

Question 1: From the previous assignment, radiative heat transfer between two parallel plates.

Epsilon = 0.1

$$Q_{12} = 1035.81 \text{ W/m}^2$$

$$Q_{12 \text{ N shield}} = 1 / (N + 1) Q_{12}$$

$$\text{But } Q_{12 \text{ N shield}} = 1 \% * 1035.81 = 10.3581$$

$$10.3581 = 1 / (N + 1) 1035.81 \text{ W/m}^2$$

$$10.3581 / 1035.81 = 1 / (N + 1)$$

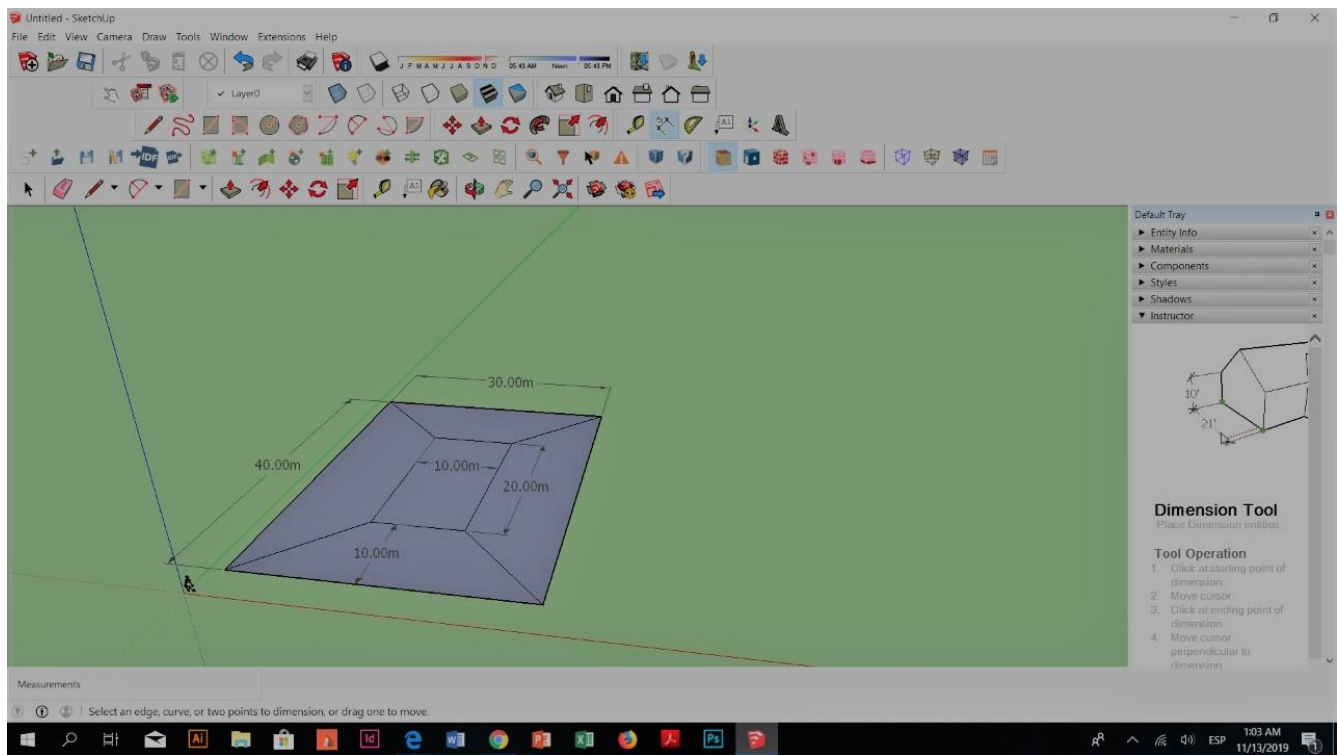
$$N + 1 = 100$$

$$N = 99$$

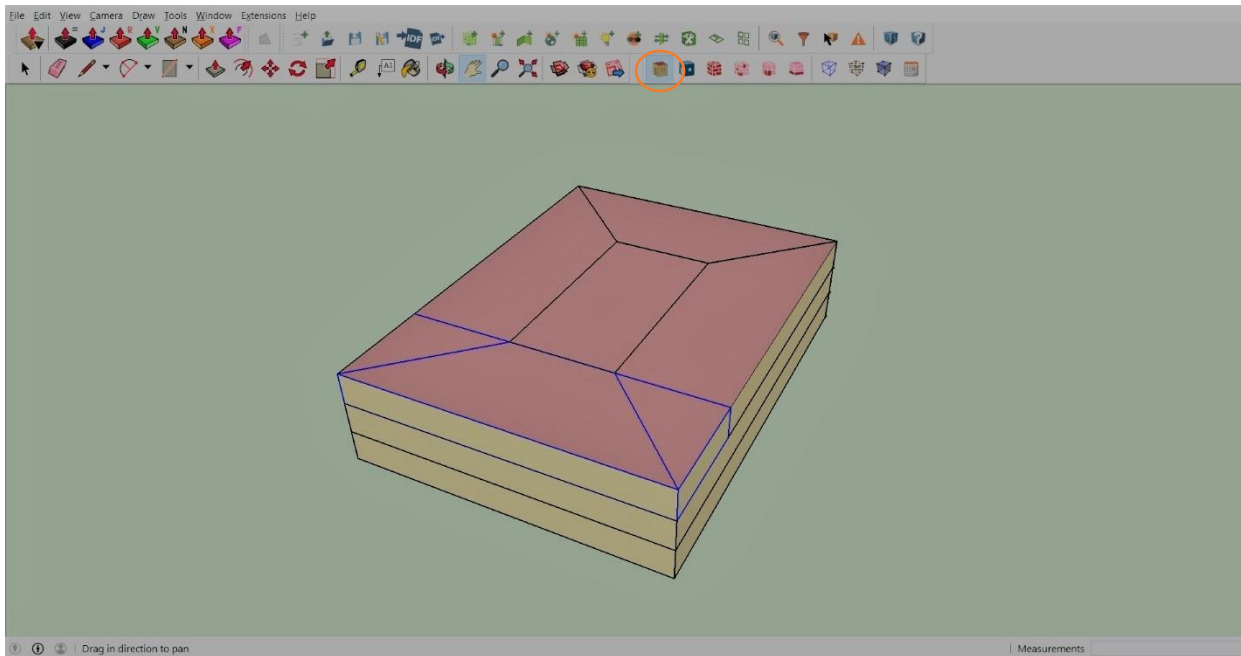
Therefore we need 99 surfaces to have the new heat transfer rate to 1%

Question 2

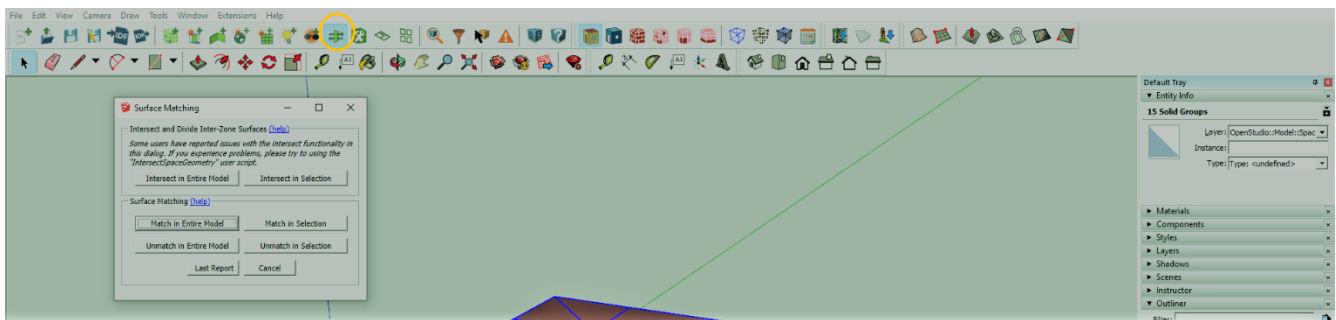
1. Draw a rectangle, with the given dimensions.

