Week Assignment 6

Task 1:

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 transfer rate to be 1 % of the case without shields?

If the values are not equal

$Q_{from\ previous\ example}$ = 3625.4

1 % of $\dot{Q}$ = 36.254
$\varepsilon = 0.1$

$$36.253 = \frac{\sigma(T_1^4 - T_2^4)}{\left(\frac{1}{\varepsilon_1} + \frac{1}{\varepsilon_2} - 1\right) -}$$

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

1% of previous case $\dot{Q} = \frac{1}{100} \times 3625.3 \frac{W}{m^2} = 36.253\ ^W/_{m^2}$

$$36.253 \frac{W}{m^2} = \frac{5.67 \times 10^{-8} \times (800^4 - 500^4)}{(N+1)(\frac{1}{0.1} + \frac{1}{0.1} - 1)}$$

$$36.253 \frac{W}{m^2} = \frac{19680.57}{(N+1)(19)}$$

$N + 1 = 28.57$

N=27.57~28

If the values are equal

$\varepsilon_1 = \varepsilon_2 = \varepsilon_{3.1} = \varepsilon_{3.2} = 0.1$

T1 = 800 K

T2=500K

$$\frac{Q}{A} = \frac{\sigma\left(T_1^4 - T_2^4\right)}{\left(\frac{1}{\varepsilon} + \frac{1}{\varepsilon} - 1\right)} \quad \frac{Q}{A} = \frac{5.67 \times 10^{-8} \times \left(800^4 - 500^4\right)}{\left(\frac{1}{0.1} + \frac{1}{0.1} - 1\right)} = 1035.81 \text{ w/ m}^2$$
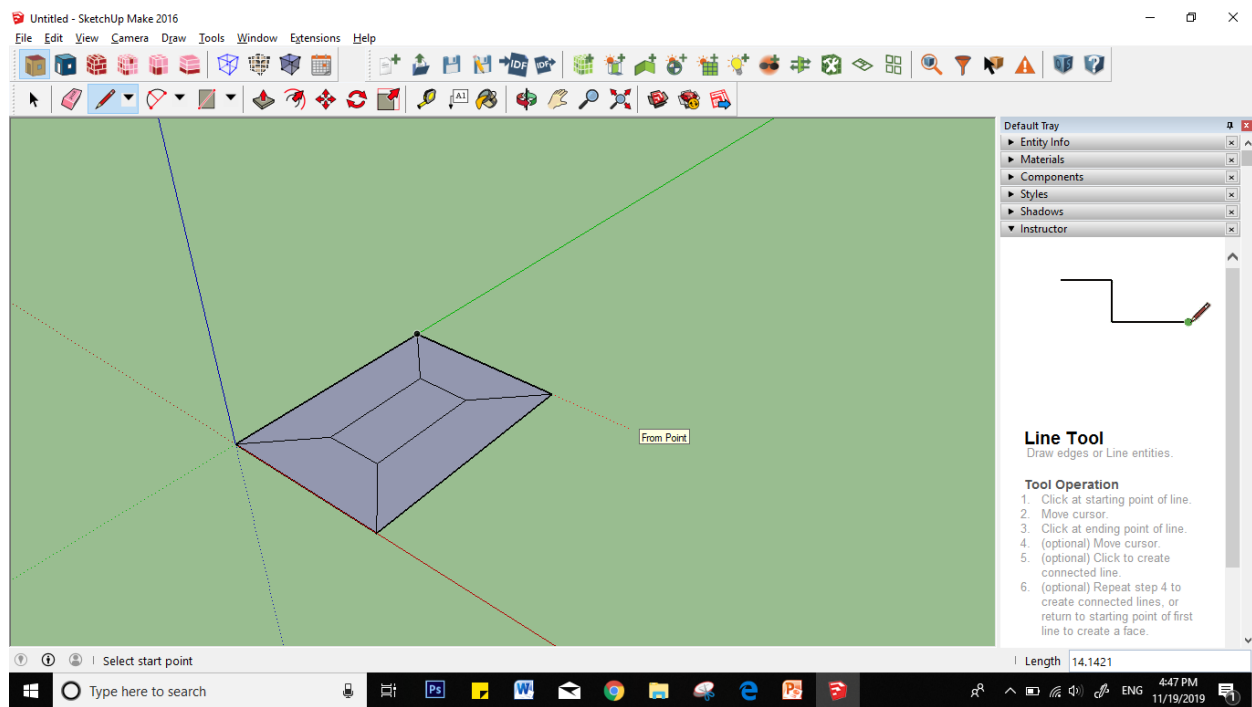
1035.81 X 1% = 10.35

