

Week six assignment

Wednesday, November 13, 2019 1:47 AM

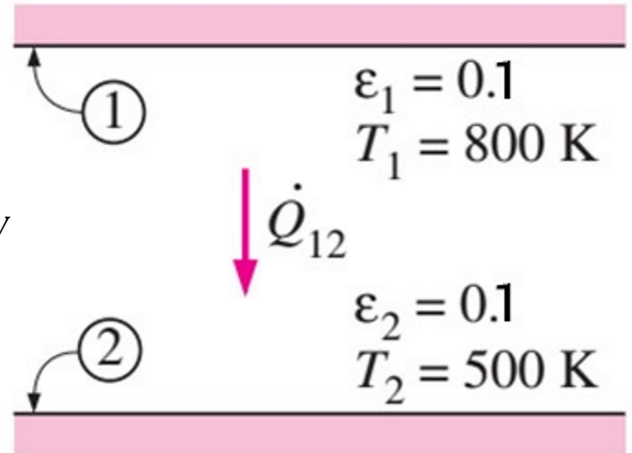
Task 1:

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 ?

$$\dot{Q}_{N \text{ shield}} = 1\% \dot{Q}(\text{no shield})$$

$$\dot{Q}(\text{no shield}) = 1.5 \times 5.67 \times 10^{-8} \frac{800^4 - 500^4}{\frac{1}{0.1} + \frac{1}{0.1} - 1} = 1553.72 \text{ W}$$

$$\dot{Q}_{N \text{ shield}} = \frac{A\sigma(T_1^4 - T_2^4)}{\left(\frac{1}{\epsilon_1} + \frac{1}{\epsilon_2} - 1\right) \left(\frac{1}{\epsilon_{3,1}} + \frac{1}{\epsilon_{3,2}} - 1\right)}$$



$$Q(n\text{-shields}) = A\sigma(T_1^4 - T_2^4) / ((n+1)[2\epsilon - 1])$$

$$Q_{1-2(\text{with } n \text{ shields})} = \left(\frac{1}{n+1}\right) \frac{A\sigma(T_1^4 - T_2^4)}{\left[\frac{2}{\epsilon} - 1\right]}$$

Q with n shield = 1% Q without shield

Q with shield / Q without shield = 0.01

$$\frac{1}{(n+1) \left(\frac{2}{\epsilon} - 1\right)} = 0.01$$

$$\frac{1}{19(n+1)} = 0.01$$

$$100 = n + 1$$

$$n = 99$$

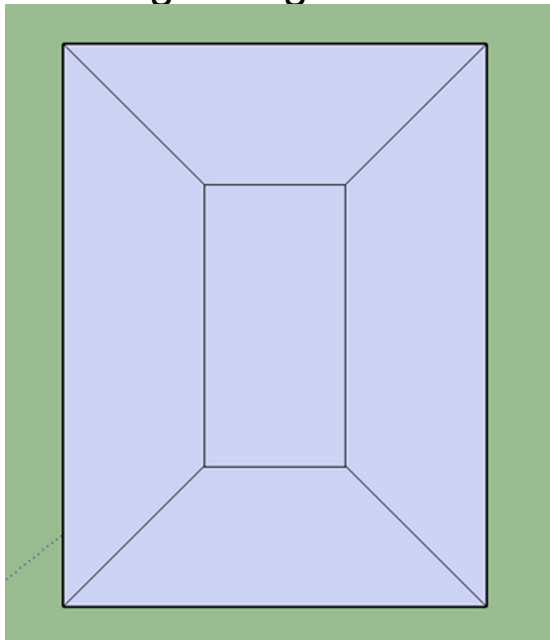
And hence the number of shield is 99 shields

Task two:

Create a pdf file with screenshots of all of the steps we went through and explain briefly the reason behind the use of each step.

