WEEK 6 – ASSIGNMENT T_GEORGE

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

ANWSER

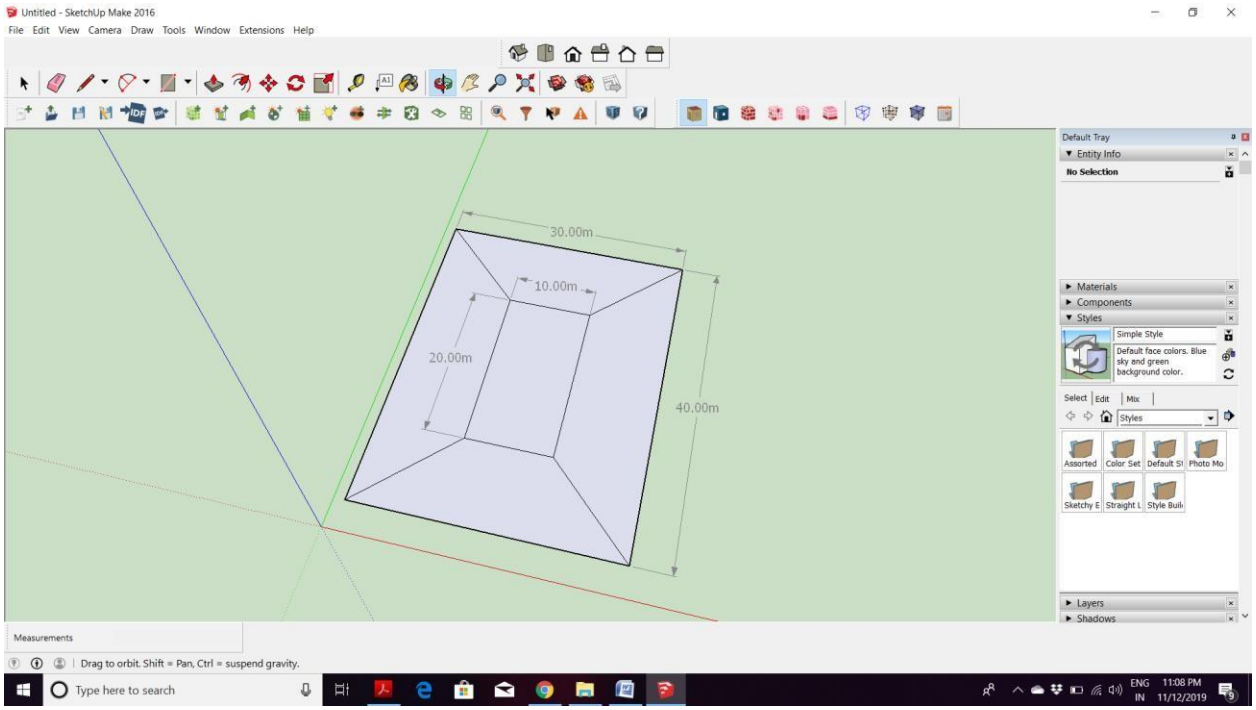
From the previous assignment

Q12 = 1035.81 W/m2
Q12 N_shield = 10.3581 W/m2
We need to calculate N
Q12 N_shield = 1/ (N+1) Q12
10.3581 = 1/ (N+1) 1035.81
10.3581/1035.81 = 1/ (N+1)
0.01 = 1/ (N+1)
100 = N+1
99 = N