$$\frac{\sigma\left(T_1^4 - T_2^4\right)}{(N+1)\left(\frac{1}{\varepsilon} + \frac{1}{\varepsilon} - 1\right)} = \frac{1}{N+1}$$
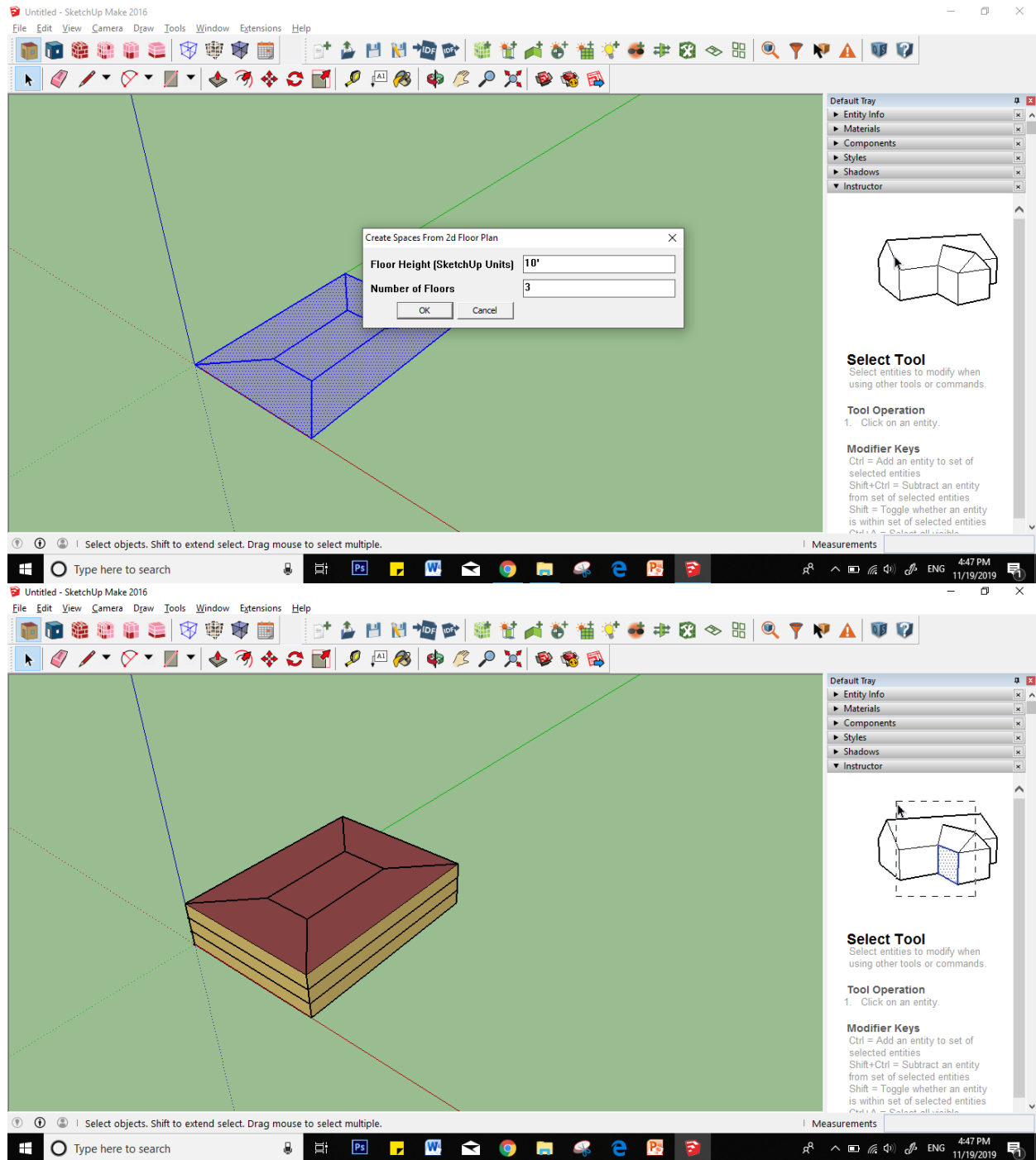
$$\frac{1}{(N+1)}Q = \frac{1}{100}Q$$

99 SURFACES TO LOWER THE RADIATION 1 %

Task 2:

Step 1: I created a building plan of a rectangle 30 x 40 m with an offset 10 m inside it and connecting the corners of the smaller rectangle to the bigger one.

Step 2: I created three levels structure by using "create spaces for diagram" tool and after that you can use the info tool icon for information.

