Submission 6

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 ?

Question:

Find the net heat exchange between the surface 1 and 2 where A1 = 1.5 m2, F12 = 0.01, T1 = 800 K, = 500 K, ϵ_1=0.2, ϵ_2=0.7, σ=5.67*10-8$\frac{W}{m^2 \cdot K4}$. q=1035.81 $\frac{W}{m^2}$

Solve the last example in the class (radiative heat exchange between two parallel plates) awhile considering the two emissivities to be 0.1, what can you conclude from the result?

Solution:

$$\frac{3625.37}{100} = \frac{\sigma(T_1^4 - T_2^4)}{\left(\frac{1}{\epsilon_1} + \frac{1}{\epsilon_2} - 1\right) + \left(\frac{1}{\epsilon_{3,1}} + \frac{1}{\epsilon_{3,2}} - 1\right)(N\ of\ Shields)}$$

$$\frac{\sigma(T_1^4 - T_2^4)}{36{,}25} = \left(\frac{1}{\epsilon_1} + \frac{1}{\epsilon_2} - 1\right) + \left(\frac{1}{\epsilon_{3,1}} + \frac{1}{\epsilon_{3,2}} - 1\right)(N)$$

$$N = (\frac{\sigma(T_1^4 - T_2^4)}{36{,}25} - \left(\frac{1}{\epsilon_1} + \frac{1}{\epsilon_2} - 1\right))/\left(\frac{1}{\epsilon_{3,1}} + \frac{1}{\epsilon_{3,2}} - 1\right) =$$

$$= (\frac{\sigma(800\text{^}4 - 500\text{^}4)}{36{,}25} - \left(\frac{1}{0{,}2} + \frac{1}{0{,}7} - 1\right))/\left(\frac{1}{0{,}1} + \frac{1}{0{,}1} - 1\right) =$$

$$= (\frac{5{,}67X10\text{^}-8(800\text{^}4 - 500\text{^}4)}{36{,}25} - \left(\frac{1}{0{,}2} + \frac{1}{0{,}7} - 1\right))/\left(\frac{1}{0{,}1} + \frac{1}{0{,}1} - 1\right) = 28\ shields$$

$$q = \frac{\sigma(800^4 - 500^4)}{\left(\frac{1}{\epsilon_1} + \frac{1}{\epsilon_2} - 1\right) + \left(\frac{1}{\epsilon_1} + \frac{1}{\epsilon_2} - 1\right)X\ (N)} \left(\frac{1}{0{,}1} + \frac{1}{0{,}1} - 1\right) =$$

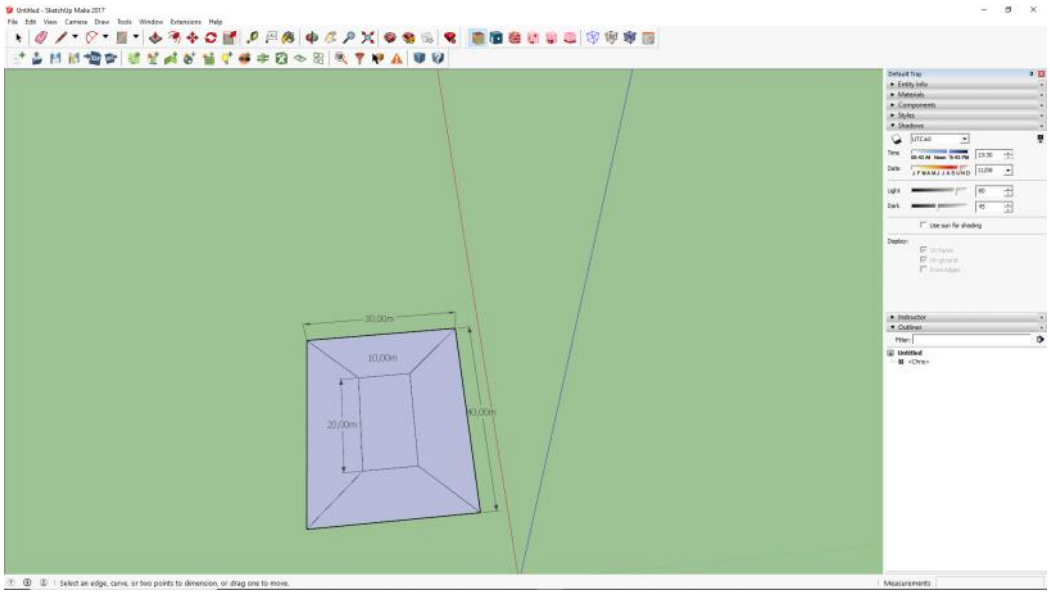
$$\frac{\sigma(800^4 - 500^4)}{\left(\frac{1}{0{,}2} + \frac{1}{0{,}7} - 1\right) + \left(\frac{1}{0{,}1} + \frac{1}{0{,}1} - 1\right)X\ (28)} = 10{,}36\frac{W}{m2}$$

