

ASSIGNMENT WEEK 6

- A. 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 ?

Without shield, $\epsilon_1 = 0.2$ and $\epsilon_2 = 0.7$,

$$\dot{Q}_{12} = \frac{E_{b1} - E_{b2}}{\frac{1 - \epsilon_1}{A\epsilon_1} + \frac{1}{AF_{12}} + \frac{1 - \epsilon_2}{A\epsilon_2}} = \frac{A\sigma(T_1^4 - T_2^4)}{\frac{1}{\epsilon_1} + \frac{1}{\epsilon_2} - 1}$$

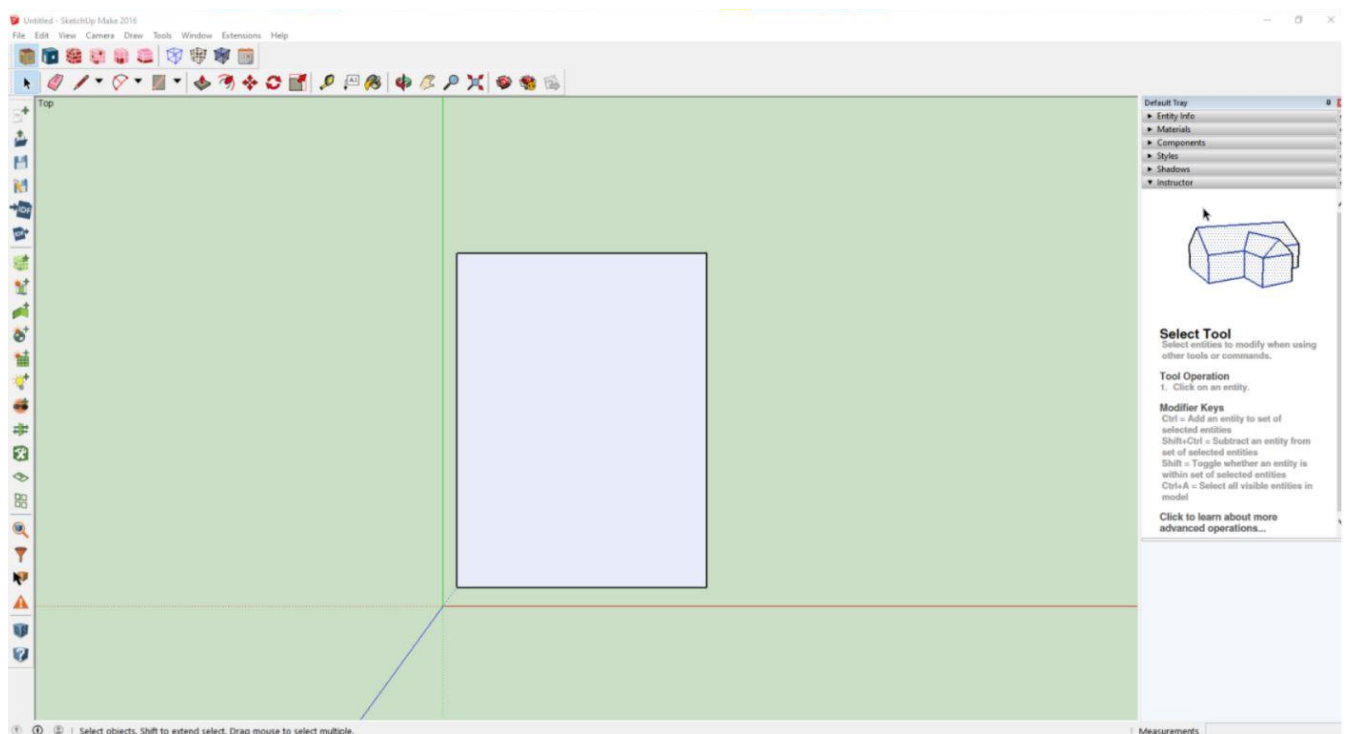
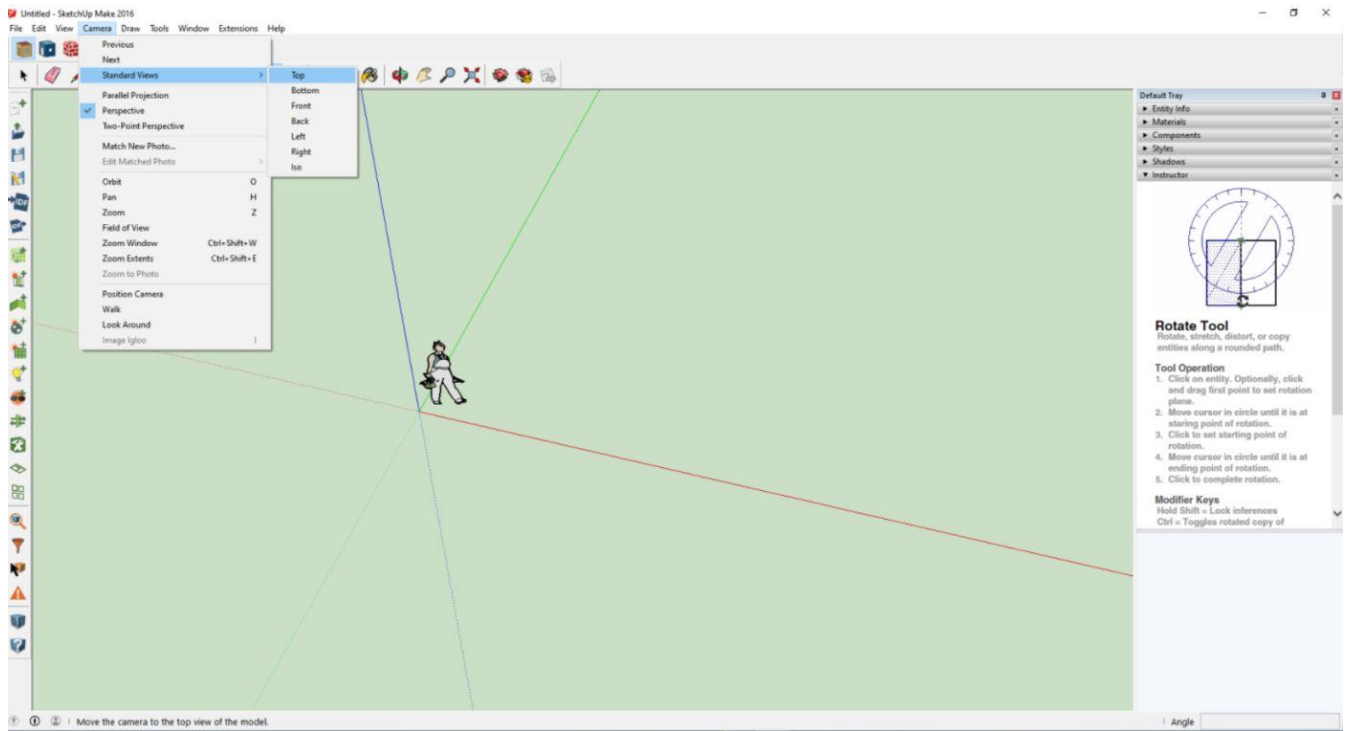
With N shield $\epsilon_3 = 0.1$