Step 3: I matched the surface of the building by using the "match surface tool" to create a suitable door window placement of the building.
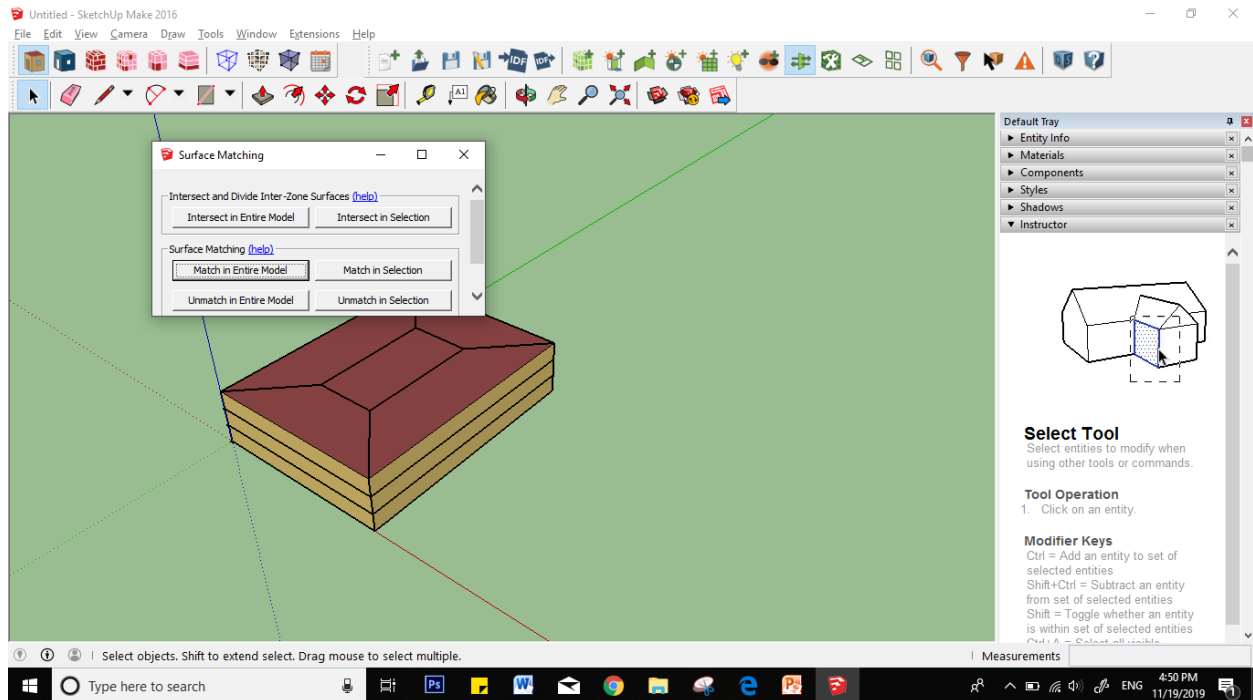
Step 4: I added windows to the building through the extensions, open