

Week 6 :

TASK 1 :

$$q_{\text{net}_{1-2}} = \frac{Q_{\text{net}_{1-2}}}{A} = \frac{A \sigma (T_2^4 - T_1^4)}{\frac{1}{\varepsilon_1} + \frac{1}{\varepsilon_2} - 1}$$

$$= \frac{\sigma (T_2^4 - T_1^4)}{\frac{1}{\varepsilon_1} + \frac{1}{\varepsilon_2} - 1} = 5,67 \times 10^{-8} \times \frac{(800^4 - 400^4)}{\frac{1}{0,1} + \frac{1}{0,1} - 1}$$

$$q_{\text{net}_{1-2}} = 1035,81 \text{ W/m}^2$$

$$\boxed{1035,81 \times 1\% = 10,35}.$$

$$i, e, q_{\text{net}_{1-2}} = q_{\text{net}_{1-2, \text{shield}}} = \frac{1}{100} q_{\text{net}_{1-2}}$$

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

$$\Rightarrow \varepsilon_1 = \varepsilon_2 = \varepsilon_n$$

$$\Rightarrow q_{\text{net}_{1-2, \text{shield}}} = \frac{\sigma (T_2^4 - T_1^4)}{(n+1) \left(\frac{1}{\varepsilon} + \frac{1}{\varepsilon} - 1 \right)}$$

Without shields:

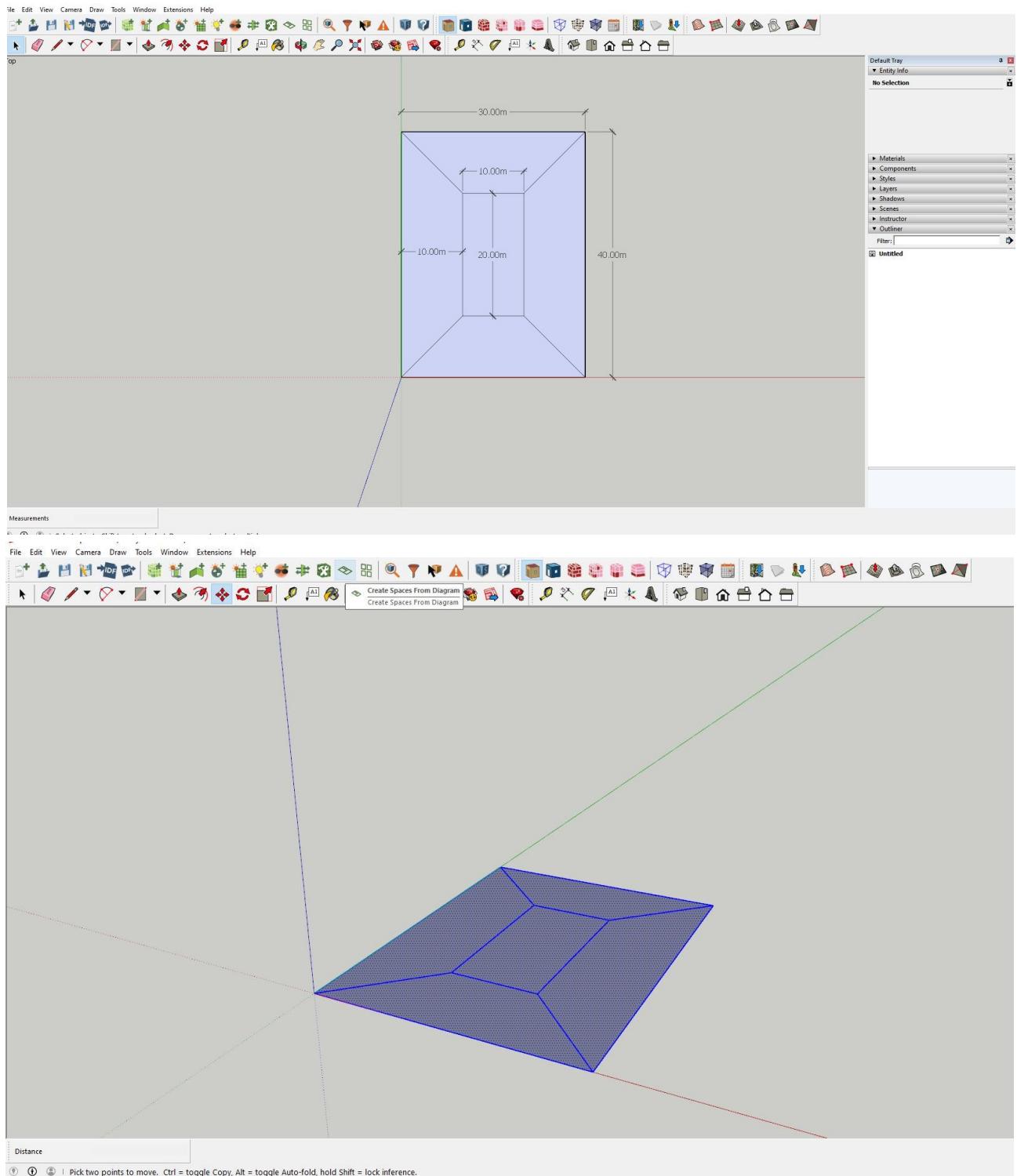
$$q = \frac{Q}{A} = 5,67 \times 10^{-8} \times \frac{800^4 - 500^4}{\frac{1}{0,2} + \frac{1}{0,1} - 1} = 3685,4$$

