Politecnico di Milano University
M.Arch Sustainable Architecture and Landscape Design
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POLITECNICO
MILANO 1863

WEEKLY SUBMISSION - TASK 06

01. 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 ?

02. 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!)

ANSWERS:

01.

$\varepsilon 1 = 0.1$
$T1 = 800 \ K$

$\dot{Q}_{12}$

$\varepsilon 2 = 0.1$
$T2 = 500 \ K$
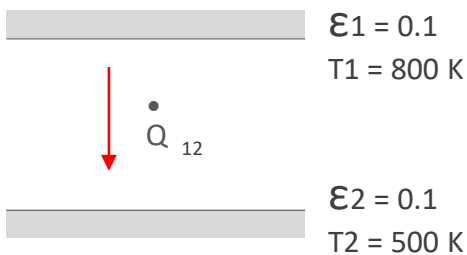
Heat transfer without shield = 1,035.8 W
To be 1% of it, the heat transfer should be = 10.358 W

$$\dot{Q}_{12, N \ shield} = \frac{1}{N+1} \ \text{x} \ \dot{Q}_{12, no \ shield}$$

$$10.358 = \frac{1}{N+1} \ \text{x} \ 1,035.8 \ W$$

$$10.358 = \frac{1,035.8}{N+1} \longrightarrow$$
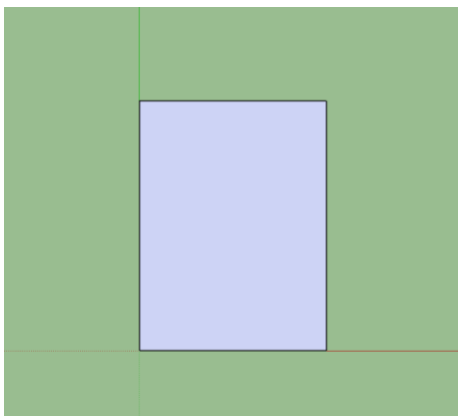
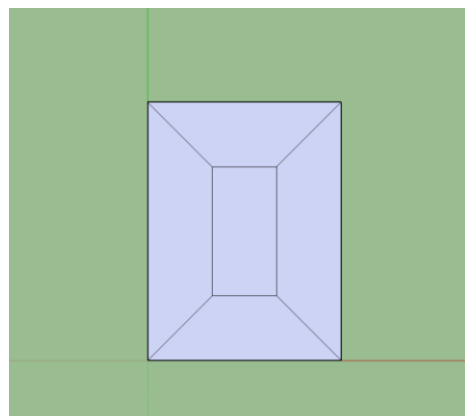$$10.358 \ N + 10.358 = 1,035.8 \ W$$

$$10.358 \ N = 1,025.442$$
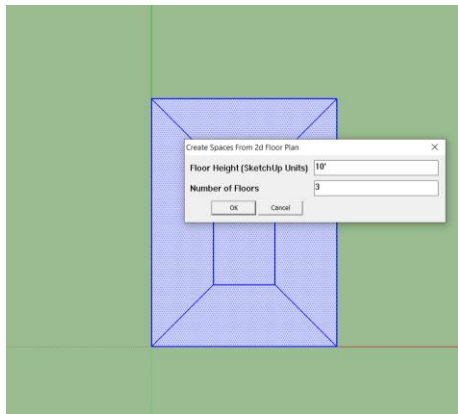
N = 99 shields

02.
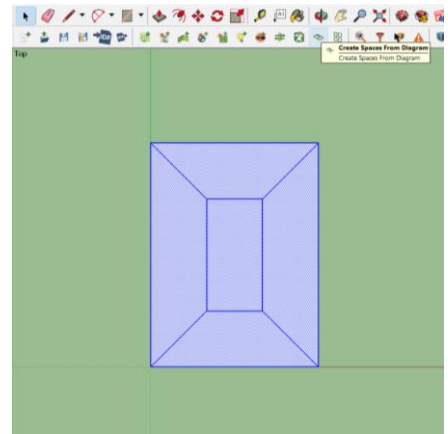
Step 01: Create a rectangle of 40x30m

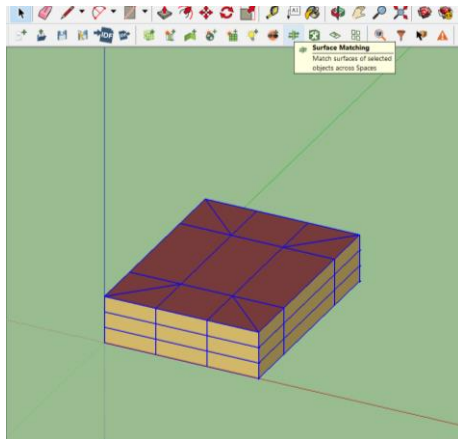Step 02: Create an offset of 10 m and connect the edges

