

#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 ?

** 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!)

Answers:

Task 1

Solution:

$$\dot{Q} = 3625.4 \text{ W/m}^2$$

$$1\% * \dot{Q} = 36.254 \text{ W/m}^2$$

$$\dot{Q}_{12, n \text{ shield}} = \frac{A\sigma(T_1^4 - T_2^4)}{\left(\frac{1}{\epsilon_1} + \frac{1}{\epsilon_2} - 1\right) + \left(\frac{1}{\epsilon_{3,1}} + \frac{1}{\epsilon_{3,2}} - 1\right) + \dots + \left(\frac{1}{\epsilon_{n,1}} + \frac{1}{\epsilon_{n,2}} - 1\right)}$$

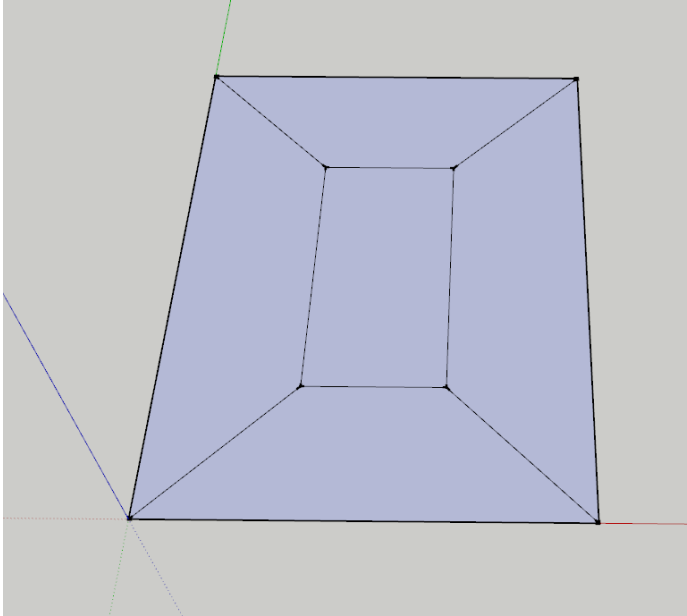
$$\therefore 1\% * \dot{Q}_{12, n \text{ shield}} = 36.254 = 5.67 * 10^{-8} * \frac{(800^4 - 500^4)}{\left(\frac{1}{0.2} + \frac{1}{0.7} - 1\right) + \left(\frac{1}{0.1} + \frac{1}{0.1} - 1\right) + \dots + \left(\frac{1}{0.1} + \frac{1}{0.1} - 1\right)} = \frac{19680.57}{5.43 + 19n}$$

$$\therefore n = \frac{\frac{19680.57}{36.254} - 5.43}{19} \approx 28.28 \approx 28$$

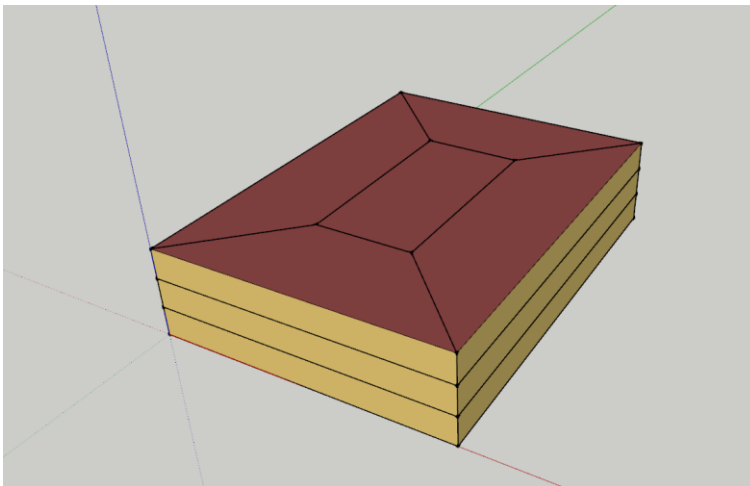
So it will take about 28 shield to have the new heat transfer rate to be 1% of the case without shields.

