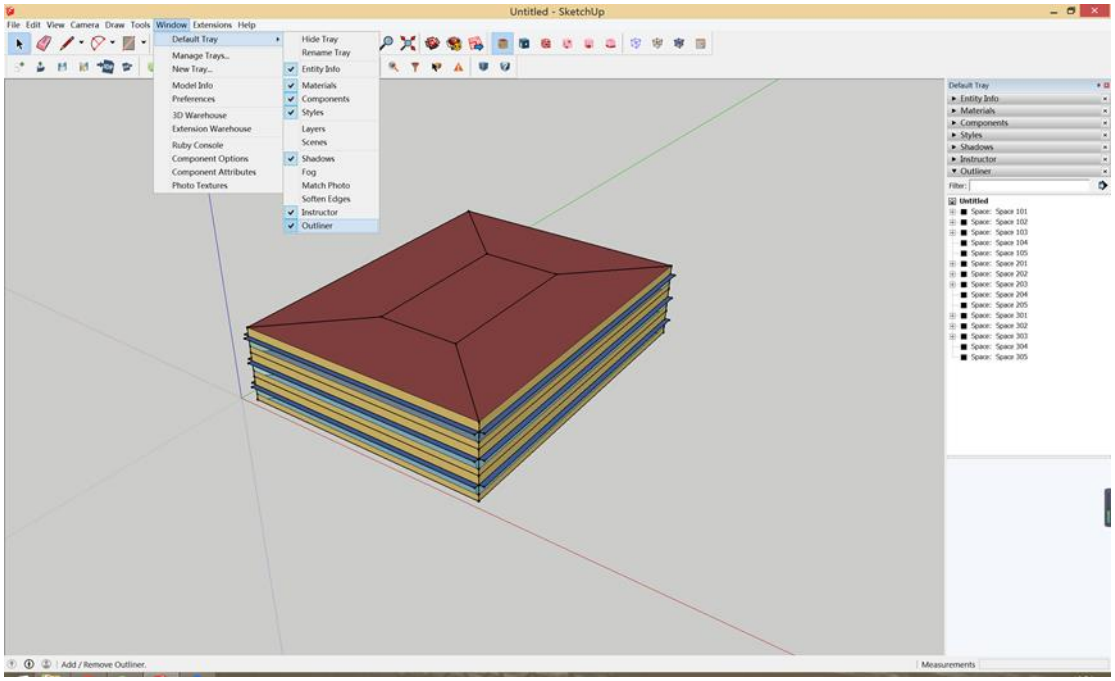



7. Click”Add Overhanges by Projection Factor”to built overhangs.

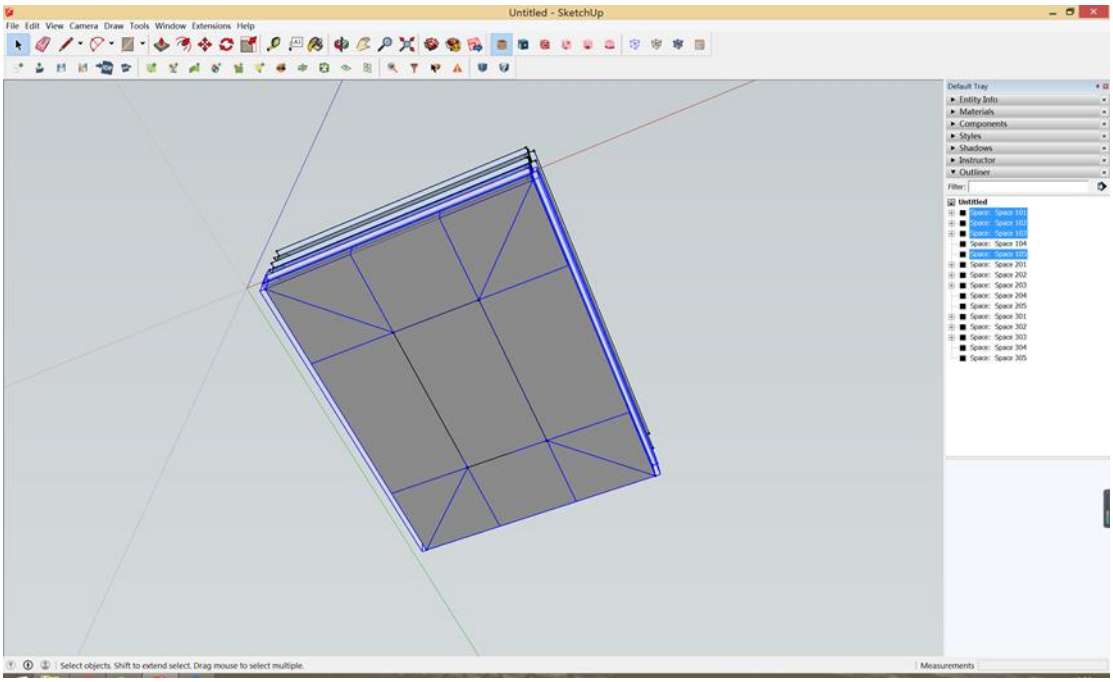




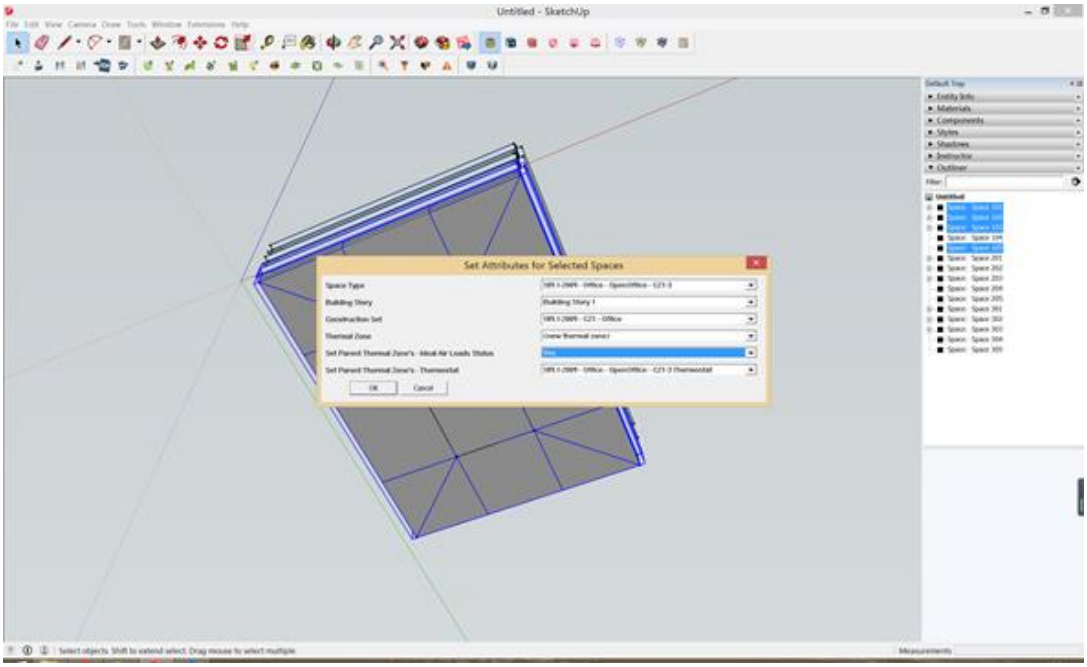

