

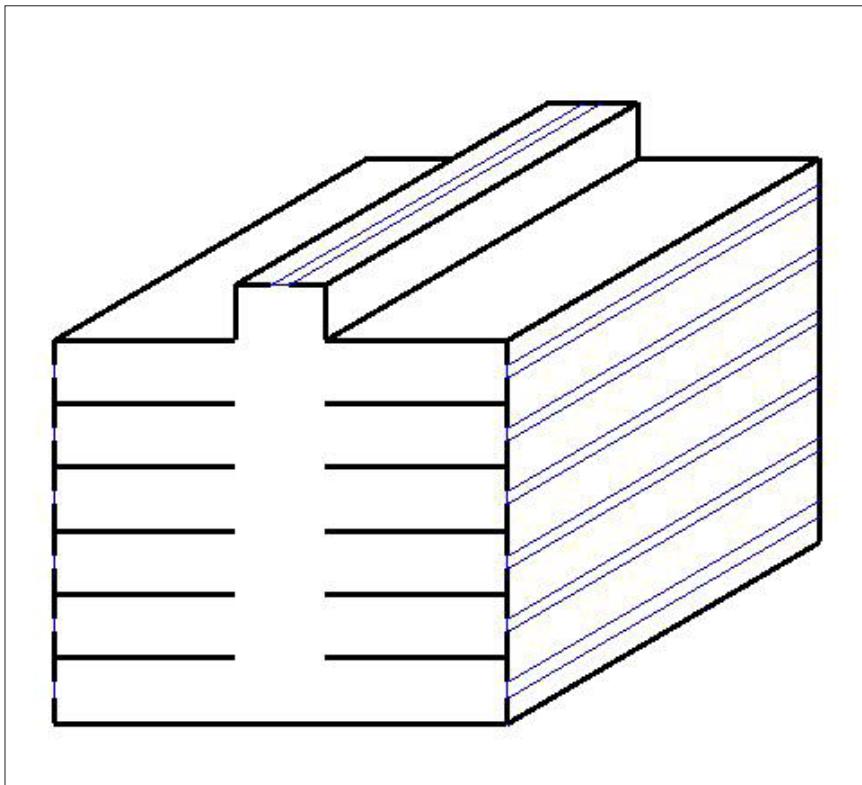
ENVIRONMENTAL SYSTEMS I

ASSIGNMENT 9: Natural Ventilation for Meyerson Hall

Bingyu Wang

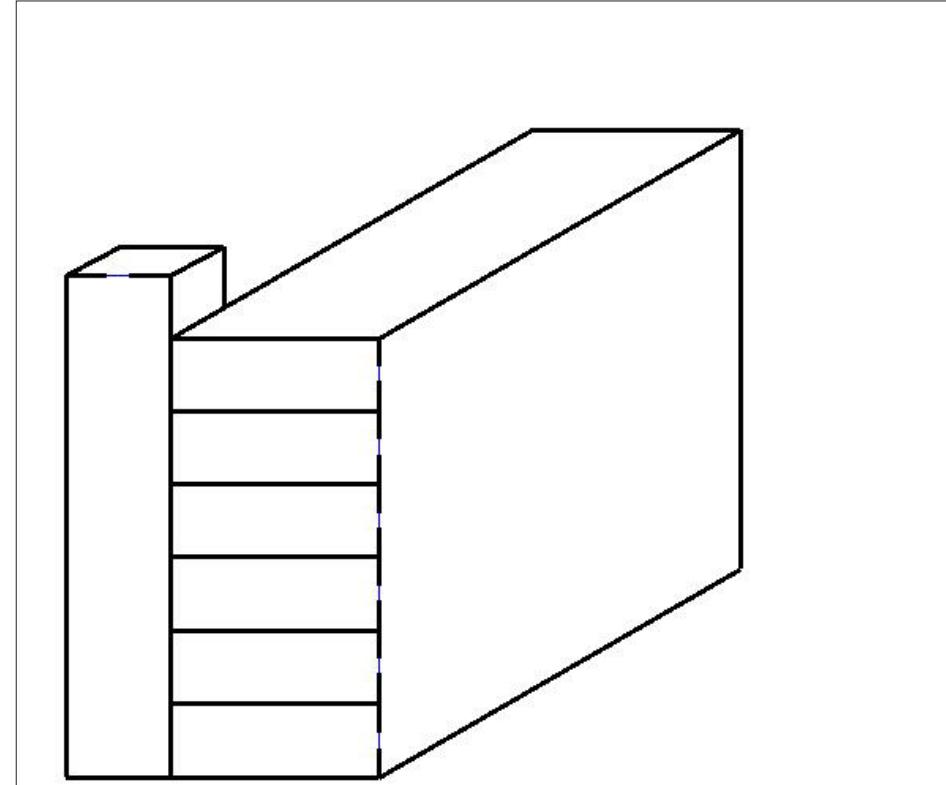
Comparison and Contrast

Central Altrium VS Ventilation Shaft



Central Altrium

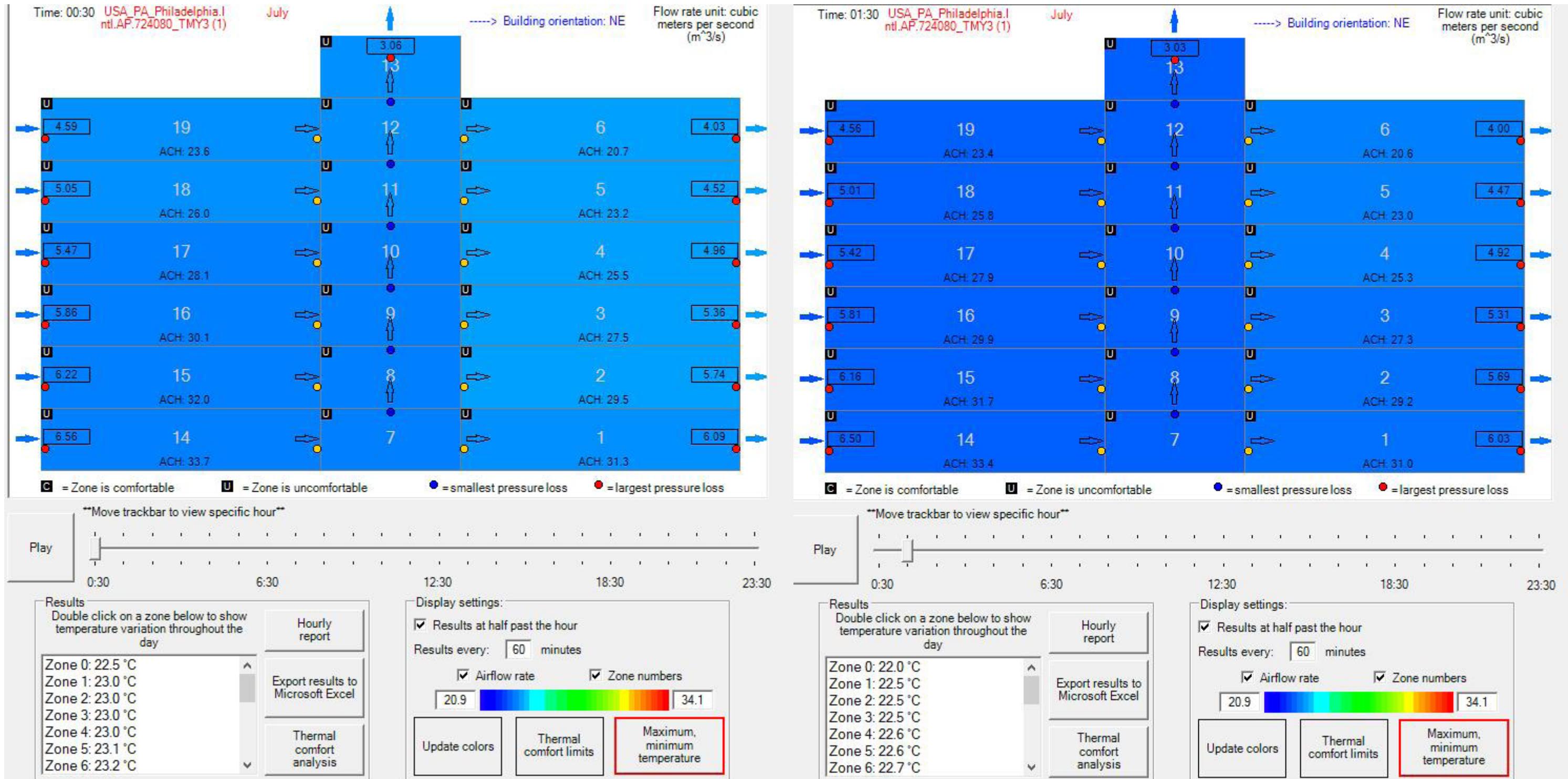
- 1) The highestest temperature of the day occurs between 9:30 am to 17:30 pm.
- 2) The average temperature throughout the measurement period is higher than that in Ventilation Shaft.
- 3) The maximum temperature occurs at the third and forth floors.
- 4) The largest pressure loss occurs at the two end sides of the building, while the smallest pressure loss occurs at the central atrium.
- 5) The percentage of total occupied hours that is too hot are over 95% in average for all six floors.
- 6) During most of the occupied hours, the air flow direction on both side of the atrium are in the same direction as the air flow on the two sides of the building.