Task 2

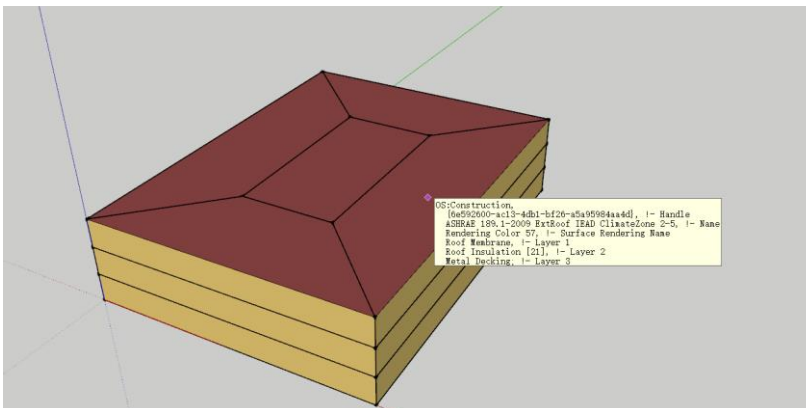
1. Draw the outline and shape of the building in sketchup.



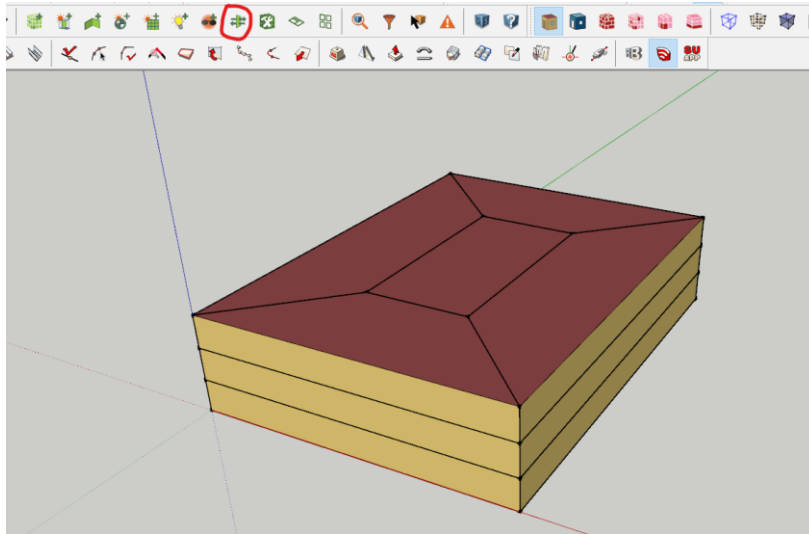
2. Use "Creat spaces from diagram" creat a 3 floor building.



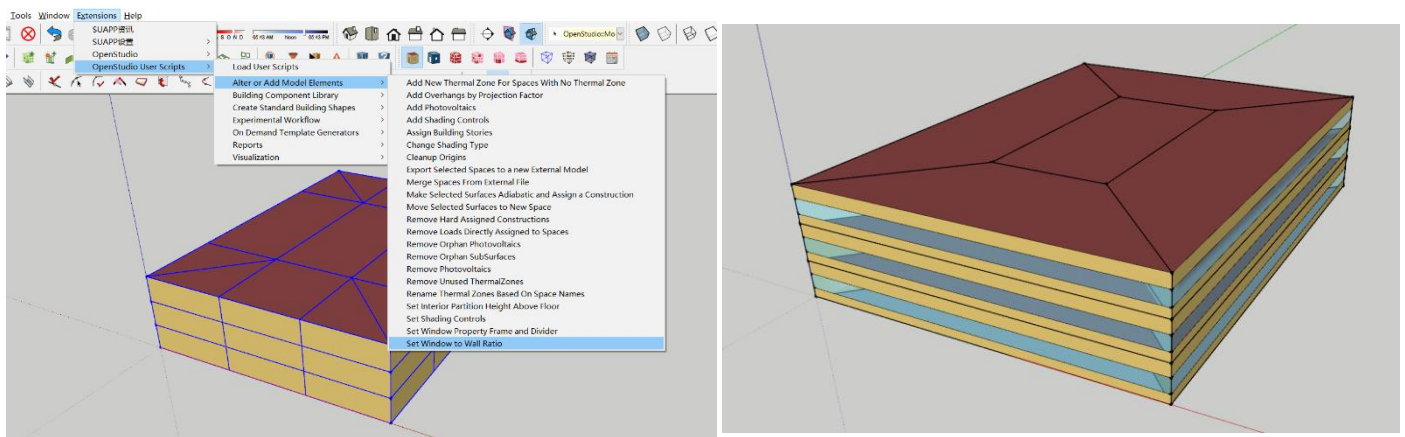
3. Use "Info tool" to check the information of materials.



