

## Assignment Week 6.

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### Previous exercise:

Heat exchange between the surface 1 and surface 2.

$$A_1 = 1,50 \text{ m}^2$$

$$T_1 = 298 \text{ K}$$

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

$$F_{12} = 0,01$$

$$T_2 = 308 \text{ K}$$

$$\epsilon_1 = \epsilon_2 = 0,10$$

•

$$Q_{1 \rightarrow 2} = \frac{A_1 \times \sigma (T_1^4 - T_2^4)}{\frac{1}{\epsilon_1} + \frac{1}{\epsilon_2} - 1}$$

$$= \frac{1,50 \text{ m}^2 \times 5,67 \cdot 10^{-8} \text{ W/m}^2 \times (298^4 \text{ K} - 308^4 \text{ K})}{\frac{1}{0,10} + \frac{1}{0,10} - 1}$$

$$= \frac{8,505 \cdot 10^{-8} \text{ W} \cdot \text{m}^2 \times (7,8 \cdot 10^9 \text{ K} - 8,9 \cdot 10^9 \text{ K})}{0,1 + 0,1 - 1}$$

$$= \frac{8,505 \cdot 10^{-8} \text{ W} \cdot \text{m}^2 \times -1,10 \cdot 10^9 \text{ K}}{19}$$

$$= \frac{-93,55 \text{ W} \cdot \text{m}^2 \cdot \text{K}}{19}$$

$$= -4,92 \text{ W} \cdot \text{m}^2$$

### New exercise:

1% of the case without shields =  $0,0492 \text{ W/m}^2$

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$$Q = \sigma \cdot \frac{(T_1^4 - T_2^4)}{\frac{1}{\epsilon_1} + \frac{1}{\epsilon_2} - 1 + ((\frac{1}{\epsilon_1} + \frac{1}{\epsilon_2} - 1) \cdot X)} =$$

$$-0,0492 \text{ W} = 5,67 \cdot 10^{-8} \text{ W/K}^4 \cdot \frac{(298^4 \text{ K} - 308^4 \text{ K})}{\frac{1}{10} + \frac{1}{10} - 1 + ((\frac{1}{10} + \frac{1}{10} - 1) \cdot X)} =$$

$$-0,0492 \text{ W} = 5,67 \cdot 10^{-8} \text{ W/K}^4 \cdot \frac{-1,10 \cdot 10^9}{19 + 19X}$$

$$-0,0492 \text{ W} \cdot (19 + 19X) = 5,67 \cdot 10^{-8} \text{ W/K}^4 \cdot -1,10 \cdot 10^9 \text{ K}^4$$

$$0,93 \text{ W} + 0,93X = 6,23 \cdot 10 \text{ W}$$

$$0,93X = 6,23 \cdot 10 - 0,93$$

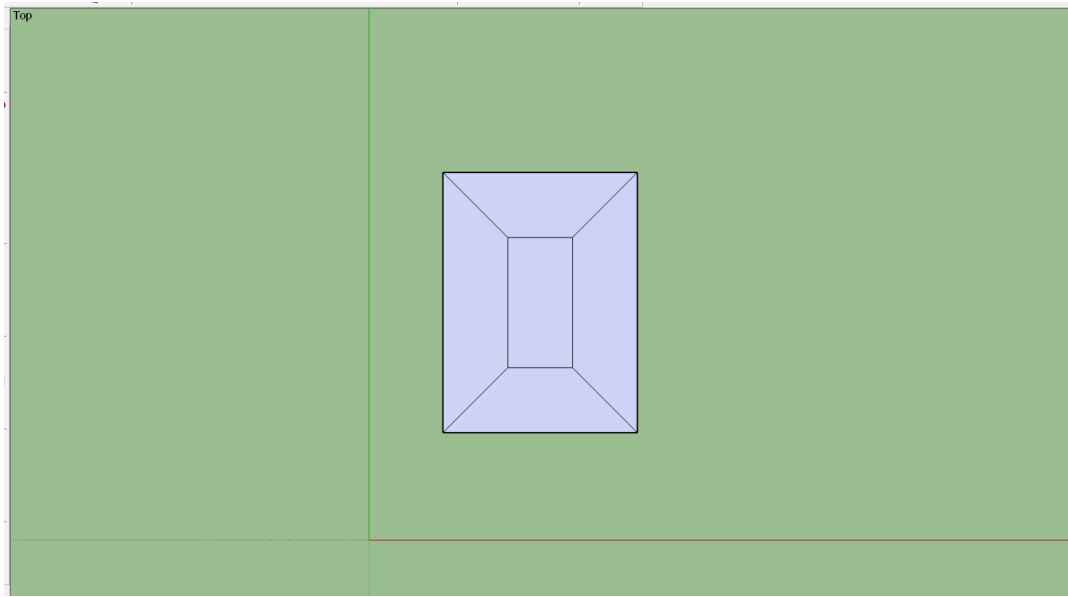
$$X = 5,3 \cdot 10 \text{ W} : 0,93 \text{ W}$$

$$X = 5,7 \cdot 10 = 57$$

We should add  
57 shields.