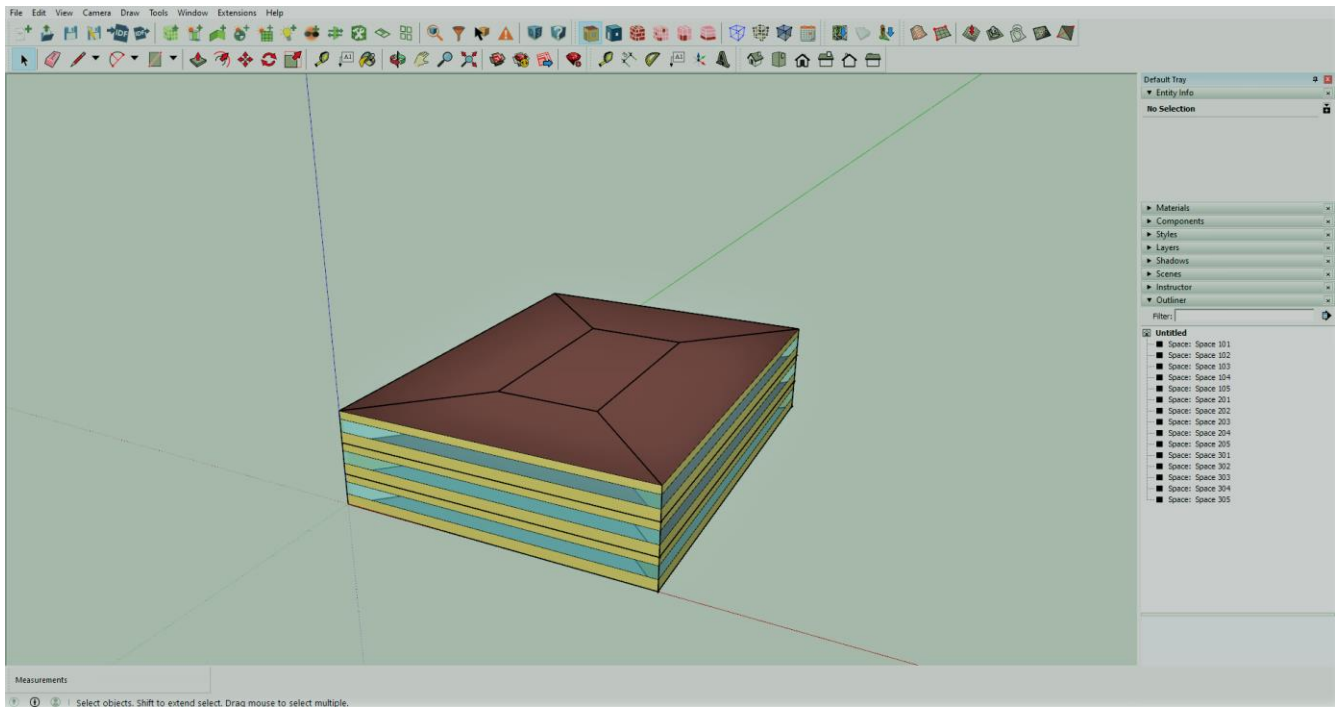
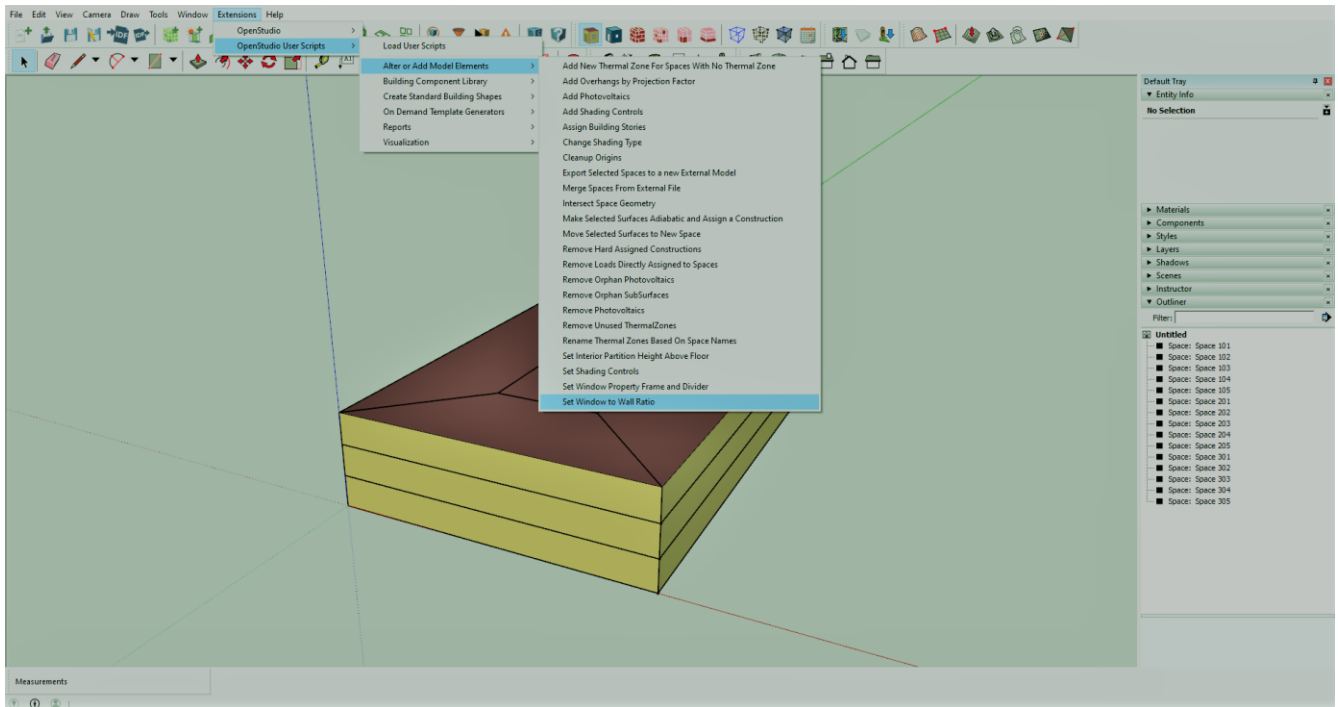