studio and continuing the following steps as shown below.
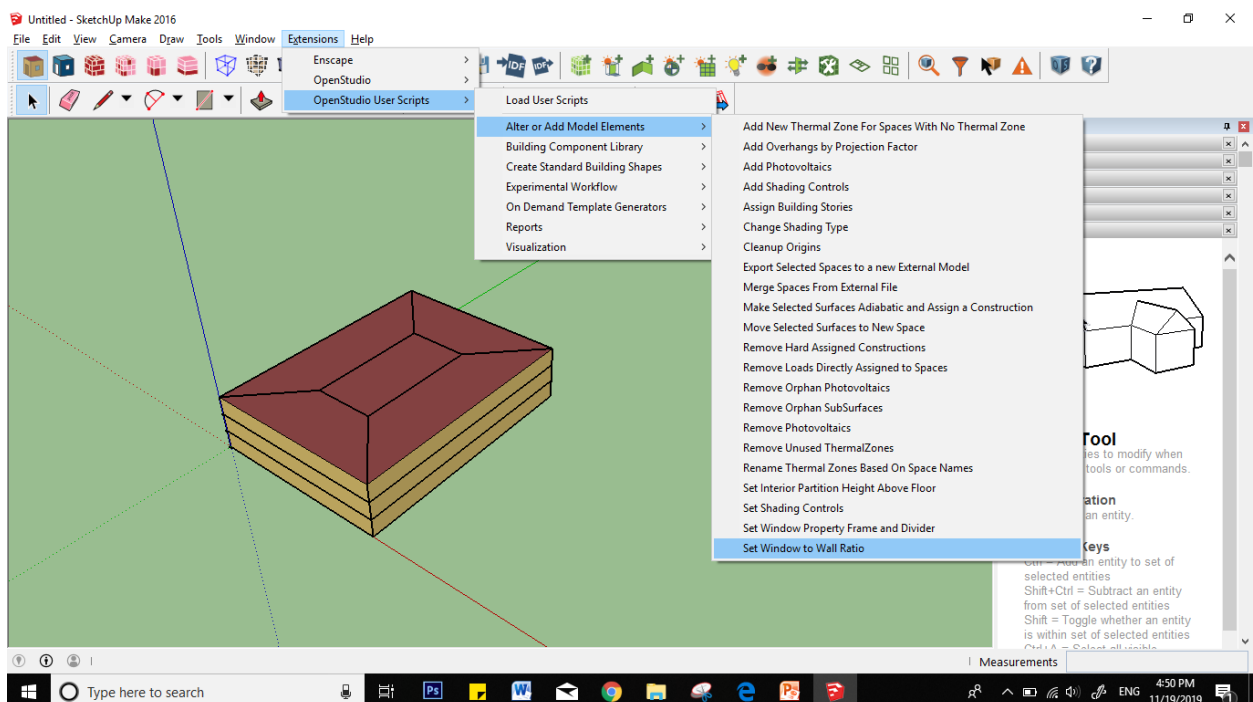
Step 5: This is the result of the windows with dimensions 0.4 and 0.75 for the offset from the floor.
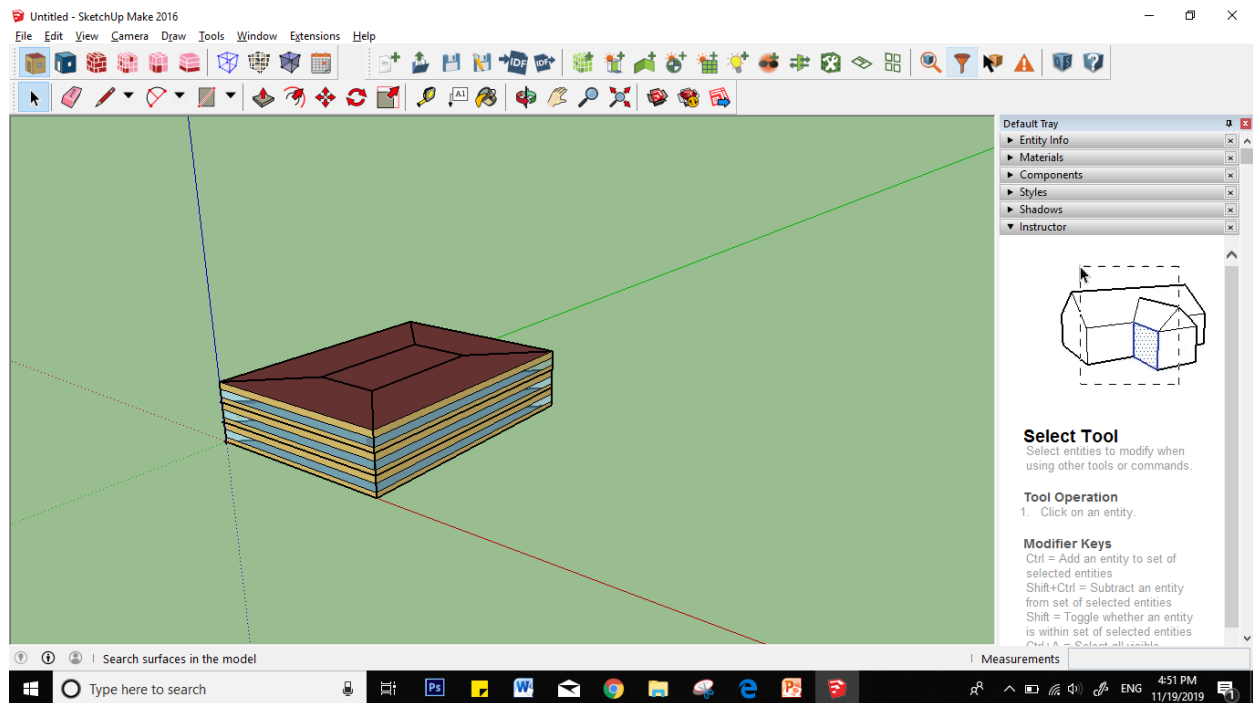