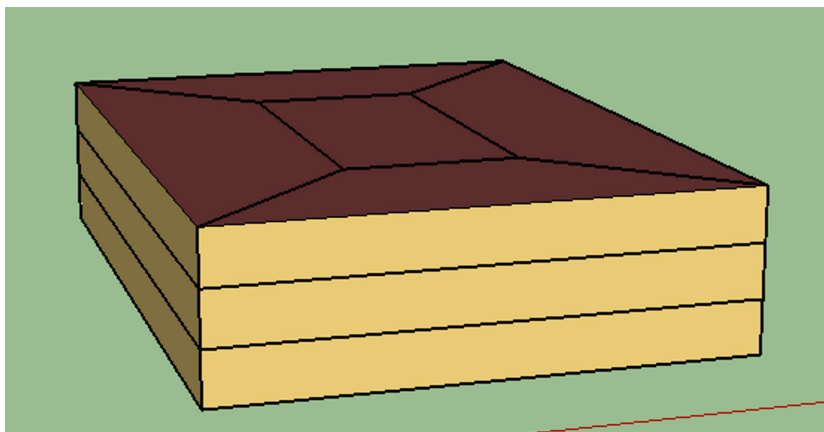
Step 1:

Creating a diagram with connected edges



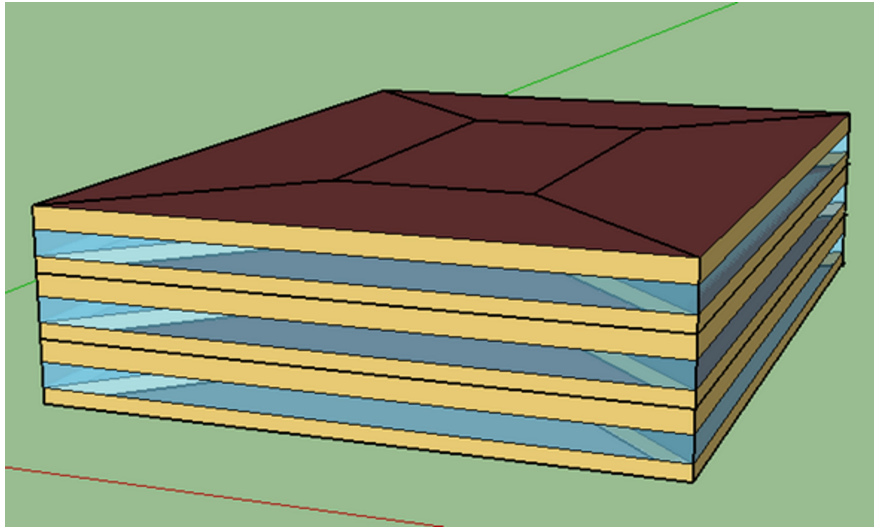
Step 2:

Creating spaces from diagram



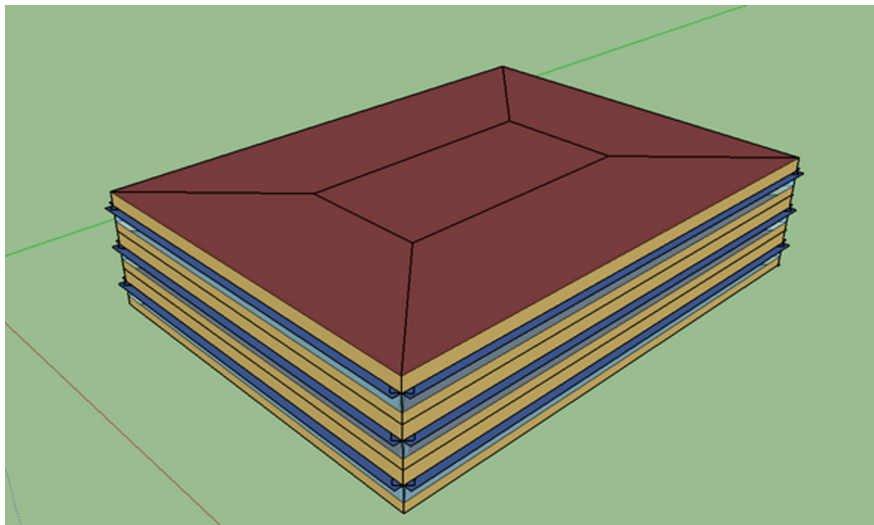
Step 3:

click on the surface matching tool to create windows in your building



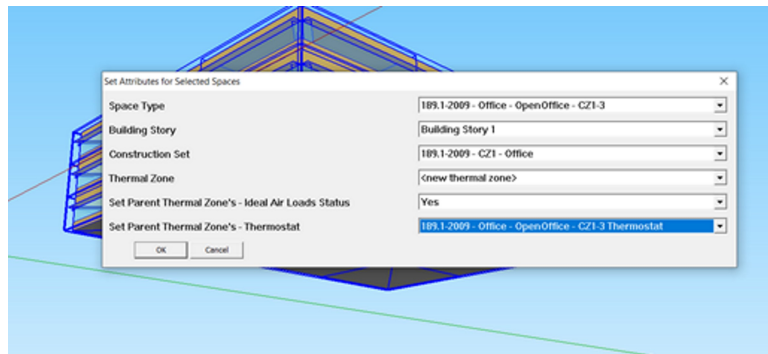
Step 4:

Overgang the external shadings



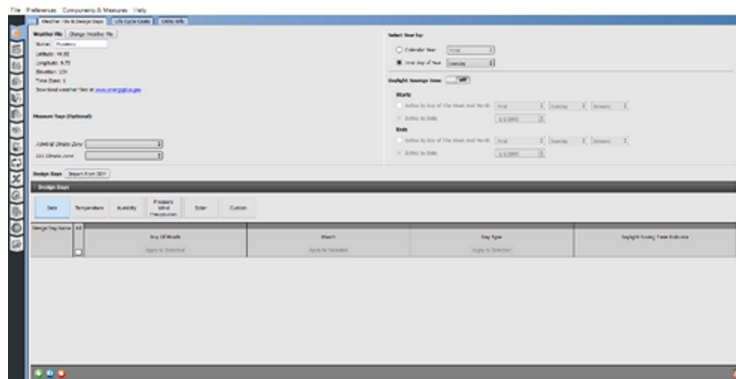
Step 5:

Add specifications to each thermal zone



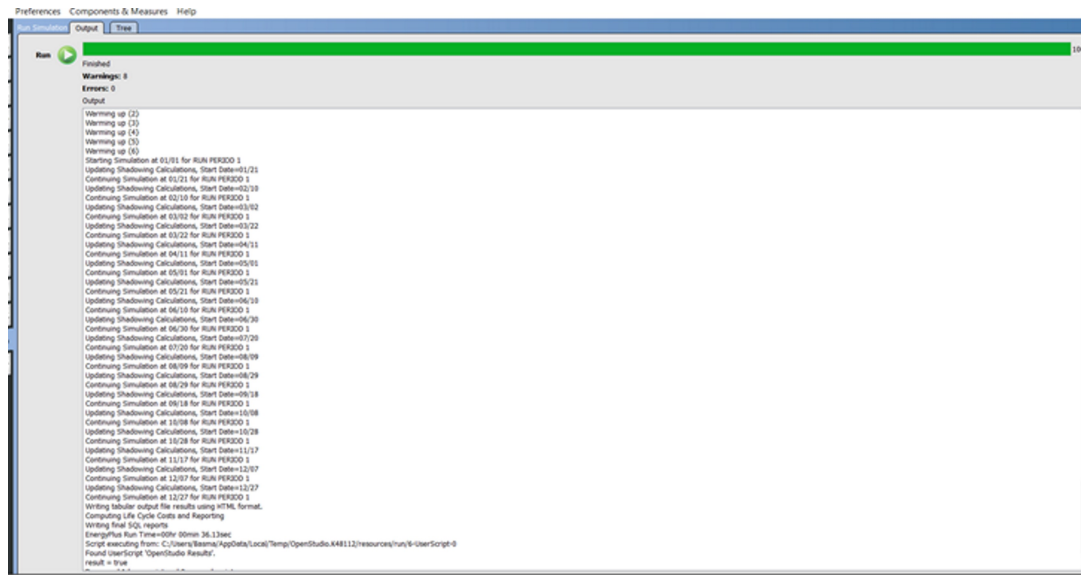
Step 6:

Launching open studio using sketchup and adding the weather data



Step 7:

Running the model



Step 8:

Reviewing the model summary in the last lab

OpenStudio Results		
Model Summary		
Building Summary		
Information	Value	Units
Building Name	Building 1	building_name
Net Site Energy	2,146,853	kWh
Total Building Area	38,750	ft ²
ELA (Based on Net Site Energy and Total Building Area)	55.40	kWh/ft ²
OpenStudio Standards Building Type		
Weather Summary		
Weather File		
Weather File	Placencia - ITA IGGG WMO#160540	
Latitude	44.92	
Longitude	9.73	
Elevation	440 (ft)	
Time Zone	1.00	
North Axis Angle	0.00	
ASHRAE Climate Zone		