2. Click on 'create spaces' from diagram, select the desired of floors and height of building.

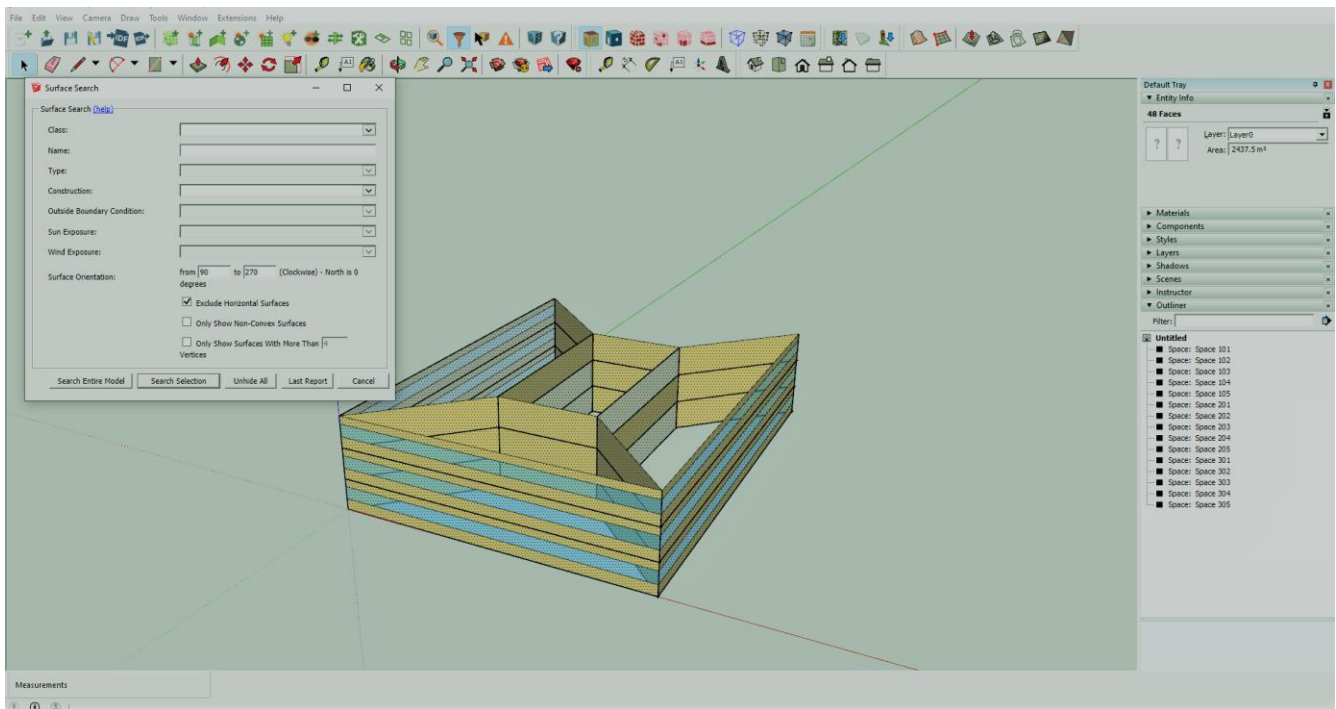
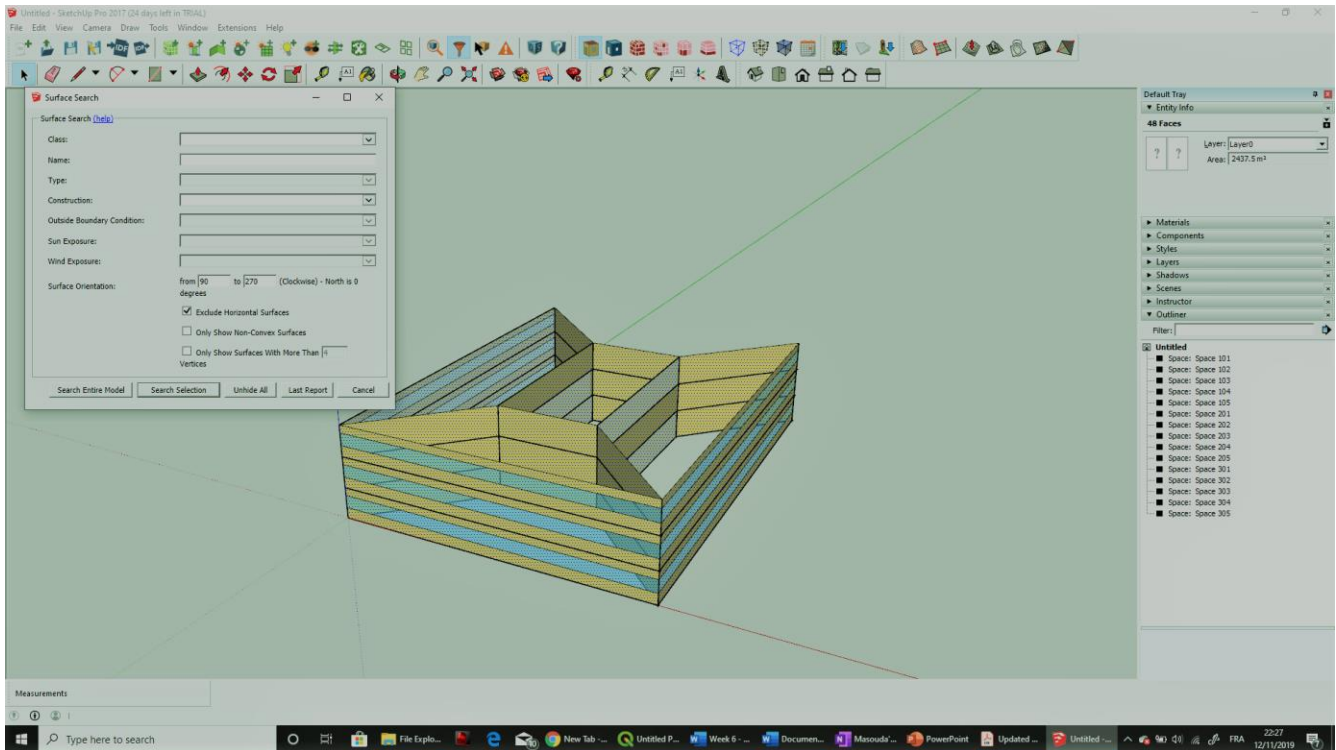