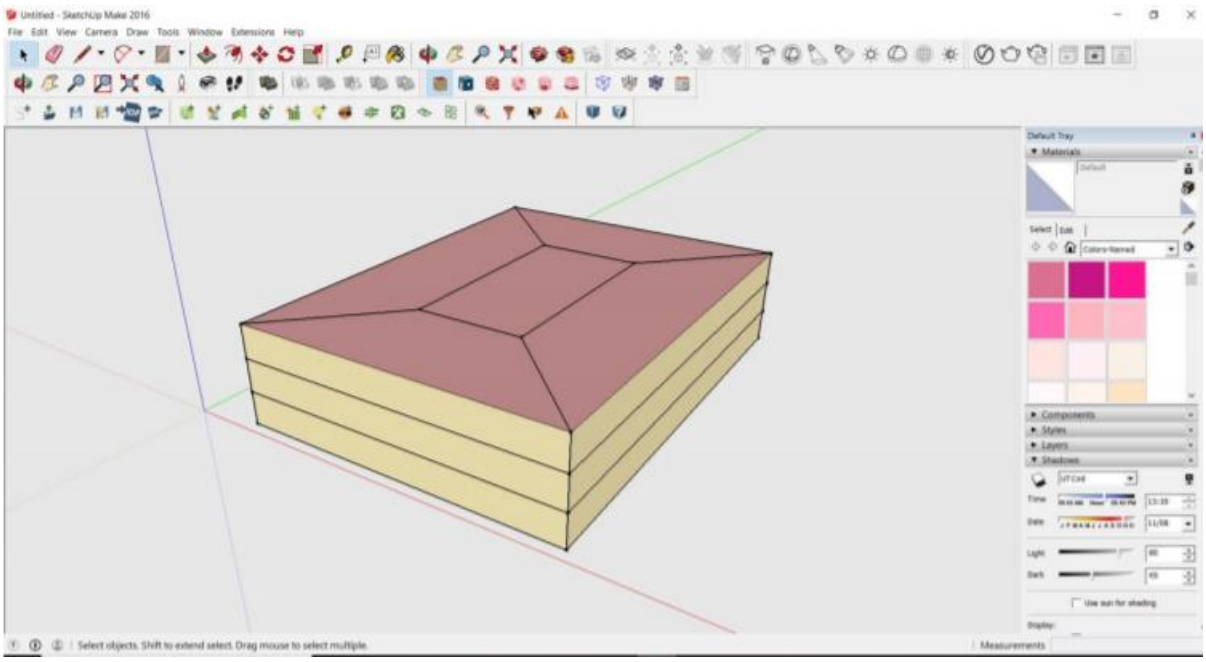
Therefore, we need 99 shields in order to have the new heat transfer to be 1% in the case without any shields

Task 2

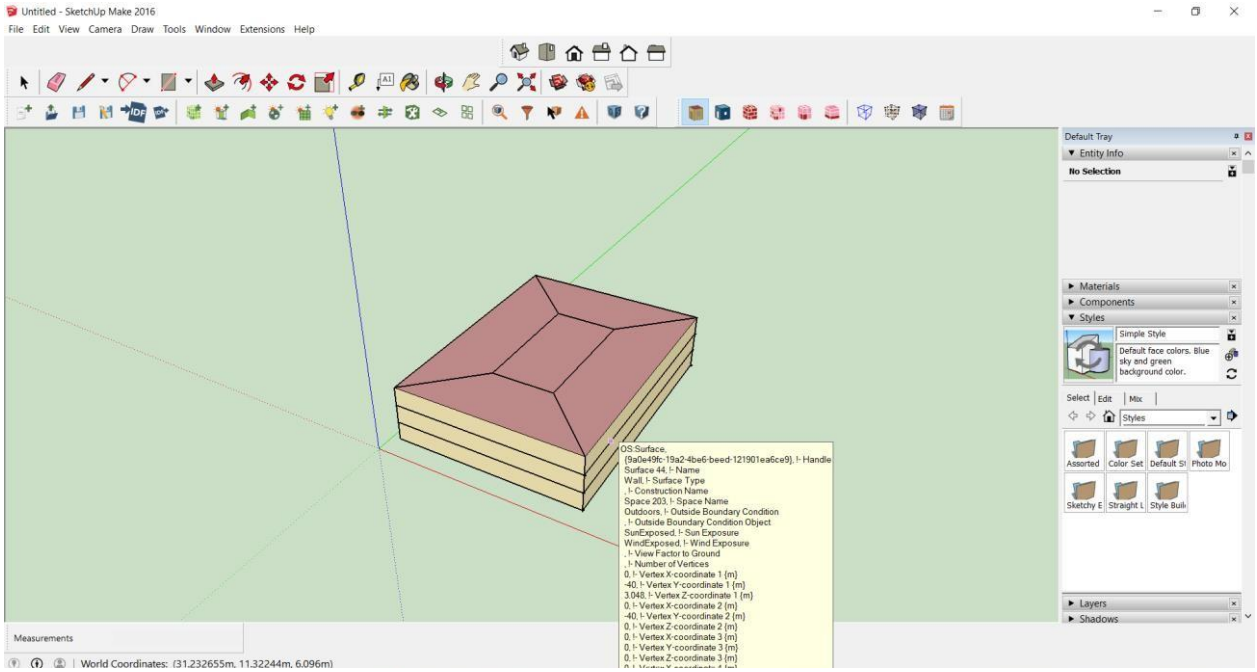
** Task 2** You should create a pdf file with screenshots of all of the steps we went through (clearly from your own file) and explain briefly the reason behind the use of each step (in your own words!)