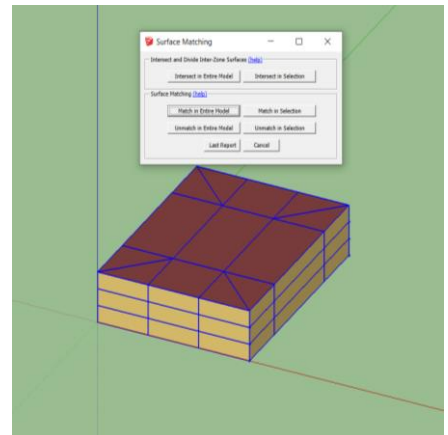**Step 03:** Select the face and click on "create spaces from diagram"

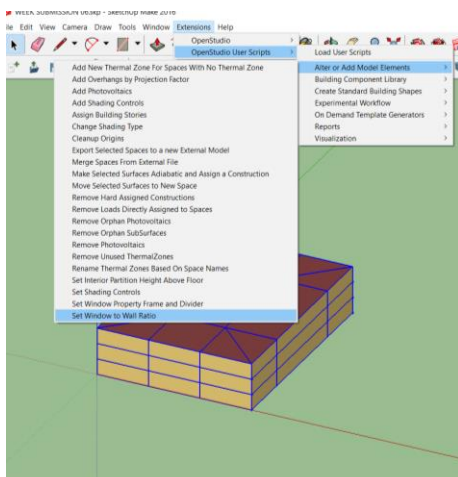**Step 04:** Create a building with 3 floors

Step 05: With the building created, select the entire volum and click on "matching surfaces.
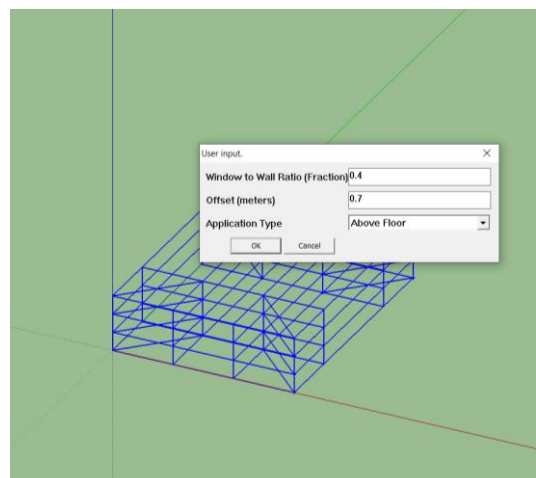

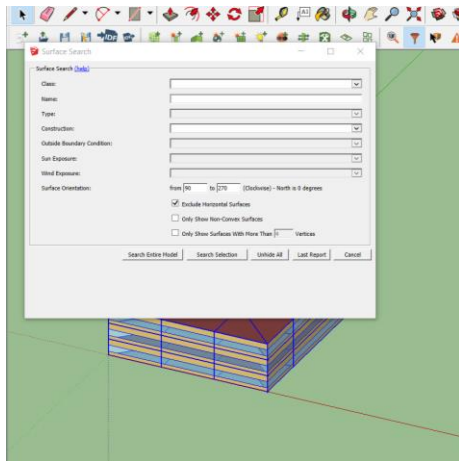**Step 06:** Click ok match in entire model > ok

Step 07: Add Windows in Extensions >
OpenStudio User Scripts
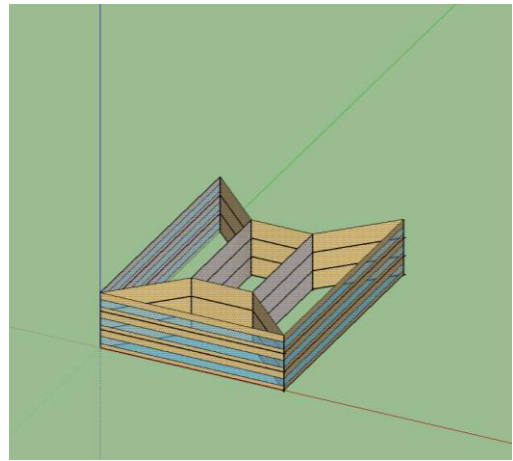Alter or Add Model Elements >
Set window to Wall Ratio