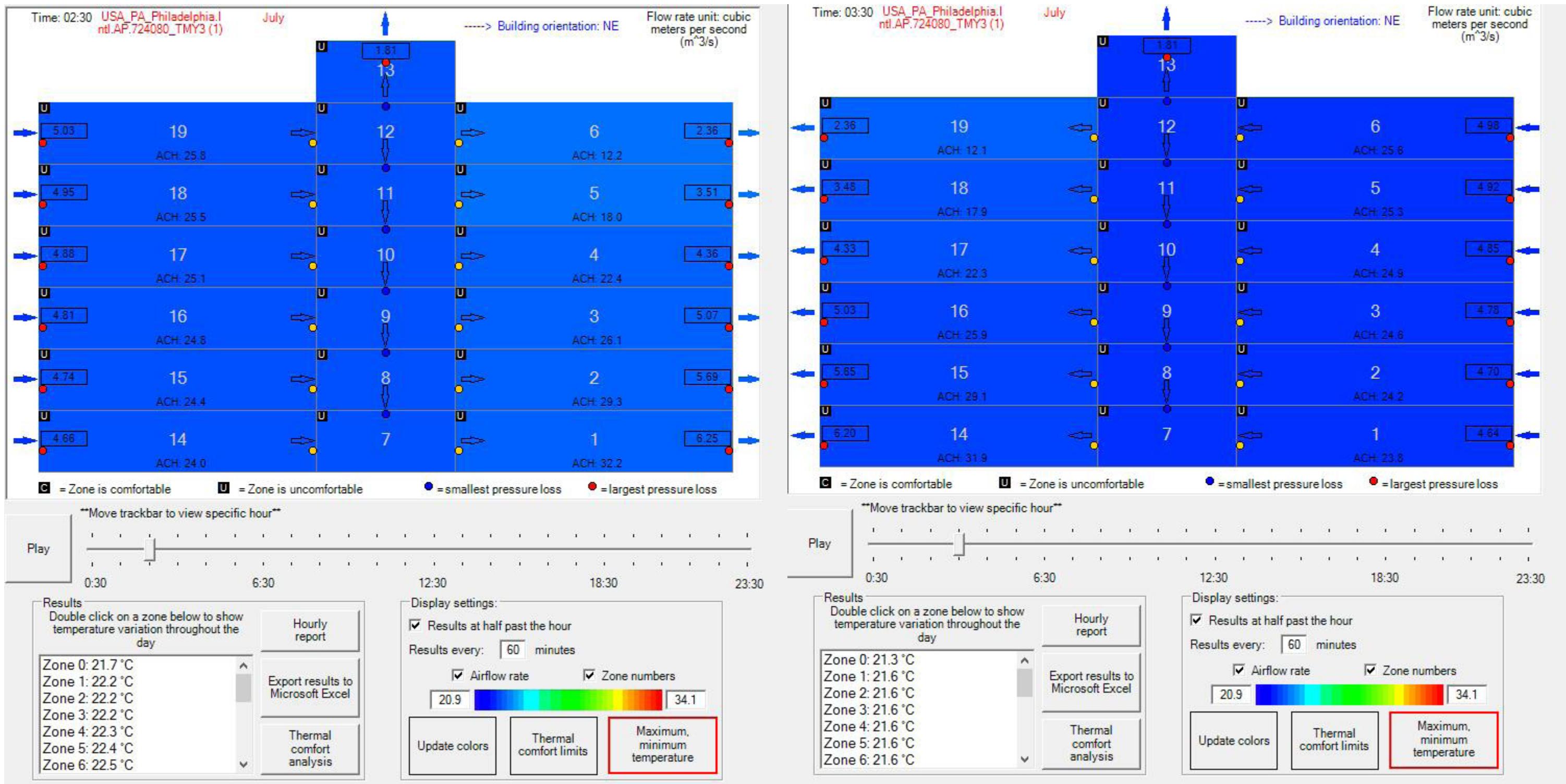
Ventilation Shaft

- 1) The highestest temperature of the day occurs between 10:30 am to 16:30 pm.
- 2) The average temperature throughout the measurement period is lower than that in Central Altrium.
- 3) The maximum temperature occurs at fifth and sixth floors.
- 4) The largest pressure loss occurs at the right end side of the building, while the smallest pressure loss occurs at the connecting face between the shaft and the other parts of the building.
- 5) The percentage of total occupied hours that is too hot are over 90% in average for all six floors.
- 6) During most of the occupied hours, the air flow direction on the right side of the shaft is different from the air flow direction on the right side of the building, which is different from the central altrium senario.