3. Click on 'Surface match' in order to be able to create windows and select 'match the entire model'

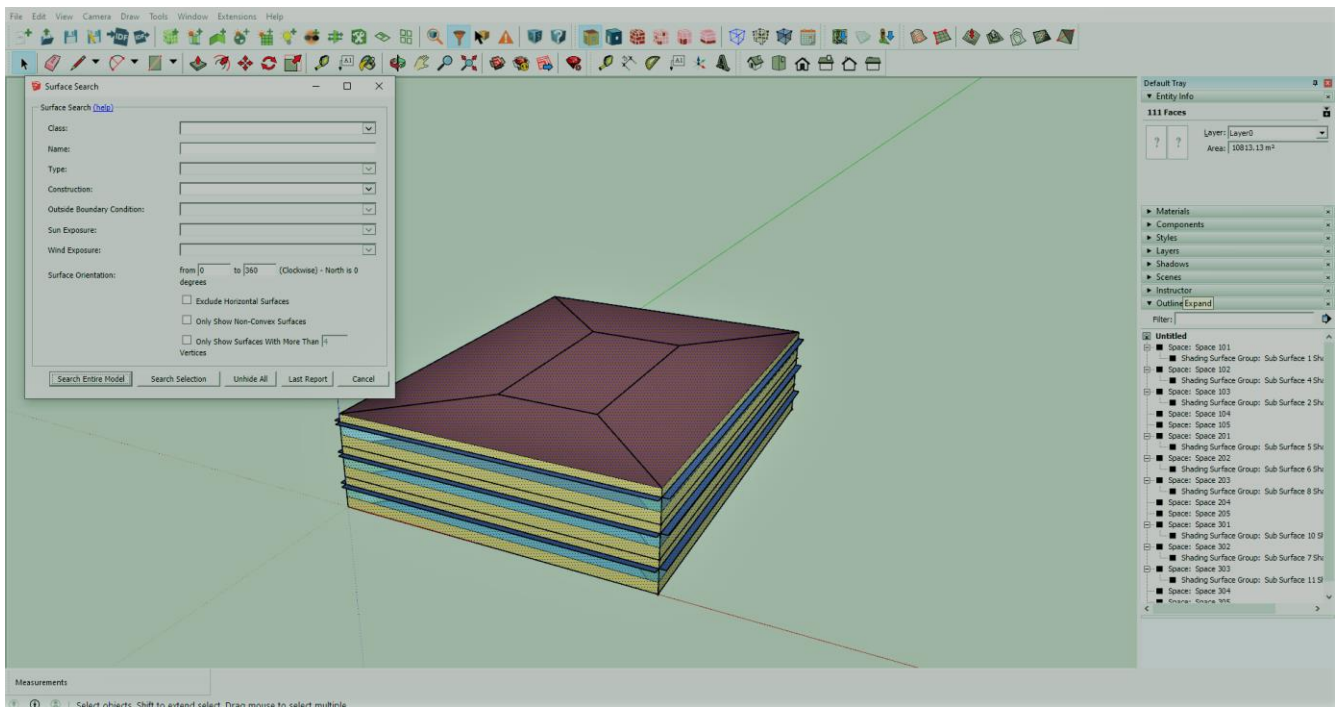
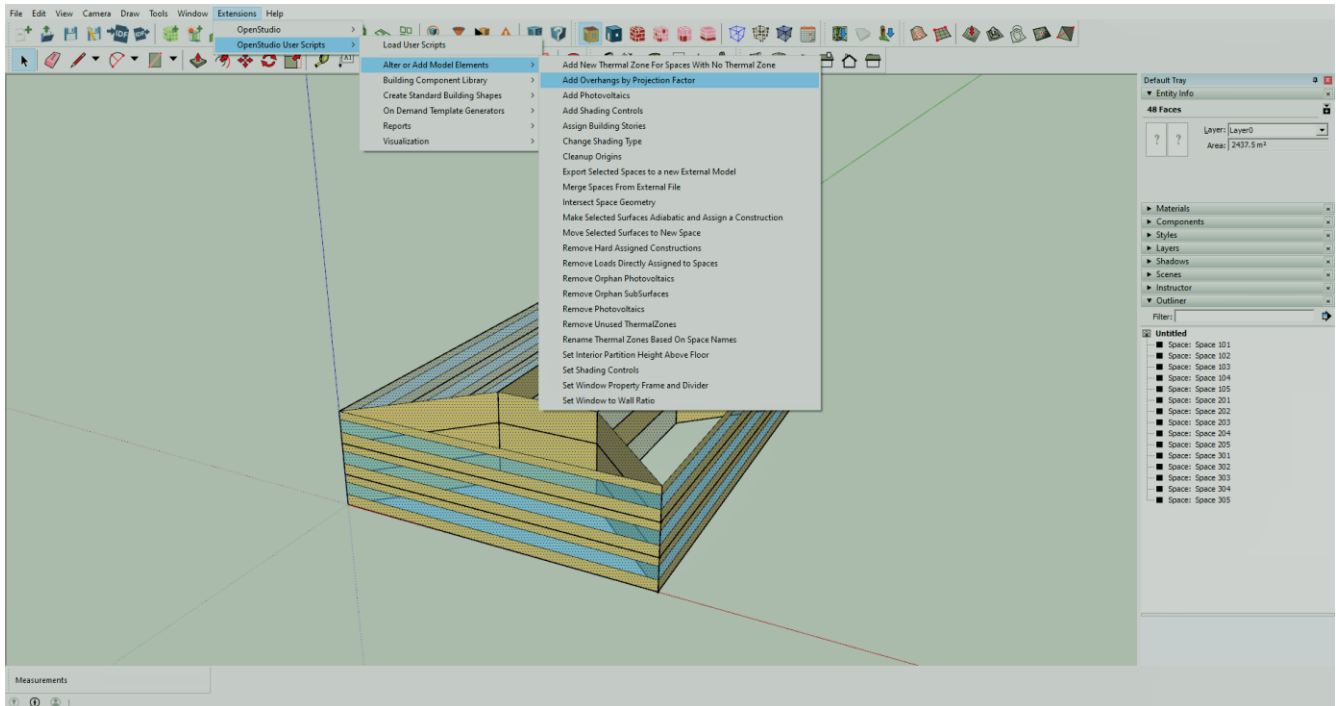