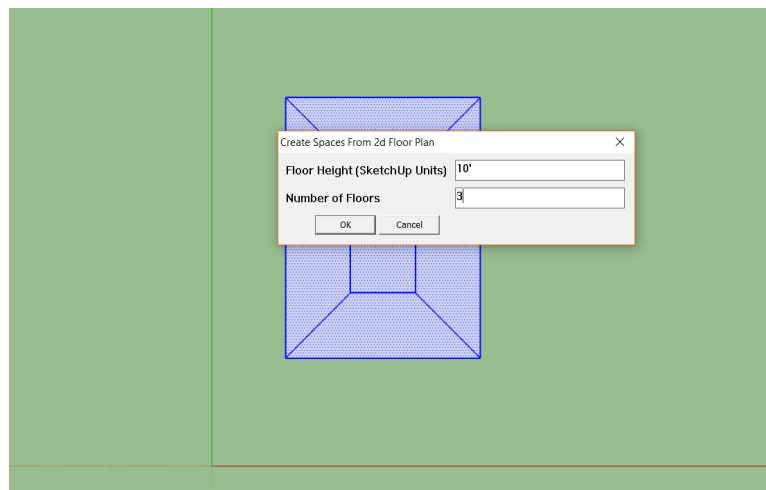
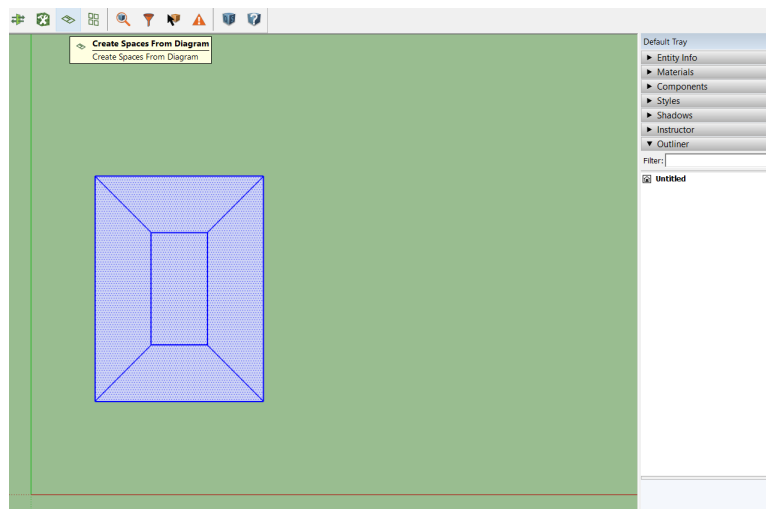
# 1. Geometry Creation

Create in Sketch up a 30m x 40m rectangle.

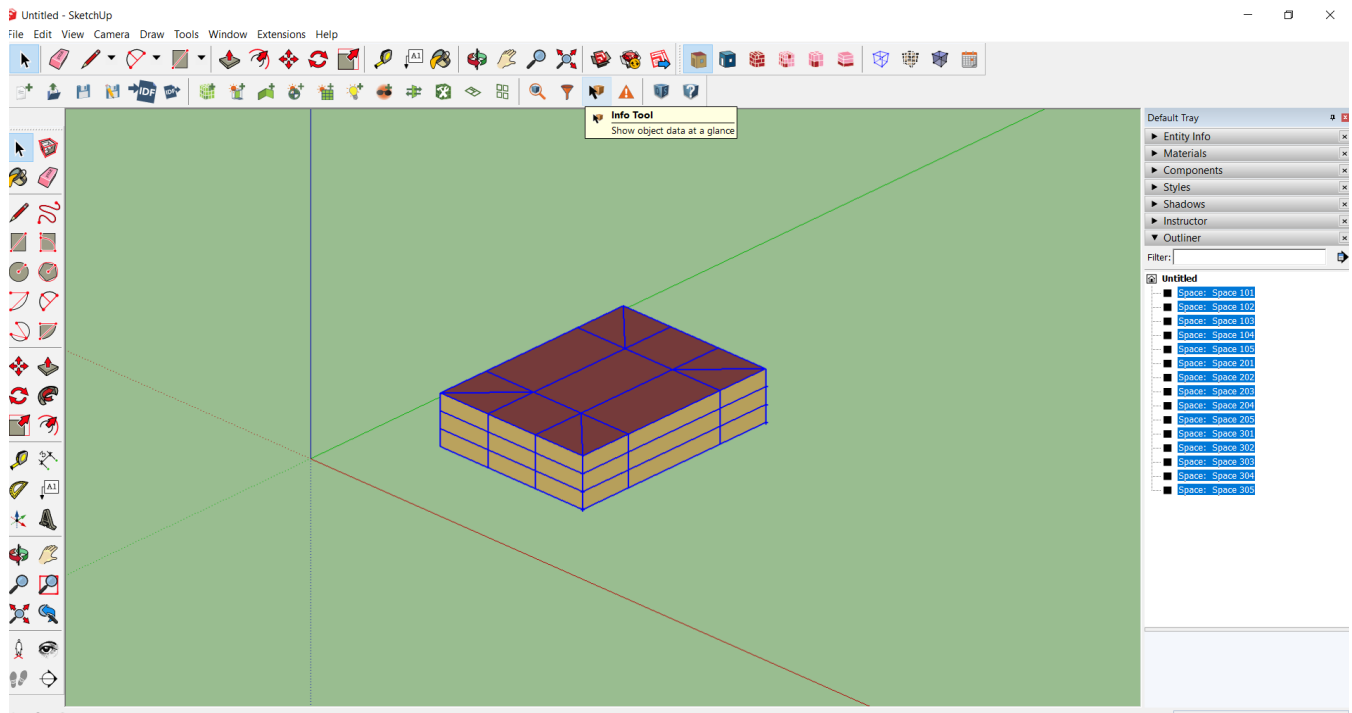


## 2. Spaces creation.

Using the Create Spaces tool we have to create 3 levels.

