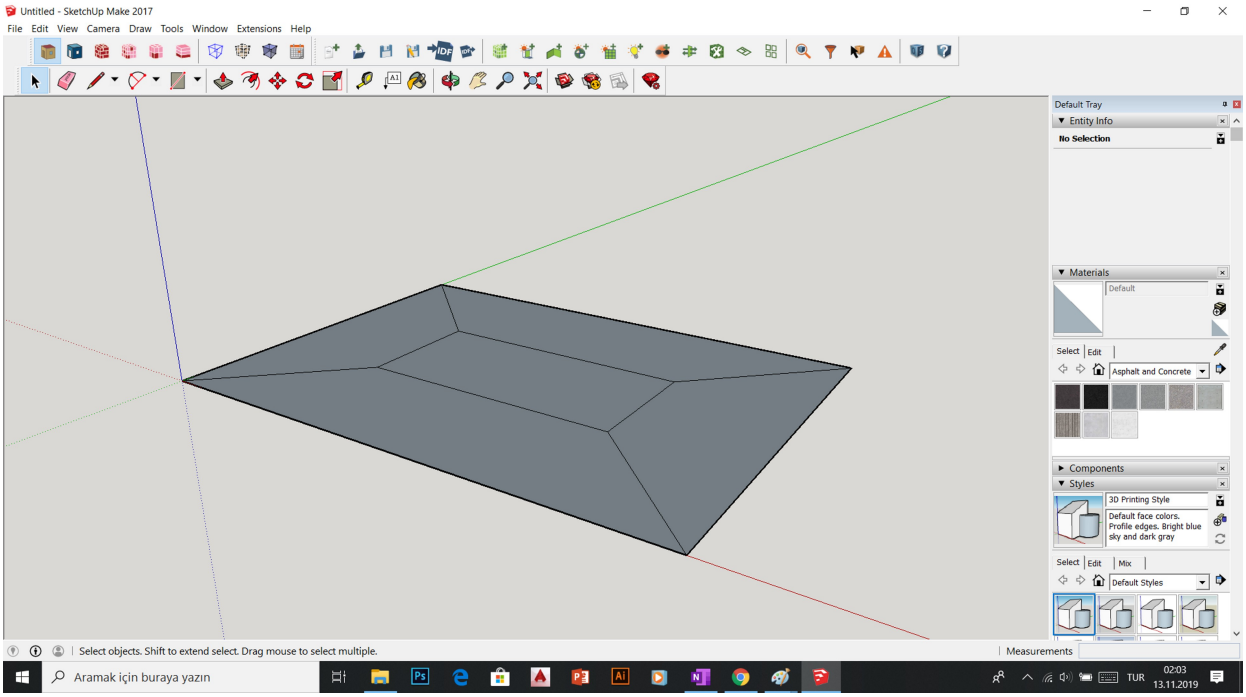
Demre Ertem Weekly Submission 6

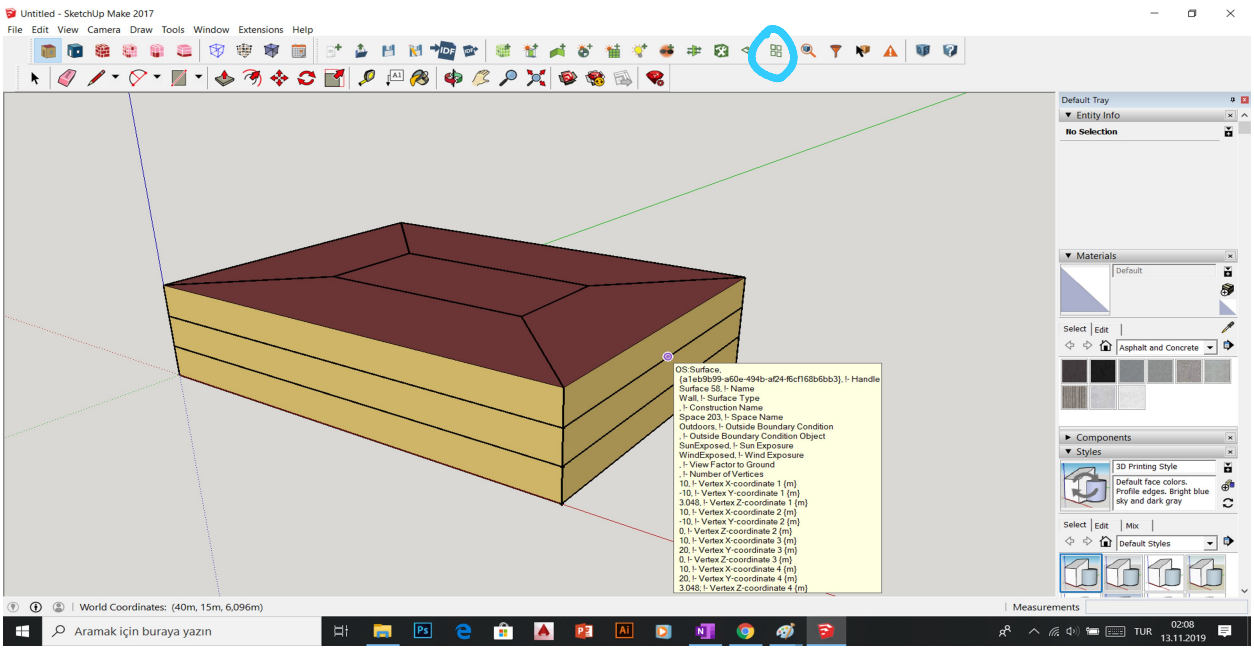
13 Kasım 2019 Çarşamba 00:28

Task1:

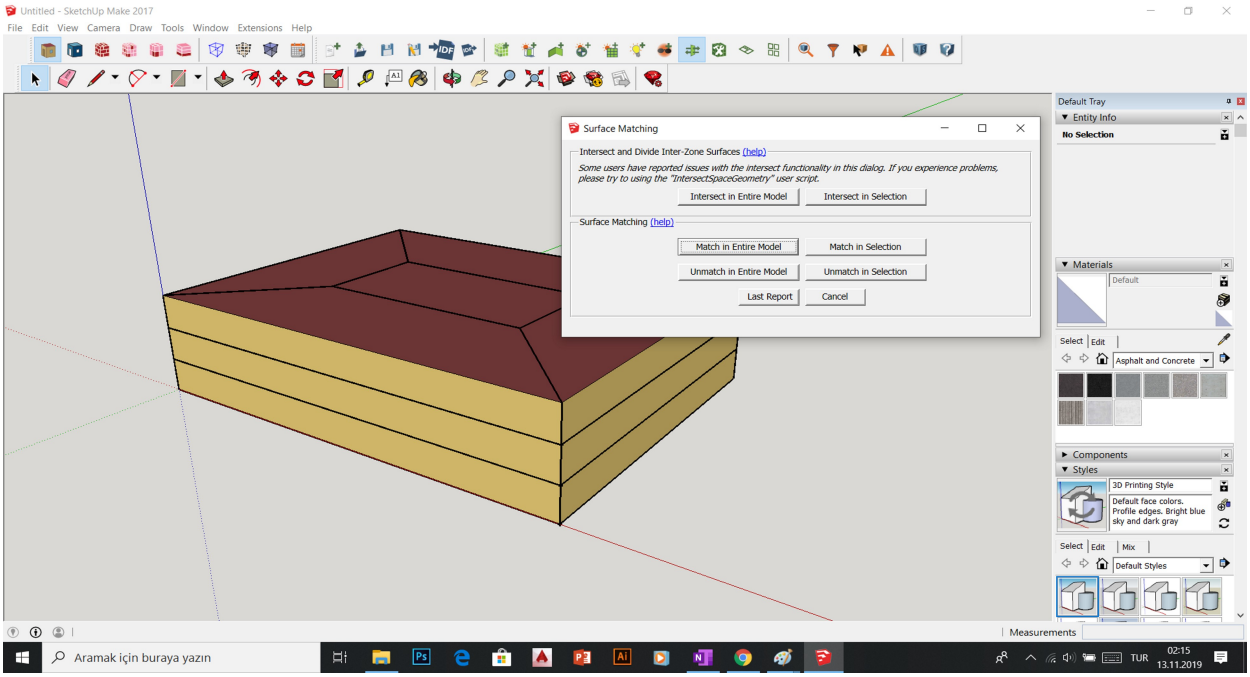
We just draw the diagram by creating a 40×30 rectangle
Then create another rectangle inside it (with the offset of 10 m)
Finally connect the edges with 4 lines !!