1% of 1085,81

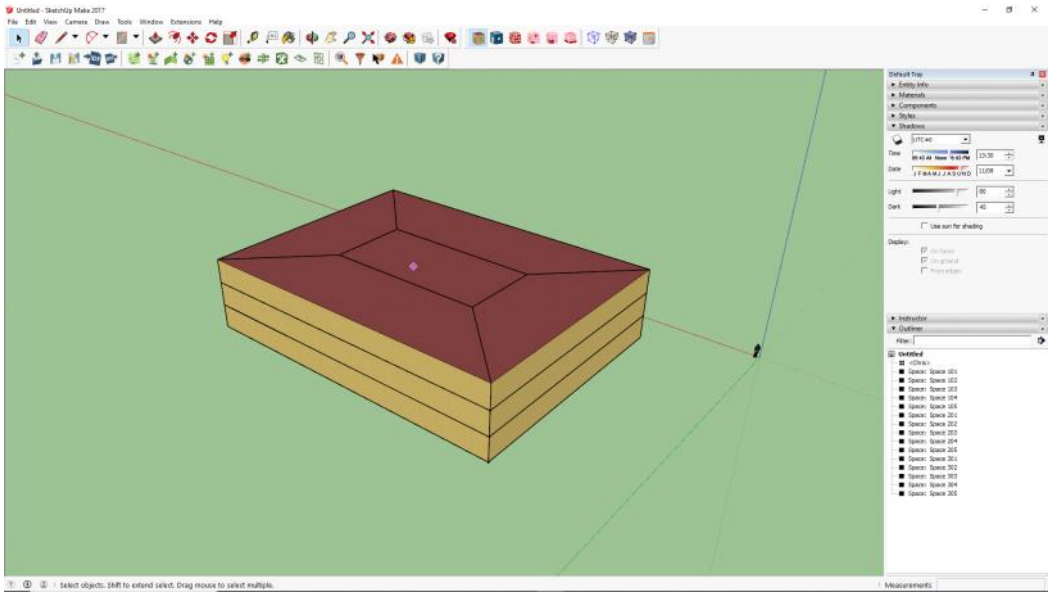
qNshields= 1/(N+1) => N= (100%/1%) -1 = 99

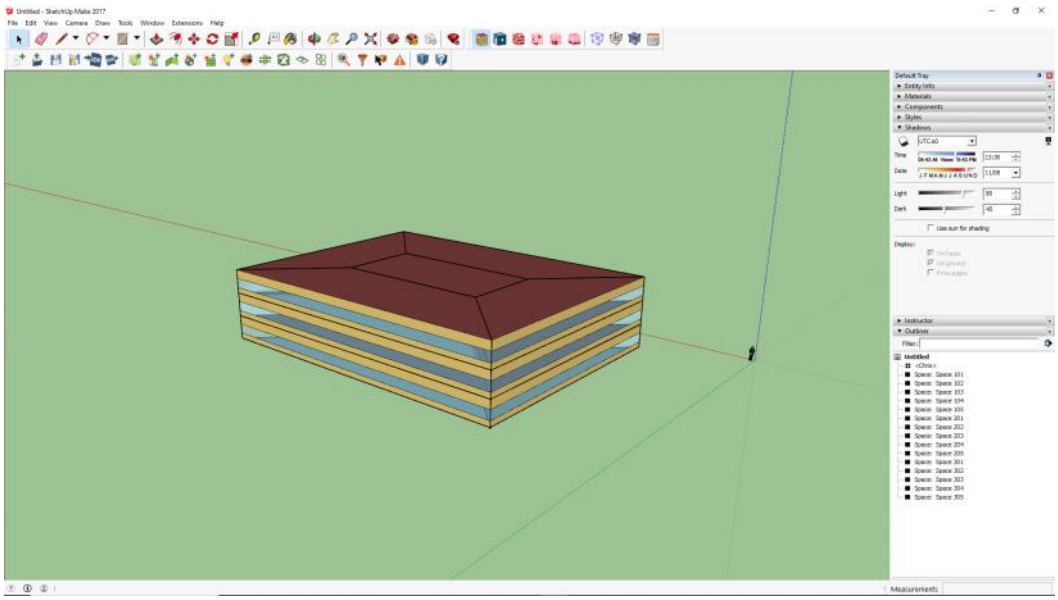
Q99 shields= $\frac{\sigma(T_1^4 - T_2^4)}{(N+1) + \left(\frac{1}{\epsilon\square} + \frac{1}{\epsilon\square} - 1\right)} = 10{,}36\ W/m2$