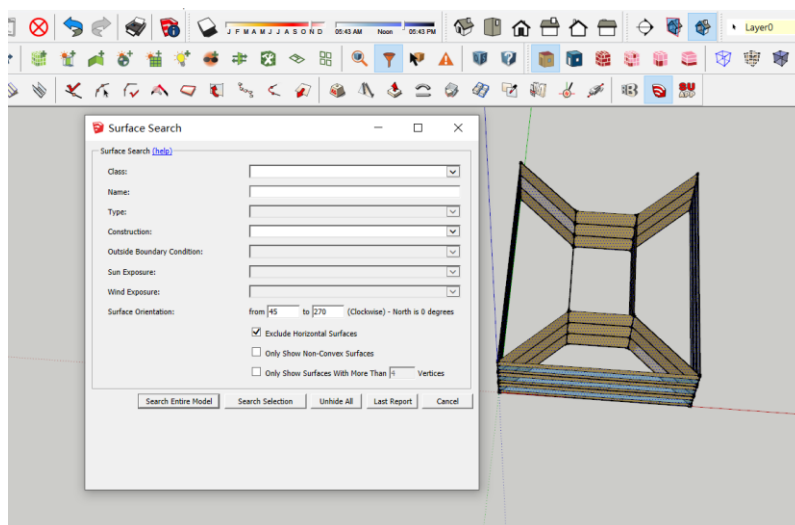
4. "surface matching"