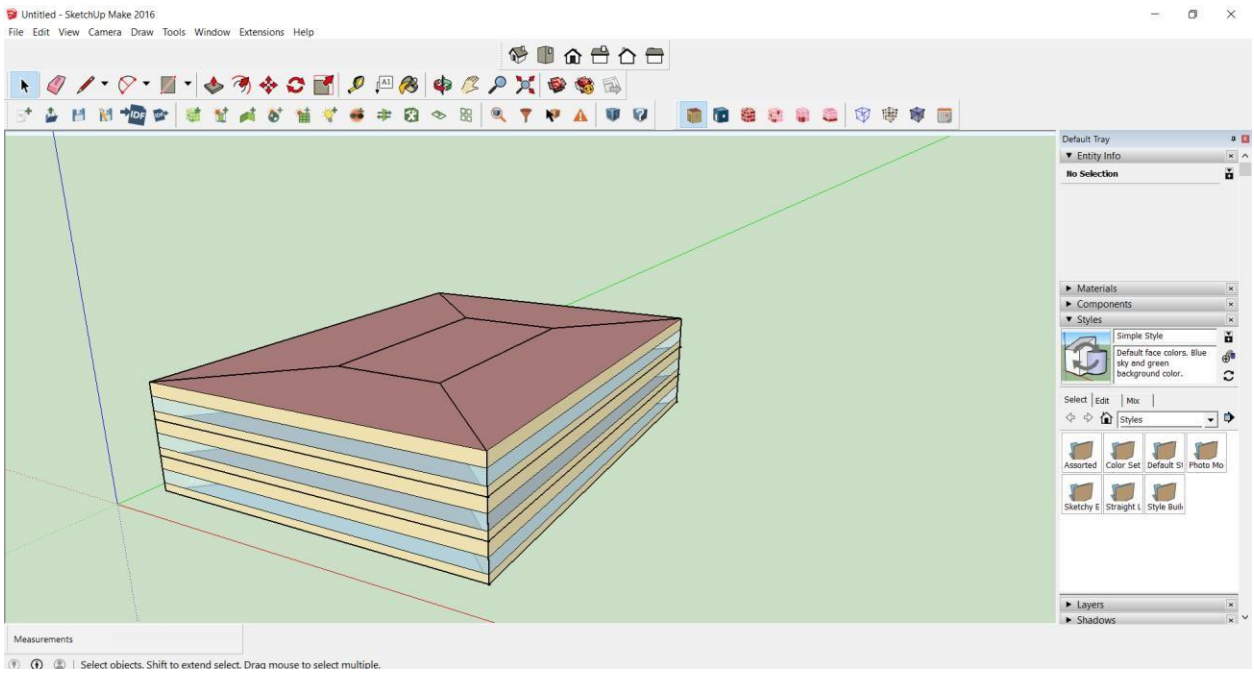
Create a rectangle of 30 x 40m and create another rectangle inside it by offsetting the bigger rectangle by 10m and join the edges



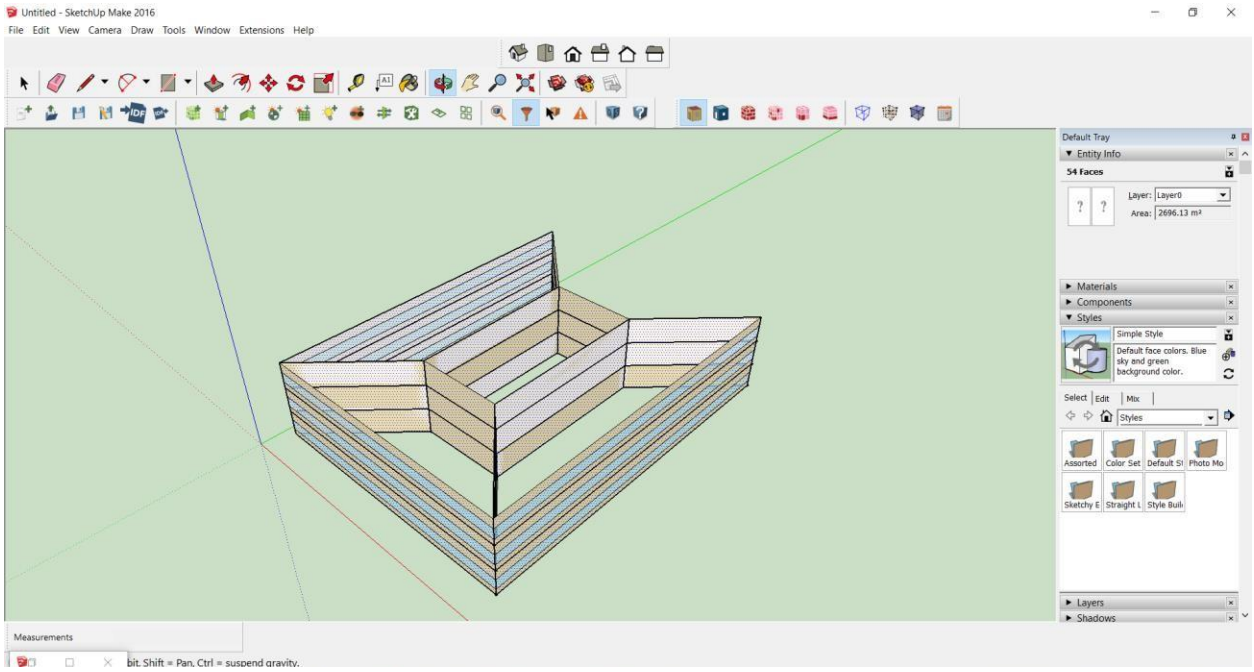
Click on ‘create spaces from diagram’ tool to define height of each floors.