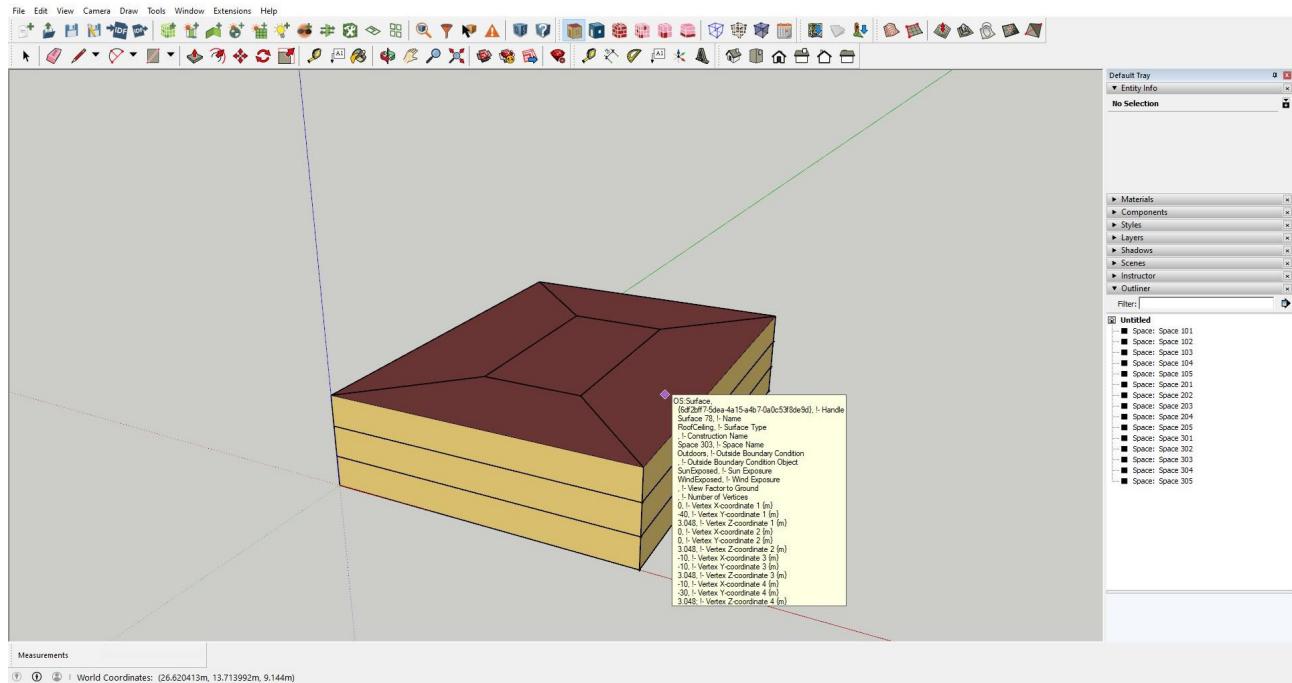
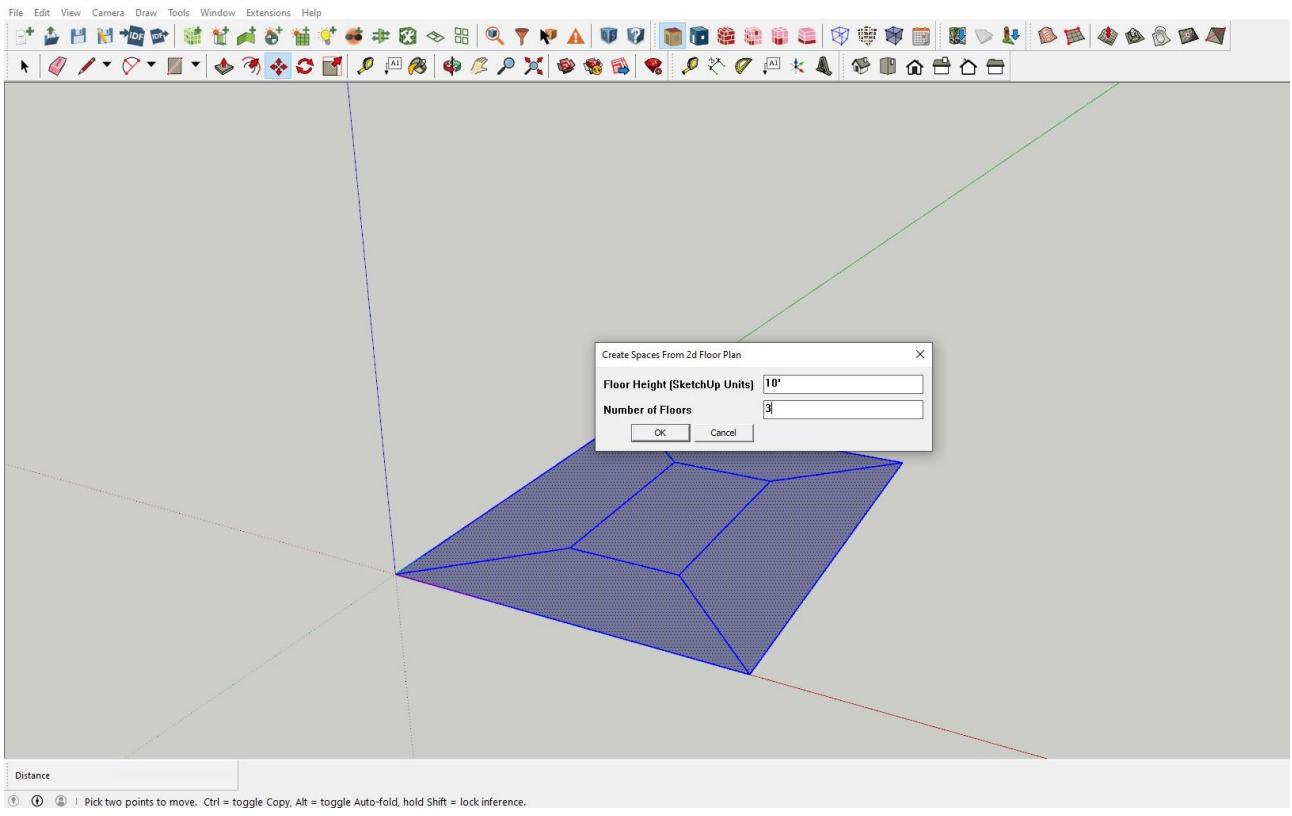
$$\boxed{3685,4 \times 1\% = 36,25}$$