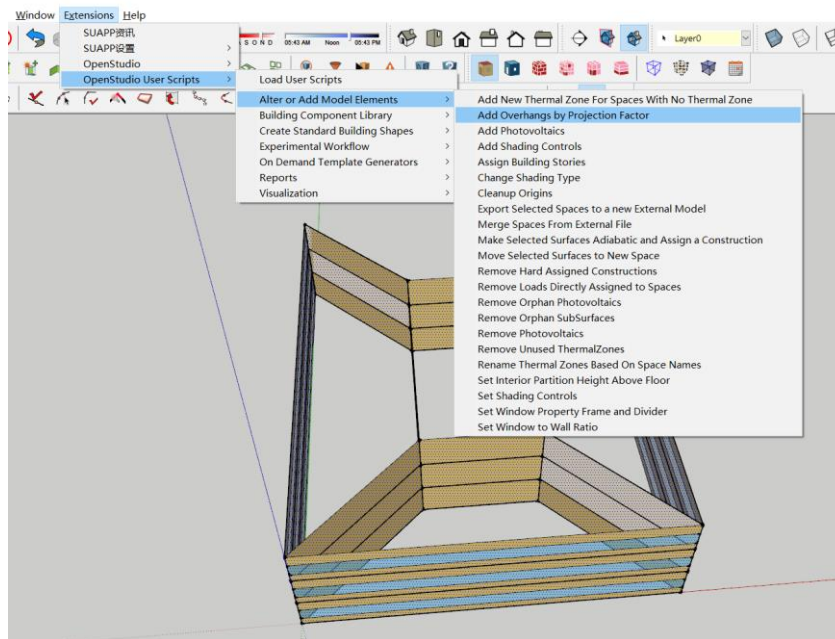
5. Build the windows



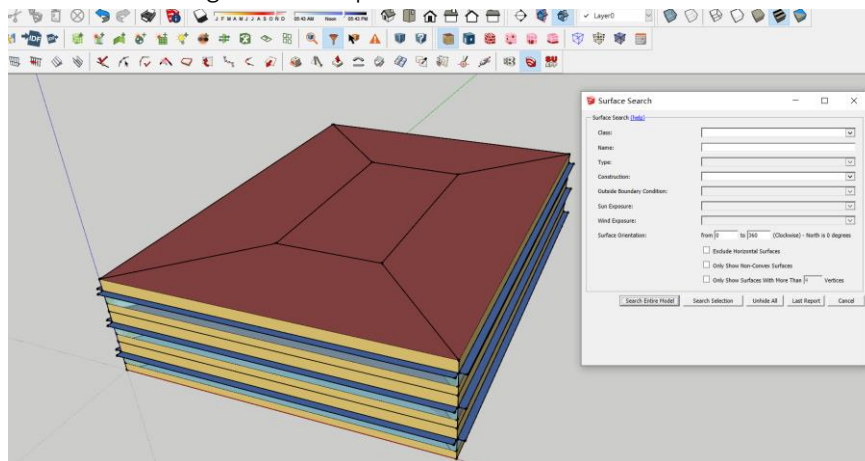
6. Select the sides except north.



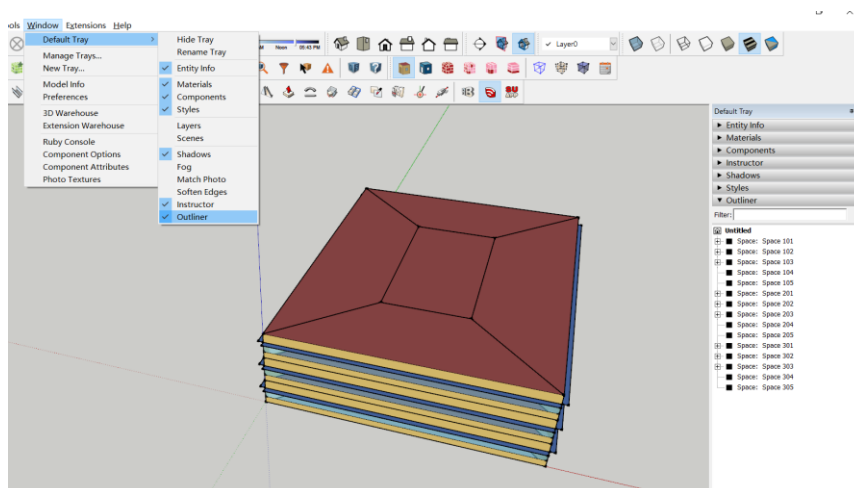
7. Building the overhangs.



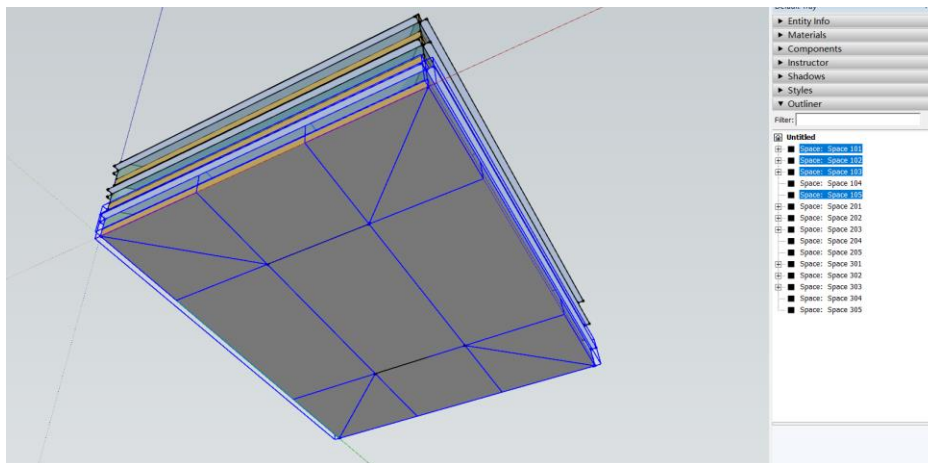
8. Select 0~360 to go back the previous view.



