

WEEK 6

Tuesday, November 12, 2019 11:03 PM

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- 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 ?

-8

$$\sigma = 5.67 \times 10$$

$$\epsilon_1 = \epsilon_2 = \epsilon_{3.1} = \epsilon_{3.2} = 0.1$$

$$T_1 = 800\text{K}$$

$$T_2 = 500\text{K}$$

If we assume that all values are equal

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 ?

$$Q/A = \frac{\sigma(T_1^4 - T_2^4)}{1/\epsilon_1 + 1/\epsilon_2 - 1} = 1035.81 \text{ W/m}^2 \quad 1035.81 \times 1\% = 10.35$$

$$\frac{\sigma(T_1^4 - T_2^4)}{(1/\epsilon_1 + 1/\epsilon_2 - 1)(N+1)} = 1/(N+1)$$

$$1/(N+1)Q = 1/100Q$$

99 Surfaces to lower the radiation to 1%

If not;

-8

$$\sigma = 5.67 \times 10$$

$$\epsilon_1 = 0.2$$

$$\epsilon_2 = 0.7$$

$$T_1 = 800\text{K}$$

$$T_2 = 500\text{K}$$

$$Q/A = \frac{\sigma(T_1^4 - T_2^4)}{1/\epsilon_1 + 1/\epsilon_2 - 1} = 3625.4 \text{ W/m}^2 \quad 3625.4 \times 1\% = 36.25$$

$$Q/A = \frac{\sigma(T_1^4 - T_2^4)}{(1/\epsilon_1 + 1/\epsilon_2 - 1) + (1/\epsilon_{3.1} + 1/\epsilon_{3.2} - 1) + (1/\epsilon_{n.1} + 1/\epsilon_{n.2} - 1)} = 36.25$$

$$19680.57/5.42 + 19n = 36.25$$

$$19680.57 = 36.25(5.42 + 19n)$$

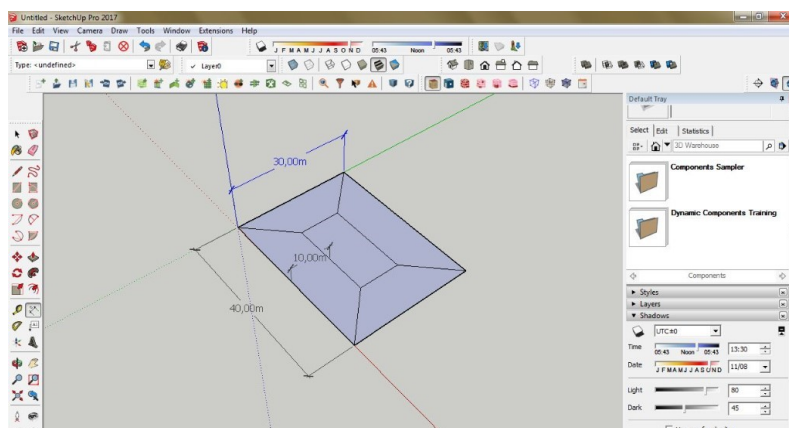
$$542.91 - 5.42 = 19n$$

$$537.49 = 19n$$

$$28.1 = n$$

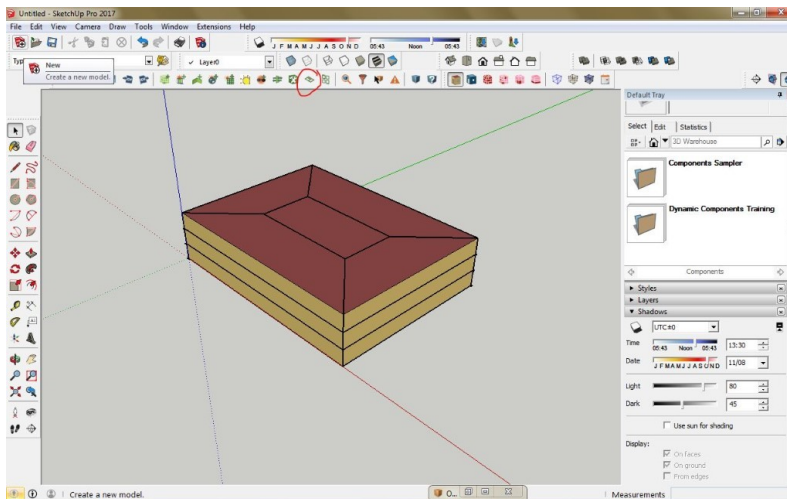
28 Shields with $\epsilon = 0.1$ in order to lower the radiative heat transfer to 1%