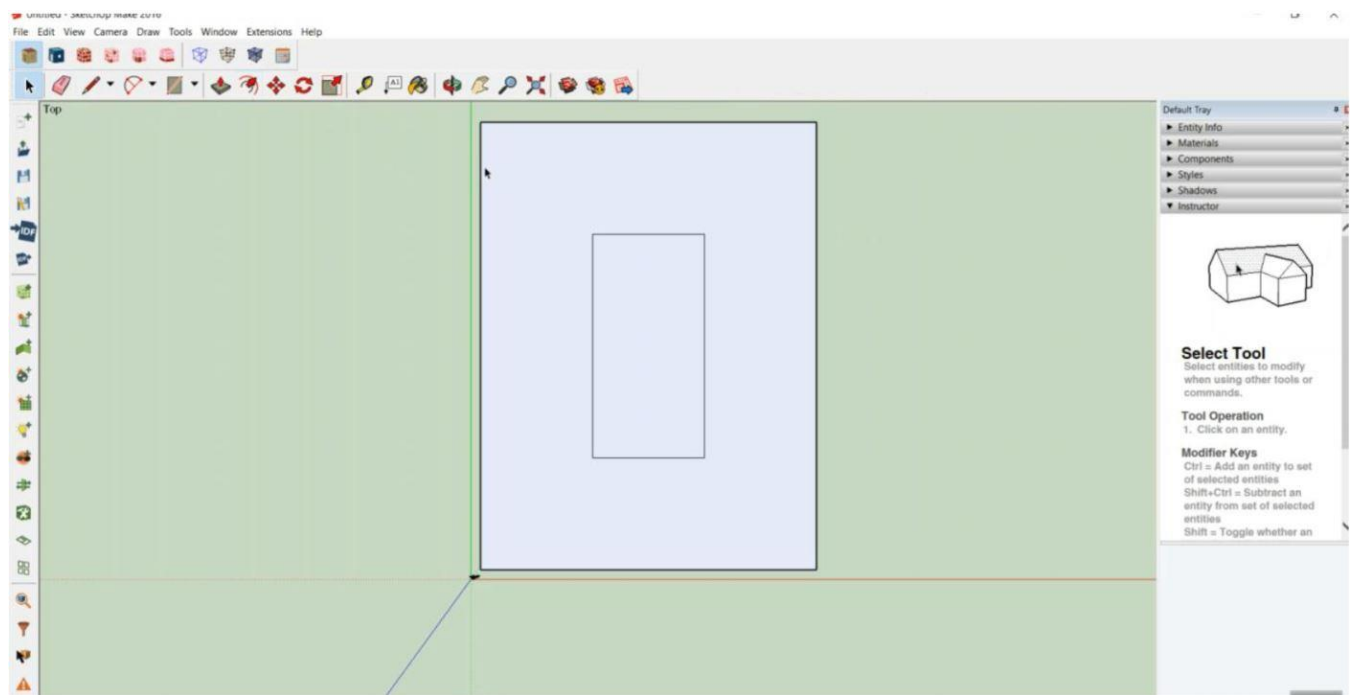
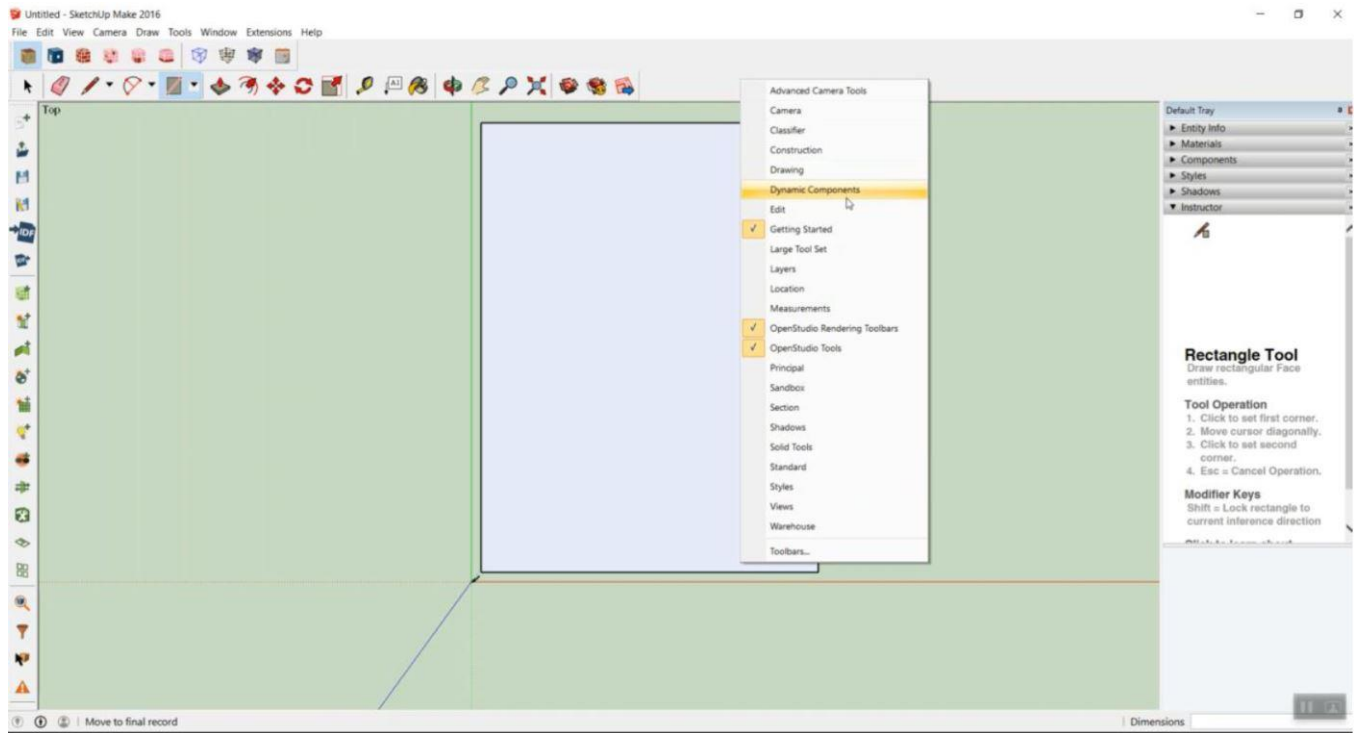
$$\begin{aligned} \dot{Q}_{12Nshields} &= \frac{E_{b1} - E_{b2}}{\frac{1 - \epsilon_1}{A\epsilon_1} + \frac{1}{AF_{13}} + \frac{1 - \epsilon_3}{A\epsilon_3} + N \times \left(\frac{1 - \epsilon_3}{A\epsilon_3} + \frac{1}{AF_{33}} + \frac{1 - \epsilon_3}{A\epsilon_3} \right) + \frac{1 - \epsilon_3}{A\epsilon_3} + \frac{1}{AF_{32}} + \frac{1 - \epsilon_2}{A\epsilon_2}} \\ &= \frac{A\sigma(T_1^4 - T_2^4)}{\left(\frac{1}{\epsilon_1} + \frac{1}{\epsilon_3} - 1 \right) + N \left(\frac{1}{\epsilon_3} + \frac{1}{\epsilon_3} - 1 \right) + \left(\frac{1}{\epsilon_3} + \frac{1}{\epsilon_2} - 1 \right)} \\ &= \frac{A\sigma(T_1^4 - T_2^4)}{\left(\frac{1}{\epsilon_1} + \frac{1}{\epsilon_2} - 1 \right) + (N + 1) \left(\frac{1}{\epsilon_3} + \frac{1}{\epsilon_3} - 1 \right)} \\ \frac{\dot{Q}_{12Nshields}}{\dot{Q}_{12}} &= \frac{\left(\frac{1}{\epsilon_1} + \frac{1}{\epsilon_2} - 1 \right) + (N + 1) \left(\frac{1}{\epsilon_3} + \frac{1}{\epsilon_3} - 1 \right)}{\frac{1}{\epsilon_1} + \frac{1}{\epsilon_2} - 1} = 1 + (N + 1) \frac{\frac{1}{\epsilon_3} + \frac{1}{\epsilon_3} - 1}{\frac{1}{\epsilon_1} + \frac{1}{\epsilon_2} - 1} = 100 \end{aligned}$$