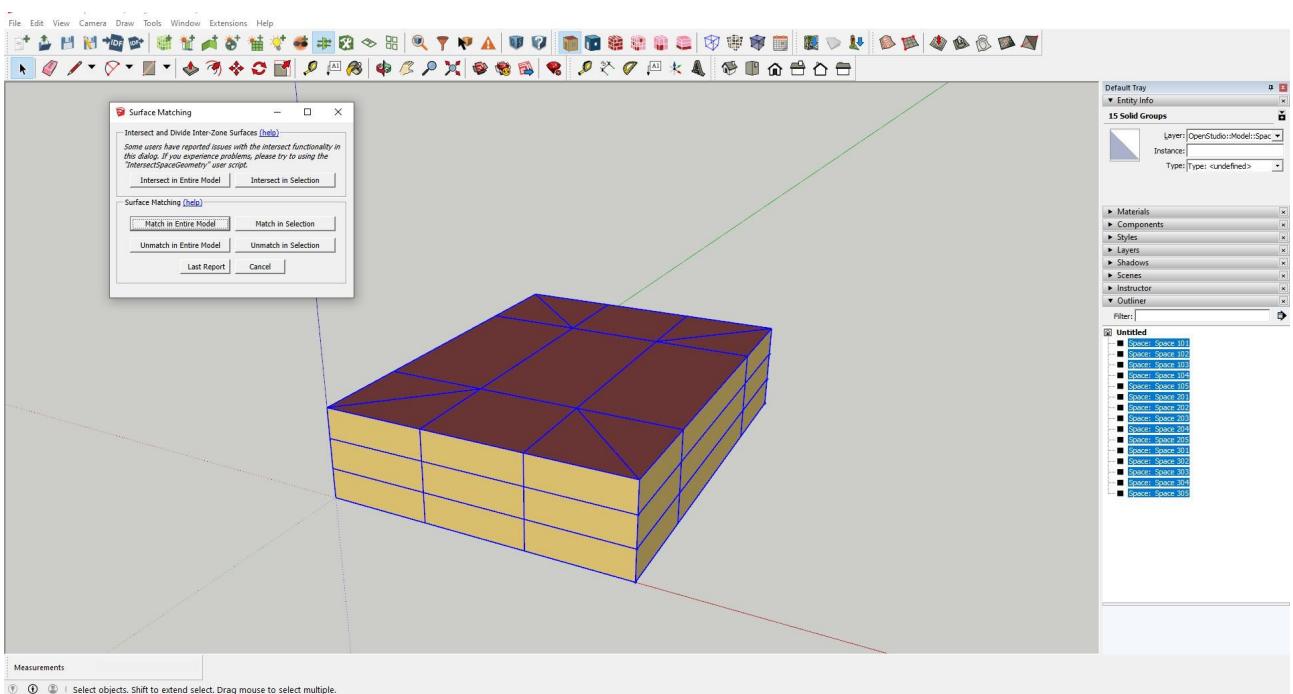
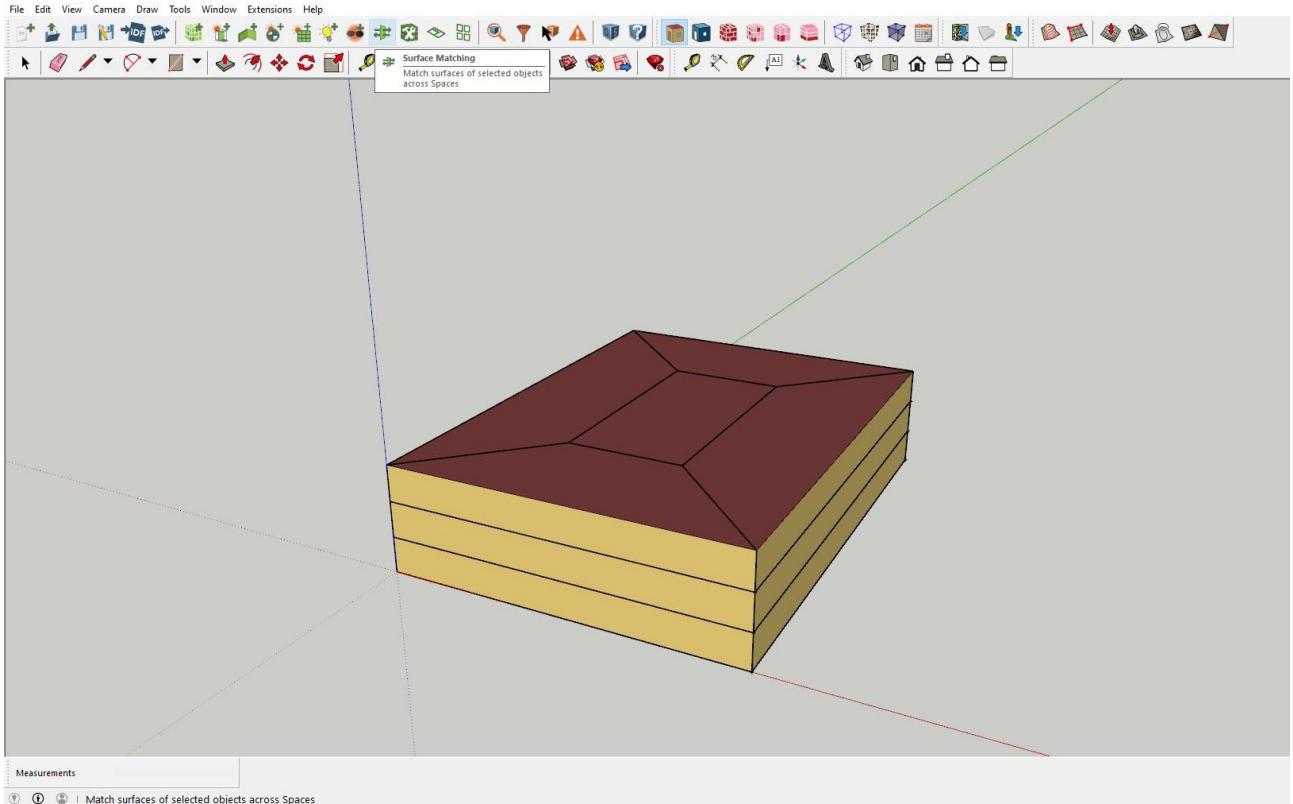
$$\frac{\dot{Q}}{A} = \frac{\sigma (T_n^4 - T_0^4)}{\left(\frac{1}{\varepsilon_1} + \frac{1}{\varepsilon_n} - 1 \right) + \left(\frac{1}{\varepsilon_{3,1}} + \frac{1}{\varepsilon_{3,2}} - 1 \right) + \left(\frac{1}{\varepsilon_{n,1}} + \frac{1}{\varepsilon_{n,2}} - 1 \right)}$$