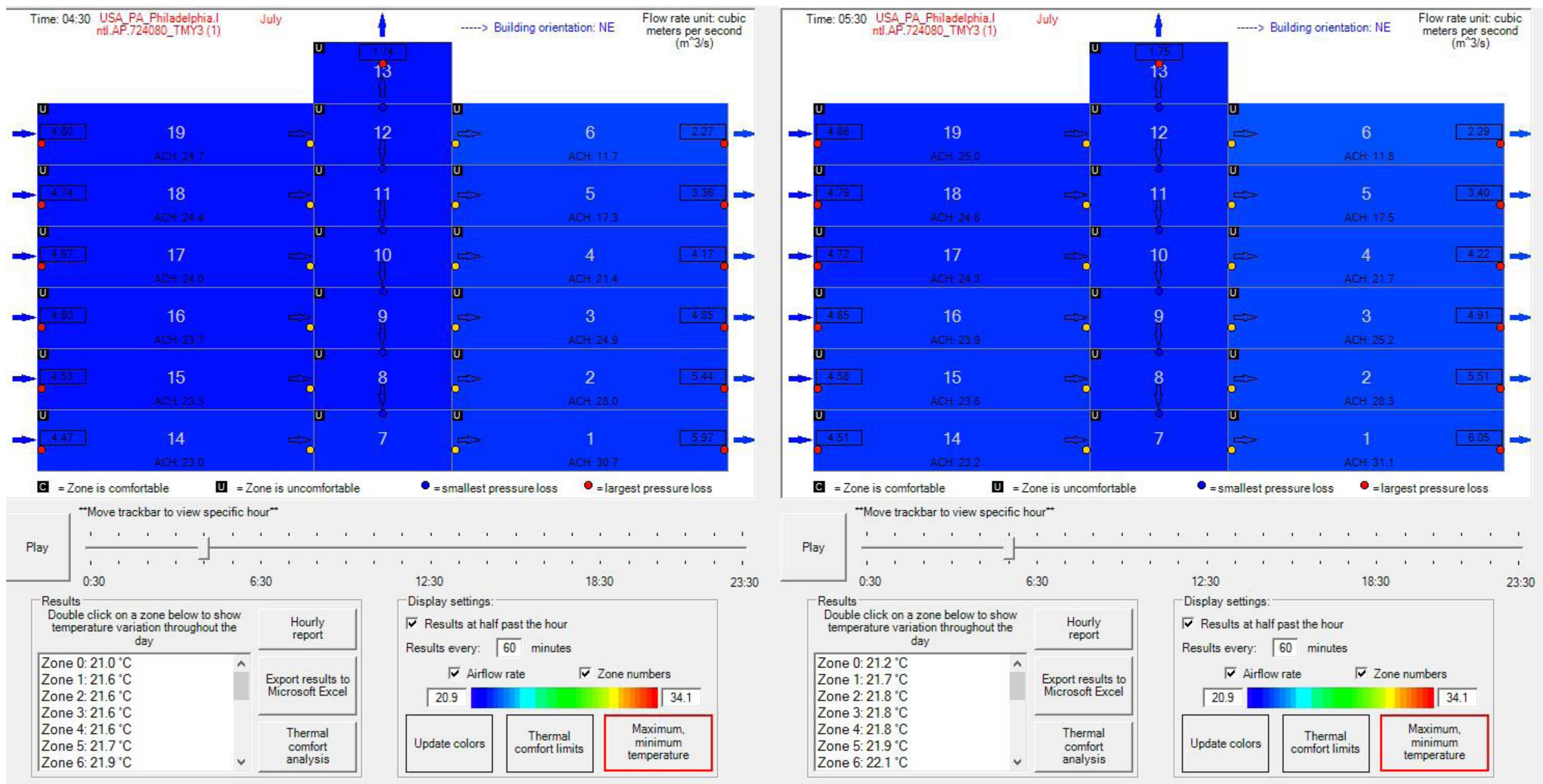
Central Altrium-Simulation Result