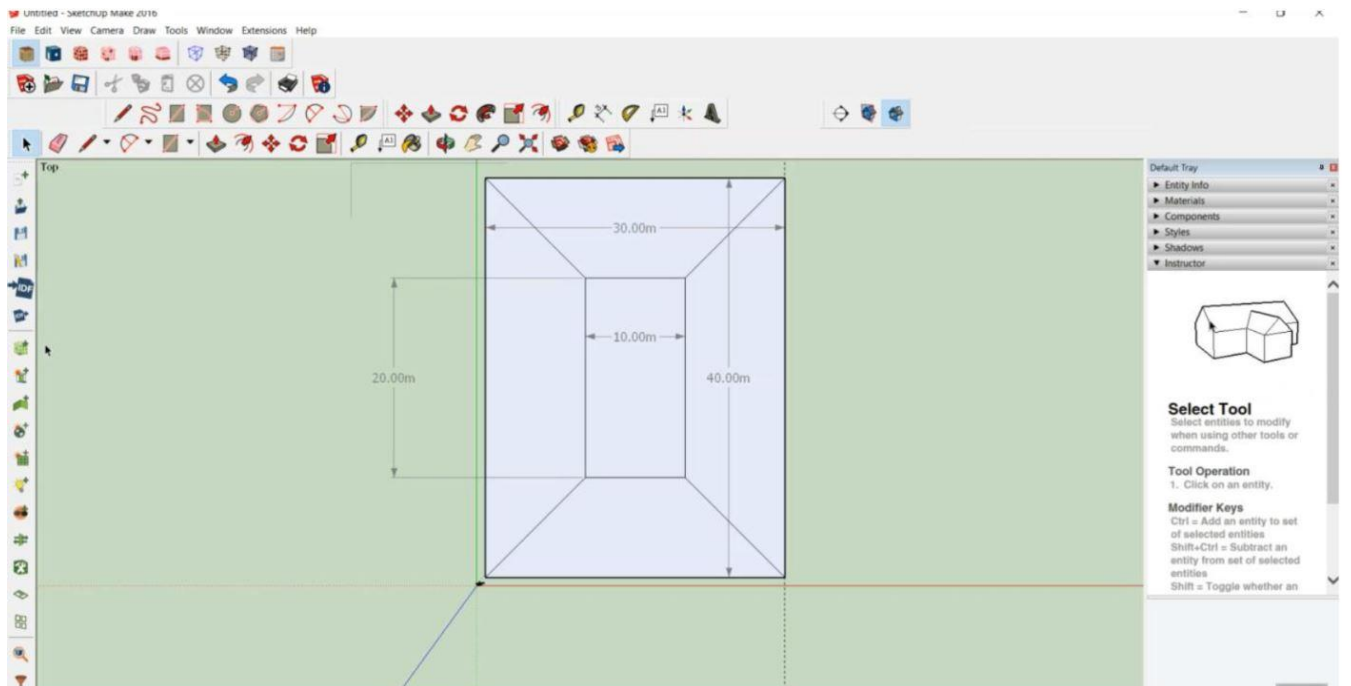
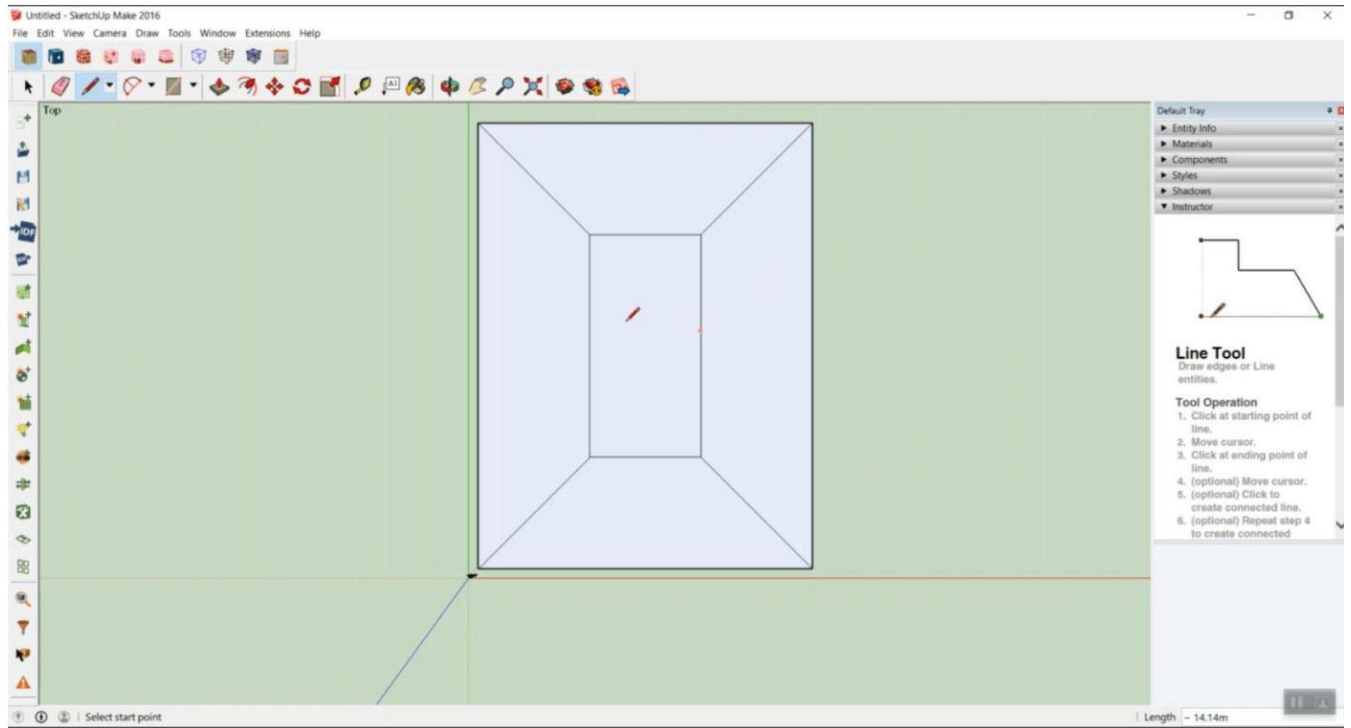
$$\Leftrightarrow N = 99 \times \frac{\frac{1}{\epsilon_1} + \frac{1}{\epsilon_2} - 1}{\frac{1}{\epsilon_3} + \frac{1}{\epsilon_3} - 1} - 1 = 99 \times \frac{\frac{1}{0.2} + \frac{1}{0.7} - 1}{\frac{1}{0.1} + \frac{1}{0.1} - 1} - 1 \approx 27.3$$

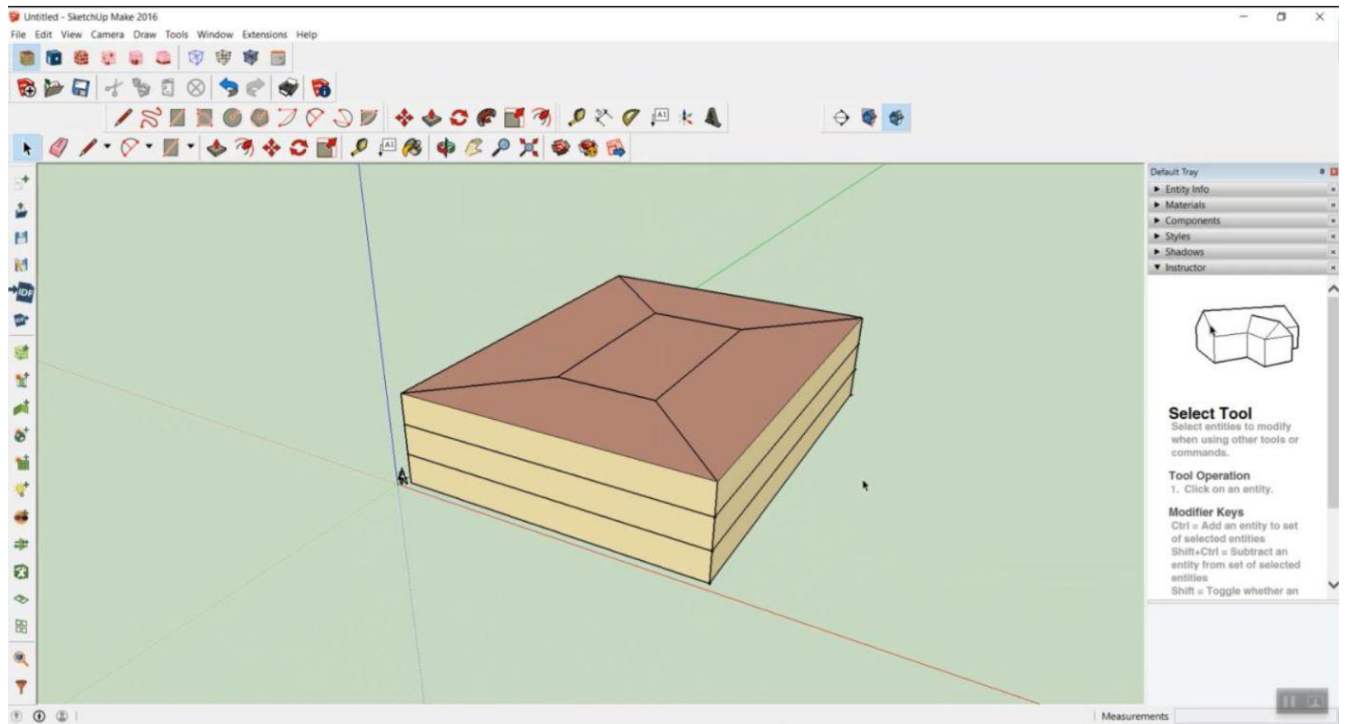
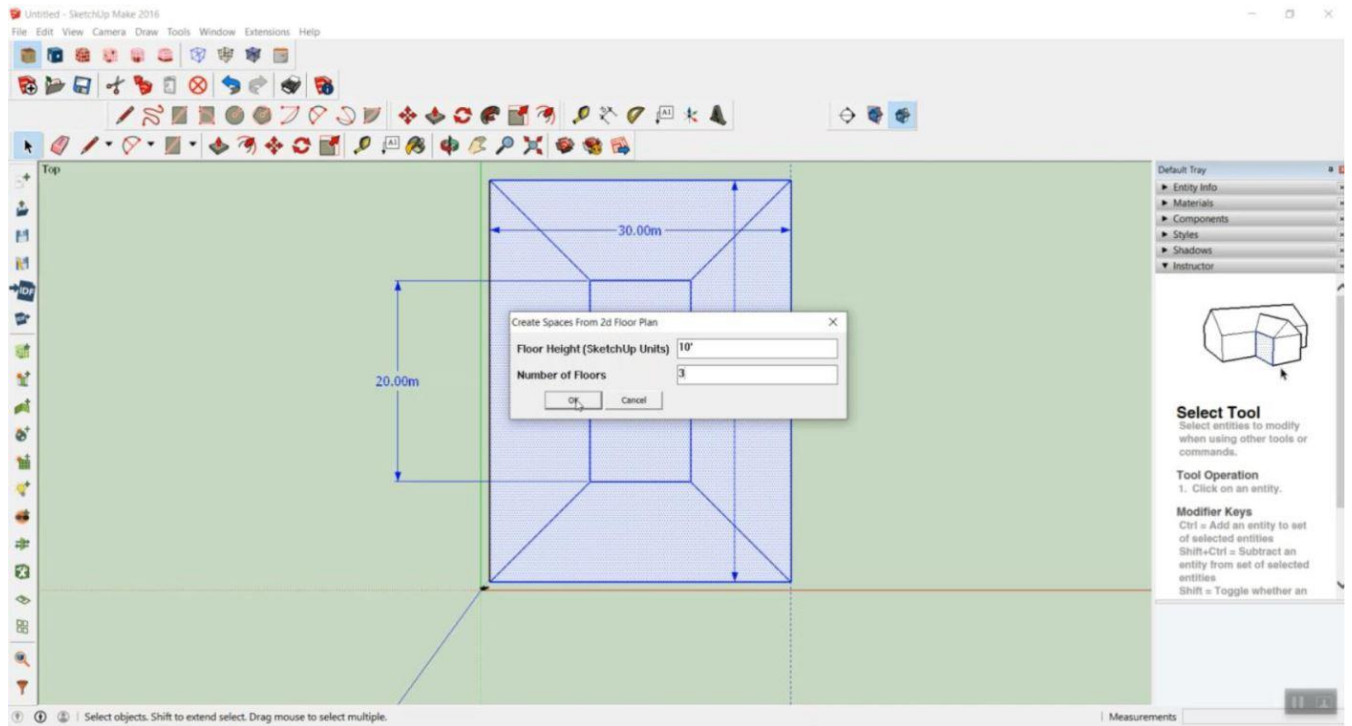
Conclusion: 27 shields can be added.