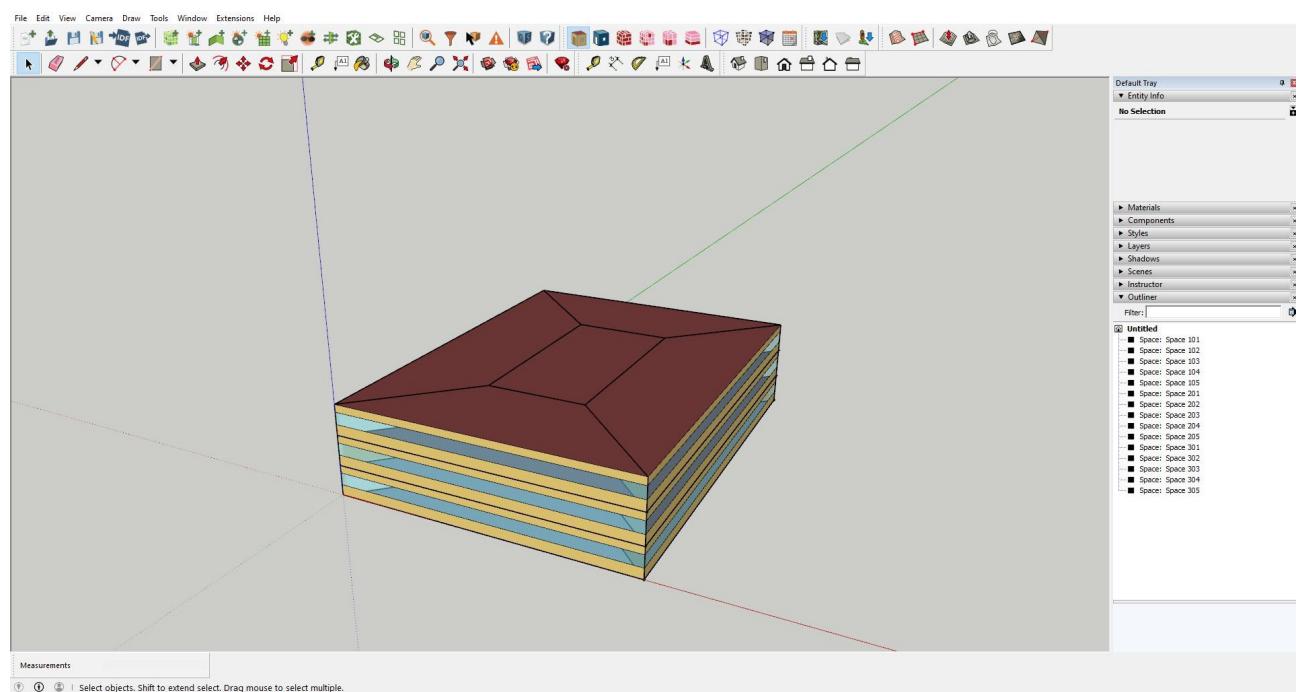
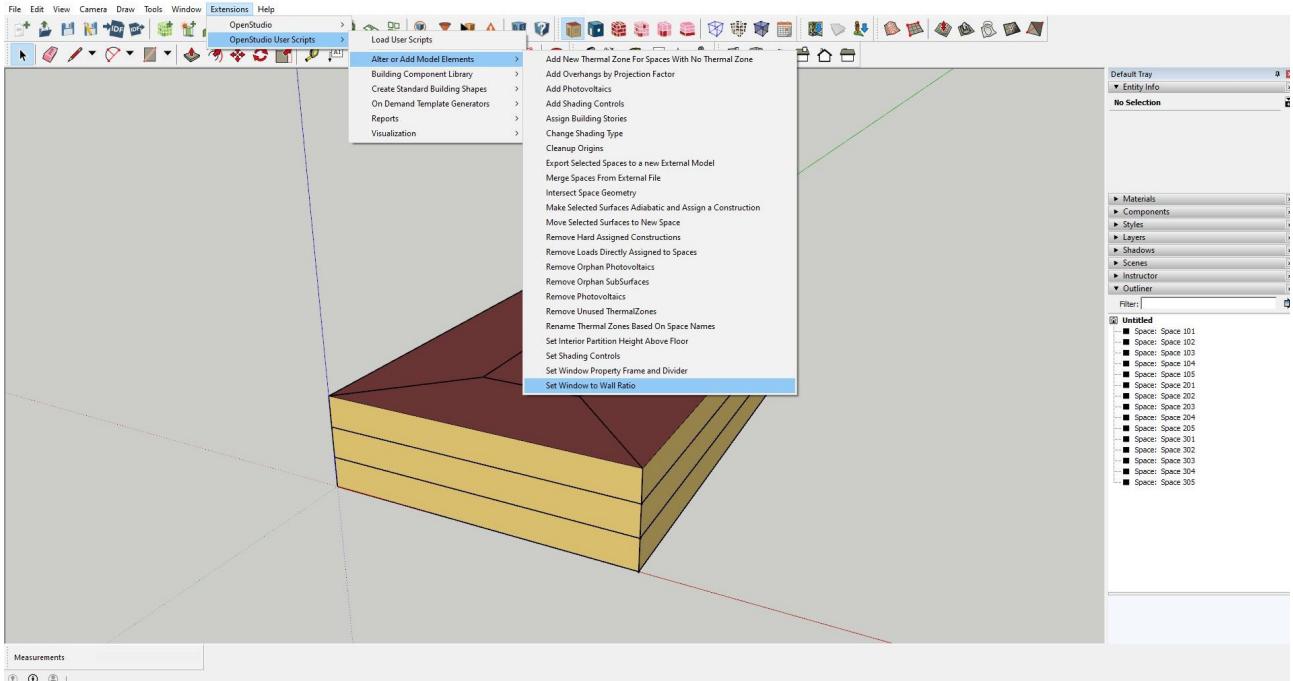
$$= \frac{19680,57}{5,42 + 19n} = 36,25 \Leftrightarrow n = \frac{537,49}{19} = \boxed{28,1}$$