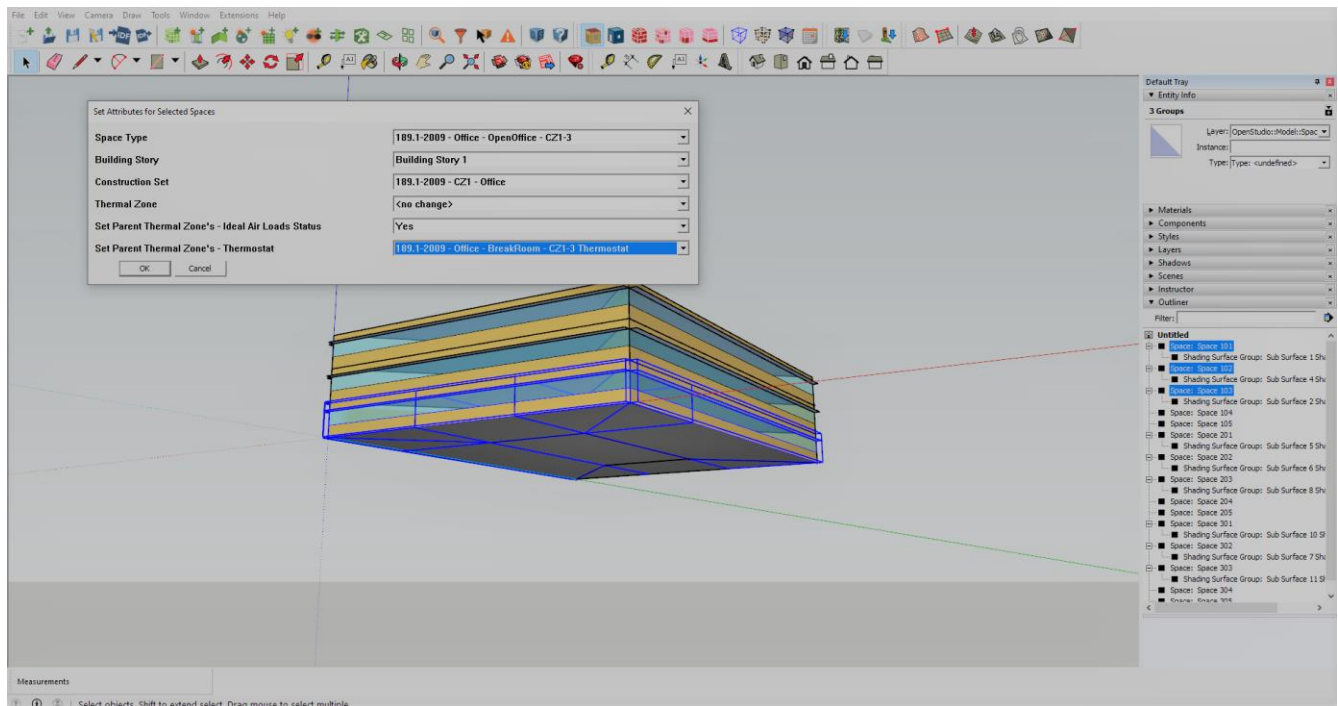
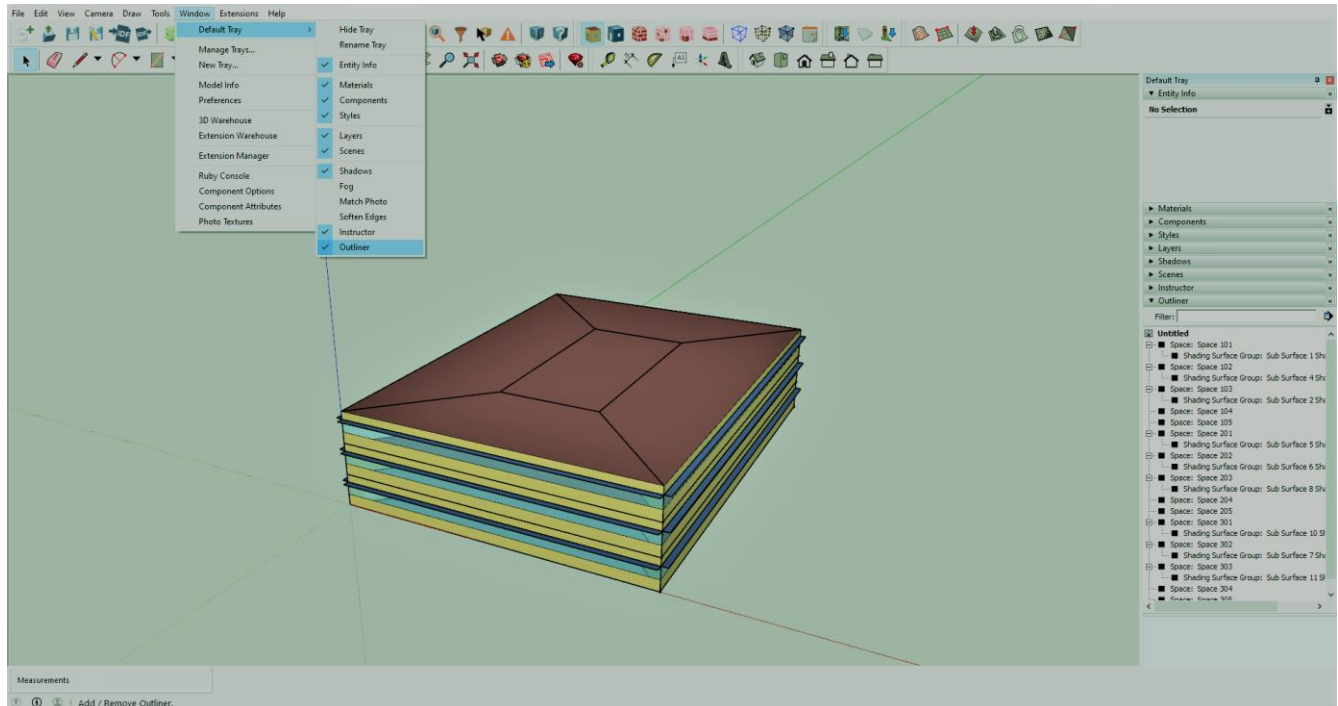
4. With search surfaces, select all the facades apart from the northern façade for shading.



