

## Week 6

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**Task 1** 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?

$$Q_{12, \text{noshield}} = \frac{A\sigma(T_1^4 - T_2^4)}{\frac{1}{\epsilon_1} + \frac{1}{\epsilon_2} - 1}$$

$$Q_{12, N \text{ shield}} = \frac{A\sigma(T_1^4 - T_2^4)}{(N+1)(\frac{1}{\epsilon_1} + \frac{1}{\epsilon_2} - 1)} = \frac{1}{N+1} Q_{12, \text{noshield}}$$

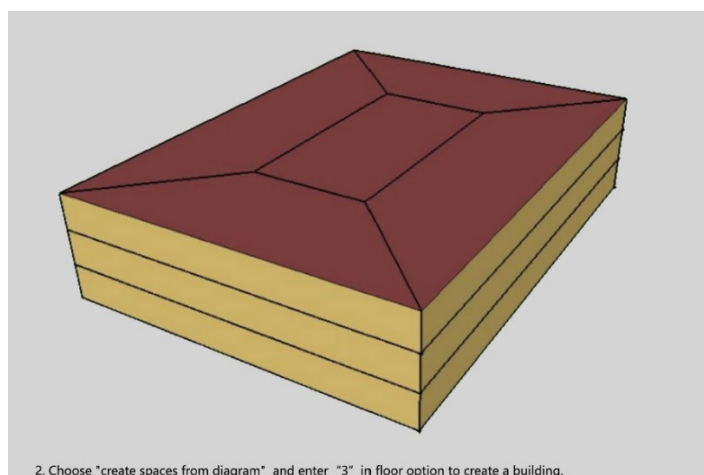
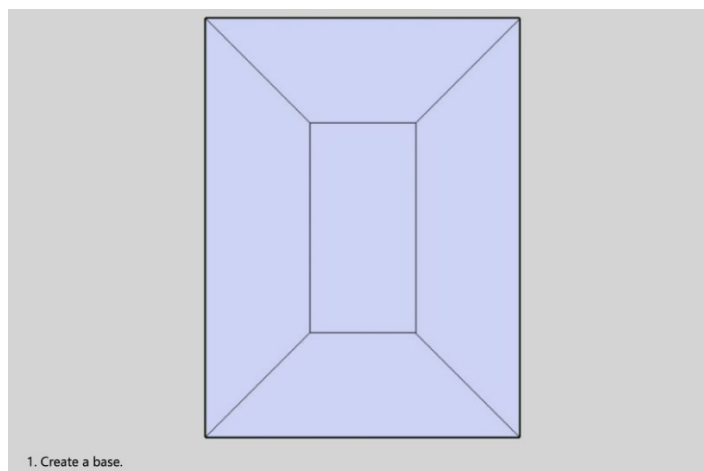
So if want heat transfer rate to be 1% of the case without shields

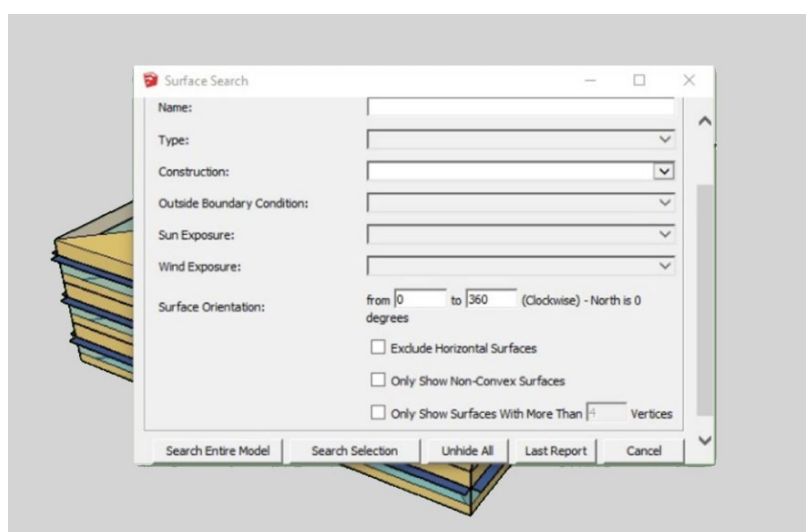
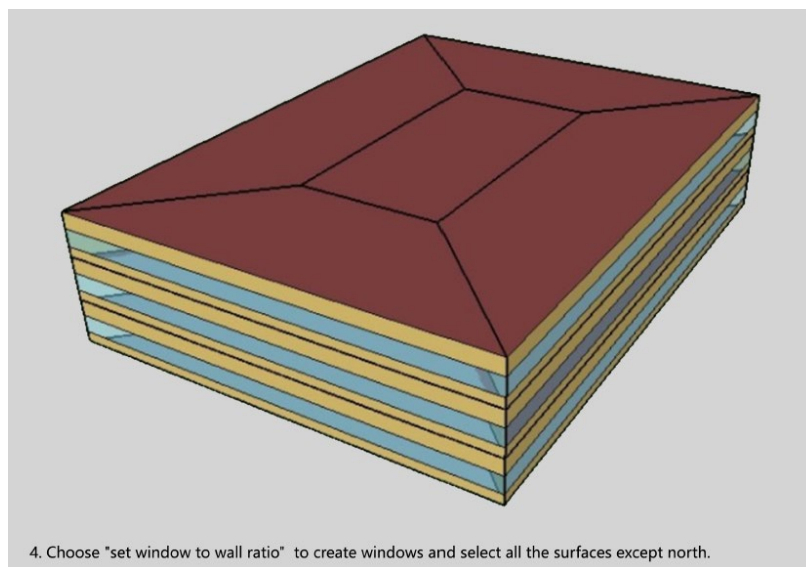
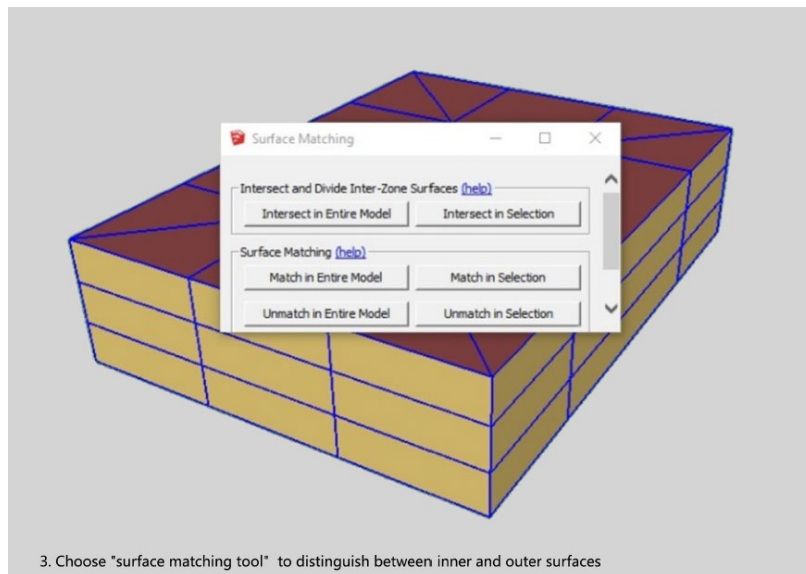
Then we have  $\frac{1}{N+1} = 1\%$