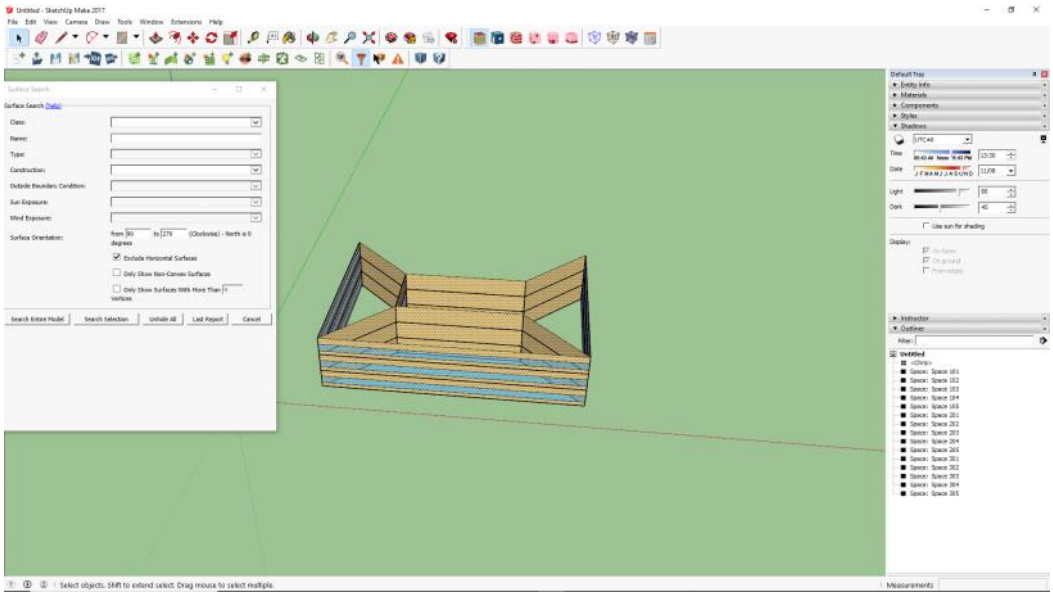
** Task 2** You should create a pdf file with screenshots of all of the steps we went through (clearly from your own file) and explain briefly the reason behind the use of each step (in your own words!)