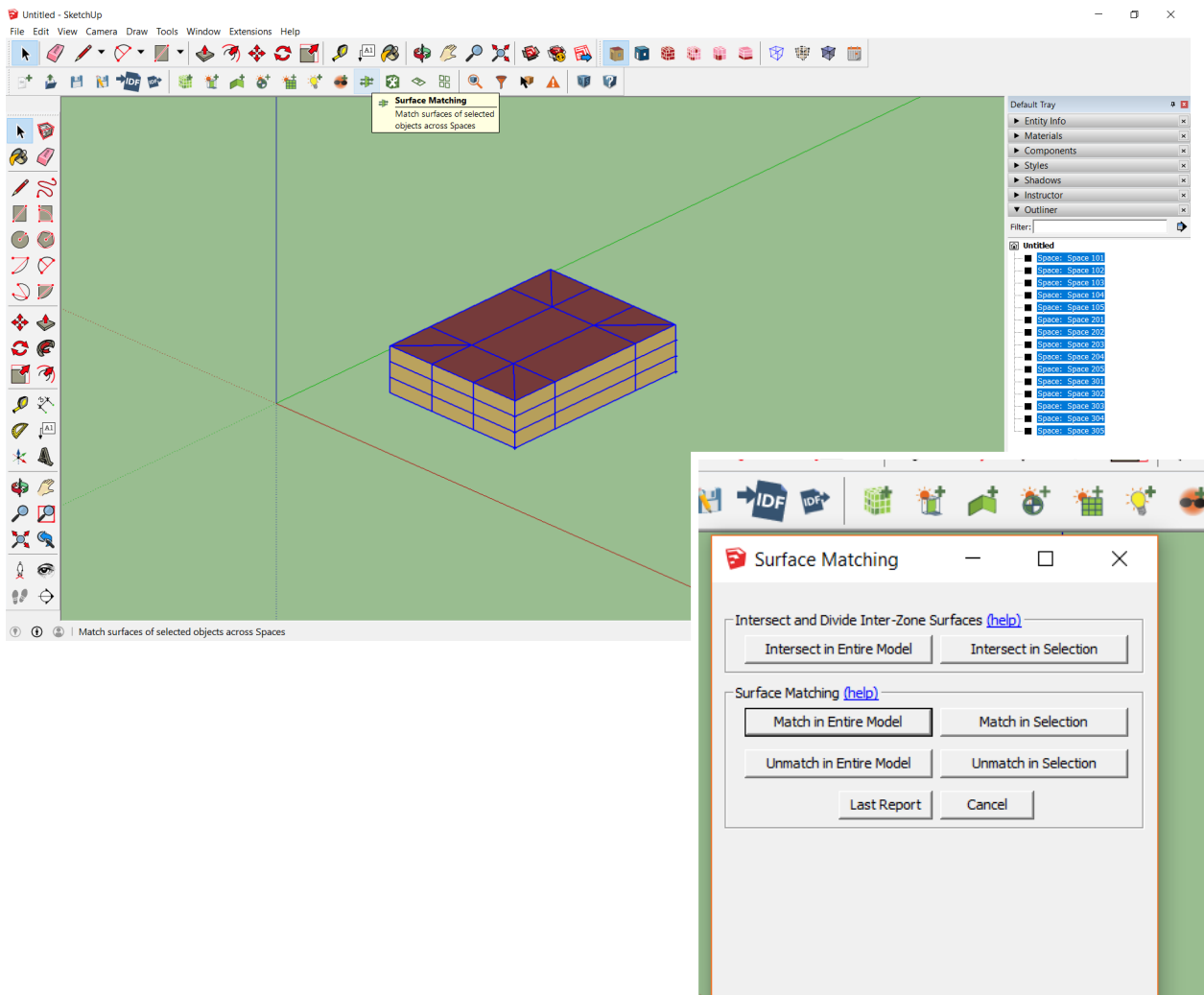


Creating the levels, new layers appear at the right side off the screen. Once the steps are complete, the file needs to be save as an OpenStudio model.