Step 08: Set the fraction of window to wall ratio, the offset in meters and the application type > ok
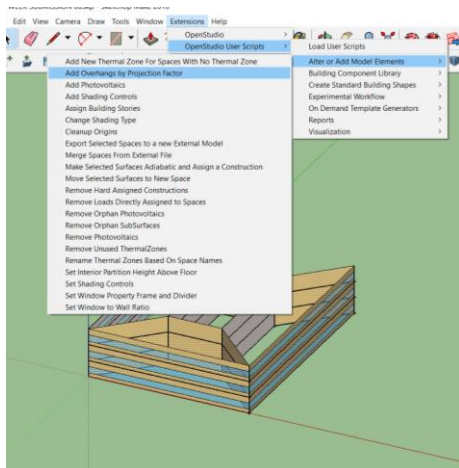
Step 09: Select the facade surface except the north, using search surface.
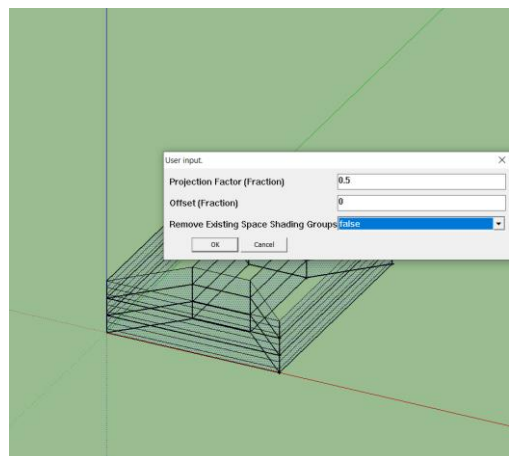

Step 10: All facade surfaces were selected except north.
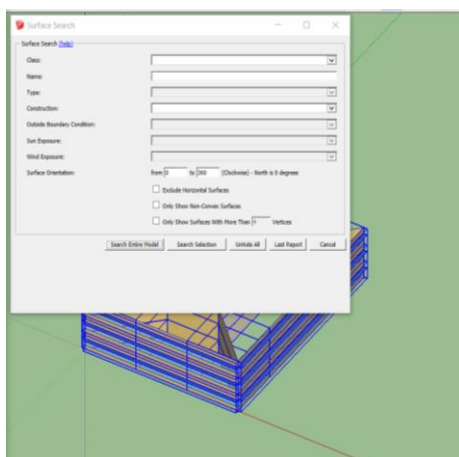

Step 11: Add overhang through Extensions> OpenStudio User Scripts > Alter or Add Model Elements > Add Overhangs by Projection Factor
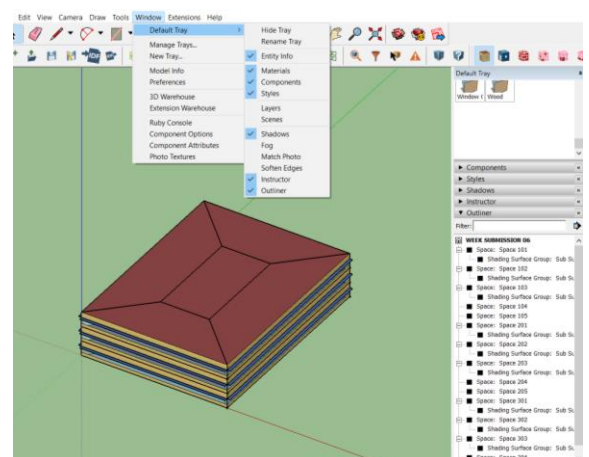

Step 12: Insert the values for projection factor, offset and mark as false the Remove Existing Space Shading Groups option.
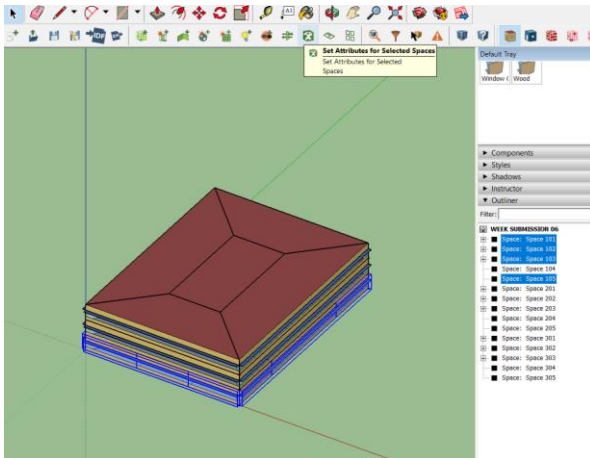