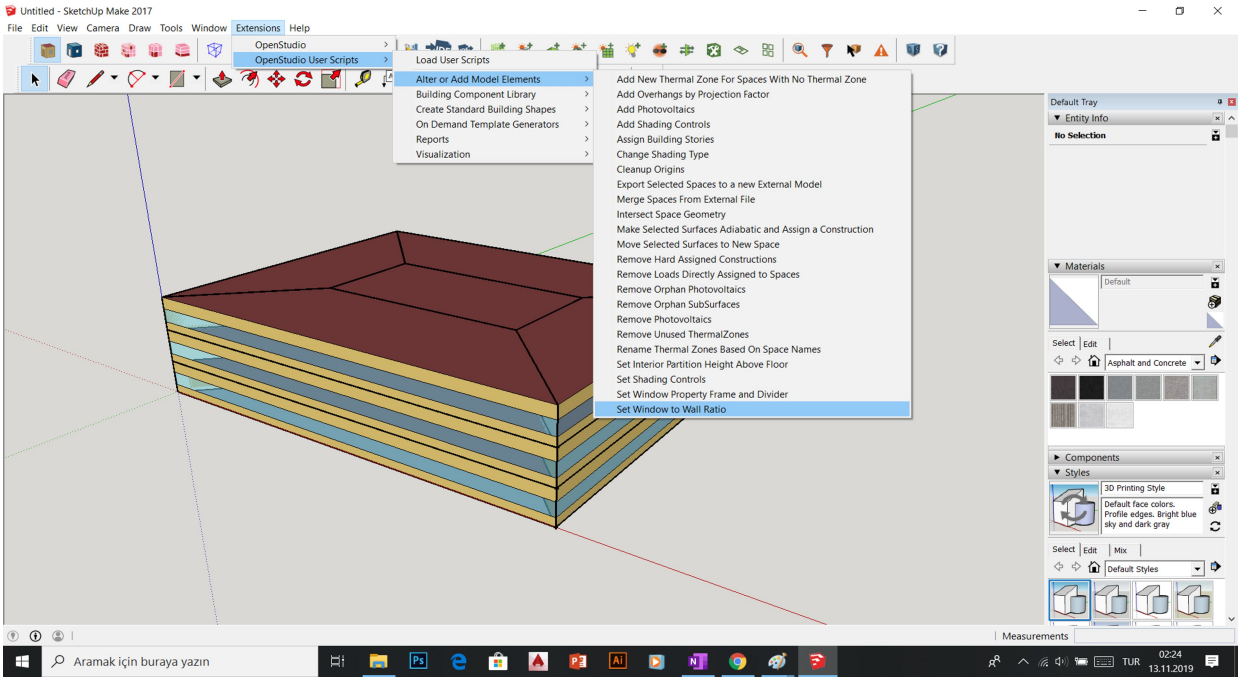
To create levels for model, First select the roof and click inside the blue circle button and WRITE THE LEVEL HEIGHT AND LEVEL NUMBER. Once you created the building you can use info tool to see the properties of each surface, and you will see that the boundary conditions have been automatically assigned.



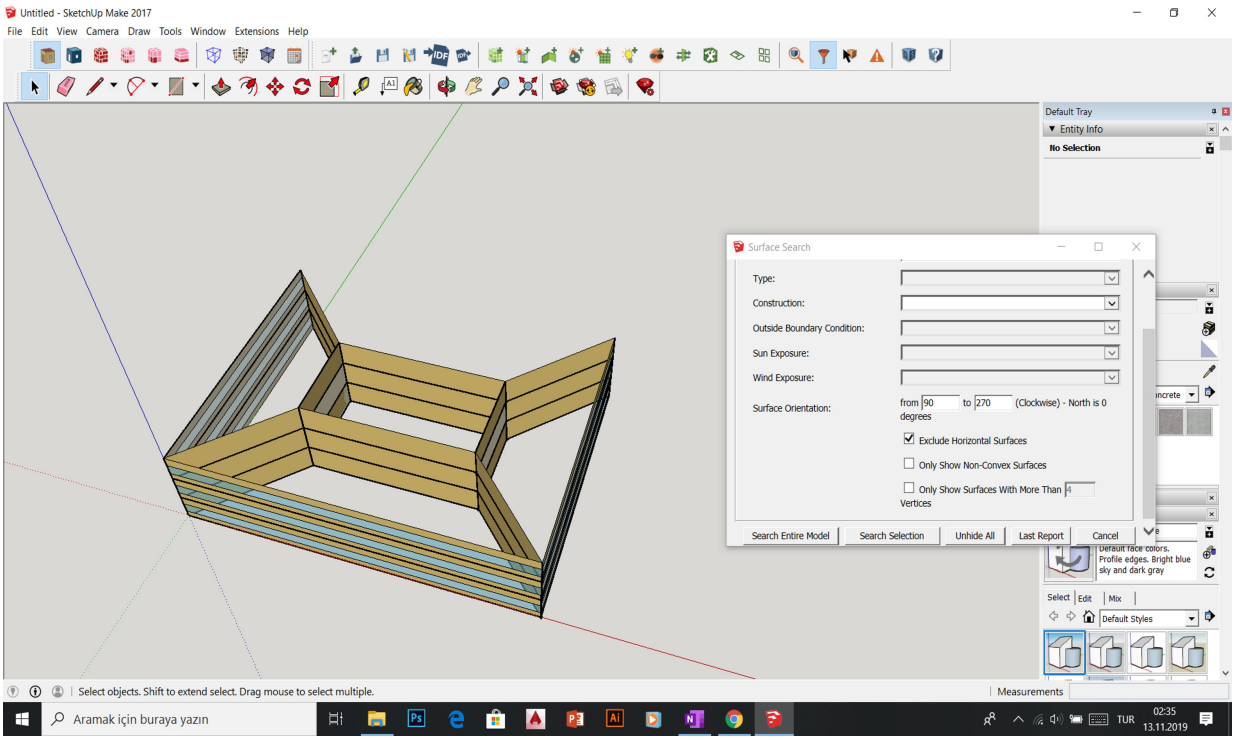
You need to carry out this step since if not you might have windows inside your building