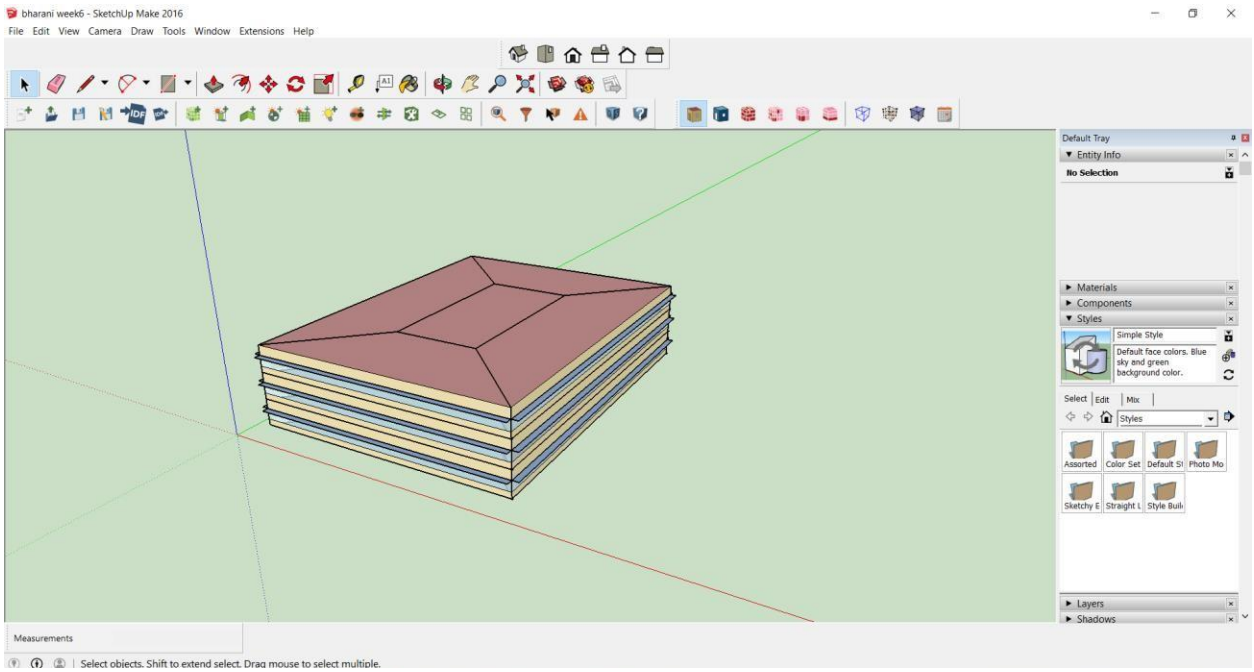
Click on the info tool to see the properties of each surface