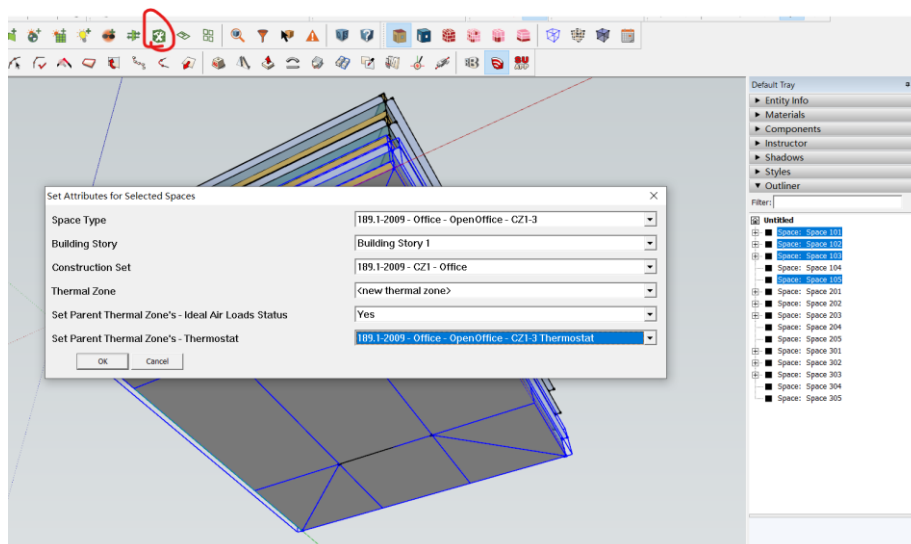
9. Open the outliner tray.