8. Open the"Outliner"

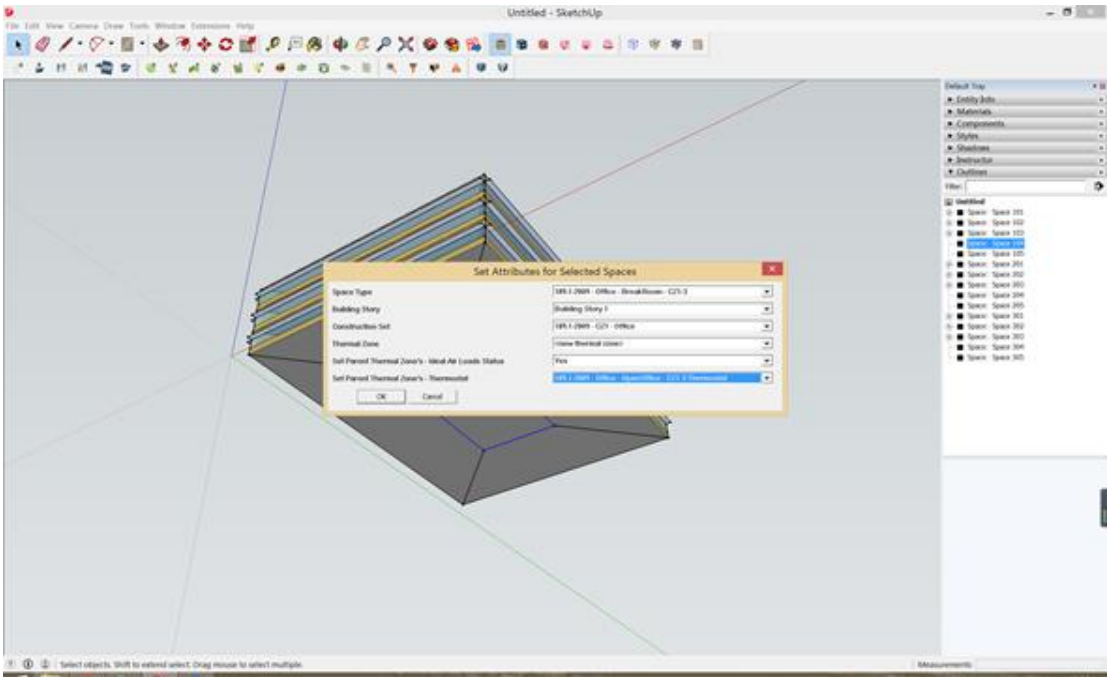


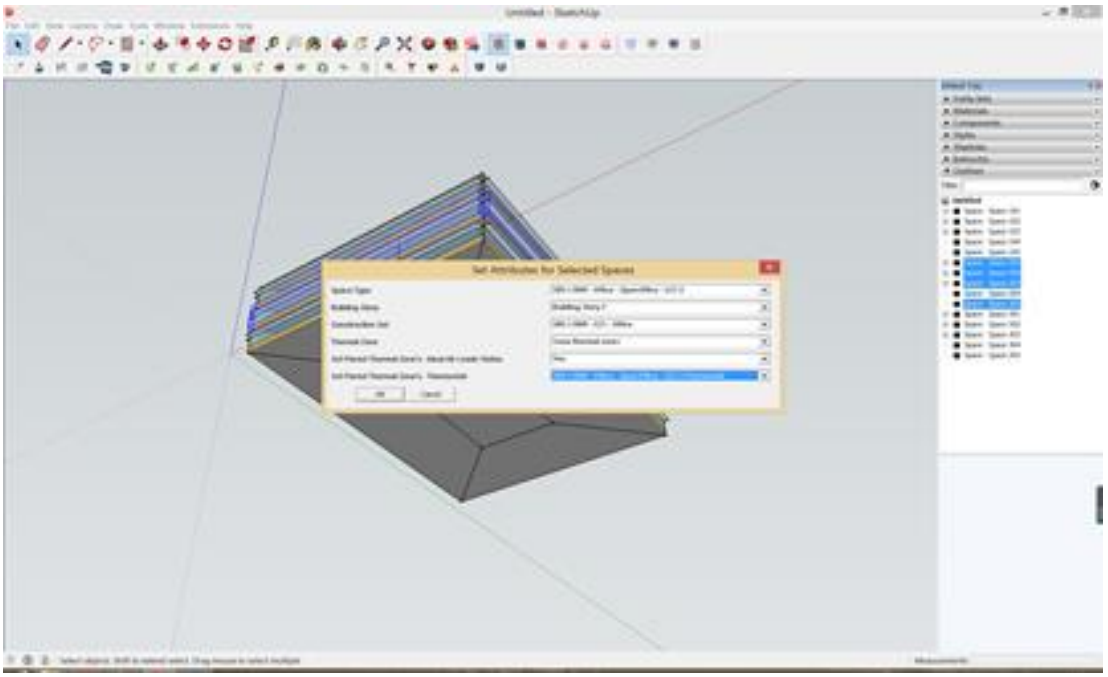

9. Choose the space of each thermal zone.

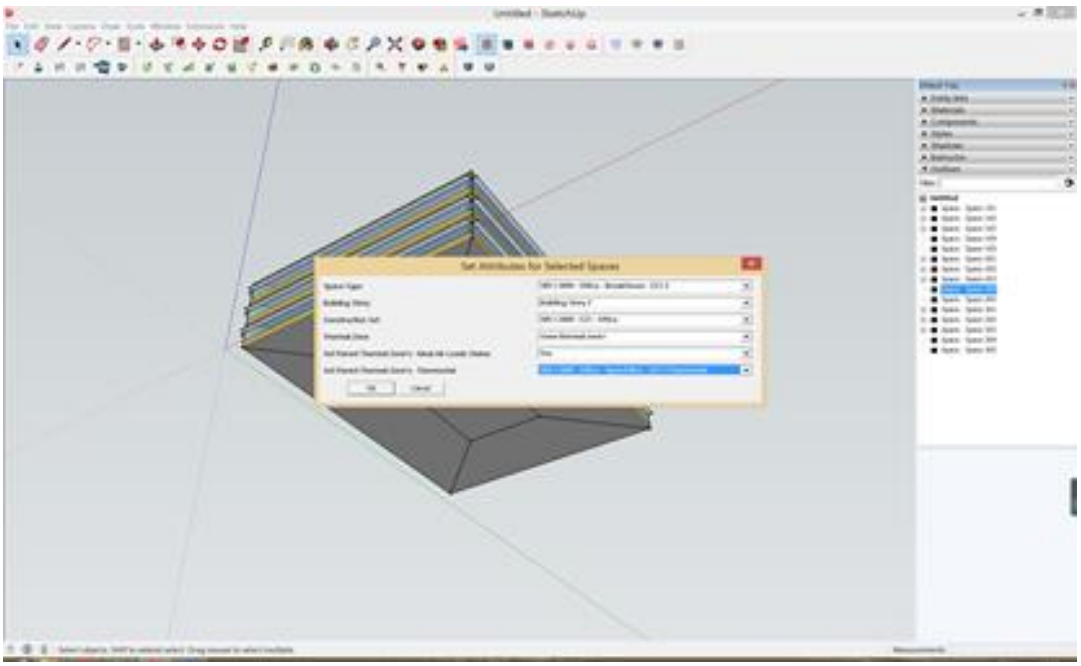


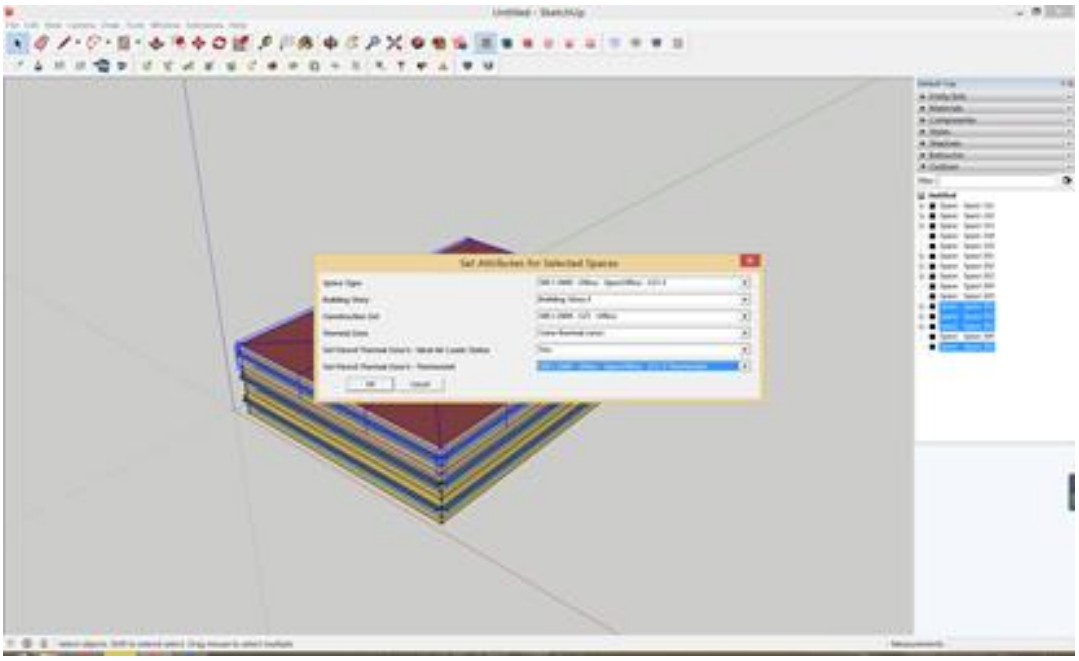