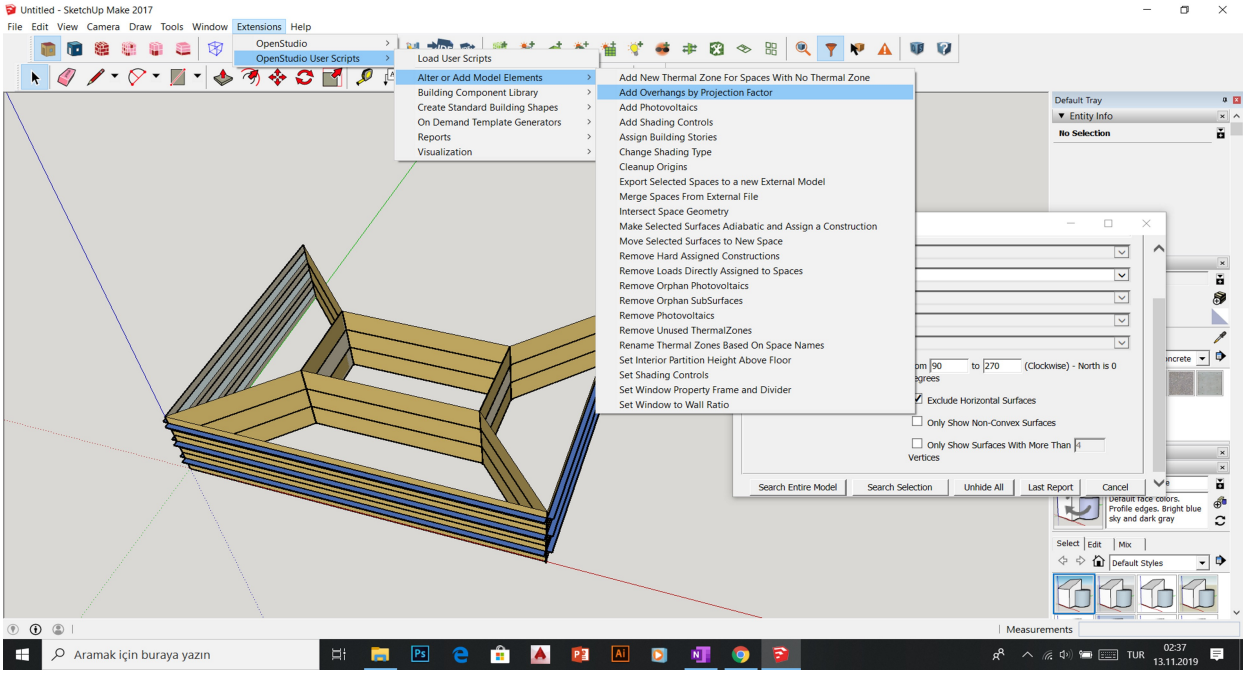


Add windows



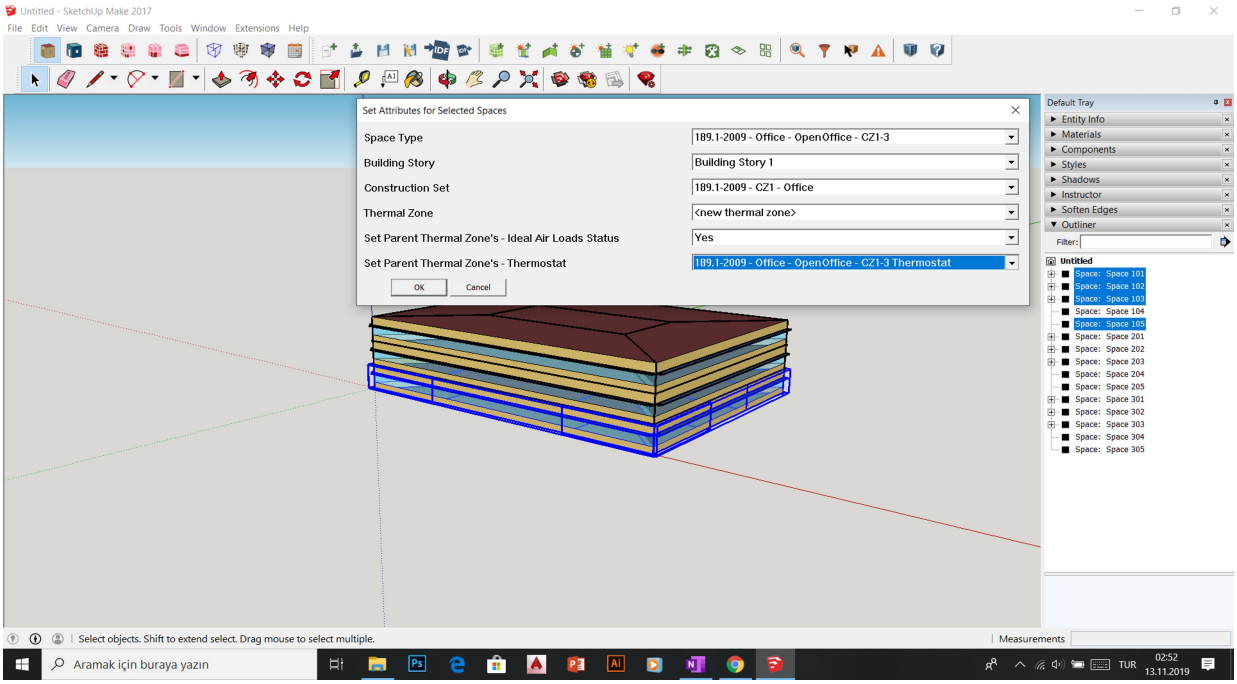