step 6: I used the surface selection and selected all the building except the north surface to add external shadings. Change the surface orientation section to 45 and 270.
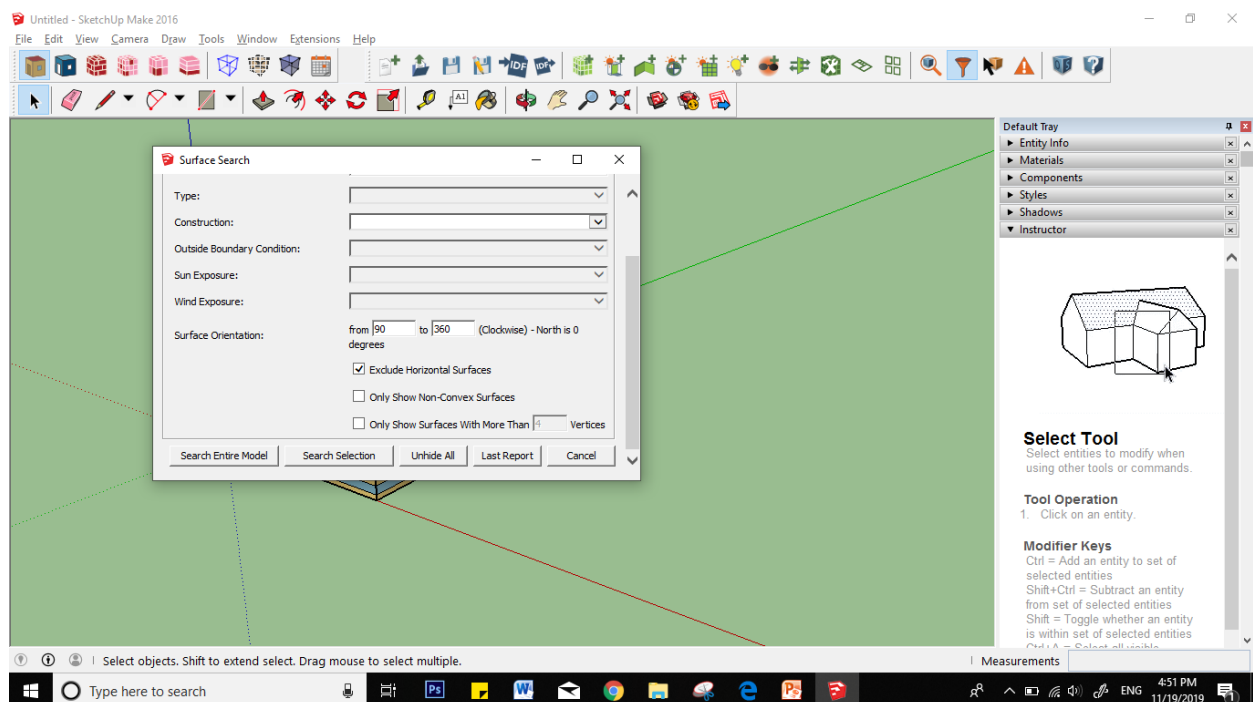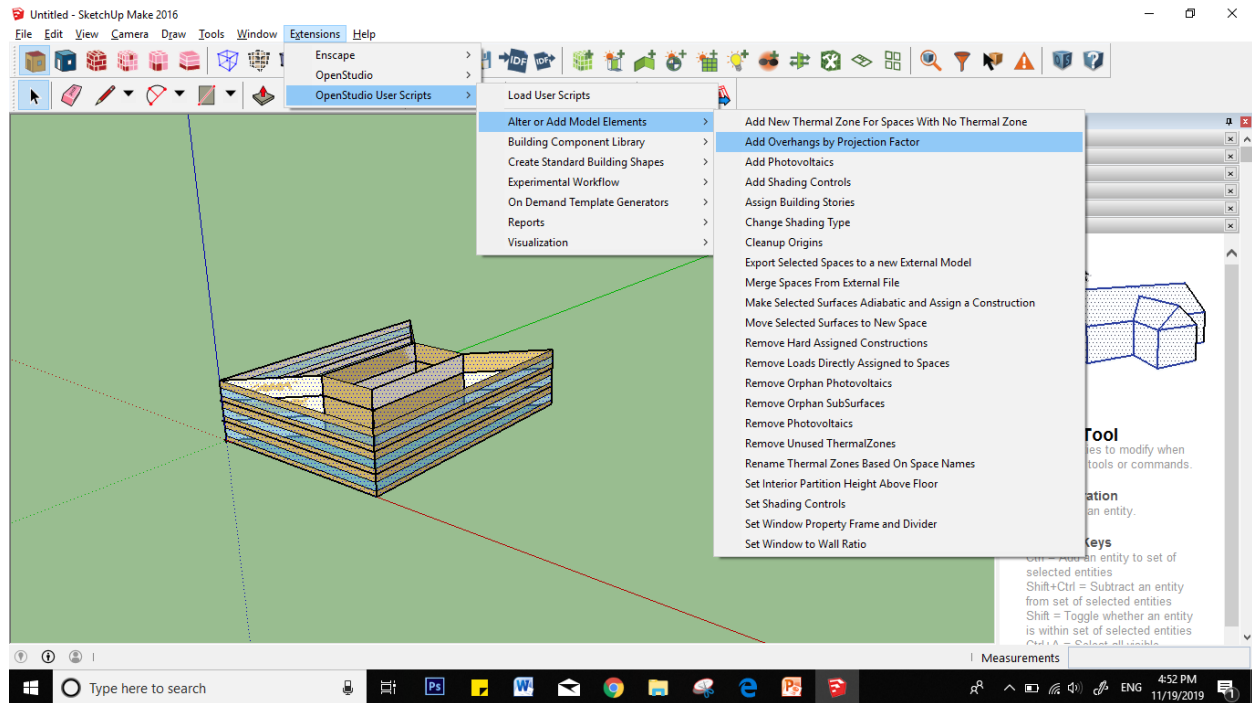