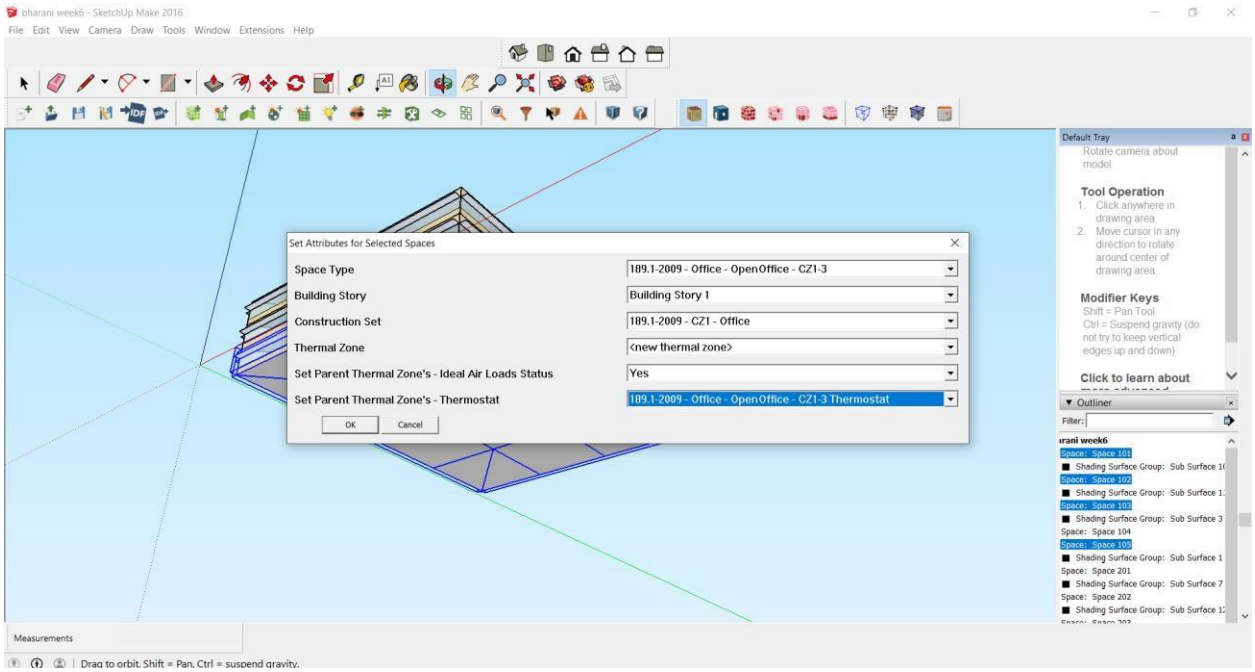
To create windows, click on surface matching tool to match all the surfaces and click on set window to wall ratio and give the values to create windows. Assuming there is no harsh sun in the North façade, we exclude that by typing 90° to 360° in the dialog box



Select the entire model surface expect north side. Click on ‘search surface’ tool to exclude the surface to provide shading and give the surface orientation from 90 to 360.



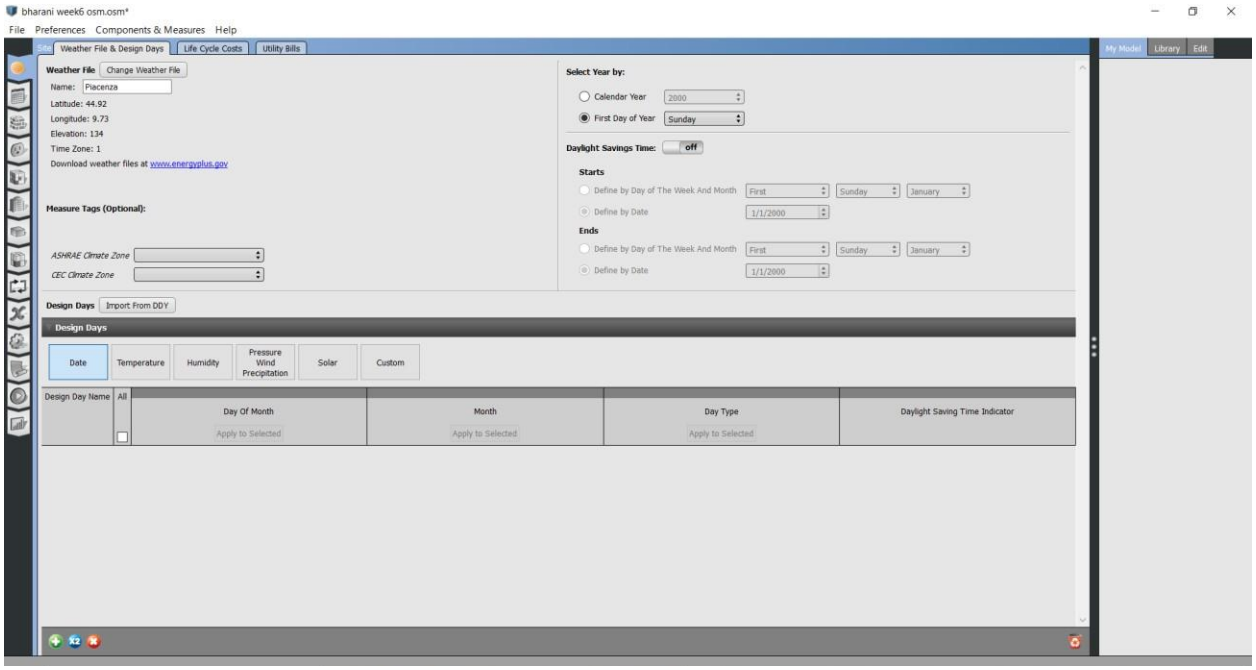
Using the ‘add overhangs by projection factor’ tool to provide sun shades for the windows by inputting the width of the projection.