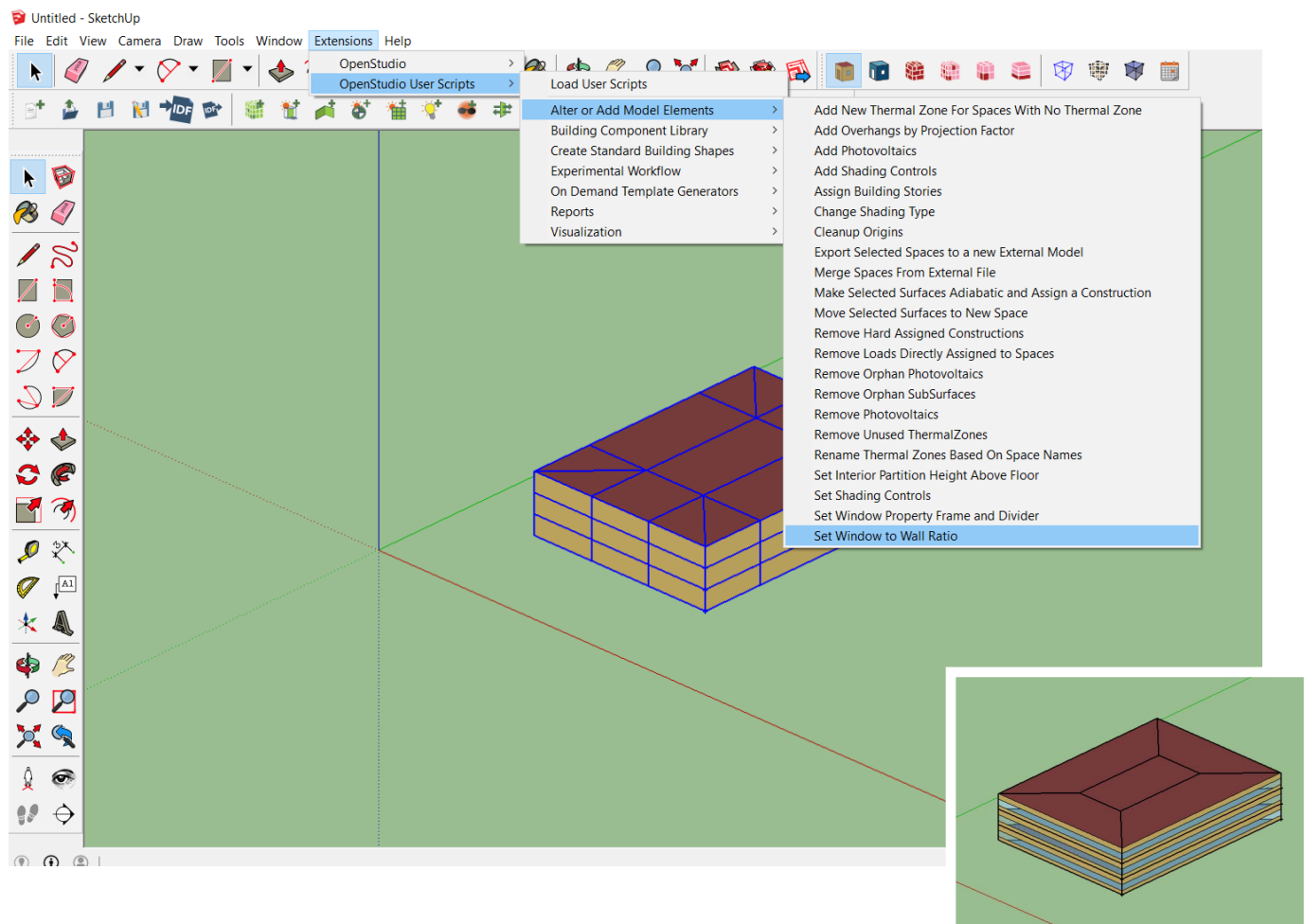


### 3. Match the model.

Using the surfaces matches tool we have to match the entire model. This step is mandatory to be able to create the windows.