- 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

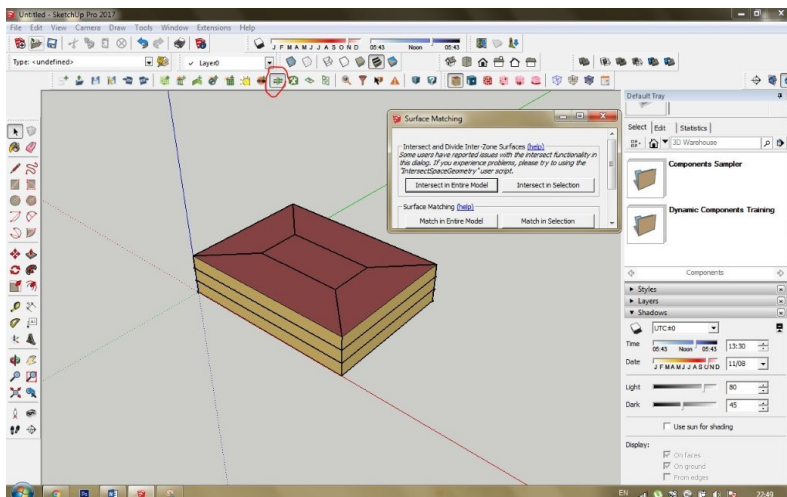




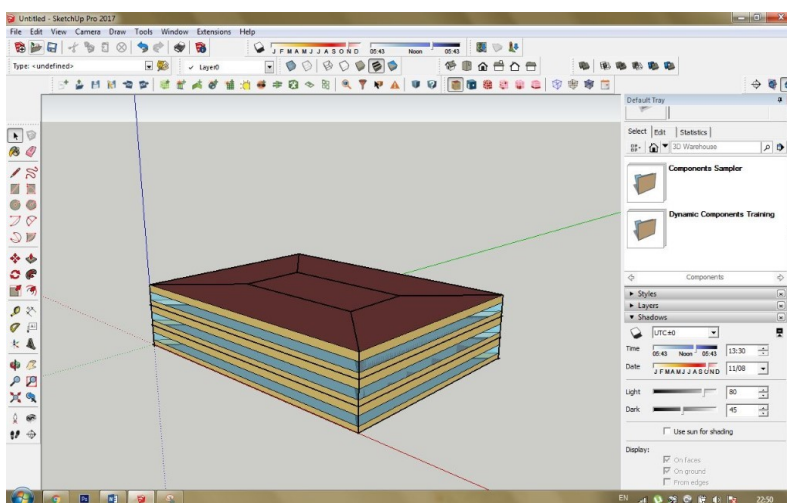
First, in sketch up I created the floor plan of a simple office building. Open offices and the break room.



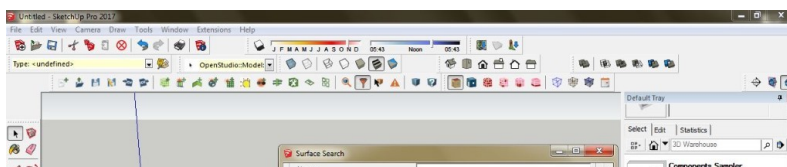
Then I clicked the create spaces from diagram, floor height 10' and 3 floors. I can see the information with the info tool.



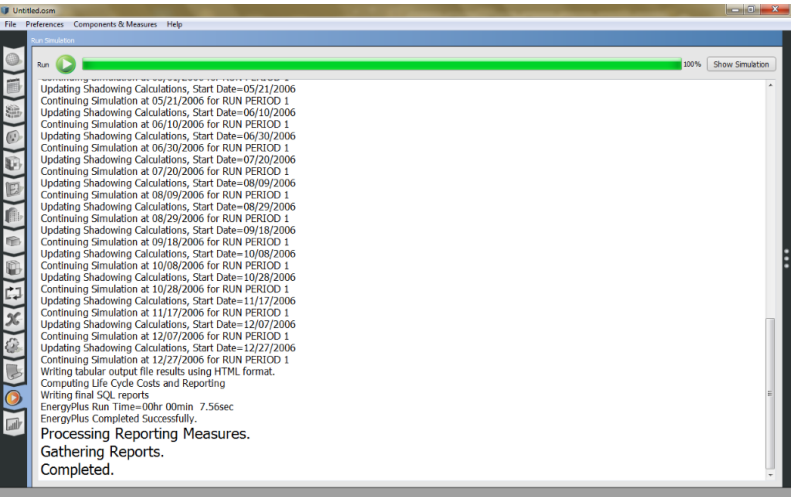
In order to define interior and outer walls, I used surface matching tool.



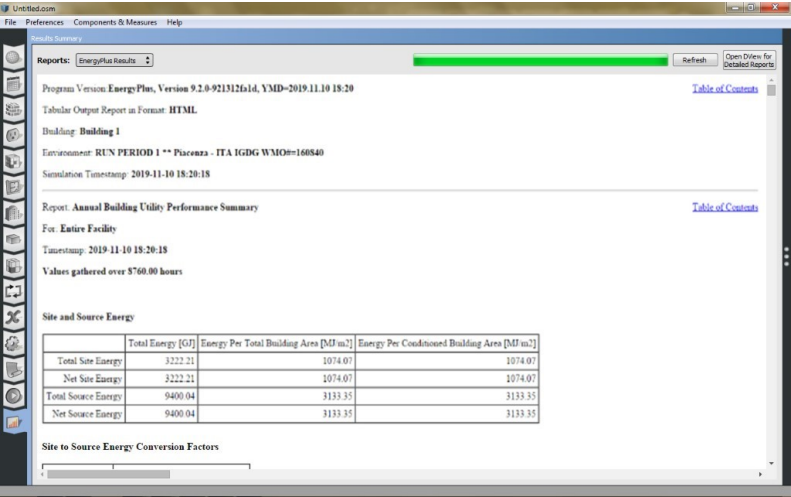
Then using the extensions tab I added the window ratios to the spaces of 70%



I open OpenStudio and open my file which I created in Skethup and add weather and design days in the file by importing.



I run the model.



I have my results in the last tab.