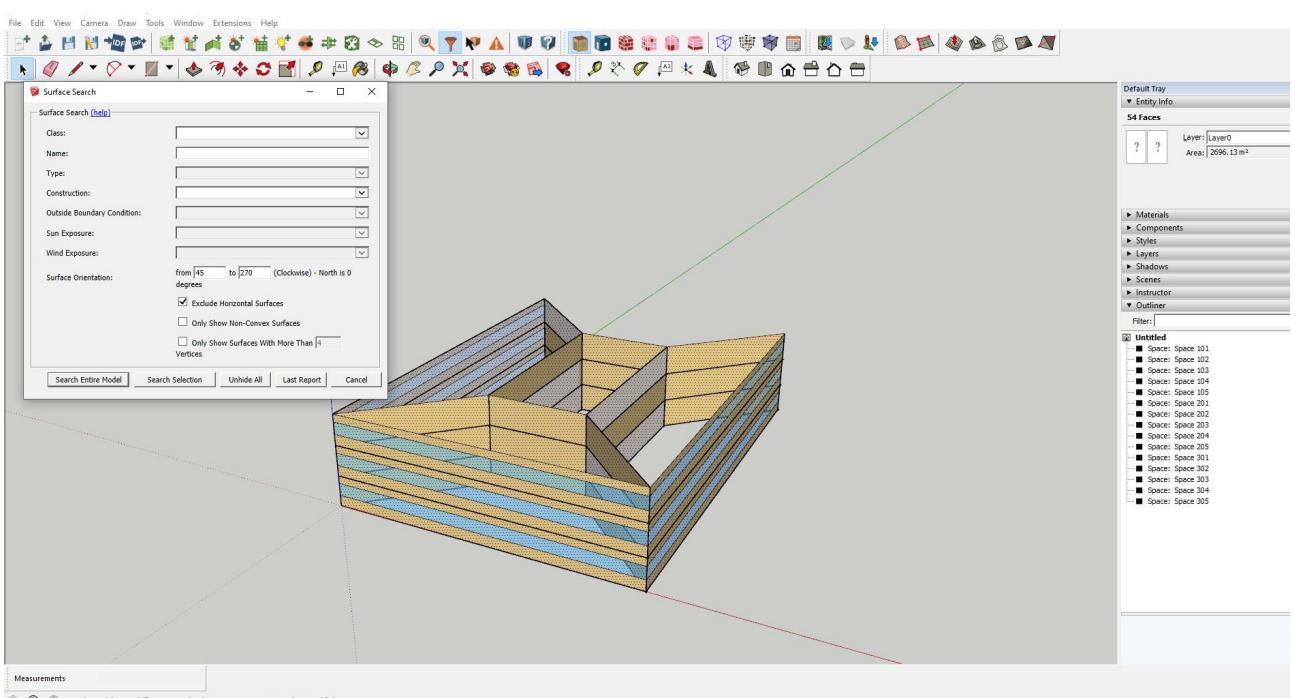
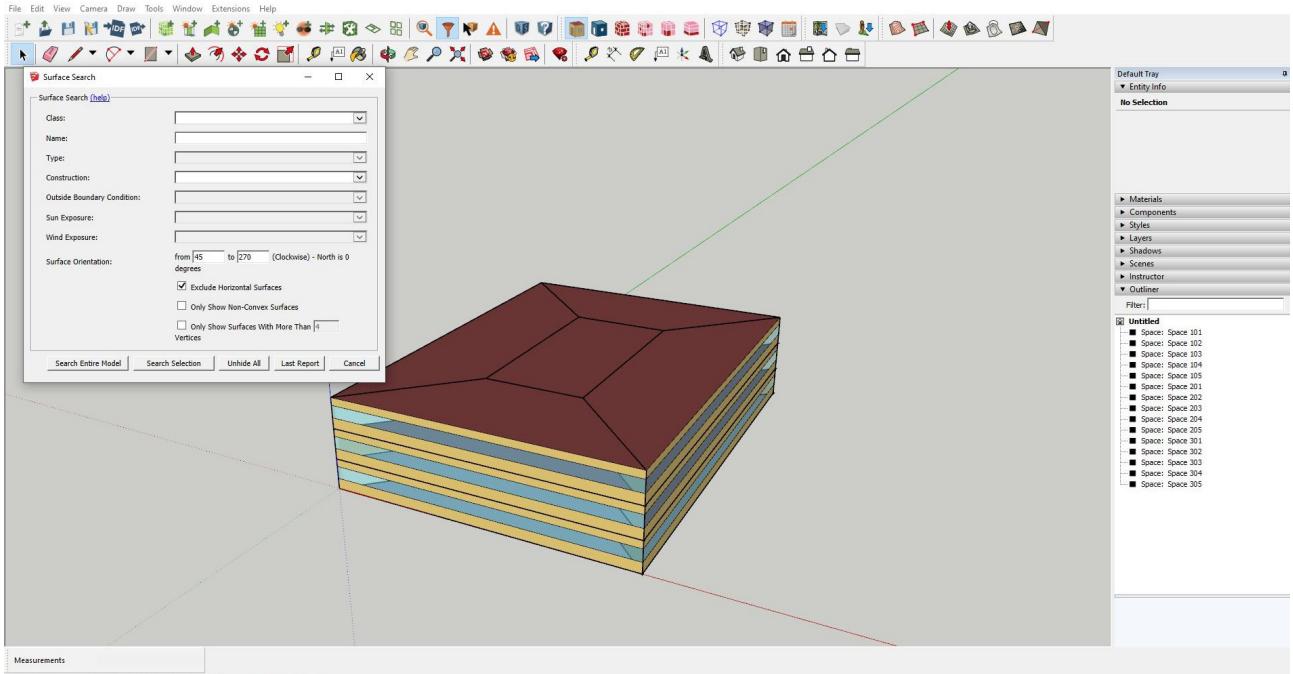
TASK 2:

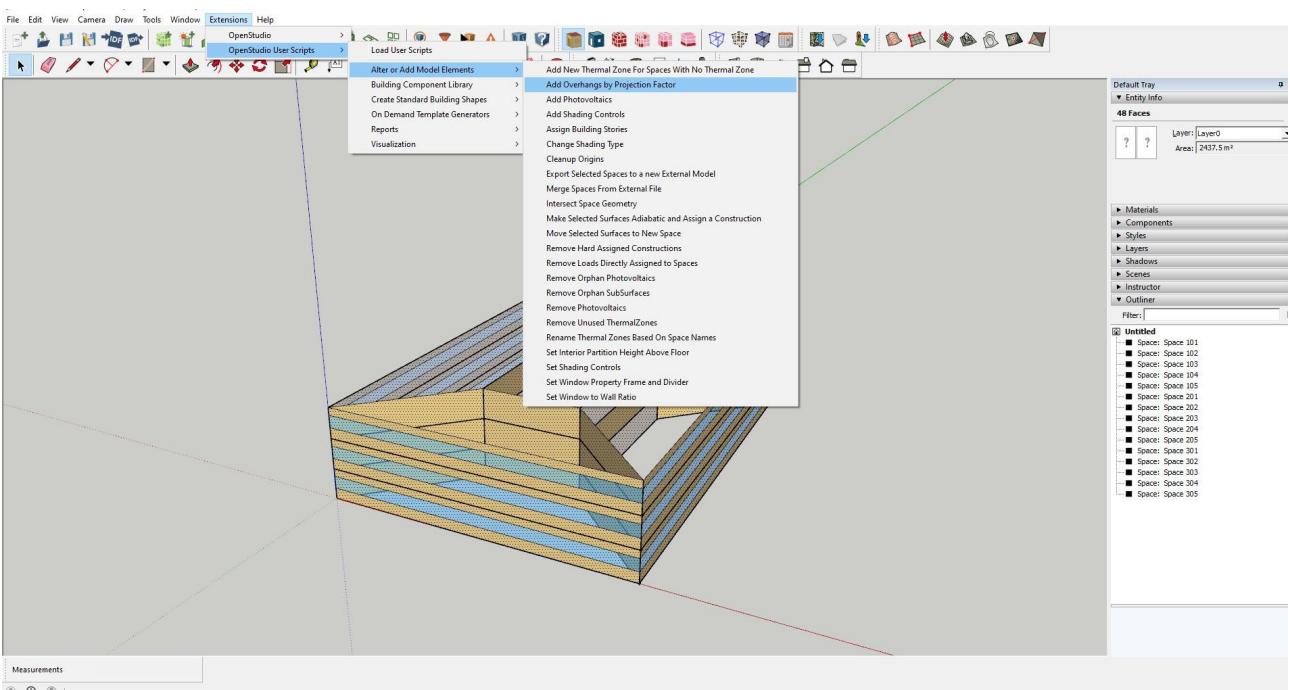
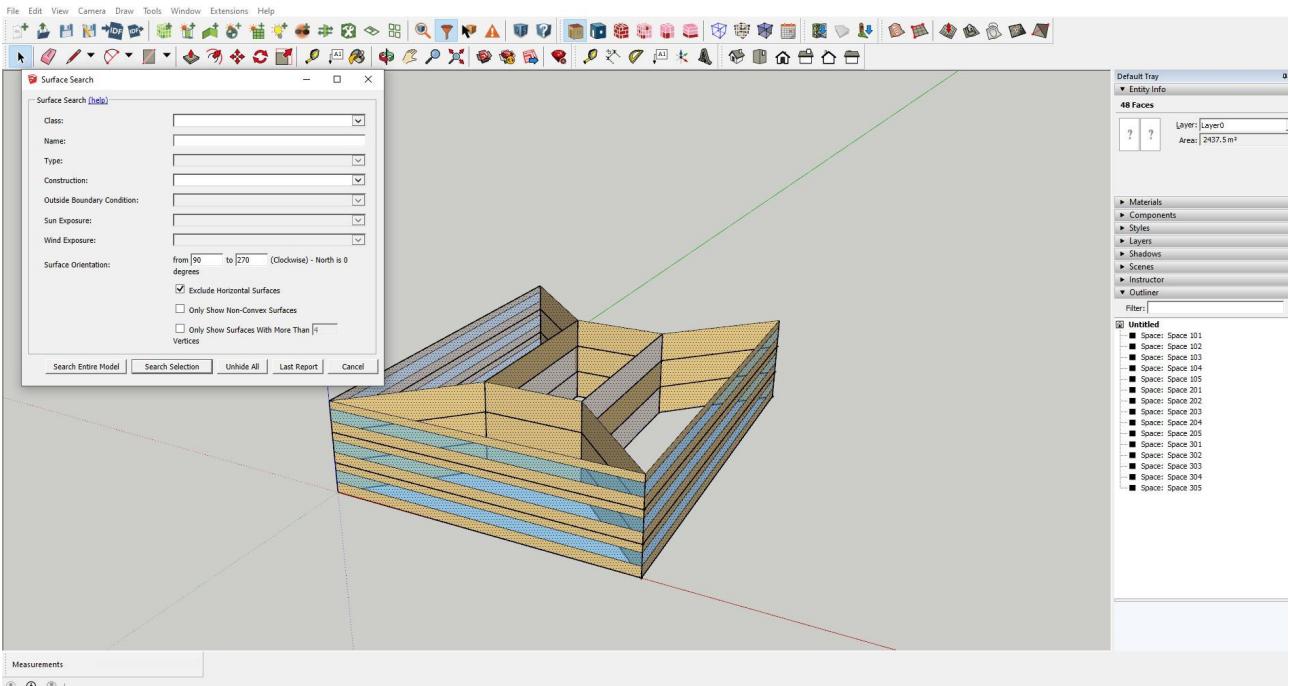