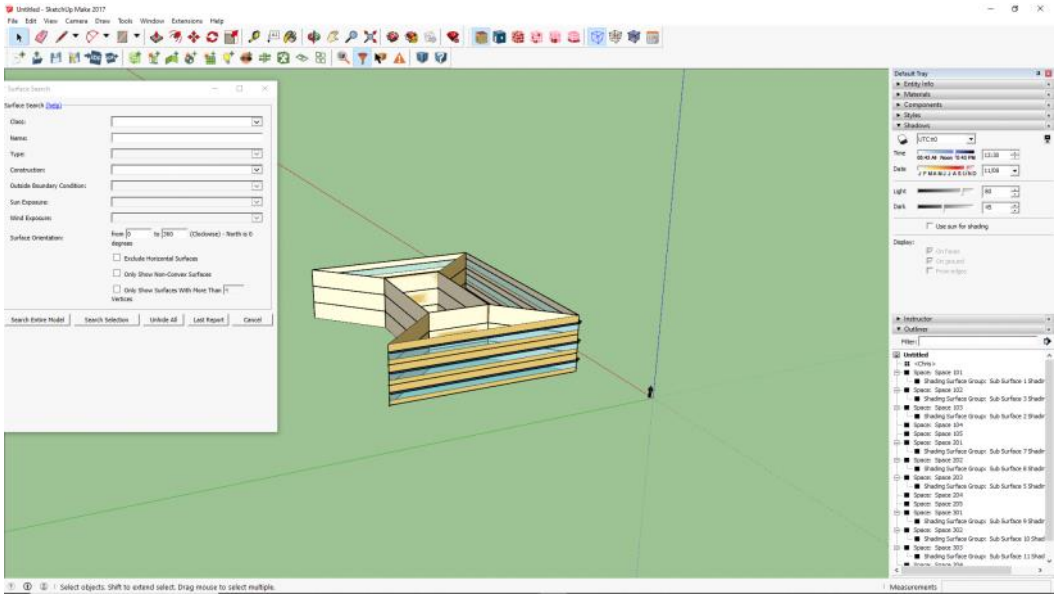


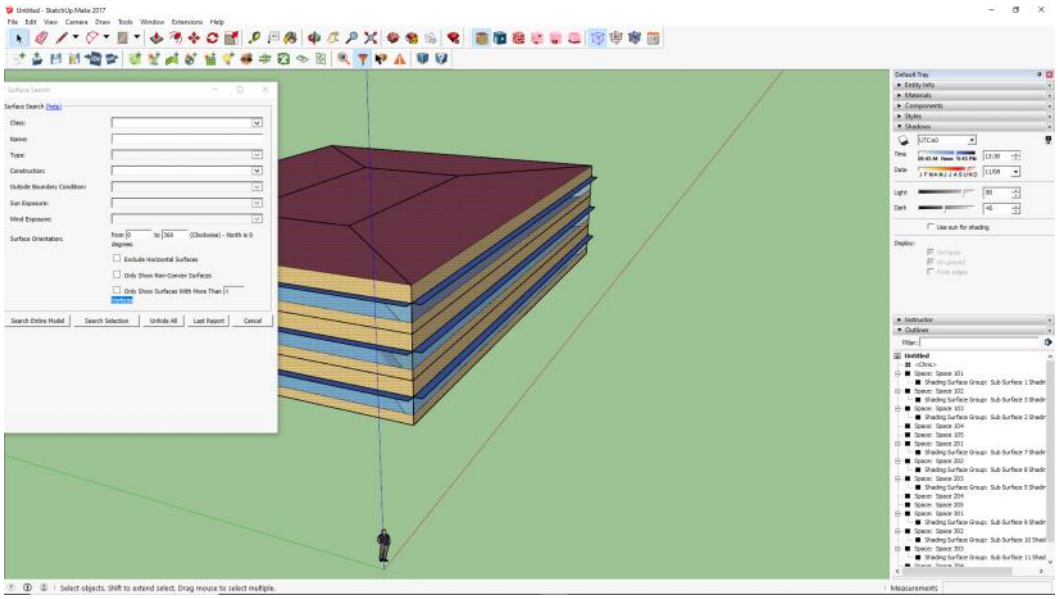
I hve created a rectagle 40X30m , then offset 10m