10. Click “Set Attributes for Selected Space”to set parameters.

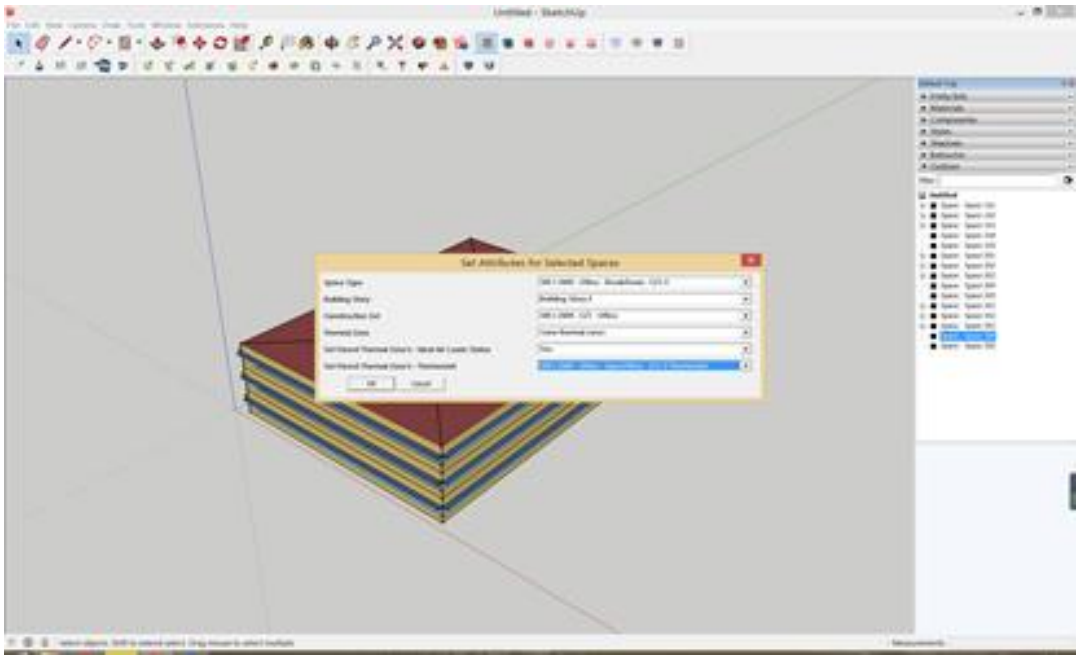



Untitled - SketchUp
Set Attributes for Selected Spaces

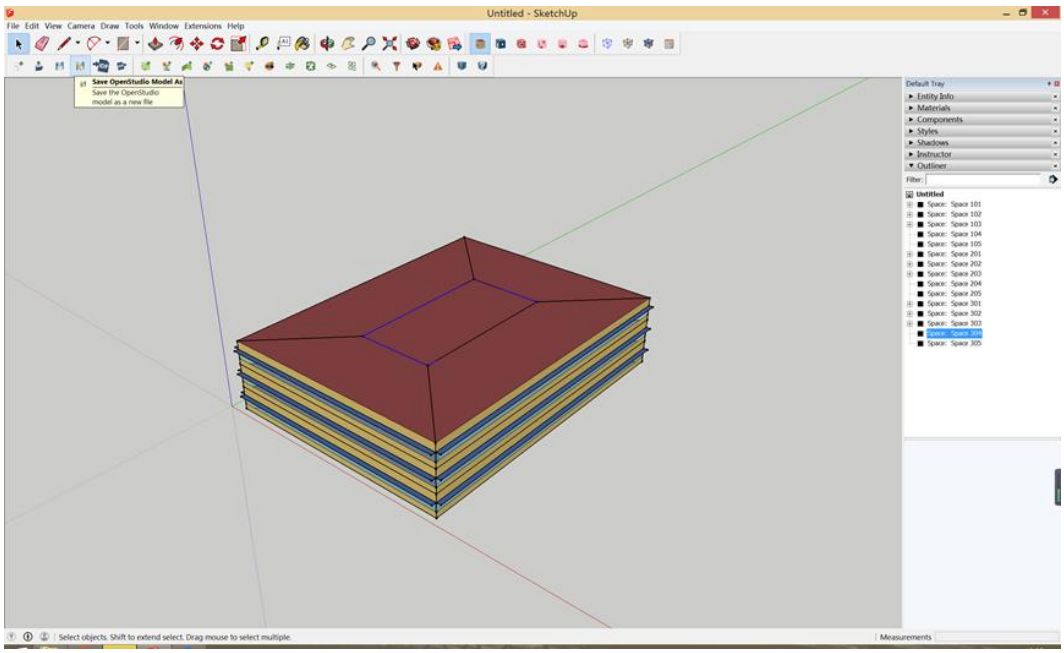