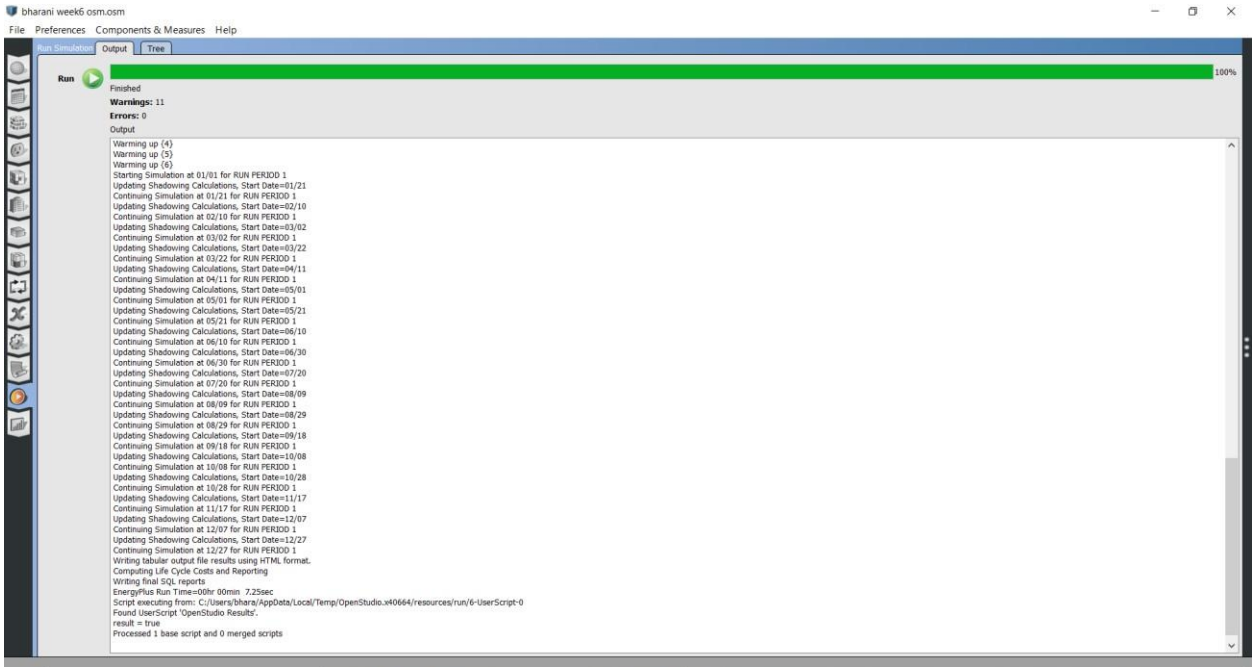
Click on ‘set attributes for the selected spaces’ to provide thermal zones for spaces

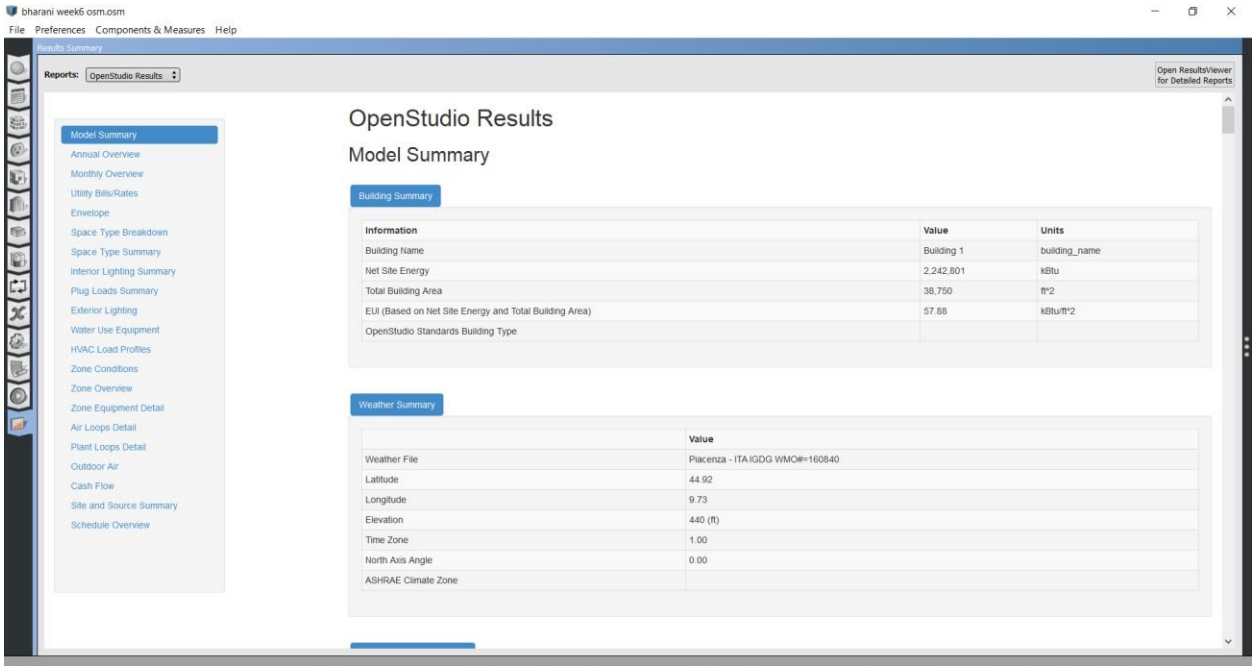
Repeat the process for each floor.