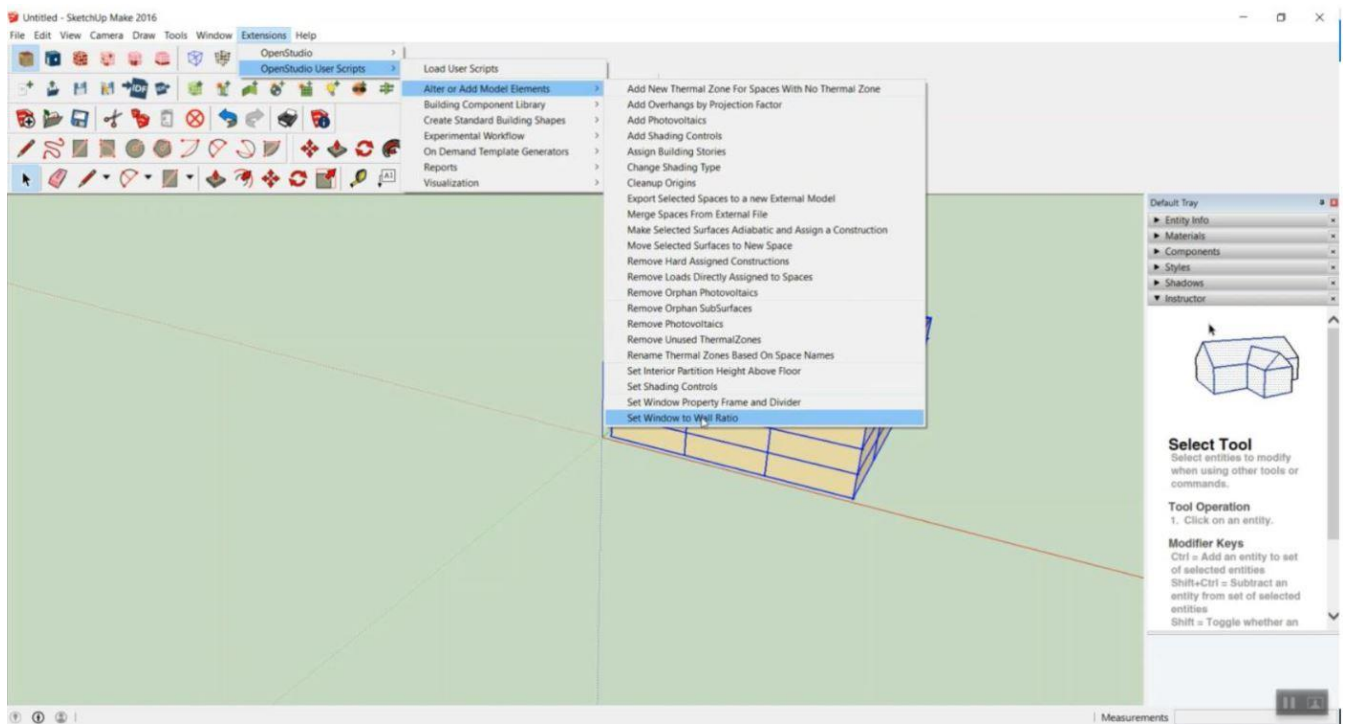
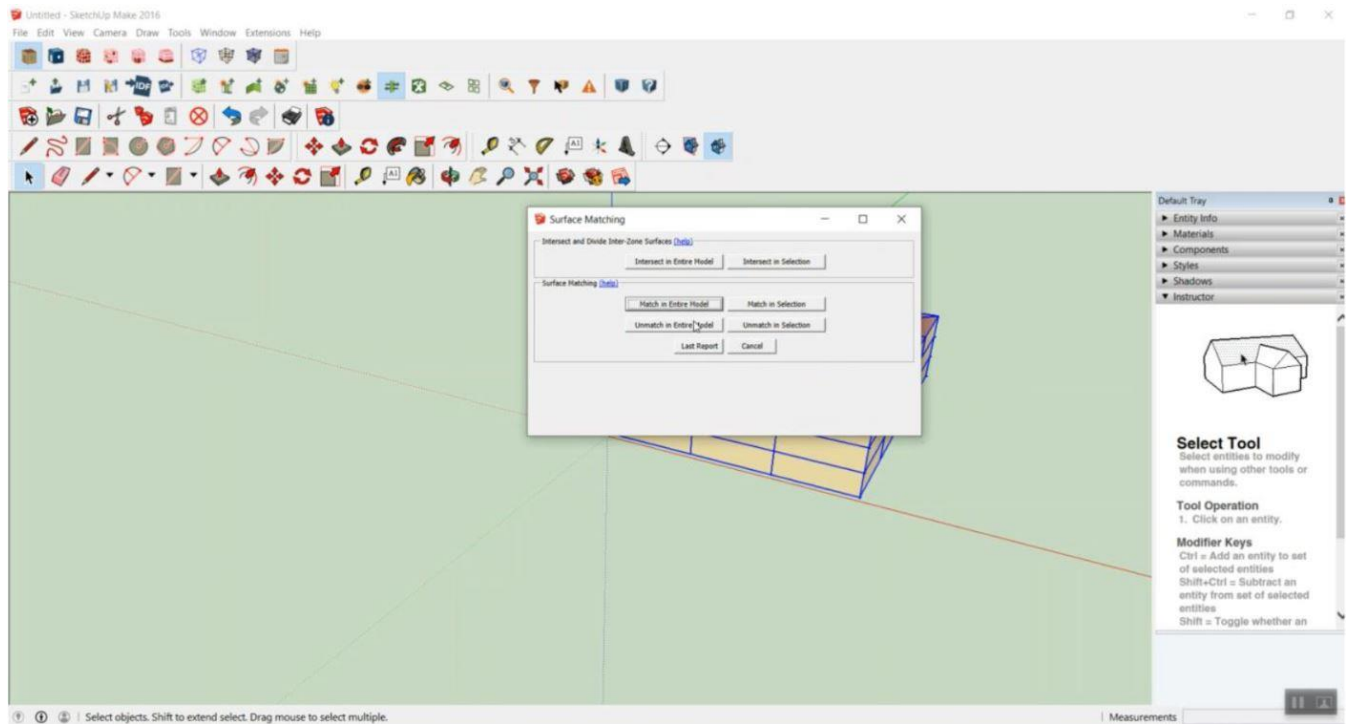
B. You should create a pdf file with screenshots of all of the steps we went through (clearly from your own file) and explain briefly the reason behind the use of each step (in your own words!)