Set Attributes for Selected Spaces

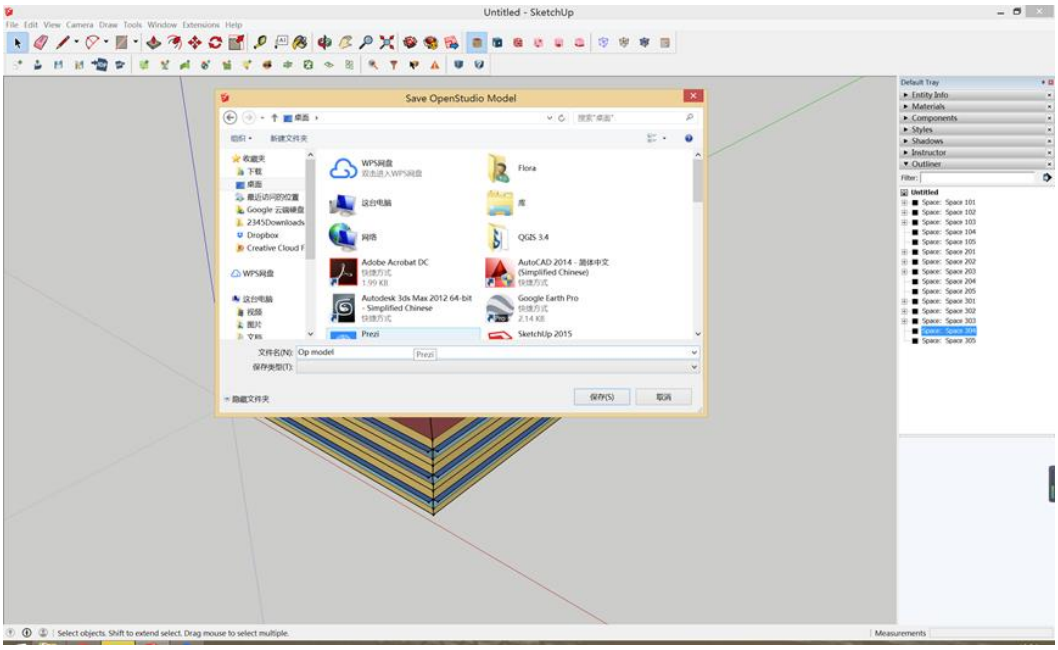

Set Attributes for Selected Spaces


Set Attributes for Selected Spaces

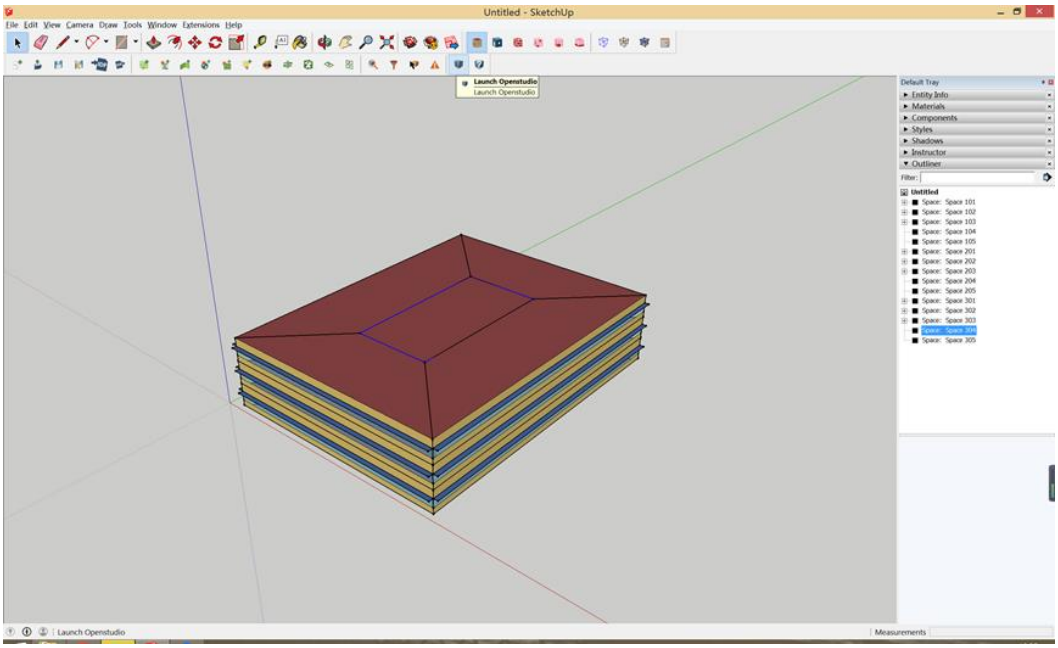