Then go to the extensions – Alter or add model element – add overhangs by projection factor
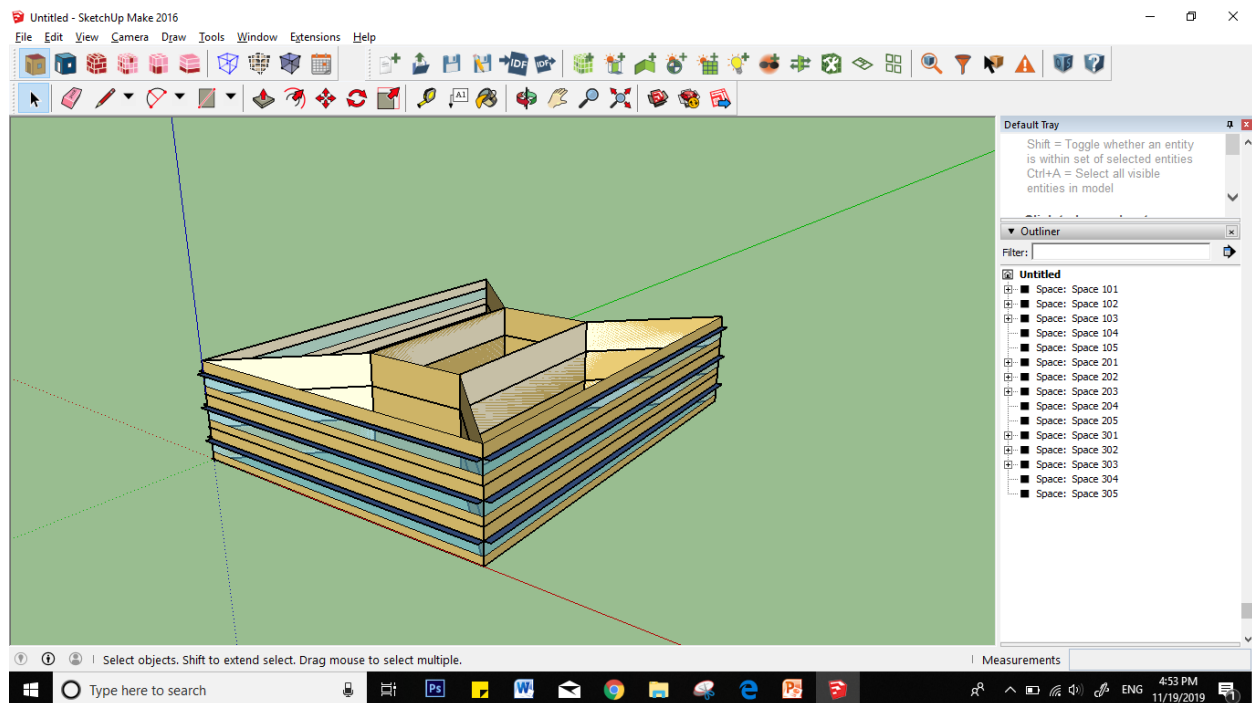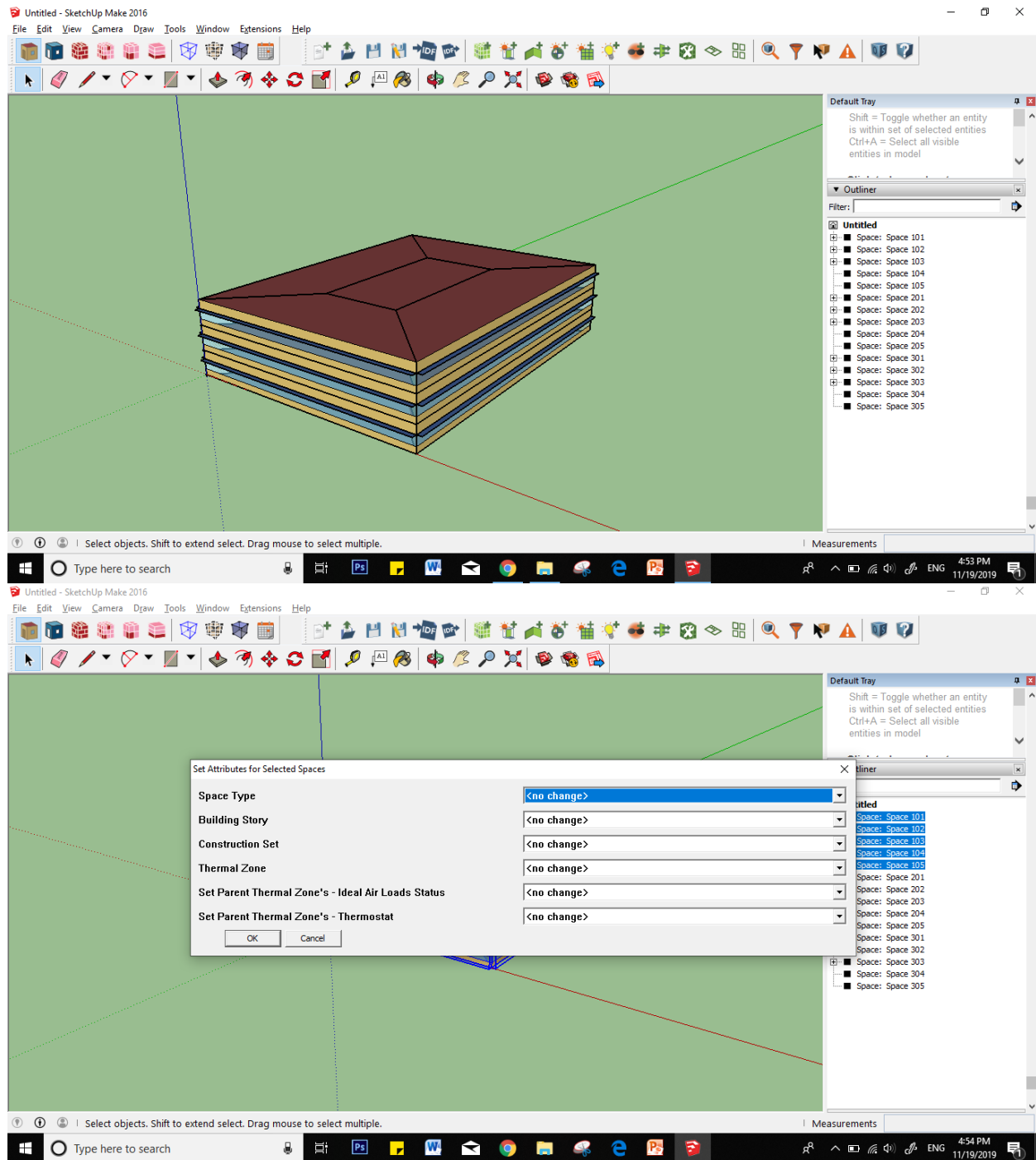
Step7: Then we start using spaces choosing spaces of each thermal zones ad we add it specifications.