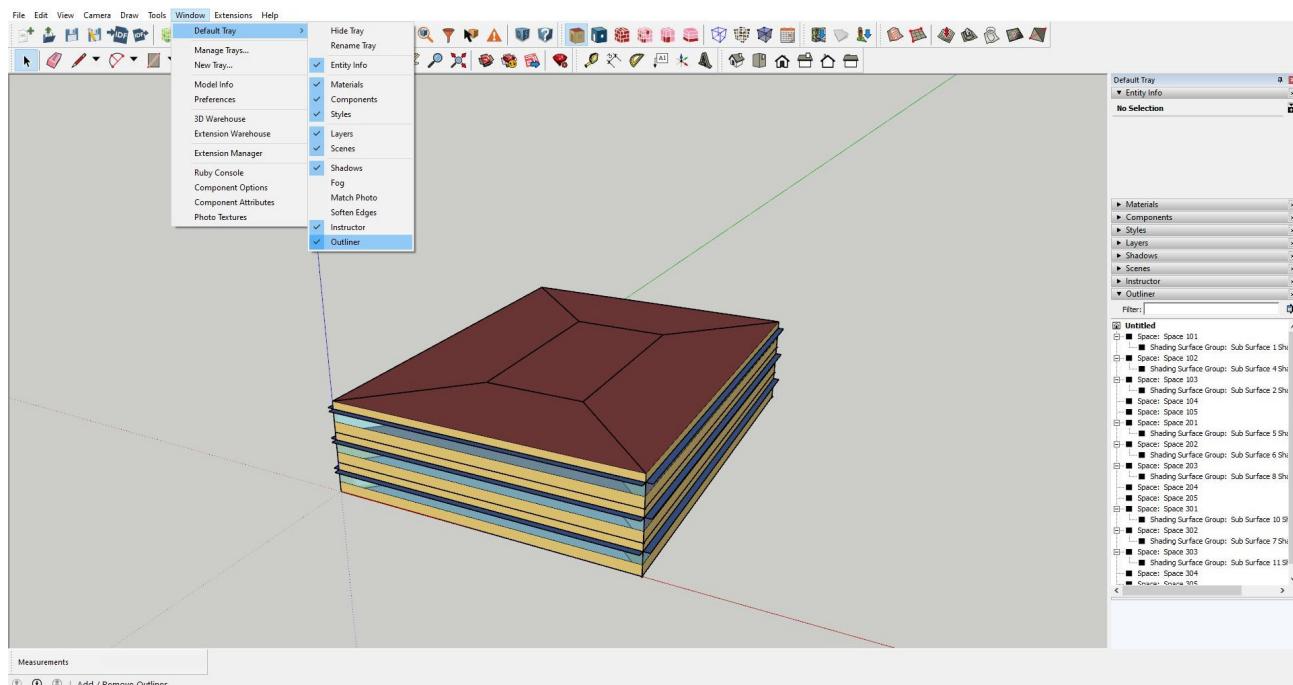
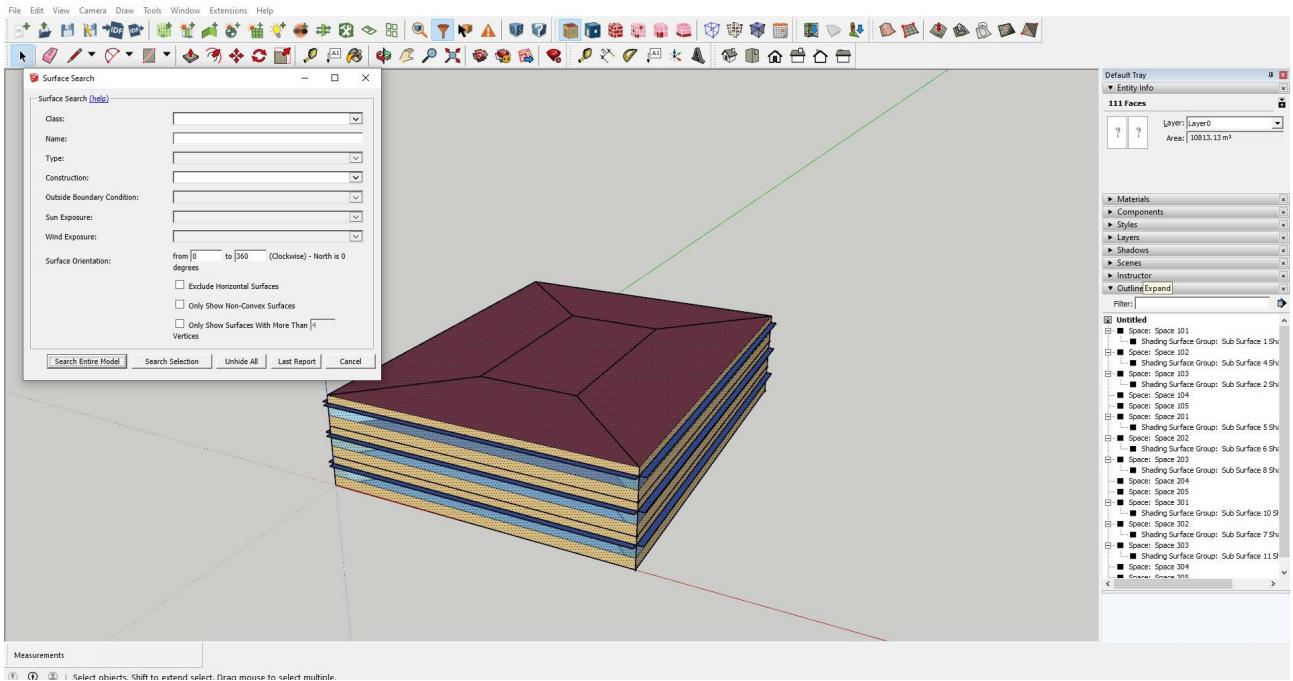