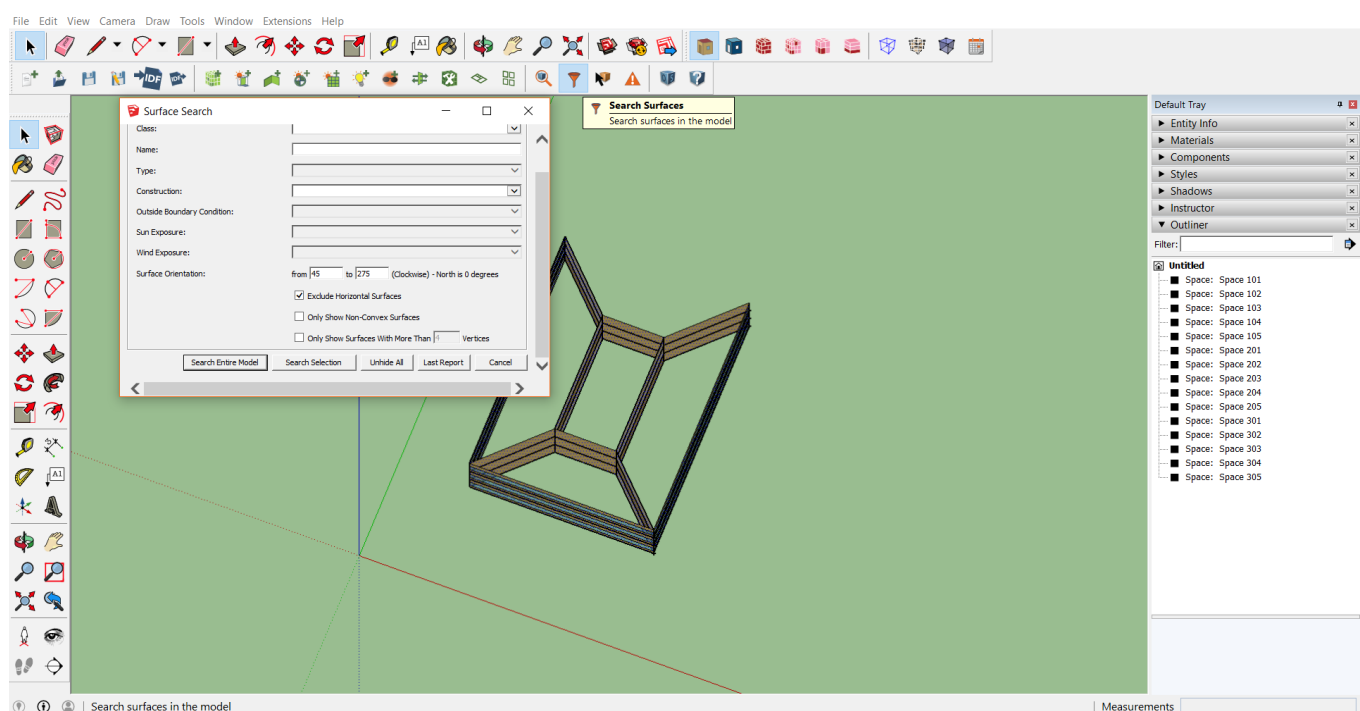


### 3. Windows placements.

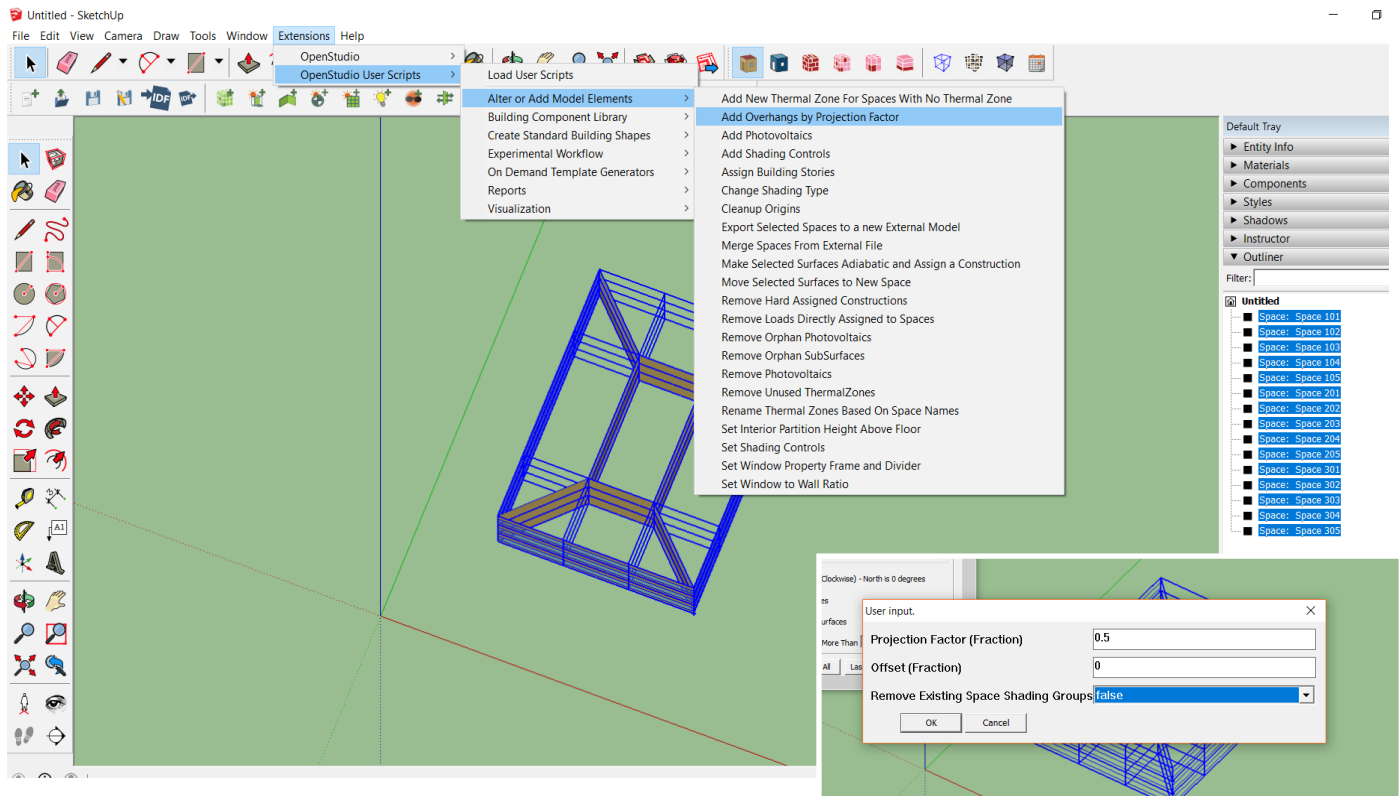