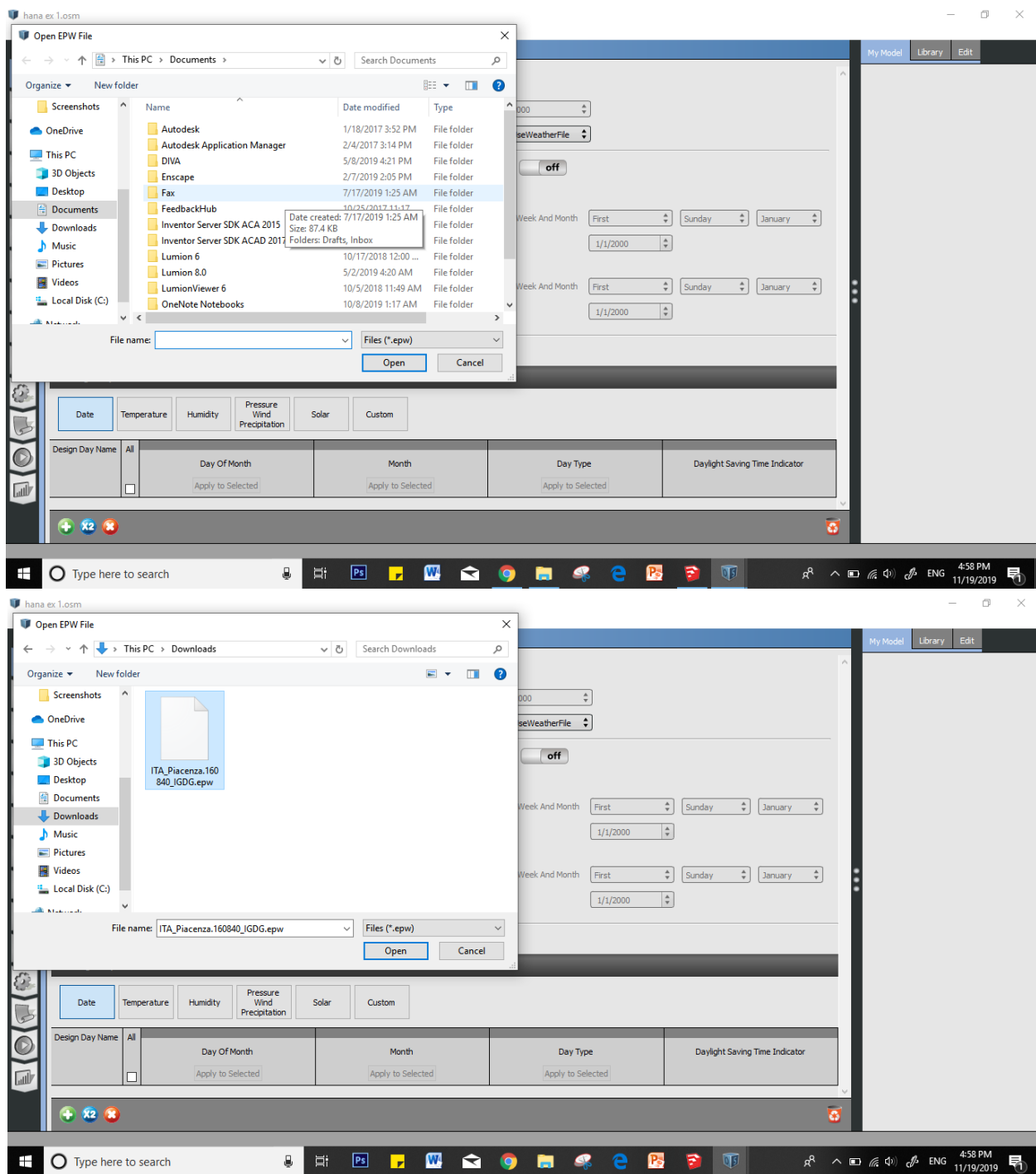
Step 8: I save the project as an open studio so that I can open it in open studio software. I open the file created and add the weather data of Piacenza and then I run it.