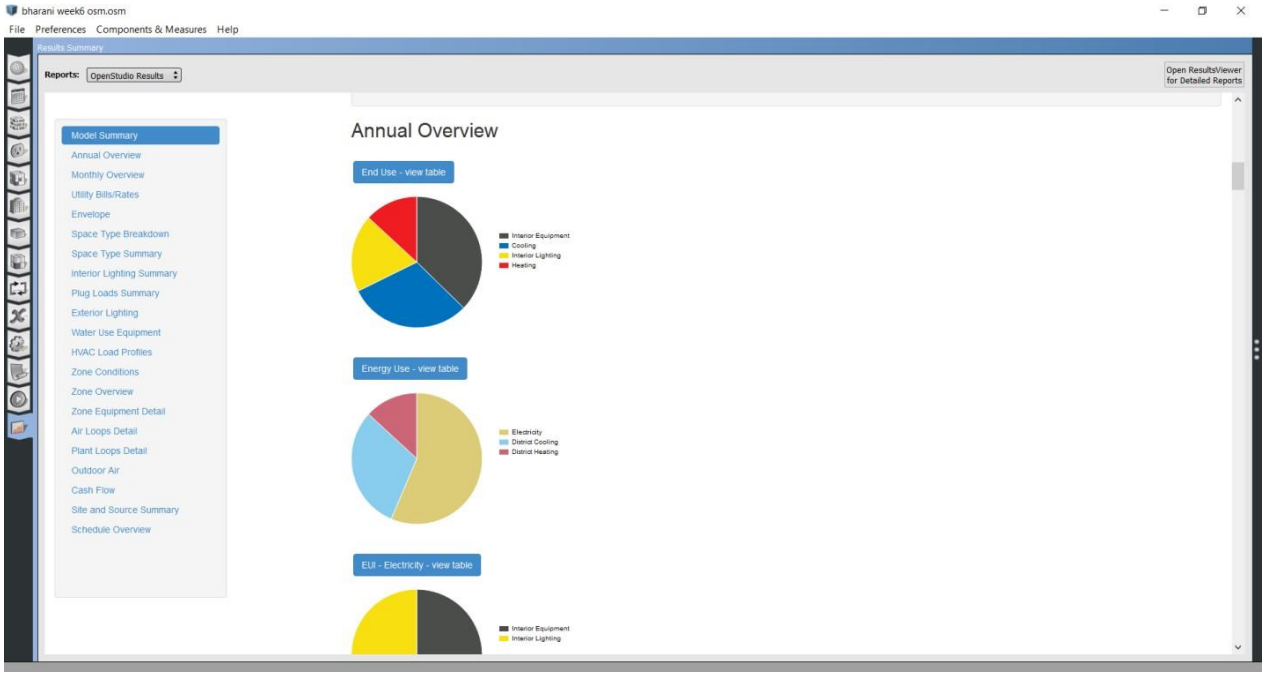
Click on save as and save the process



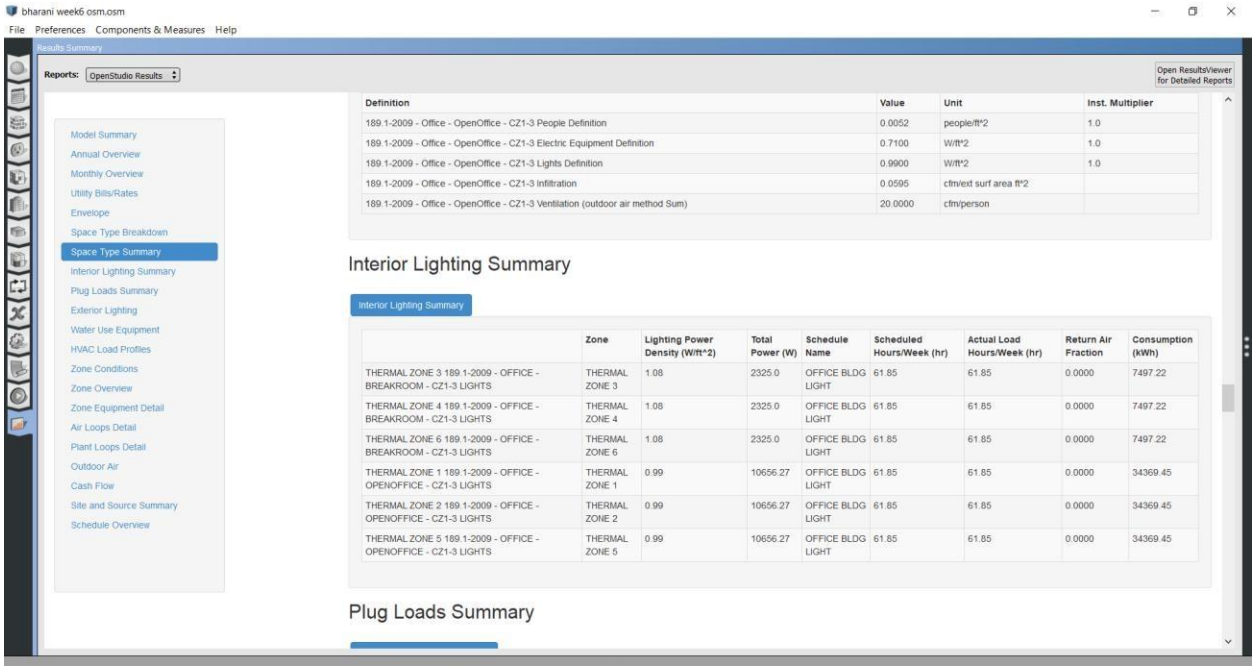
Open the ‘OPEN STUDIO’ software and input weather data of Piacenza i.e. Piacenza weather data (assuming the office is in Piacenza). And then load the sketch file in this software and we run the model to calculate the energy consumption and other information.


bharani week6 osm.osm
File Preferences Components & Measures Help
Run Simulation
Output
Tree
Run
100%
Finished
Warnings: 11
Errors: 0
Output
Warming up (4)
Warming up (5)
Warming up (6)
Starting Simulation at 01/01 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=01/21
Continuing Simulation at 01/21 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=02/10
Continuing Simulation at 02/10 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=03/02
Continuing Simulation at 03/02 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=03/22
Continuing Simulation at 03/22 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=04/11
Continuing Simulation at 04/11 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=05/01
Continuing Simulation at 05/01 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=05/21
Continuing Simulation at 05/21 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=06/10
Continuing Simulation at 06/10 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=06/30
Continuing Simulation at 06/30 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=07/20
Continuing Simulation at 07/20 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=08/09
Continuing Simulation at 08/09 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=08/29
Continuing Simulation at 08/29 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=09/18
Continuing Simulation at 09/18 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=10/08
Continuing Simulation at 10/08 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=10/28
Continuing Simulation at 10/28 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=11/17
Continuing Simulation at 11/17 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=12/07
Continuing Simulation at 12/07 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=12/27