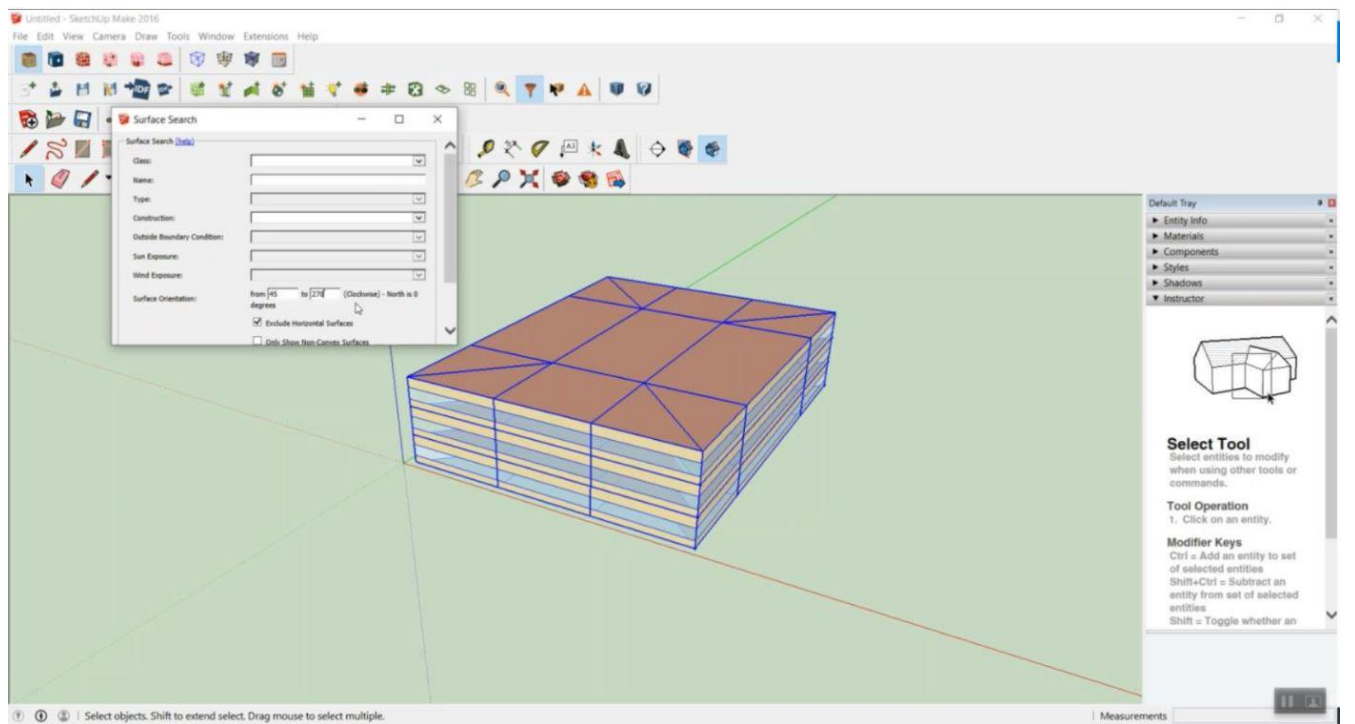
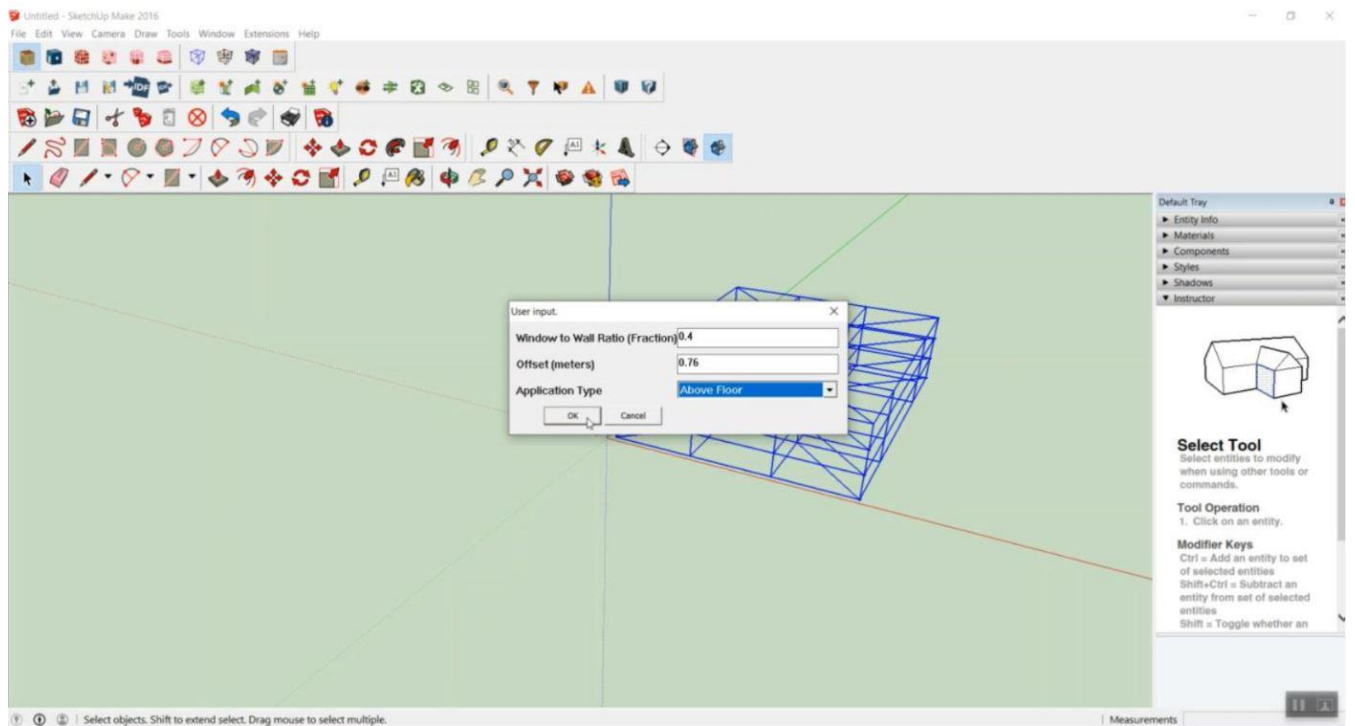