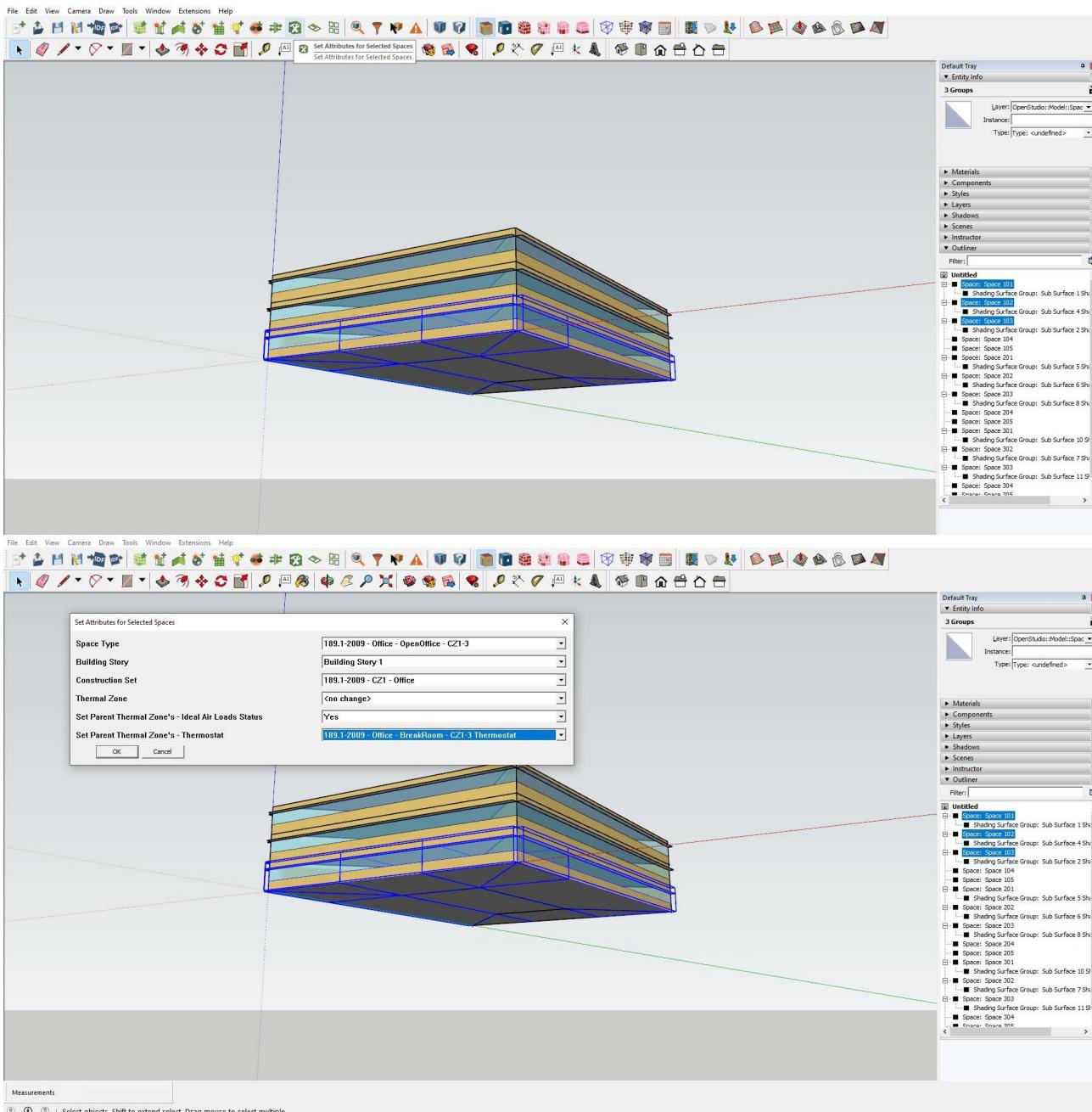


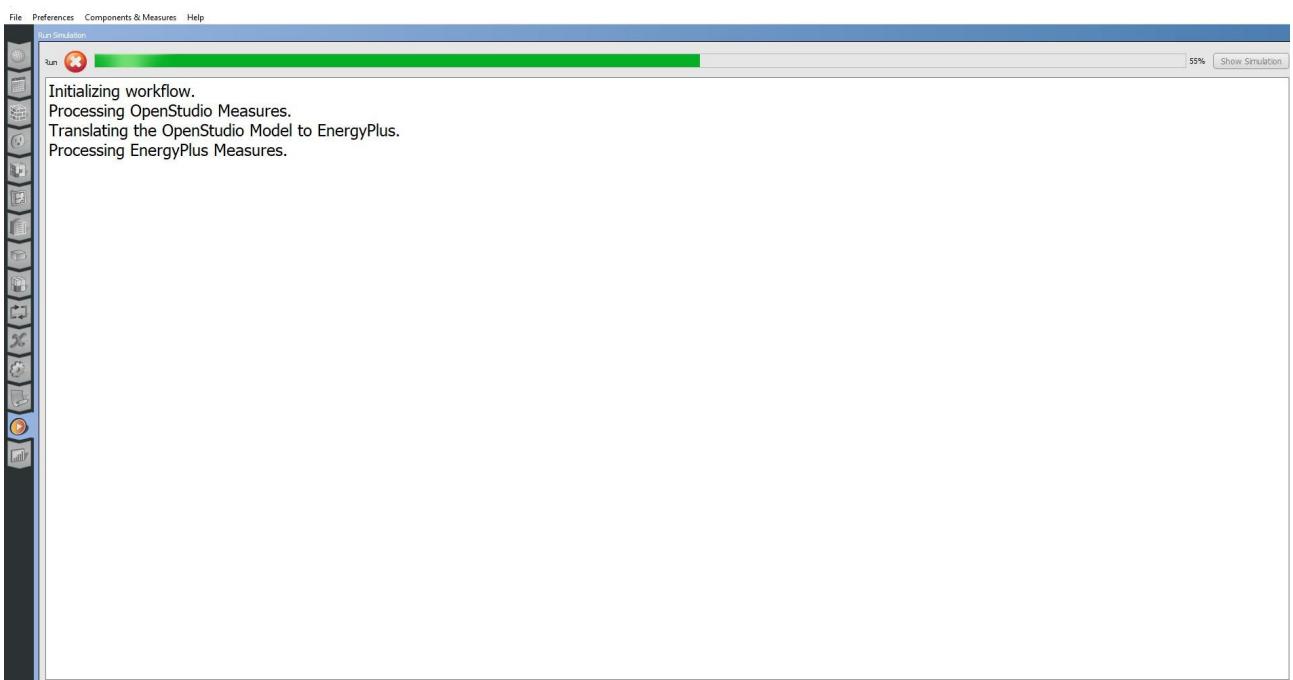
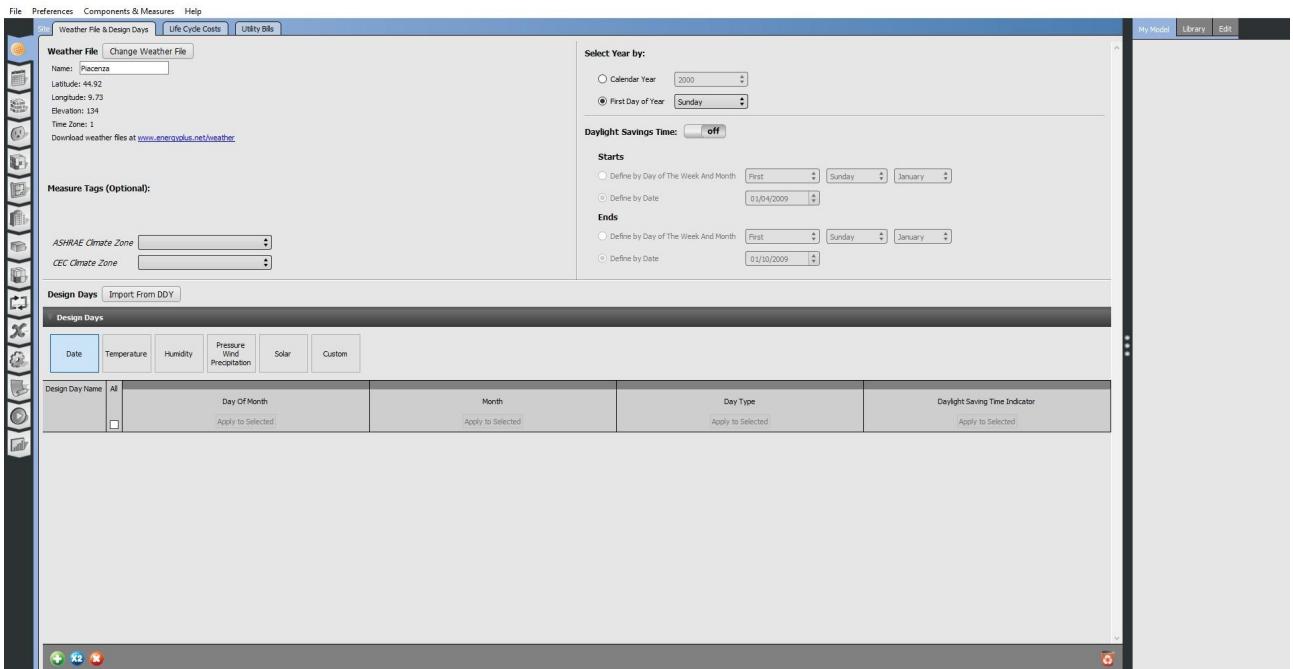












Results Summary

Report: EnergyPlus Results

Program Version: EnergyPlus, Version 9.2.0-921312fa1d, YMD=2019.11.12 22:34

Tabular Output Report in Format: HTML

Building: Building 1

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

Simulation Timestamp: 2019-11-12 22:34:53

Report: Annual Building Utility Performance Summary

For: Entire Facility

Timestamp: 2019-11-12 22:34:53

Values gathered over 8760.00 hours

Site and Source Energy

	Total Energy [GJ]	Energy Per Total Building Area [MJ/m ²]	Energy Per Conditioned Building Area [MJ/m ²]
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
Steam	0.300
Gasoline	1.050
Diesel	1.050
Coal	1.050

File Preferences Components & Measures Help

Construction Sets Constructions Materials

Name: 189.1-2009 - C21 - Office

Exterior Surface Constructions

Walls	Floors	Roofs
extslabcarpet 189.1-2009 ExtrWall Mass ClimateZone 1	extslabcarpet 4n ClimateZone 1-8	ASHRAE 189.1-2009 ExtRoof IEAD ClimateZone 1

Interior Surface Constructions

Walls	Floors	Ceilings
Interior Wall	Interior Floor	Interior Ceiling