### 4. Selection.

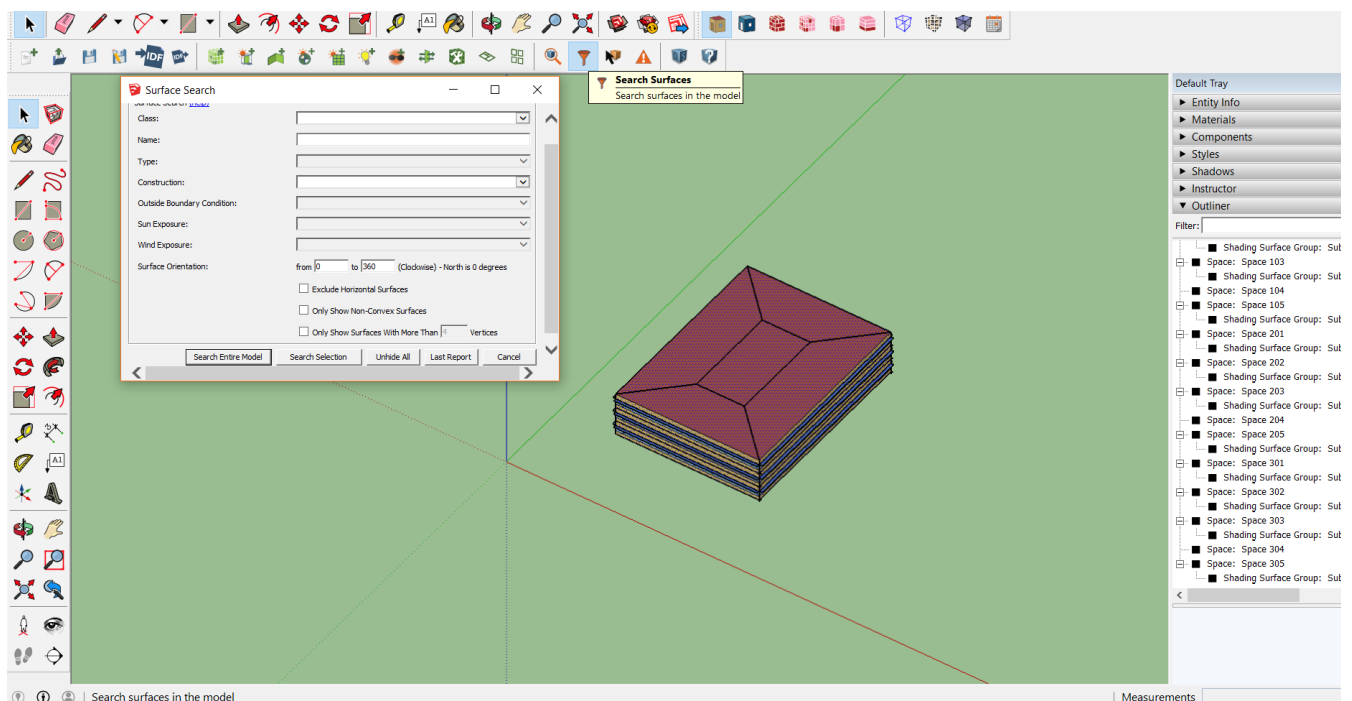
Using the Search Surfaces tool we have to select all the facades except the north one.