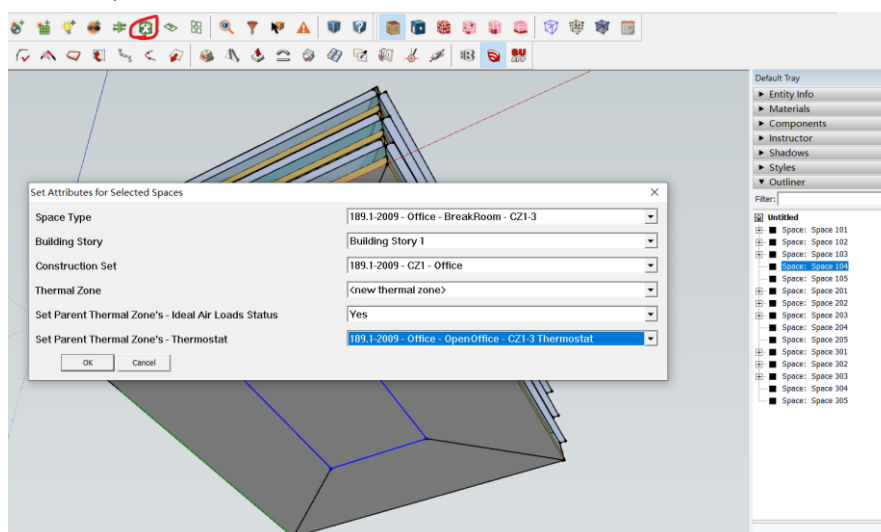
10. Select the thermal zones



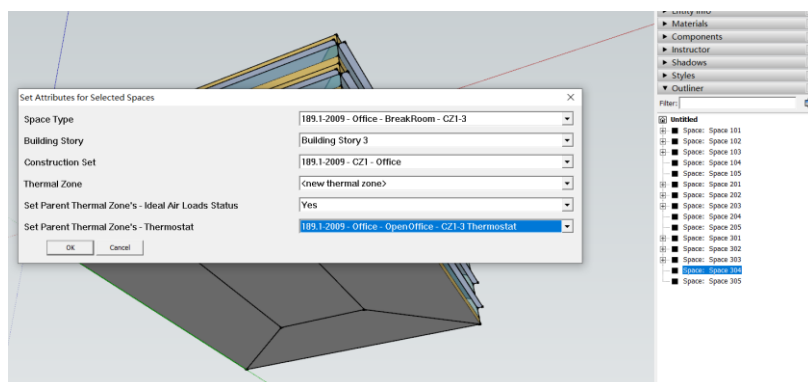
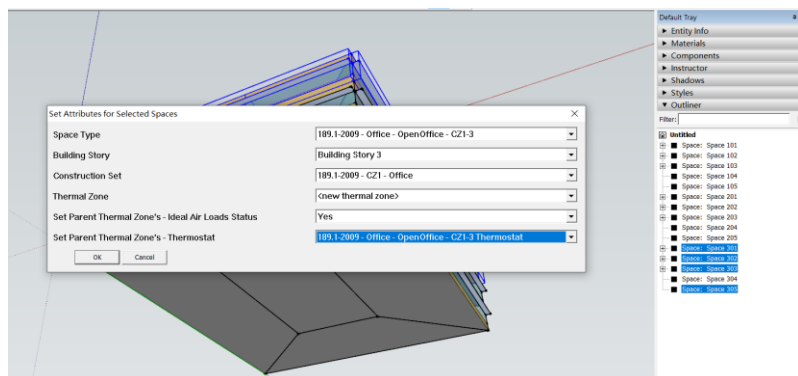
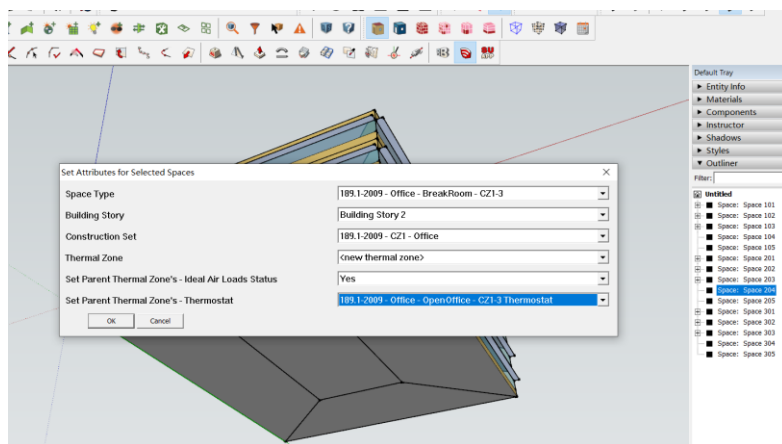
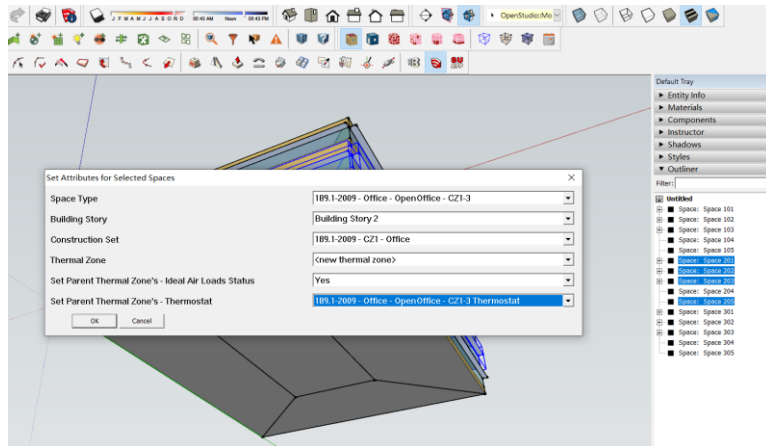
11. Set the specifications for thermal zones.