Add Overhangs except north



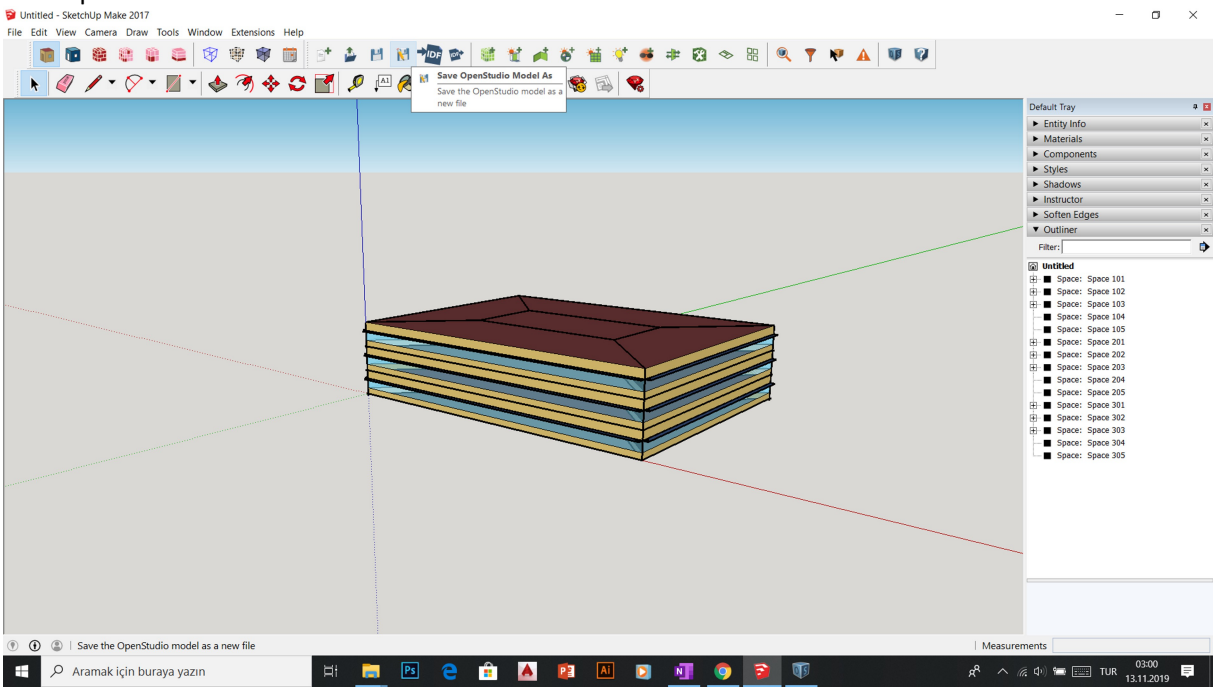


And Then turn back to 0-360