## 4. External shading addition.

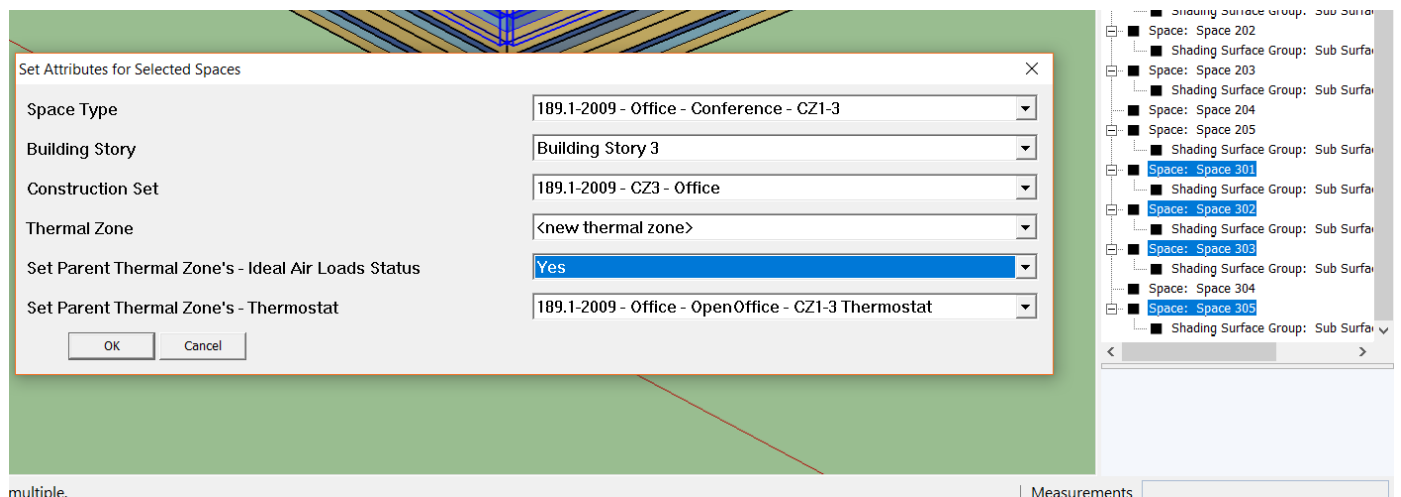
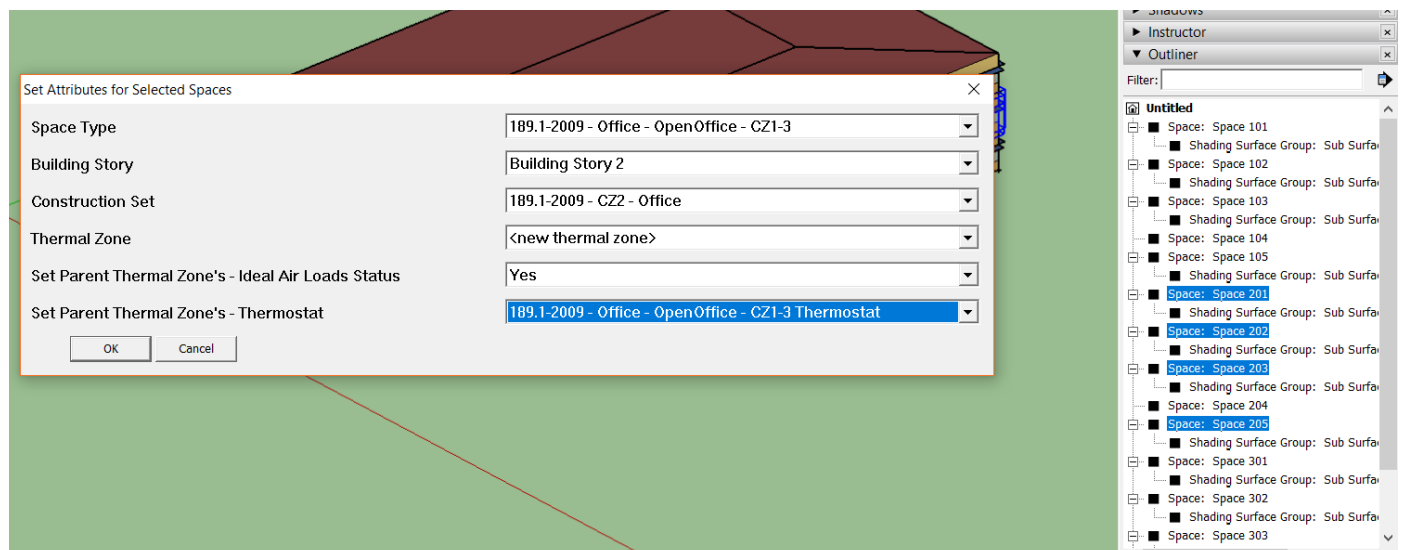
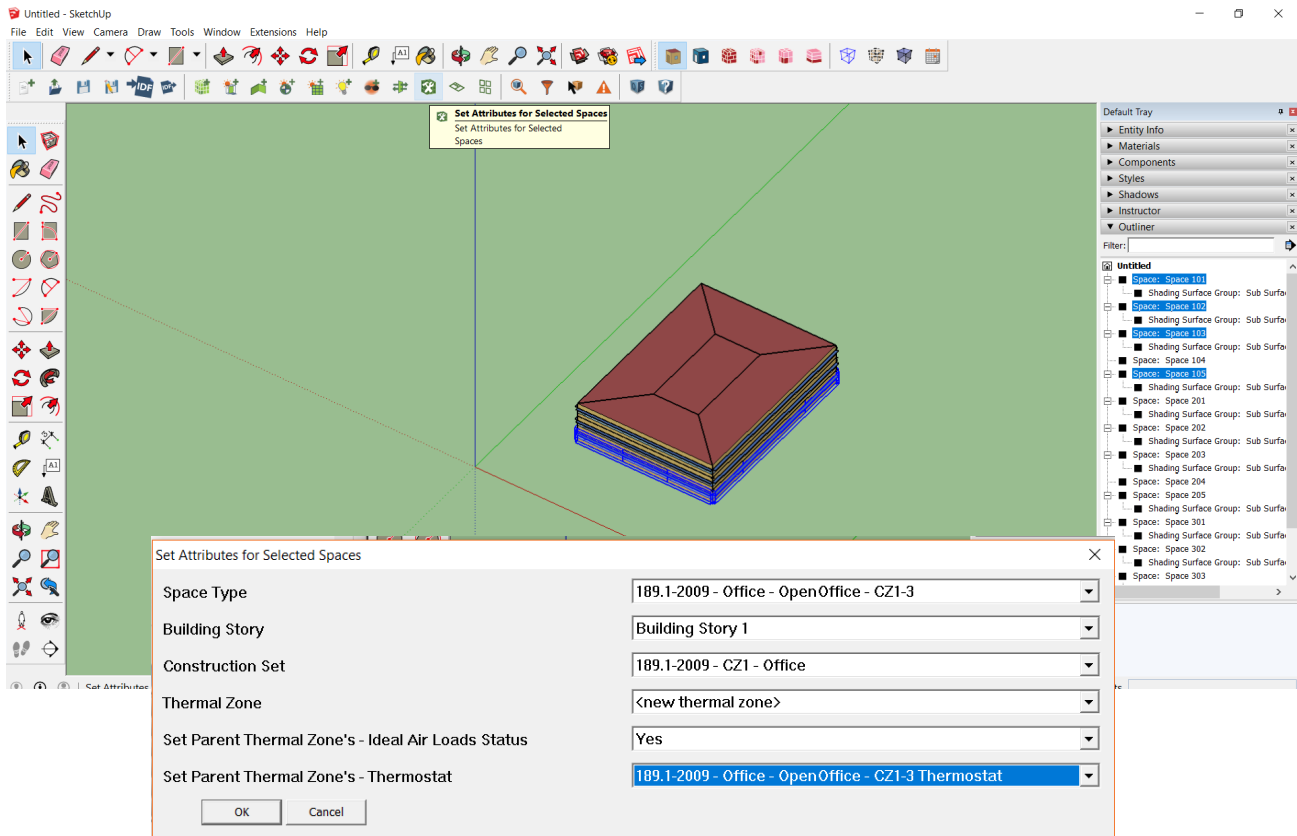