11. Save the model.

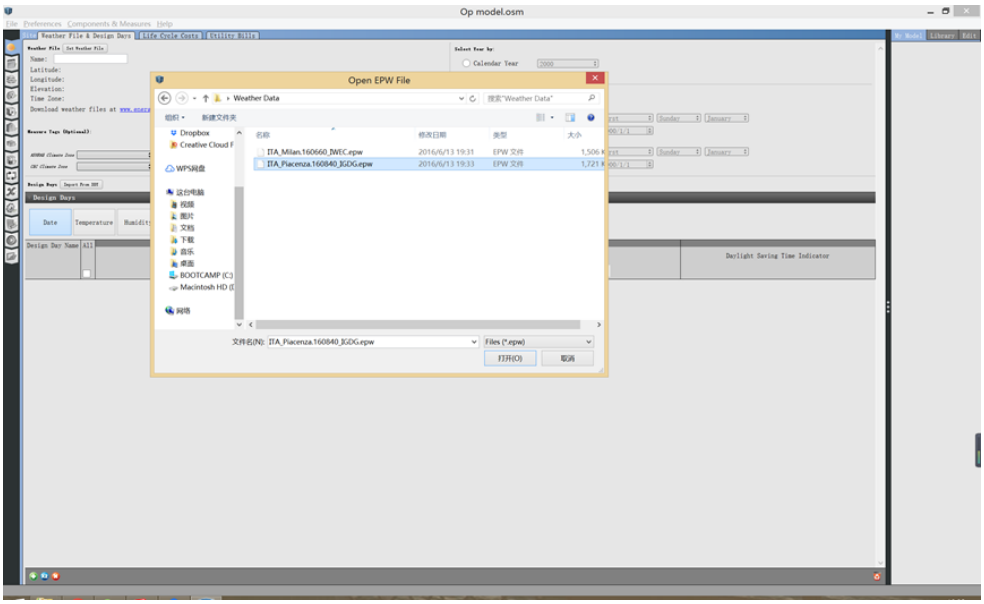




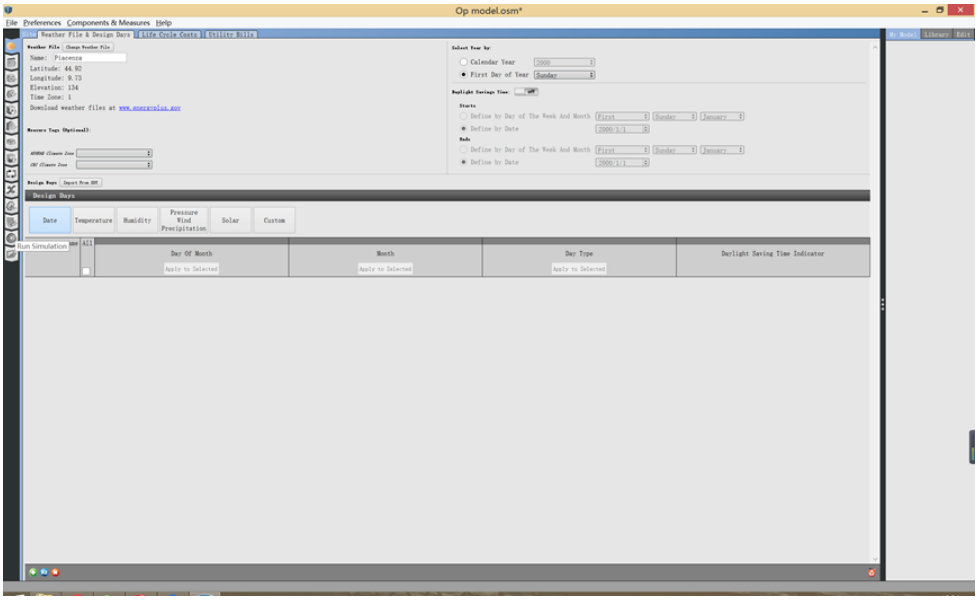

12. Run the Open studio.

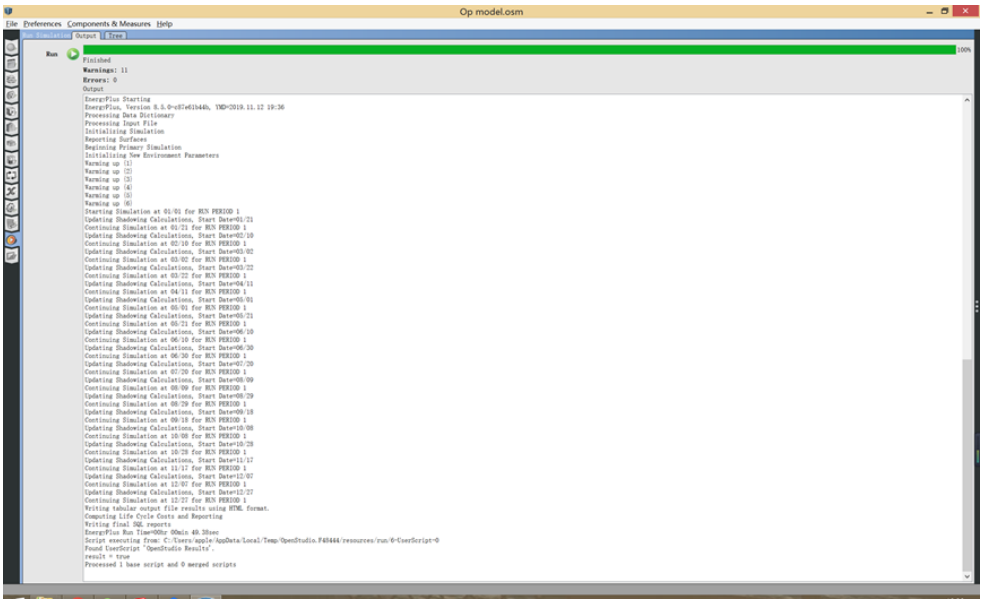



13. Add the weather data.