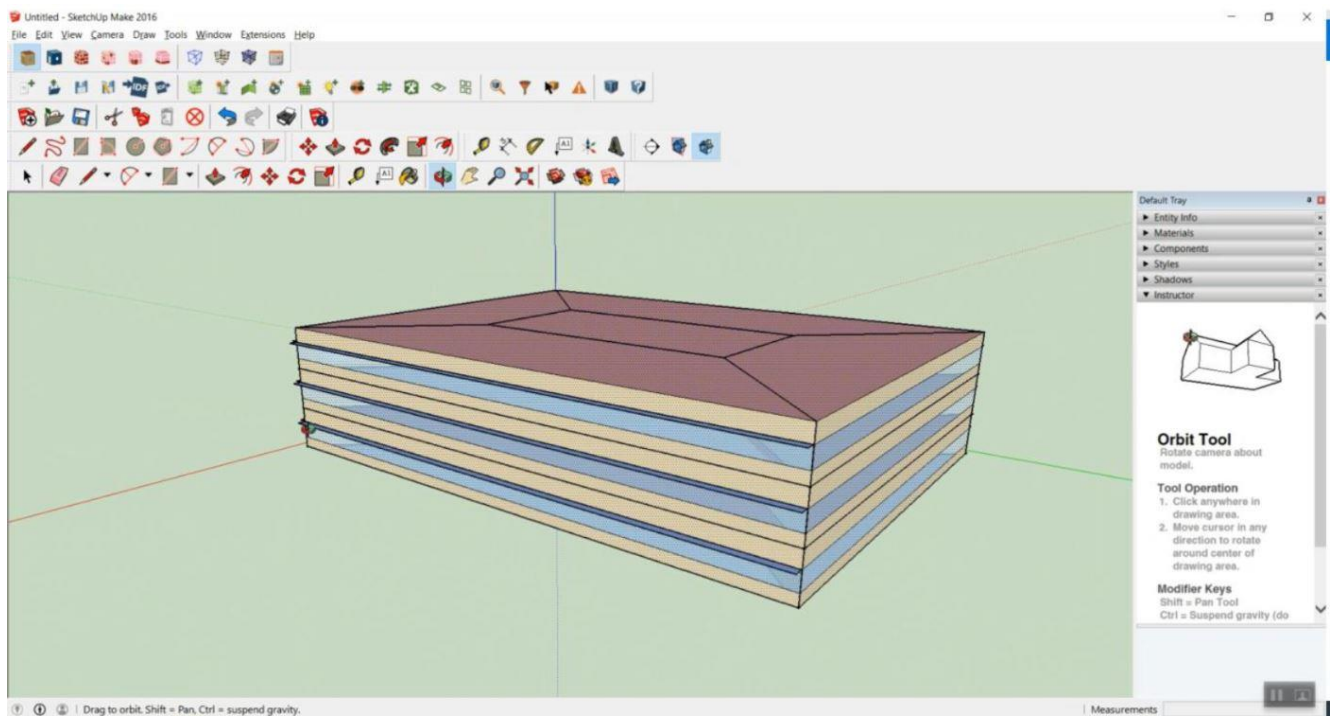
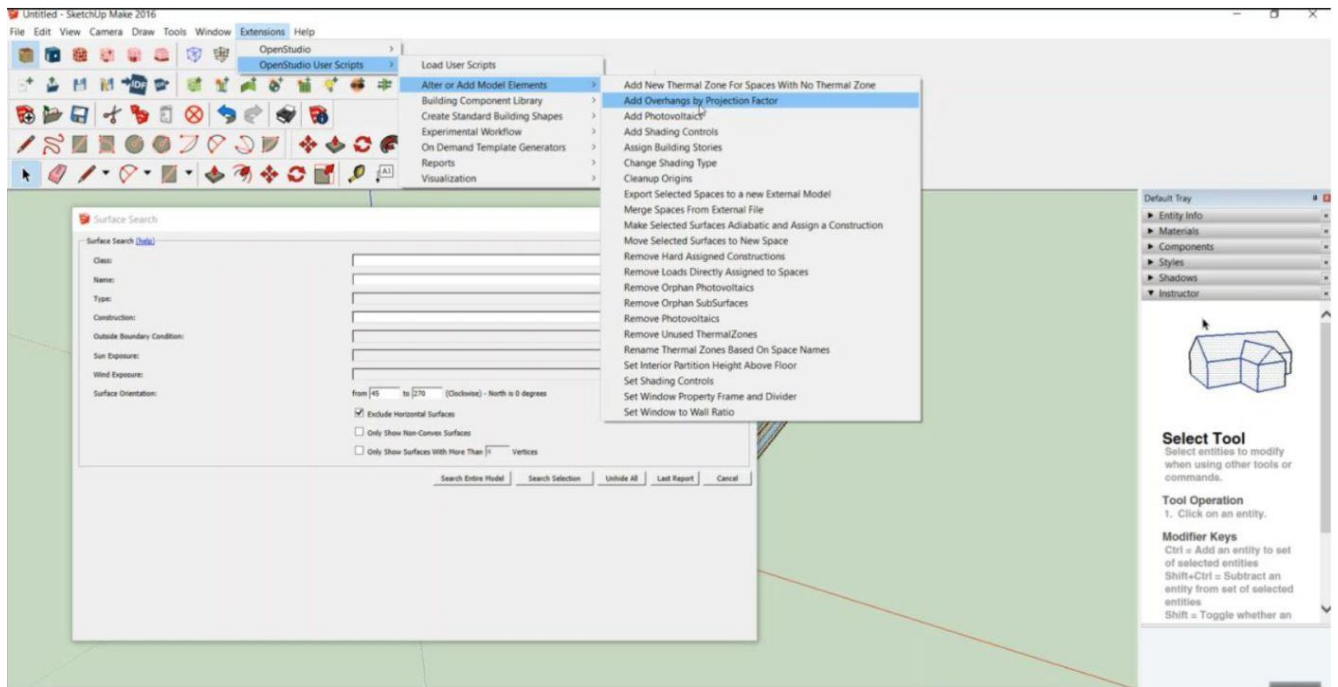


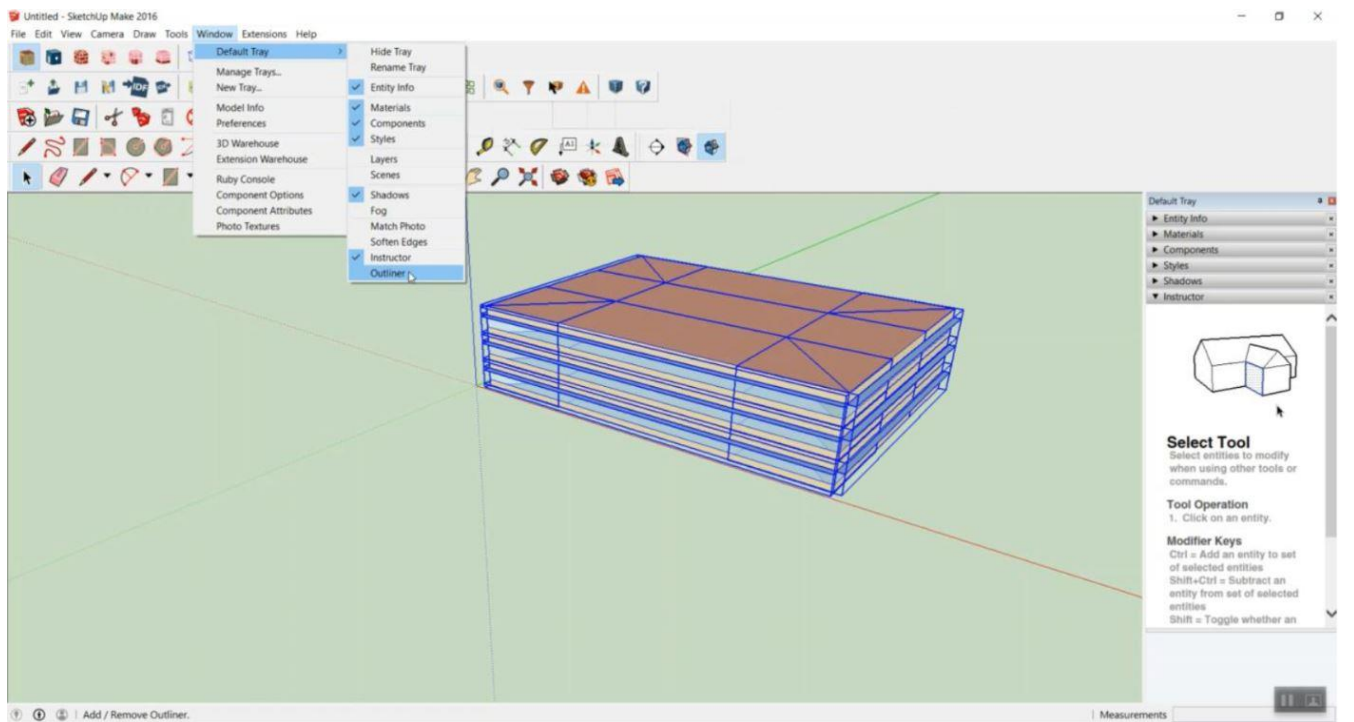
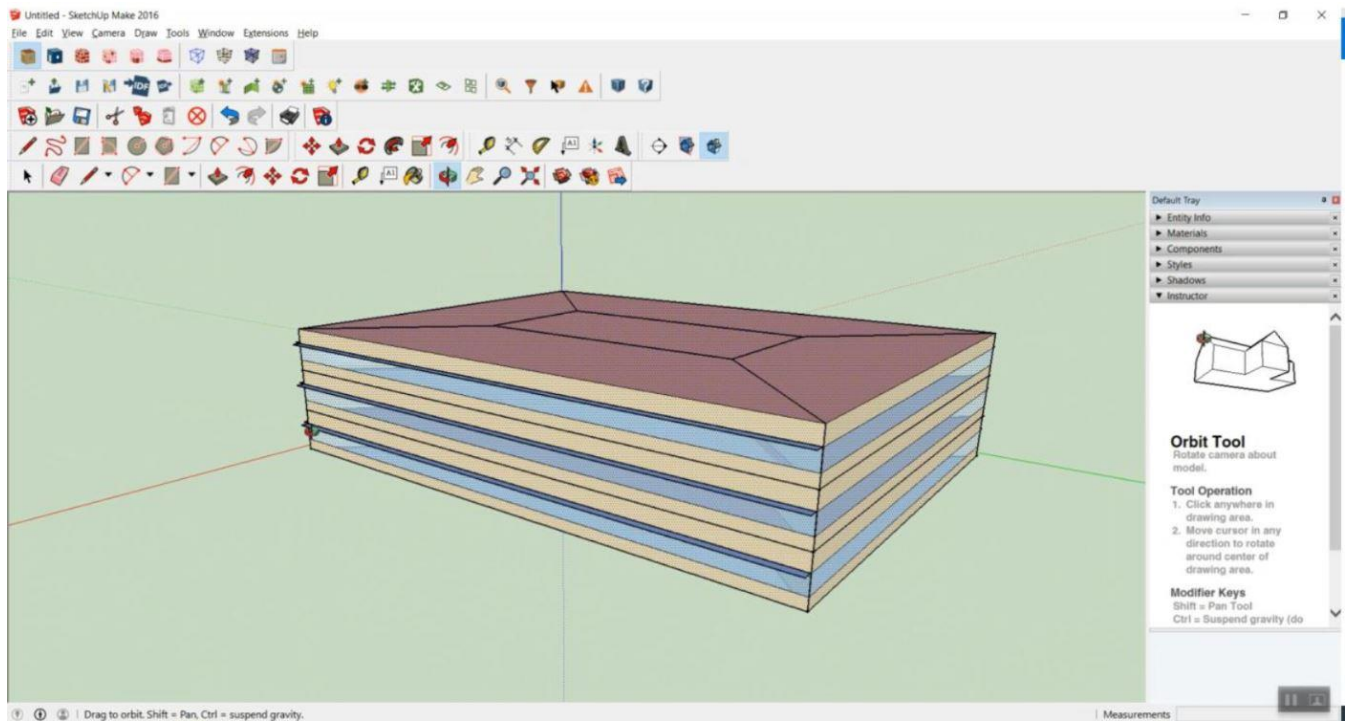