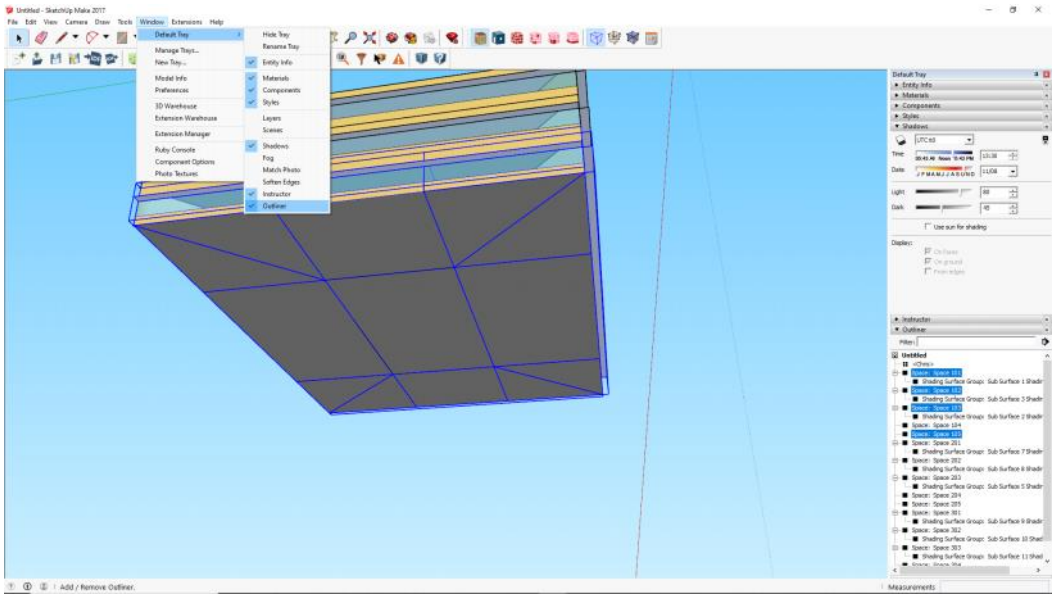


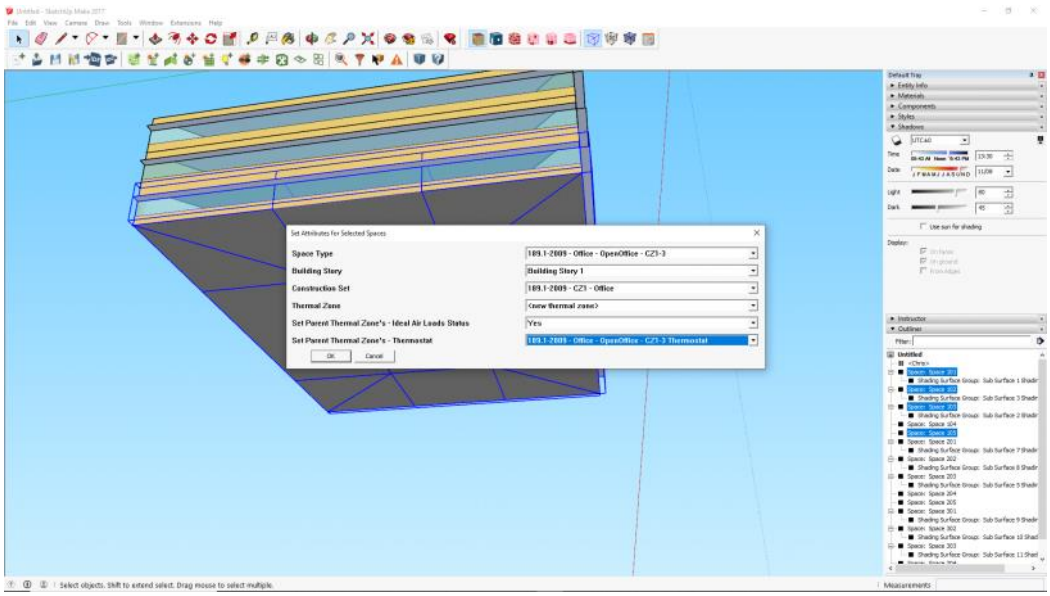


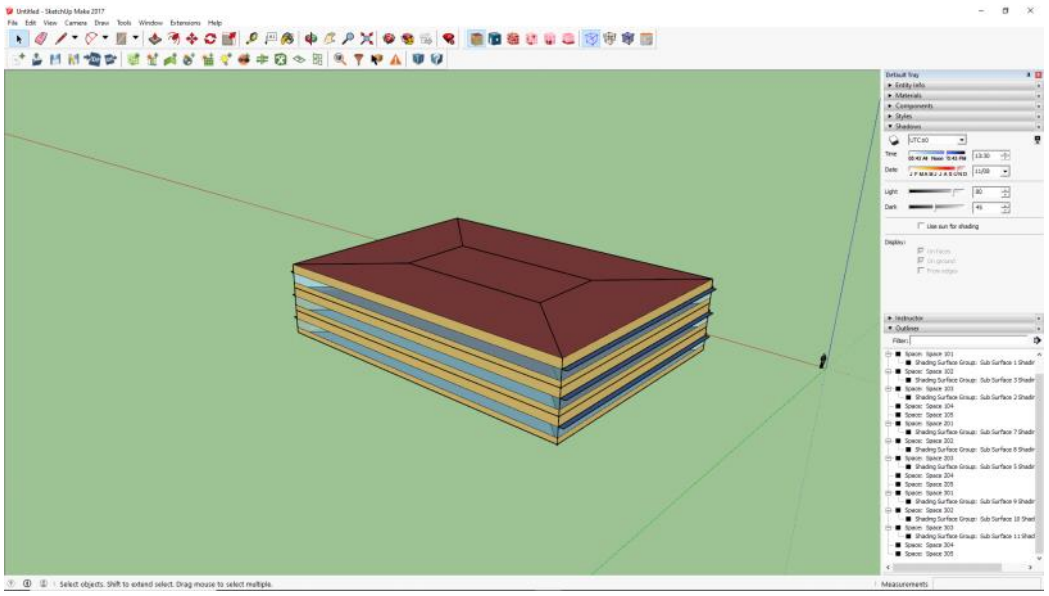


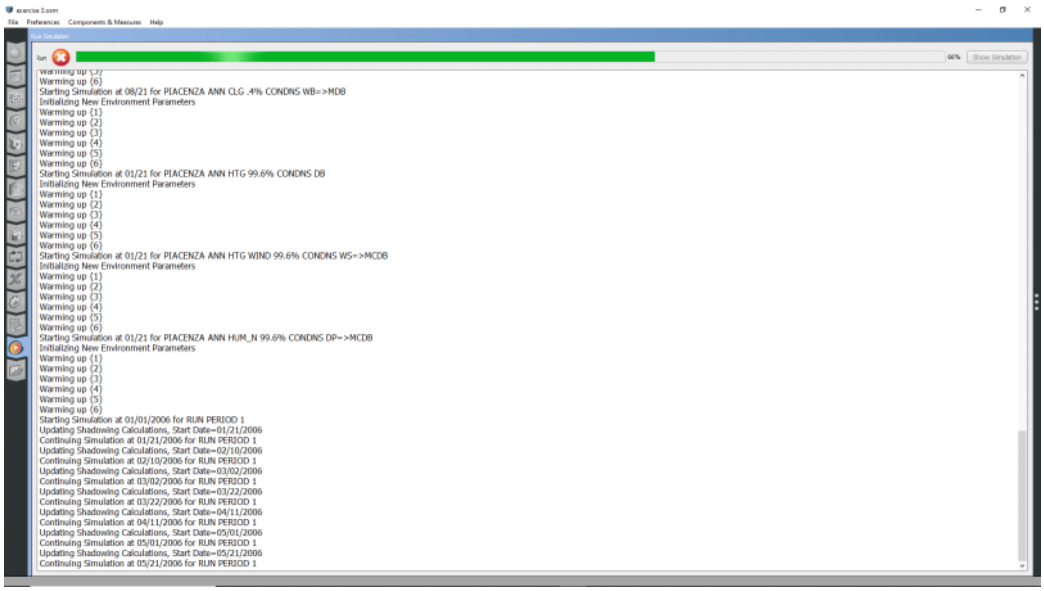







Set Attributes for Selected Spaces
Space Type
189.1-2009 - Office - OpenOffice - CZ3-3
Building Story
Building Story 1
Construction Set
189.1-2009 - CZ3 - Office
Thermal Zone
<new thermal zone>
Set Parent Thermal Zone's - Ideal Air Loads Status
Yes
Set Parent Thermal Zone's - Thermostat
189.1-2009 - Office - OpenOffice - CZ3-3 Thermostat
OK
Cancel




exercise 1.osm
File Preferences Components & Measures Help
Run Simulation
Run
66%
Show Simulation
Warming up {6}
Starting Simulation at 08/21 for PIACENZA ANN CLG .4% CONDNS WB=>MDB
Initializing New Environment Parameters
Warming up {1}
Warming up {2}
Warming up {3}
Warming up {4}
Warming up {5}
Warming up {6}
Starting Simulation at 01/21 for PIACENZA ANN HTG 99.6% CONDNS DB
Initializing New Environment Parameters
Warming up {1}
Warming up {2}
Warming up {3}
Warming up {4}
Warming up {5}
Warming up {6}
Starting Simulation at 01/21 for PIACENZA ANN HTG WIND 99.6% CONDNS WS=>MCDB
Initializing New Environment Parameters
Warming up {1}
Warming up {2}
Warming up {3}
Warming up {4}
Warming up {5}
Warming up {6}
Starting Simulation at 01/21 for PIACENZA ANN HUM_N 99.6% CONDNS DP=>MCDB
Initializing New Environment Parameters
Warming up {1}
Warming up {2}
Warming up {3}
Warming up {4}
Warming up {5}
Warming up {6}
Starting Simulation at 01/01/2006 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=01/21/2006
Continuing Simulation at 01/21/2006 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=02/10/2006
Continuing Simulation at 02/10/2006 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=03/02/2006
Continuing Simulation at 03/02/2006 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=03/22/2006
Continuing Simulation at 03/22/2006 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=04/11/2006
Continuing Simulation at 04/11/2006 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=05/01/2006
Continuing Simulation at 05/01/2006 for RUN PERIOD 1
Updating Shadowing Calculations, Start Date=05/21/2006
Continuing Simulation at 05/21/2006 for RUN PERIOD 1