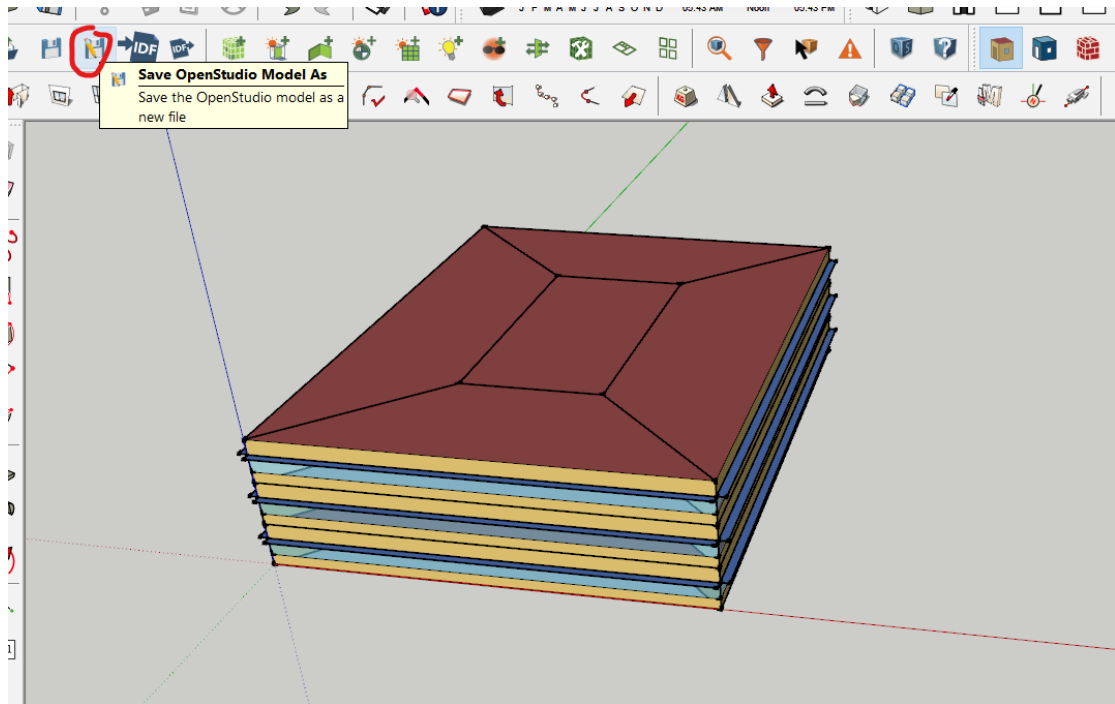
12. Set the specifications for the breakroom.



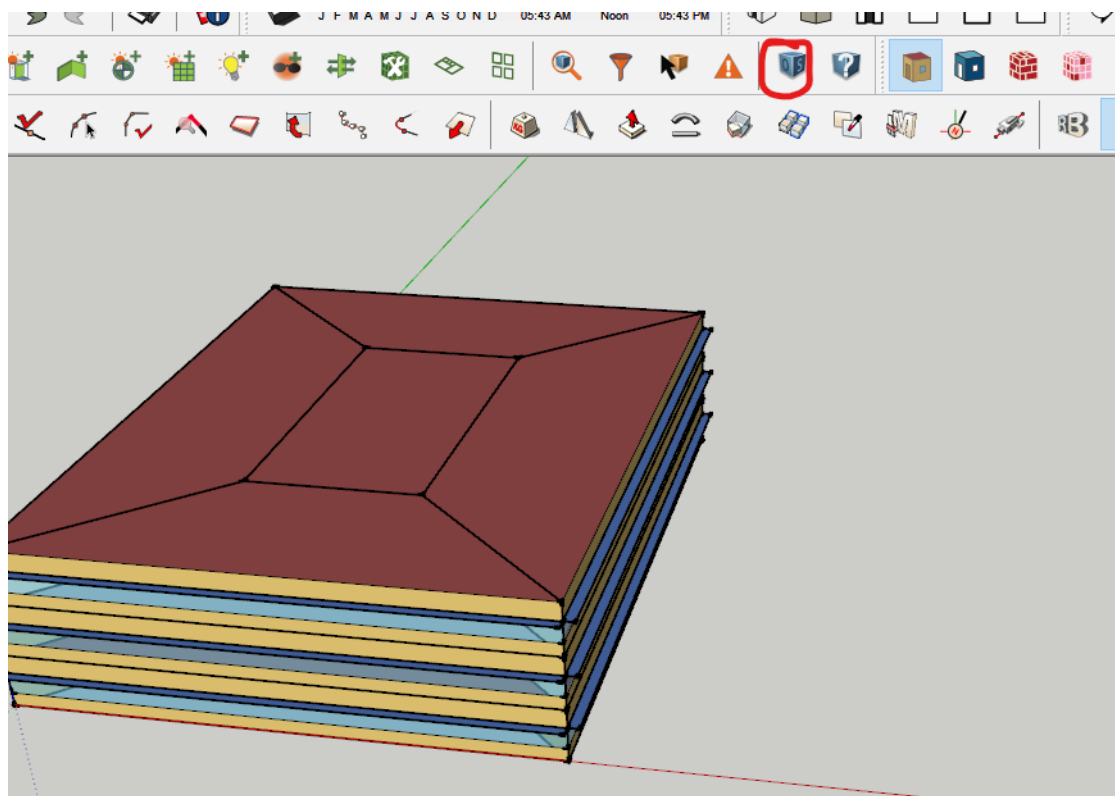
13. Finish the other parts by the same way.