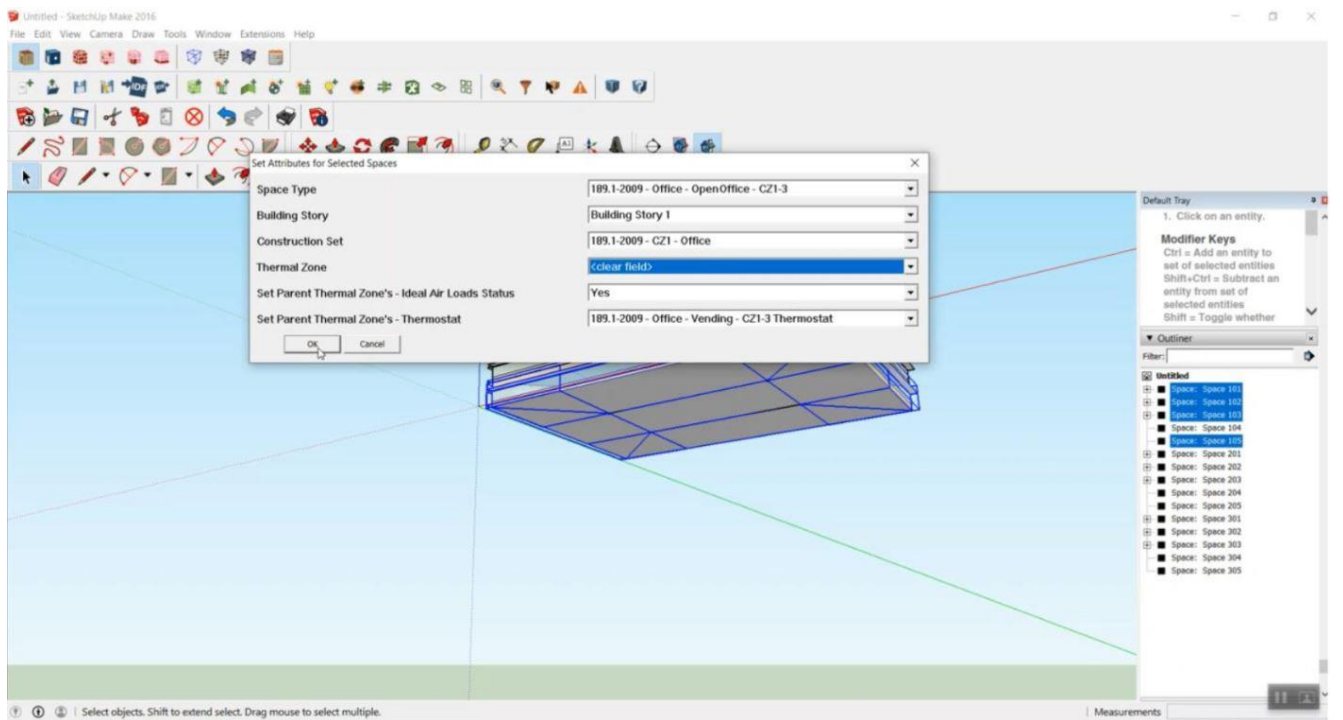
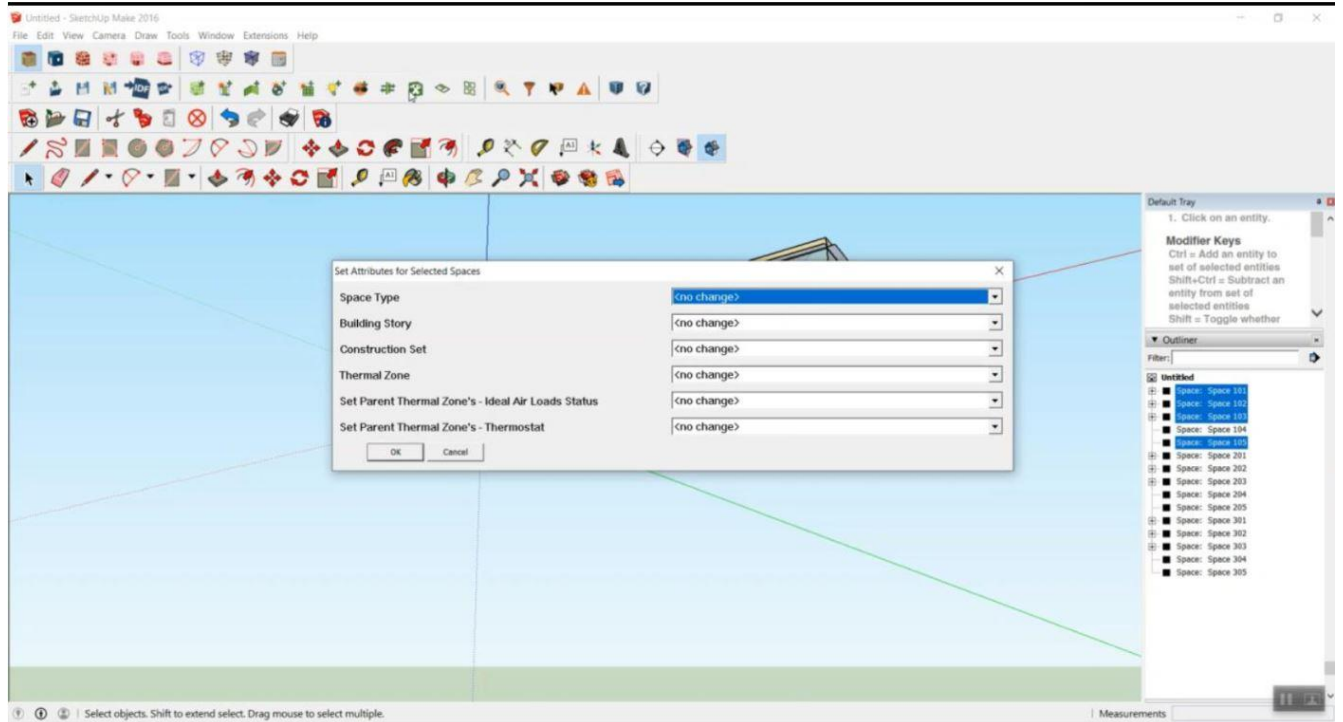