Screenshot 1 (top):

hana ex 1.osm*

File Preferences Components & Measures Help

Run Simulation | Output | Tree

Run

Ready

Notice: EnergyPlus 8.5.0 Build "c87e61b44b" is required and not yet located. Run Preferences -> Scan For Tools to locate.

Warnings: 0

Errors: 0

Output

0%

Type here to search   4:59 PM 11/19/2019

Screenshot 2 (bottom):

Untitled - SketchUp Make 2016

File Edit View Came...

hana ex 1.osm*

File Preferences Components & Measures Help

Site | Weather File & Design Days | Life Cycle Costs | Utility Bills

My Model | Library | Edit

Weather File   Change Weather File

Name: Piacenza

Latitude: 44.92

Longitude: 9.73

Elevation: 134

Time Zone: 1

Download weather files at www.energyplus.gov

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

Select Year by:

○ Calendar Year   2000

● First Day of Year   Sunday

Daylight Savings Time: off

Starts

○ Define by Day of The Week And M...

● Define by Date

Ends

○ Define by Day of The Week And M...

○ Define by Date

Default Tray

Shift = Toggle whether an entity is within set of selected entities

Ctrl+A = Select all visible entities in model

▼ Outliner

Filter:

Untitled
- Space: Space 101
- Space: Space 102
- Space: Space 103
- Space: Space 104
- Space: Space 105
- Space: Space 201
- Space: Space 202
- Space: Space 203
- Space: Space 204
- Space: Space 205
- Space: Space 301
- Space: Space 302
- Space: Space 303
- Space: Space 304
- Space: Space 305

Select objects. Shift to extend select. Drag mouse to select multiple.

Measurements

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