Using the search surfaces tool and applying 0 to 360 parameters we can visualize again the entire model.



## 5. Adding of specifications.

Choosing each thermal zone, we have to add the specifications.

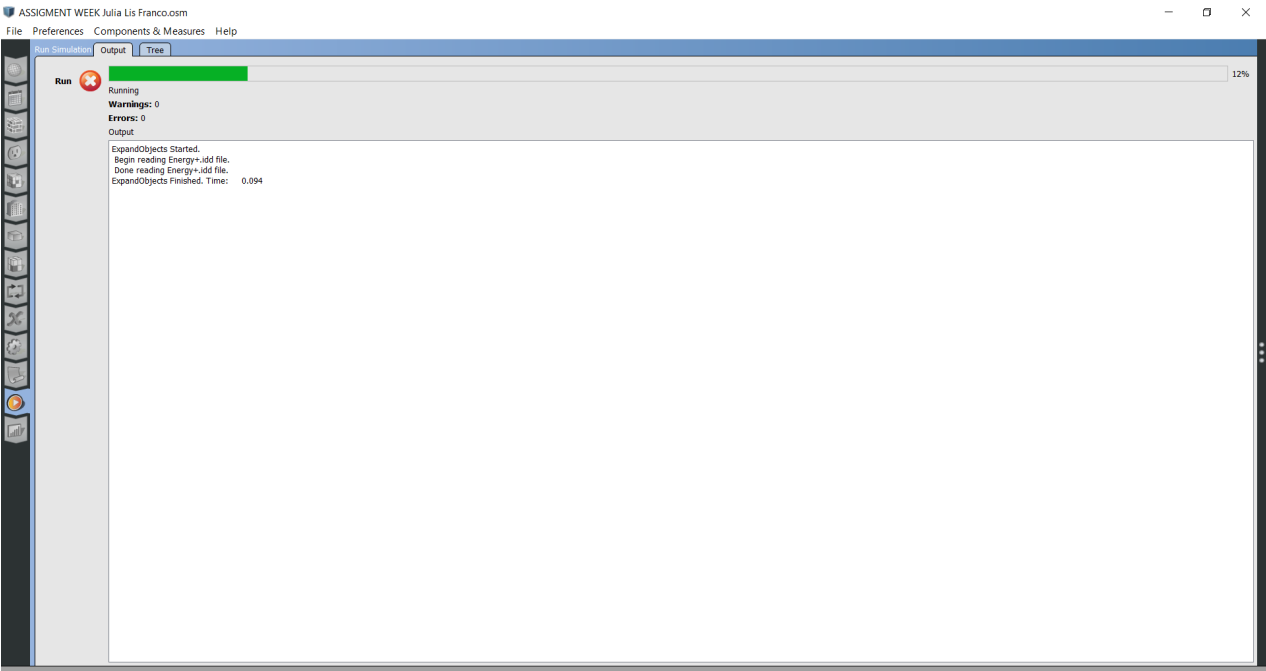
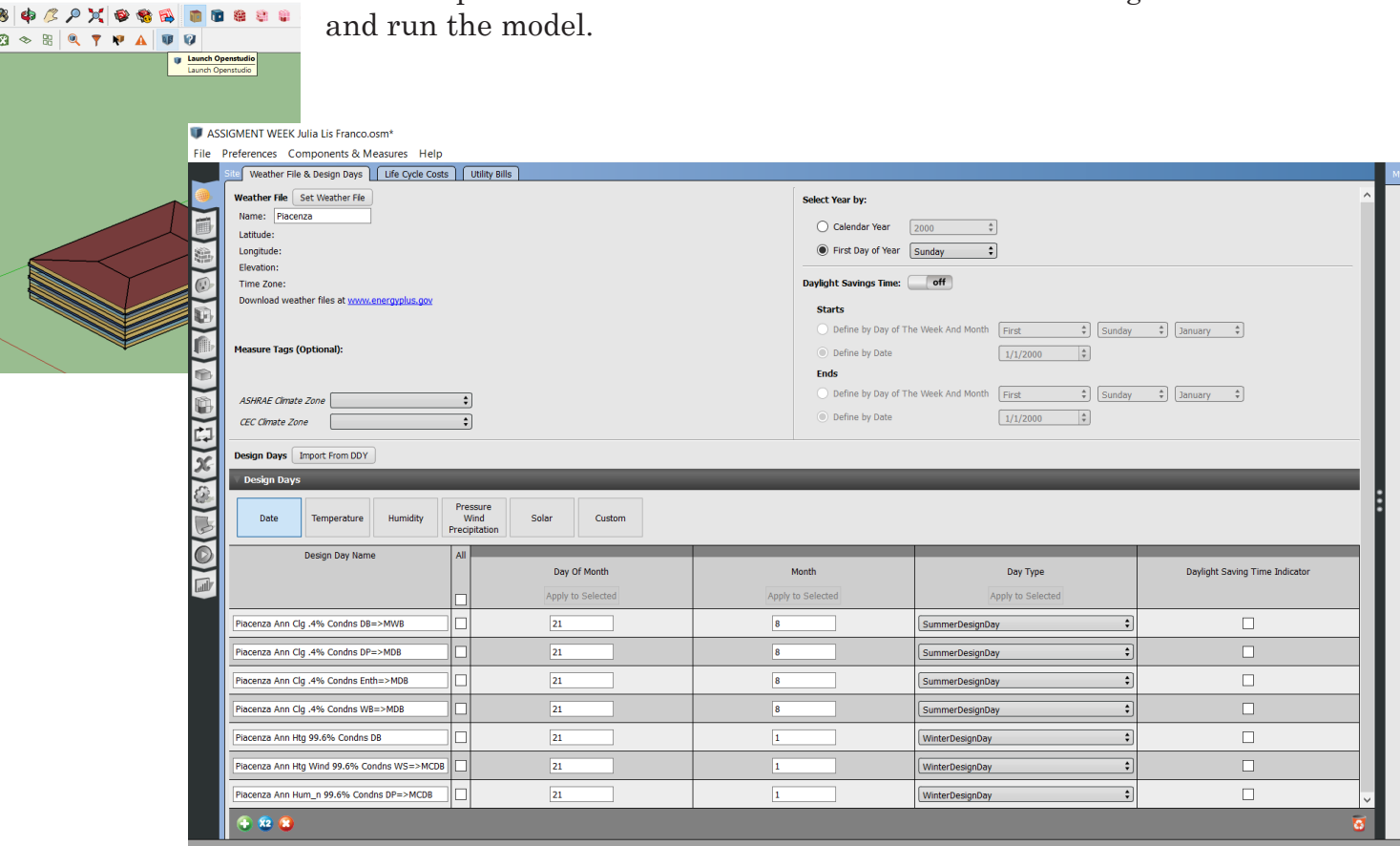


multiple.

Measurements

# 6. OpenStudio launching.

Launch open studio and add the weather conditions using the DDY file and run the model.



## 6. Result reviews.

The screenshot displays the 'Results Summary' window of the EnergyPlus software. The window has a menu bar with 'File', 'Preferences', 'Components & Measures', and 'Help'. Below the menu bar is a toolbar with various icons. The main content area is titled 'Results Summary' and contains the following information:

**Reports:** EnergyPlus Results

Program Version: **EnergyPlus, Version 8.5.0-c87e61b44b**, YMD=2019.11.06 13:20

Tabular Output Report in Format: **HTML**

Building: **Building 1**

Environment: **RUN PERIOD 1 \*\* Piacenza - ITA IGDG WMO#=160840**

Simulation Timestamp: **2019-11-06 13:20:06**

**Report: Annual Building Utility Performance Summary**

For: **Entire Facility**

Timestamp: **2019-11-06 13:20:06**

Values gathered over **8760.00** hours

**Site and Source Energy**

	Total Energy [GJ]	Energy Per Total Building Area [MJ/m2]	Energy Per Conditioned Building Area [MJ/m2]
Total Site Energy	0.00		
Net Site Energy	0.00		
Total Source Energy	0.00		
Net Source Energy	0.00		

**Site to Source Energy Conversion Factors**

	Site=>Source Conversion Factor
Electricity	3.167
Natural Gas	1.084
District Cooling	1.056
District Heating	3.613

On the right side of the window, there is a button labeled 'Open ResultsViewer for Detailed Reports' and a link labeled 'Table of Contents'.