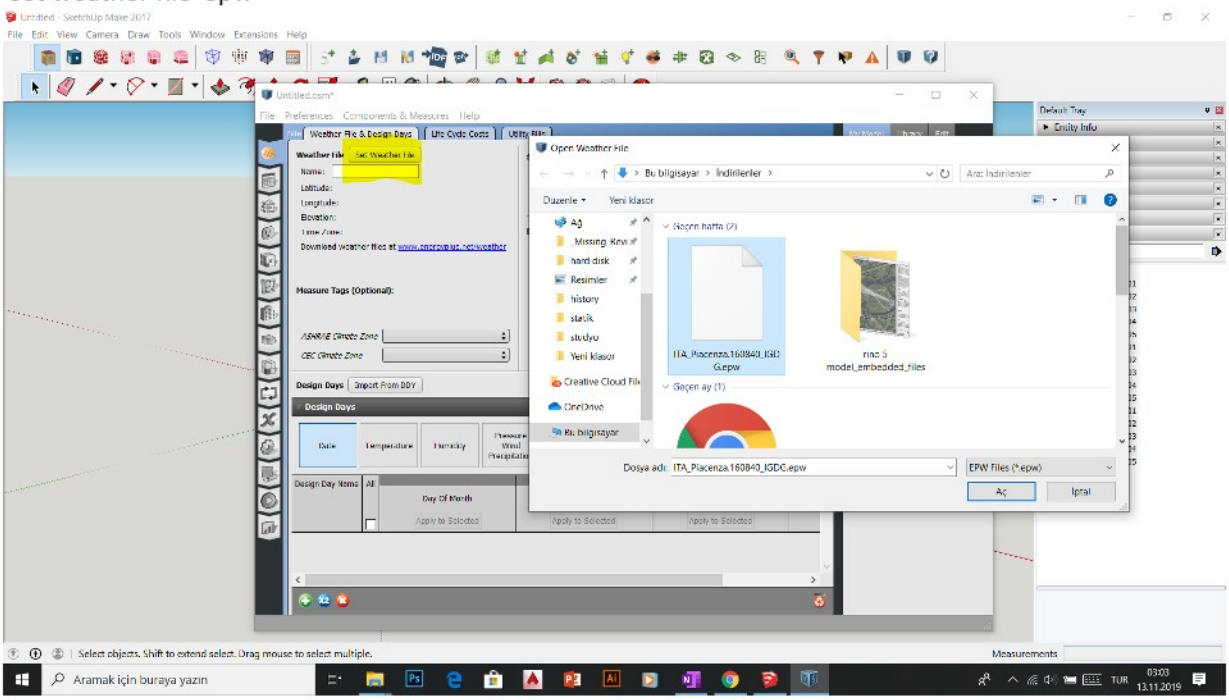
Now we choose the spaces of each thermal zone and we add specifications:



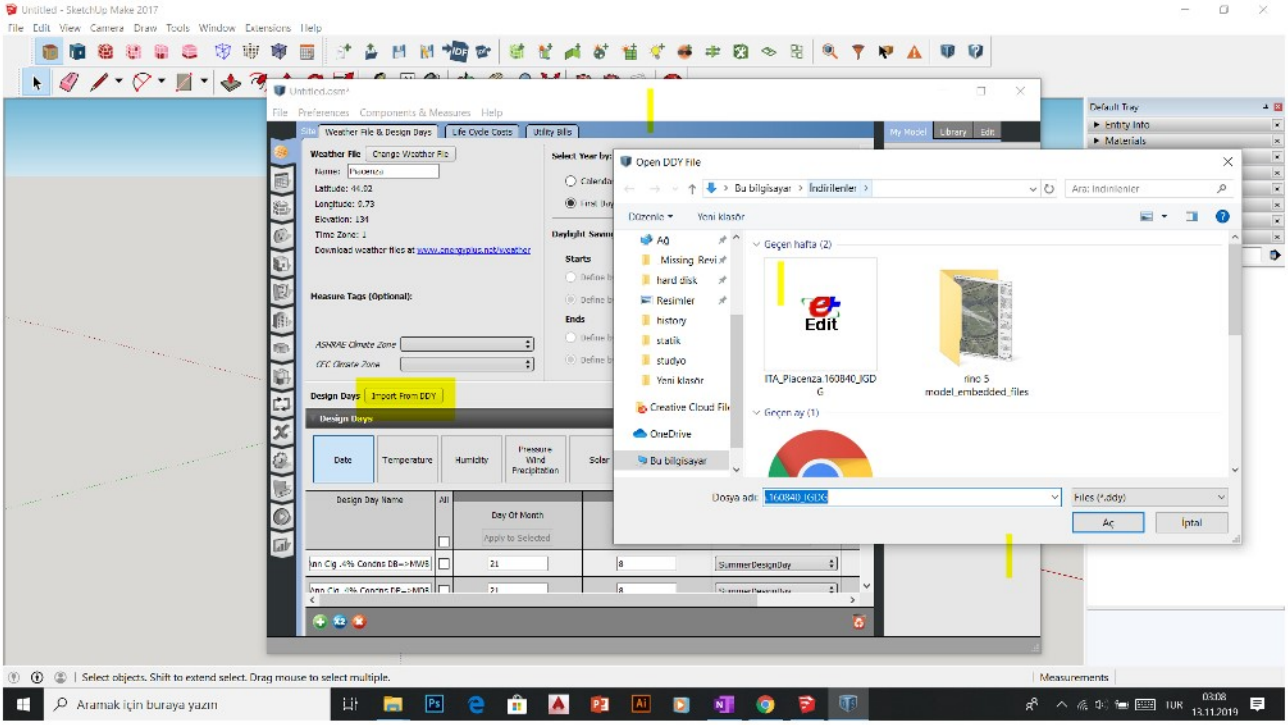
Save open studıo save model as



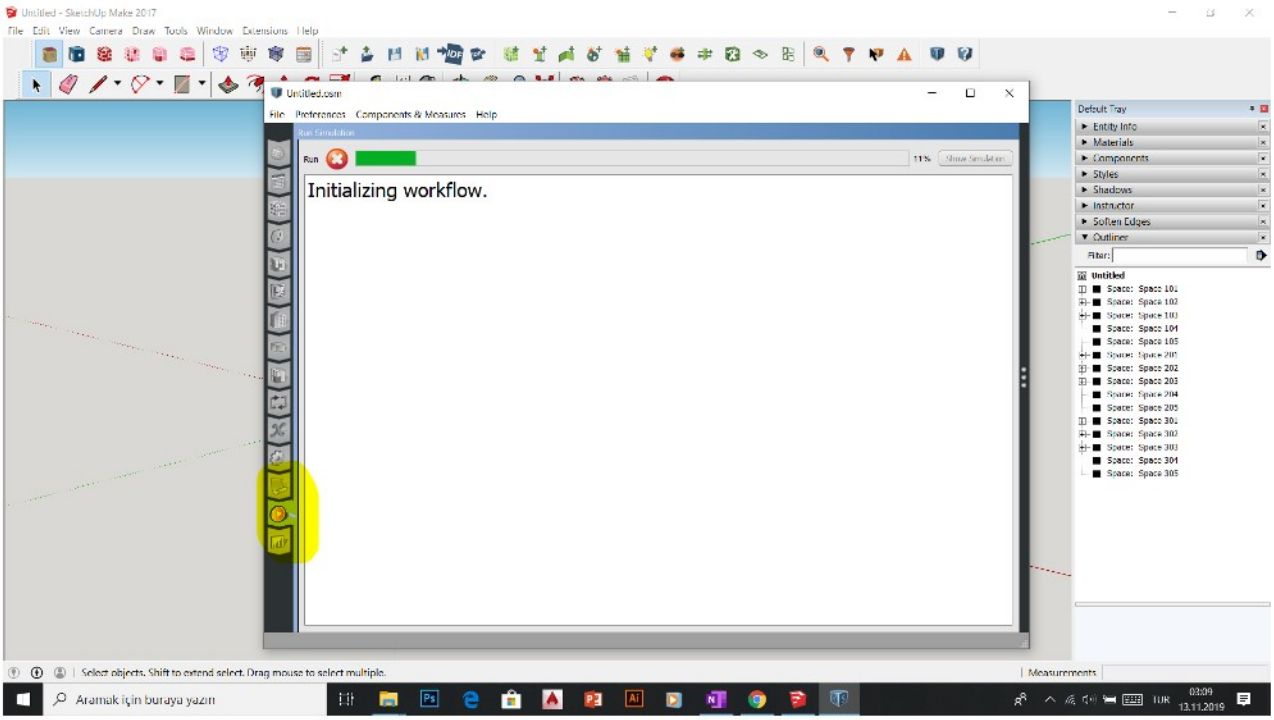
set weather file"epw"