Ground Contact Surface Constructions

Walls	Floors	Ceilings
extslabcarpet ClimateZone 1-8	extslabcarpet ClimateZone 1-8	extslabcarpet ClimateZone 1-8

Exterior Sub Surface Constructions

Fixed Windows	Operable Windows	Doors
ASHRAE 189.1-2009 ExtWindow Mass ClimateZone 1	ASHRAE 189.1-2009 Operable Window ClimateZone 1	Exterior Door

Glass Doors

Drag From Library

Overhead Doors

Drag From Library

Skylights

Drag From Library

Tubular Daylight Domes

Drag From Library

Interior Sub Surface Constructions

Drag From Library

Constructions

- Air Wall
- ASHRAE 189.1-2009 ExtRoof IEAD ClimateZone 1
- ASHRAE 189.1-2009 ExtRoof IEAD ClimateZone 2-5
- ASHRAE 189.1-2009 ExtRoof IEAD ClimateZone 7-8
- ASHRAE 189.1-2009 ExtRoof Metal ClimateZone 6
- ASHRAE 189.1-2009 ExtWall Mass ClimateZone 1
- ASHRAE 189.1-2009 ExtWall Mass ClimateZone 2
- ASHRAE 189.1-2009 ExtWall Mass ClimateZone 3
- ASHRAE 189.1-2009 ExtWall Mass ClimateZone 4
- ASHRAE 189.1-2009 ExtWall Mass ClimateZone 5
- ASHRAE 189.1-2009 ExtWall Mass ClimateZone 6
- ASHRAE 189.1-2009 ExtWall Mass ClimateZone 7-8
- ASHRAE 189.1-2009 ExtWindow ClimateZone 1
- ASHRAE 189.1-2009 ExtWindow ClimateZone 2
- ASHRAE 189.1-2009 ExtWindow ClimateZone 3