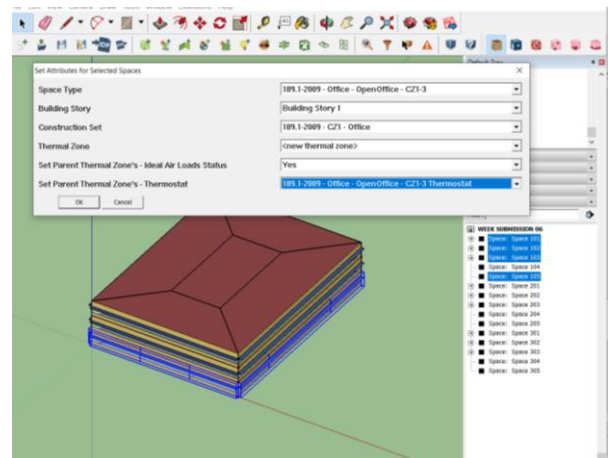Step 13: Select the entire building and with the "Search Surface"tool choose 0-360 surfaces.

Step 14: Active outliner in your tray through Window > Default Tray > Outliner
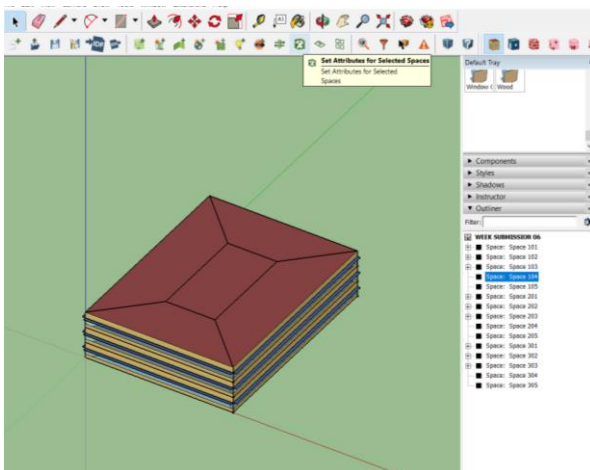
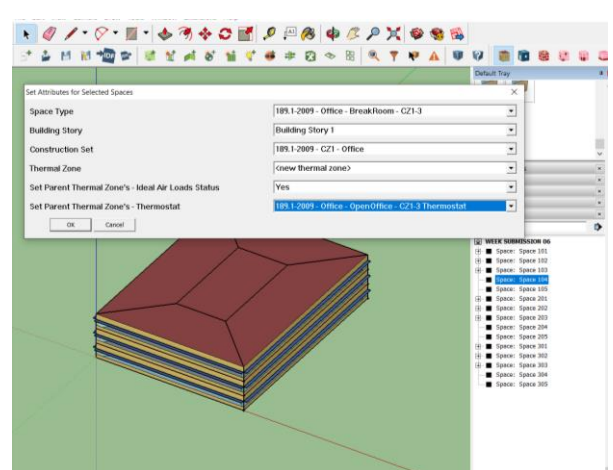**Step 15:** Select the outer spaces in the first floor and click on "Set Attributes for Selected Spaces"

Step 16: Add specifications to the outer spaces as follow:

Step 17: Select the inner space in the first floor and click on "Set Attributes for Selected Spaces"
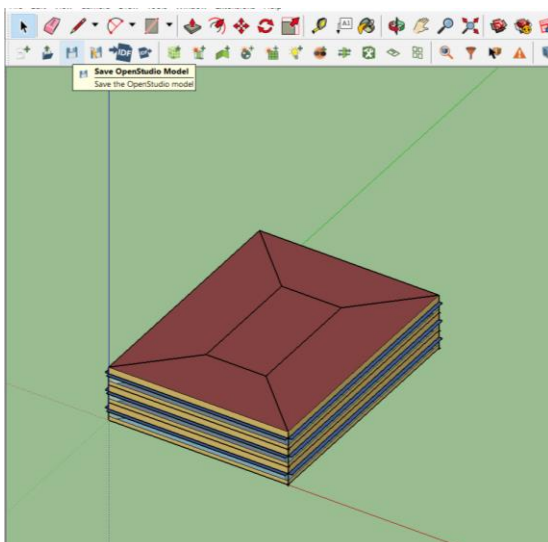

Step 18: Add specifications to the inner space as follow:

Step 19: Repeat the process for the second and third floor

Step 20: Save as a OpenStudio file

Step 21: Open OpenStudio Application, Open your file and Set Piacenza weather in Weather File

Step 22: Click on run simulation

Step 23: Run simulation process

Step 24: Review the results clicking on Results Summary