5. Using extensions, click 'add overhang' to add an overhang to the building.



6. Select the surfaces apart from the horizontal surface, activate the 'outliner' and set the attributes on all the floors.



7. Save the Open studio model from sketchup.

8. Import the weather of piacenza and run the model.

The screenshot shows the 'Weather File & Design Days' dialog box in OpenStudio. The 'Weather File' tab is active, showing fields for Name (Piacenza), Latitude (44.92), Longitude (9.73), Elevation (134), and Time Zone (1). A link to download weather files is provided. The 'Measure Tags (Optional)' section has dropdowns for ASHRAE and CEC Climate Zones. The 'Design Days' section has a button to 'Import From DDY'. The 'Design Days' table is empty. The 'Select Year by:' section has radio buttons for 'Calendar Year' (2000) and 'First Day of Year' (Sunday). The 'Daylight Savings Time' is set to 'off'. The 'Starts' and 'Ends' sections have radio buttons for 'Define by Day of The Week And Month' and 'Define by Date'.

File Preferences Components & Measures Help

Weather File & Design Days Life Cycle Costs Utility Bills

Weather File Change Weather File

Name: Piacenza

Latitude: 44.92

Longitude: 9.73

Elevation: 134

Time Zone: 1

Download weather files at www.energyplus.net/weather

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	All	Day Of Month	Month	Day Type	Daylight Saving Time Indicator
	<input type="checkbox"/>	Apply to Selected	Apply to Selected	Apply to Selected	Apply to Selected

Select Year by:

☐ Calendar Year 2000

☒ First Day of Year Sunday

Daylight Savings Time: off

Starts

☐ Define by Day of The Week And Month First Sunday January

☐ Define by Date 01/04/2009

Ends

☐ Define by Day of The Week And Month First Sunday January

☐ Define by Date 01/10/2009

The screenshot shows the 'Run Simulation' dialog box in OpenStudio. The 'Run' button is highlighted. The 'Warnings: 1' and 'Errors: 0' status is shown. The 'Output' tab is active, displaying the simulation progress and output text.

File Preferences Components & Measures Help

Run Simulation Output Tree

Run

Running

Warnings: 1

Errors: 0

Output

ExpandObjects Started.

Begin reading Energy+.idd file.

Done reading Energy+.idd file.

ExpandObjects Finished. Time: 0.109

9. Check the table for energy results.

File Preferences Components & Measures Help

Results Summary

Reports: OpenStudio Results

Open Results/Viewer for Detailed Reports

OpenStudio Results

Model Summary

- Model Summary
- Annual Overview
- Monthly Overview
- Utility Bills/Rates
- Envelope
- Space Type Breakdown
- Space Type Summary
- Interior Lighting Summary
- Plug Loads Summary
- Exterior Lighting
- Water Use Equipment
- HVAC Load Profiles
- Zone Conditions
- Zone Overview
- Zone Equipment Detail
- Air Loops Detail
- Plant Loops Detail
- Outdoor Air
- Cash Flow
- Site and Source Summary
- Schedule Overview

Building Summary

Information	Value	Units
Building Name	Building 1	building_name
Net Site Energy	2,244,763	kBtu
Total Building Area	38,750	ft ²
EUI (Based on Net Site Energy and Total Building Area)	57.93	kBtu/ft ²
OpenStudio Standards Building Type		

Weather Summary

	Value
Weather File	Piacenza - ITA IGDG WMO#-160840
Latitude	44.92
Longitude	9.73
Elevation	440 (ft)
Time Zone	1.00
North Axis Angle	0.00
ASHRAE Climate Zone	

File Preferences Components & Measures Help

Results Summary

Reports: EnergyPlus Results

Open Results/Viewer for Detailed Reports

Program Version: EnergyPlus, Version 8.5.0-c87e61b44b, YMD=2019.11.12 22:05

Tabular Output Report in Format: HTML

Building: Building 1

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

Simulation Timestamp: 2019-11-12 22:05:19

Report: Annual Building Utility Performance Summary

For: Entire Facility

Timestamp: 2019-11-12 22:05:19

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	2368.35	657.88	657.88
Net Site Energy	2368.35	657.88	657.88
Total Source Energy	6106.49	1696.25	1696.25
Net Source Energy	6106.49	1696.25	1696.25

Site to Source Energy Conversion Factors

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