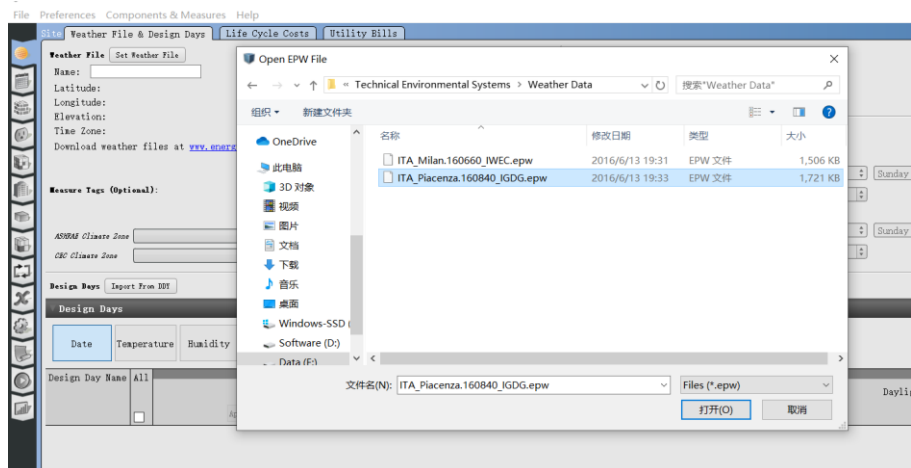
14. Save openstudio model as a file.



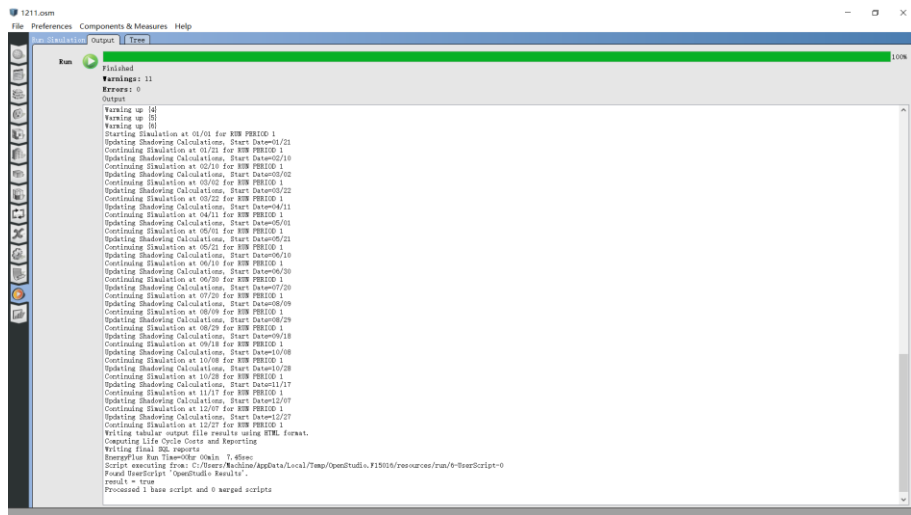
15. Run the Openstudio



16. Load the weather file



17. Run the analysis.



18. Get the results!!! 🤪