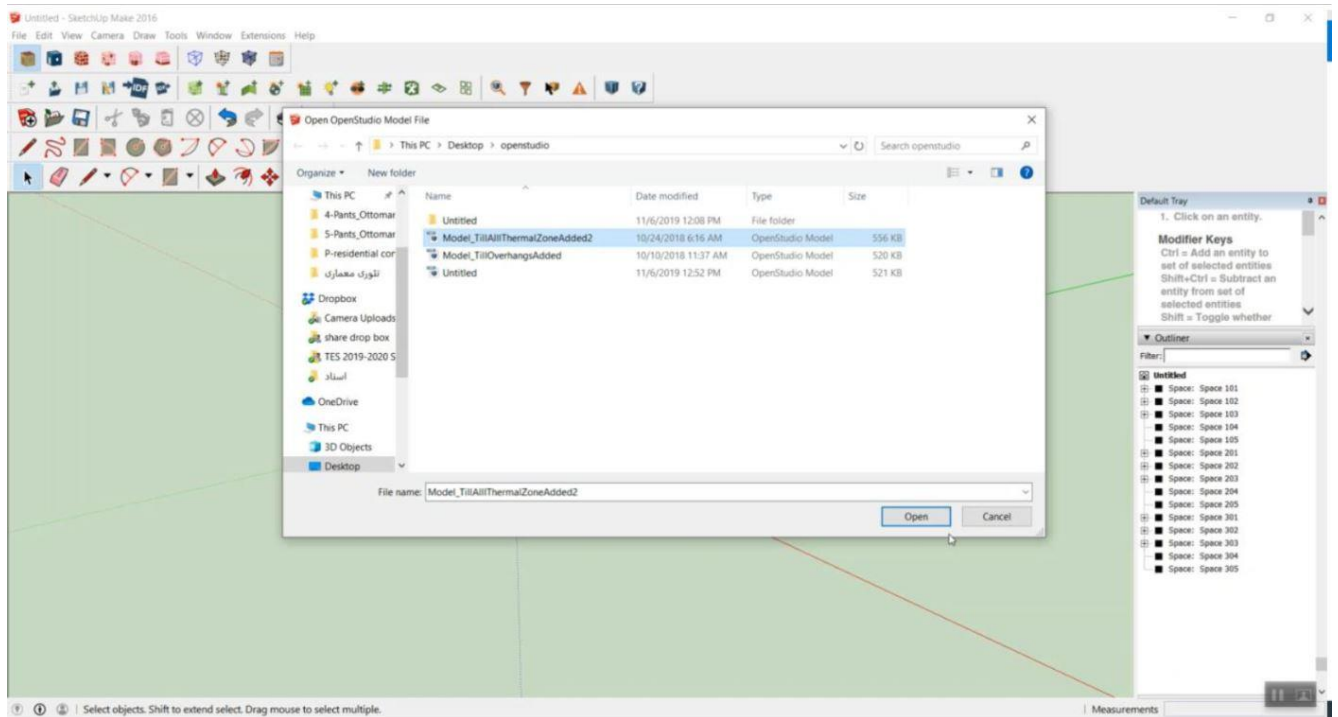




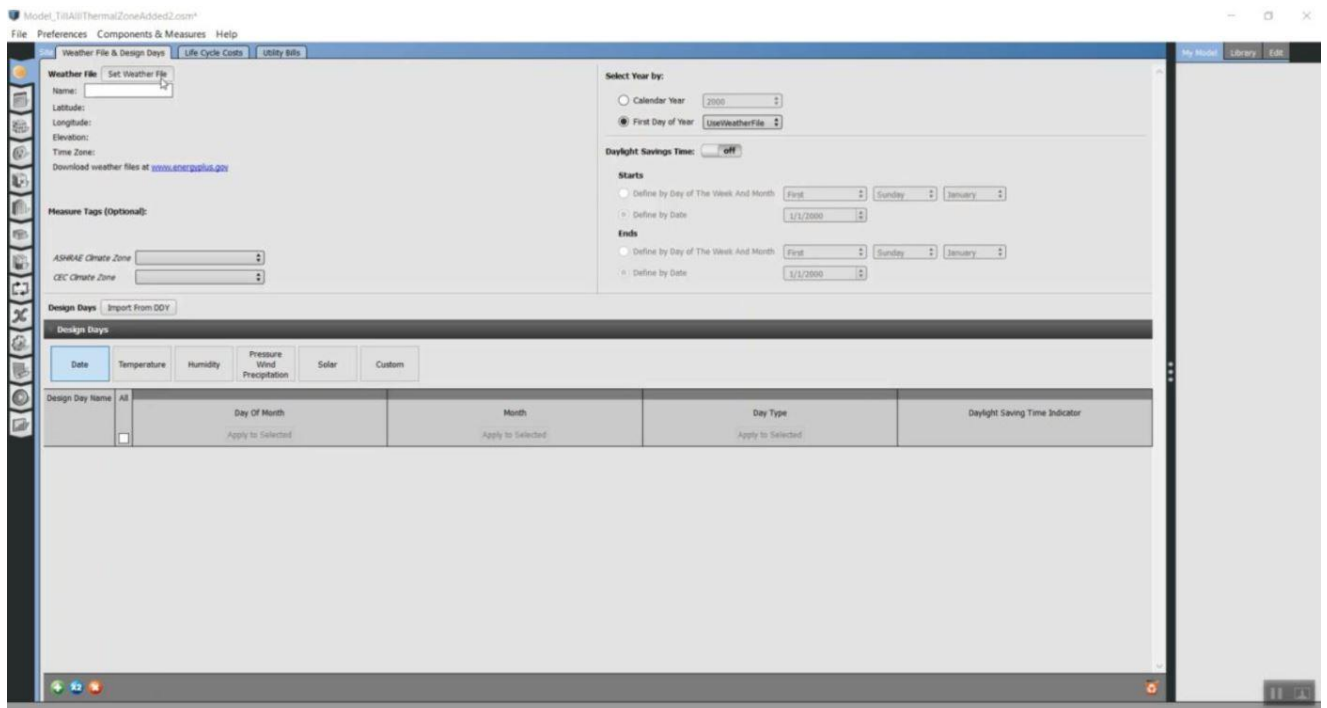








Now inserting the weather data for Piacenza (file extension .ddy/.epw)



Weather File & Design Days

Life Cycle Costs

Utility Bills

Weather File

Change Weather File

Name:

Latitude: 44.92

Longitude: 9.73

Elevation: 134

Time Zone: 1

Download weather files at www.energysys.gov

Select Year by:

☐ Calendar Year

☒ First Day of Year

Daylight Savings Time:

Starts

☐ Define by Day of The Week And Month

☐ Define by Date

Ends

☐ Define by Day of The Week And Month

☐ Define by Date

Measure Tags (Optional):

ASHRAE Climate Zone

CEC Climate Zone

Design Days

Import From DDY

Design Days

Date

Temperature

Humidity

Pressure Wind Precipitation

Solar

Custom

Design Day Name	AB	Day Of Month	Month	Day Type	Daylight Saving Time Indicator
		Apply to Selected	Apply to Selected	Apply to Selected	
Piacenza Ann Clg 4% Condns DB=>MWB	<input type="checkbox"/>	<input type="text" value="21"/>	<input type="text" value="8"/>	<input type="text" value="SummerDesignDay"/>	<input type="checkbox"/>
Piacenza Ann Clg 4% Condns DP=>MDB	<input type="checkbox"/>	<input type="text" value="21"/>	<input type="text" value="8"/>	<input type="text" value="SummerDesignDay"/>	<input type="checkbox"/>
Piacenza Ann Clg 4% Condns Enthalpy=>MDB	<input type="checkbox"/>	<input type="text" value="21"/>	<input type="text" value="8"/>	<input type="text" value="SummerDesignDay"/>	<input type="checkbox"/>
Piacenza Ann Clg 4% Condns WB=>MDB	<input type="checkbox"/>	<input type="text" value="21"/>	<input type="text" value="8"/>	<input type="text" value="SummerDesignDay"/>	<input type="checkbox"/>
Piacenza Ann Htg 99.6% Condns DB	<input type="checkbox"/>	<input type="text" value="21"/>	<input type="text" value="1"/>	<input type="text" value="WinterDesignDay"/>	<input type="checkbox"/>
Piacenza Ann Htg Wind 99.6% Condns WS=>MCDB	<input type="checkbox"/>	<input type="text" value="21"/>	<input type="text" value="1"/>	<input type="text" value="WinterDesignDay"/>	<input type="checkbox"/>
Piacenza Ann Hum 99.6% Condns DP=>MCDDB	<input type="checkbox"/>	<input type="text" value="21"/>	<input type="text" value="1"/>	<input type="text" value="WinterDesignDay"/>	<input type="checkbox"/>

SUBMITTED BY – JAGRIT VIJ

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