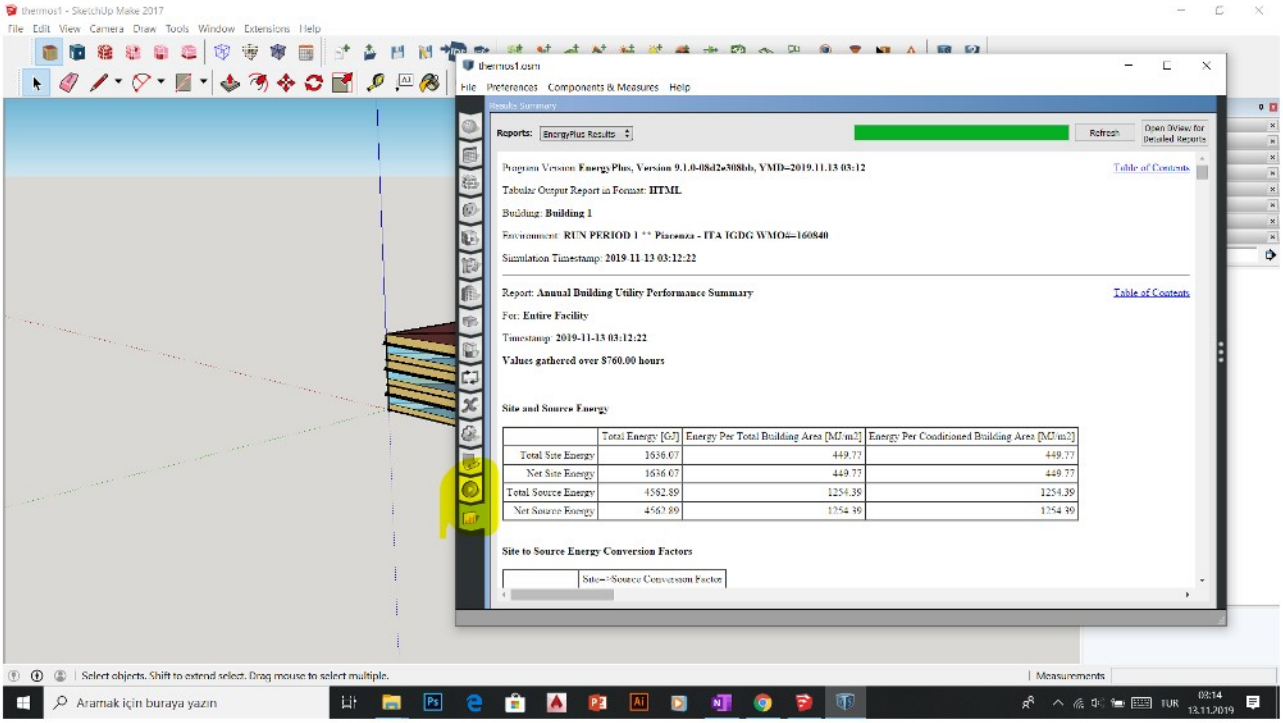
import from "ddy"



Run simulation



At the end we can see the report



Task2:

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 m2 , F_{12}= 0.01 , T_1= 298 K, T_2= 308 K,

$$\sigma = 5.67 * 10^{-8} \frac{W}{m^2 K^4}$$

$$\dot{Q}_{12,\text{ one shield}} = \frac{A\sigma(T_1^4 - T_2^4)}{\left(\frac{1}{\varepsilon_1} + \frac{1}{\varepsilon_2} - 1\right) + \left(\frac{1}{\varepsilon_{3,1}} + \frac{1}{\varepsilon_{3,2}} - 1\right)}$$

$$\dot{Q}_{12,\,N\text{ shields}} = \frac{A\sigma(T_1^4 - T_2^4)}{(N+1)\left(\frac{1}{\varepsilon} + \frac{1}{\varepsilon} - 1\right)} = \frac{1}{N+1}\dot{Q}_{12,\text{ no shield}}$$

We can easily understand from the formulas that when all emissions are equal, 1 shield reduces the radiation rate Heat transfer to 1/2, and 2 shields reduce one-third in heat transfer and 3 shieldsreduced to heat transfer to 1/4. At the end, if we want to reduce the heat transfer of radiation to 1 percent, We must add 99 shields.

$$\frac{1}{N+1}Q = \frac{1}{100}Q \qquad N=99$$