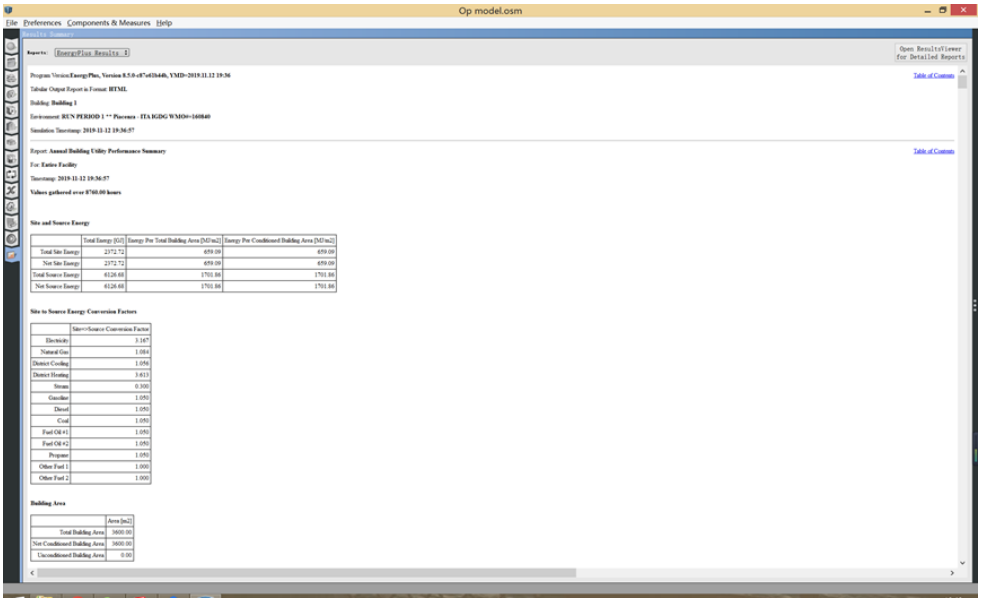


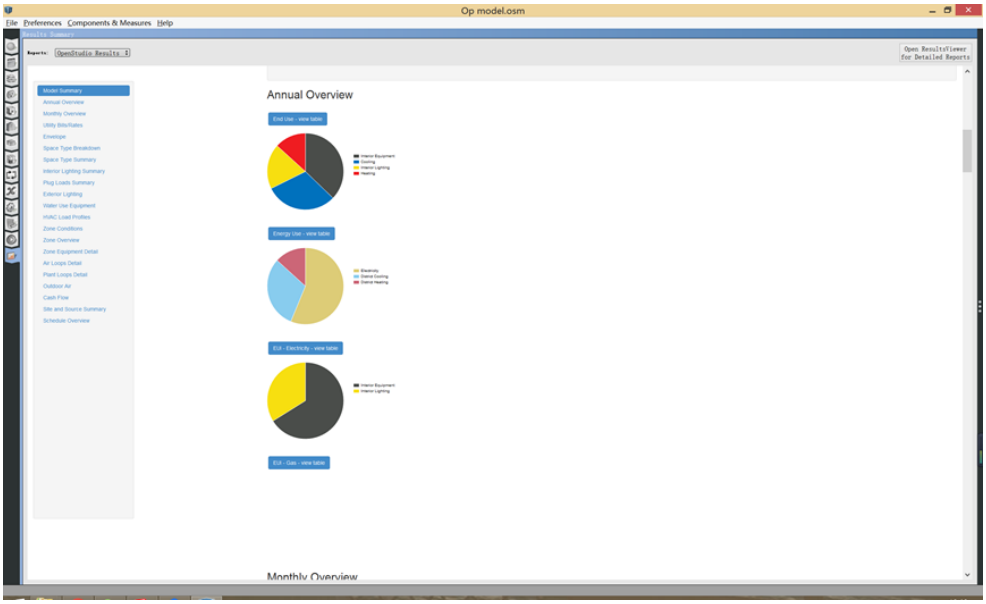

14. Run the analysis.






15. Show the result.

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Space Type Summary
Interior Lighting Summary
Plug Loads Summary
Exterior Lighting
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HVAC Load Profiles
Zone Conditions
Zone Overview
Zone Equipment Detail
Air Loops Detail
Plant Loops Detail
Outdoor Air
Cash Flow
Site and Source Summary
Schedule Overview
Annual Overview
End Use - view table
Energy Use - view table
Elt - Electricity - view table
Elt - Gas - view table
Monthly Overview