Continuing Simulation at 12/27 for RUN PERIOD 1
Writing tabular output file results using HTML format.
Computing Life Cycle Costs and Reporting
Writing final SQL reports
EnergyPlus Run Time=00hr 00min 7.25sec
Script executing from: C:/Users/bhara/AppData/Local/Temp/OpenStudio.x40664/resources/run/6-UserScript-0
Found UserScript 'OpenStudio Results'.
result = true
Processed 1 base script and 0 merged scripts


bharani week6 osm.osm
File Preferences Components & Measures Help
Results Summary
Reports: OpenStudio Results
Open ResultsViewer for Detailed Reports
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
OpenStudio Results
Model Summary
Building Summary
Information
Value
Units
Building Name
Building 1
building_name
Net Site Energy
2,242,801
kBtu
Total Building Area
38,750
ft^2
EUI (Based on Net Site Energy and Total Building Area)
57.88
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


bharani week6 osm.osm
File Preferences Components & Measures Help
Results Summary
Reports: OpenStudio Results
Open ResultsViewer for Detailed Reports
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
Annual Overview
End Use - view table
Interior Equipment
Cooling
Interior Lighting
Heating
Energy Use - view table
Electricity
District Cooling
District Heating
EUI - Electricity - view table
Interior Equipment
Interior Lighting


bharani week6 osm.osm
File Preferences Components & Measures Help
Results Summary
Reports: OpenStudio Results
Open ResultsViewer for Detailed Reports
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
District Cooling Peak Demand (kBtu/hr) - view table
District Cooling Peak Demand (kBtu/hr)
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month
Cooling
District Heating Peak Demand (kBtu/hr) - view table
District Heating Peak Demand (kBtu/hr)
Heating



After, we run the data, we arrive at the result of the energy consumption like annual overview of the consumption, monthly overview, monthly bills, lighting consumptions, plug point consumption, exterior lighting, equipment consumption(if we have loaded any), water consumption, air loops detail, cash flow etc