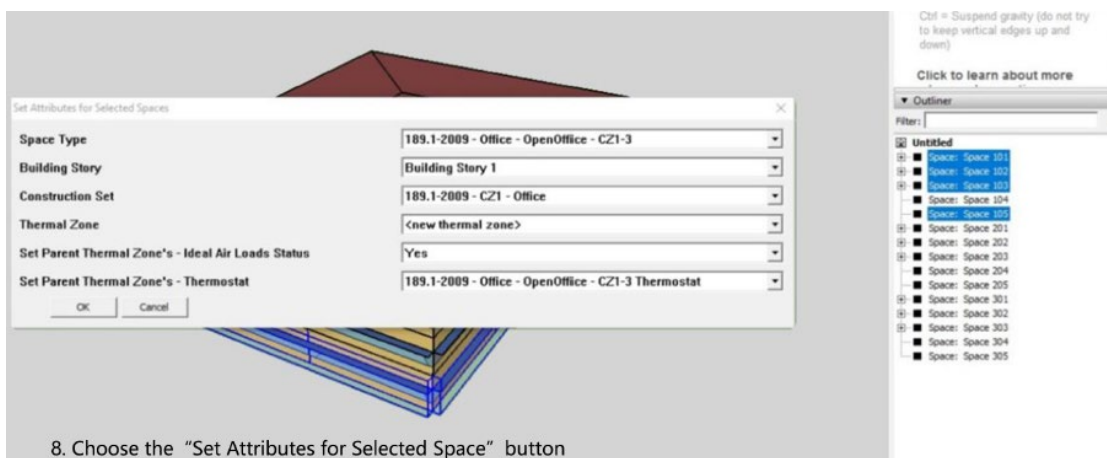
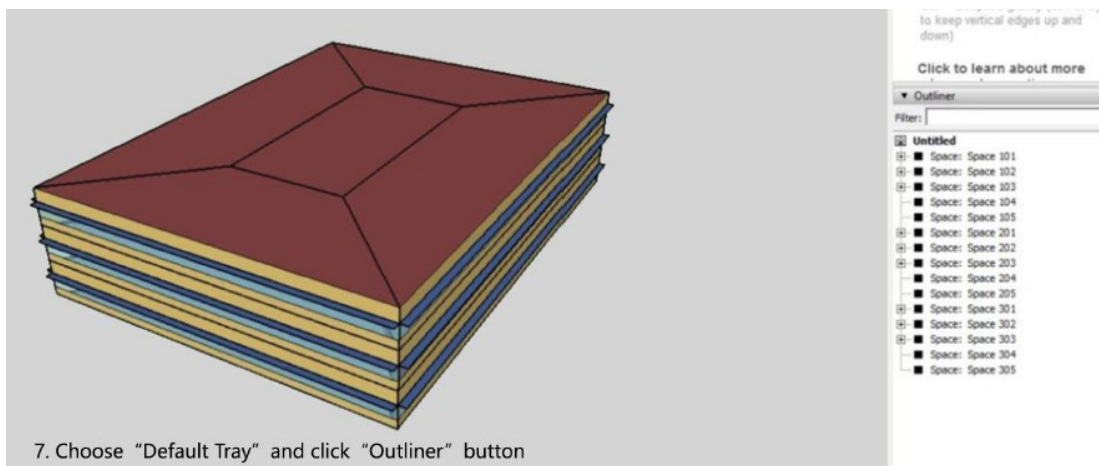
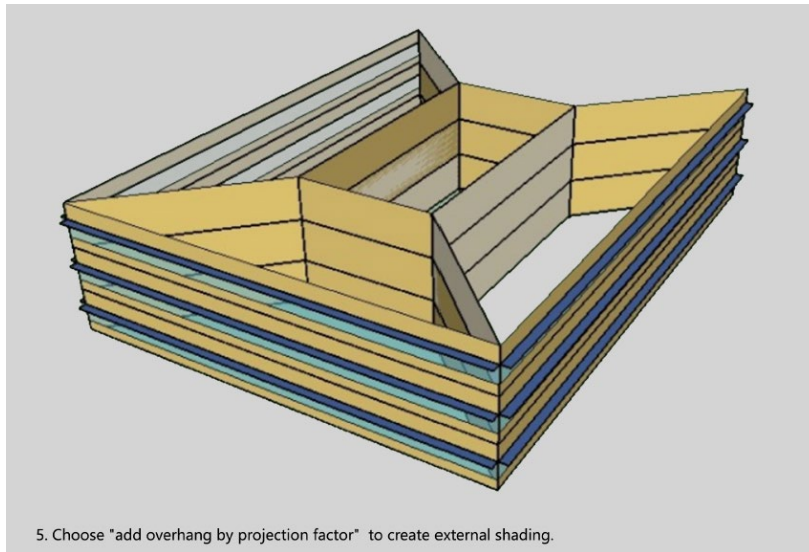
So  $N=99$

We should add 99 shields

**Task 2** Screenshots of all the steps







Weather File & Design Days Life Cycle Costs Utility Bills

ASHRAE Climate Zone:

CEC Climate Zone:

Design Days:

Ends: ☐ Define by Day of The Week And Month: First:  Sunday:  January:

☐ Define by Date: 1/1/2000

Design Days:

| Design Day Name                  | All                      | Day Of Month         | Month                | Day Type             | Daylight Saving Time Indicator |
|----------------------------------|--------------------------|----------------------|----------------------|----------------------|--------------------------------|
|                                  | <input type="checkbox"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="checkbox"/>       |
|                                  |                          | Apply to Selected    | Apply to Selected    | Apply to Selected    |                                |
| Tempe Ann Cg .4% Conds DB=>H08   | <input type="checkbox"/> | 21                   | 8                    | SummerDesignDay      | <input type="checkbox"/>       |
| Tempe Ann Cg .4% Conds DP=>H08   | <input type="checkbox"/> | 21                   | 8                    | SummerDesignDay      | <input type="checkbox"/>       |
| Tempe Ann Cg .4% Conds Erdb=>H08 | <input type="checkbox"/> | 21                   | 8                    | SummerDesignDay      | <input type="checkbox"/>       |
| Tempe Ann Cg .4% Conds WB=>H08   | <input type="checkbox"/> | 21                   | 8                    | SummerDesignDay      | <input type="checkbox"/>       |
| Phoenix Ann Htg 95.6% Conds DB   | <input type="checkbox"/> | 21                   | 1                    | WinterDesignDay      | <input type="checkbox"/>       |
| Htg Wind 99.4% Conds WS=>H08     | <input type="checkbox"/> | 21                   | 1                    | WinterDesignDay      | <input type="checkbox"/>       |
| San Juan .7 99.6% Conds DP=>H08  | <input type="checkbox"/> | 21                   | 1                    | WinterDesignDay      | <input type="checkbox"/>       |

9. Add the weather data

Run Simulation Output Tree

Run

Warnings: 10

Errors: 0

Output

```
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 30.56sec
Script executing from: C:\Users\caray\AppData\Local\Temp\OpenStudio.A10216\resources\run\6-UserScript-0
Found UserScript 'OpenStudio Results'.
result = true
Processed 1 base script and 0 merged scripts
```

10. Run the model

Results Summary

Reports:

| Site=>Source Conversion Factor |       |
|--------------------------------|-------|
| Electricity                    | 3.167 |
| Natural Gas                    | 1.084 |
| District Cooling               | 1.056 |
| District Heating               | 3.613 |
| Steam                          | 0.300 |
| Gasoline                       | 1.050 |
| Diesel                         | 1.050 |
| Coal                           | 1.050 |
| Fuel Oil #1                    | 1.050 |
| Fuel Oil #2                    | 1.050 |
| Propane                        | 1.050 |
| Other Fuel 1                   | 1.000 |
| Other Fuel 2                   | 1.000 |

Building Area

|                     | Area [m2] |
|---------------------|-----------|
| Total Building Area | 3600.00   |

11. Receive the final result