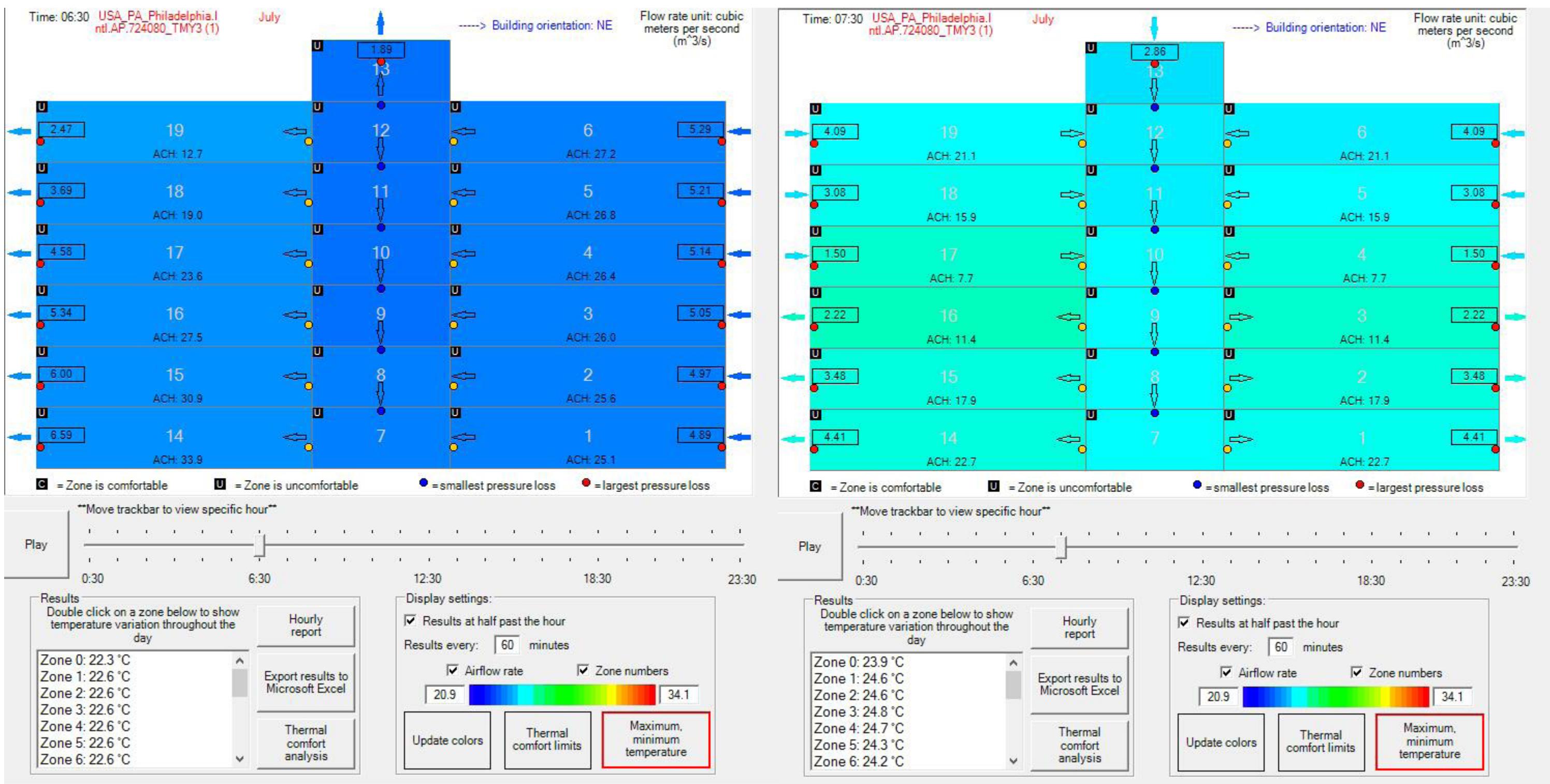
Central Altrium-Simulation Result



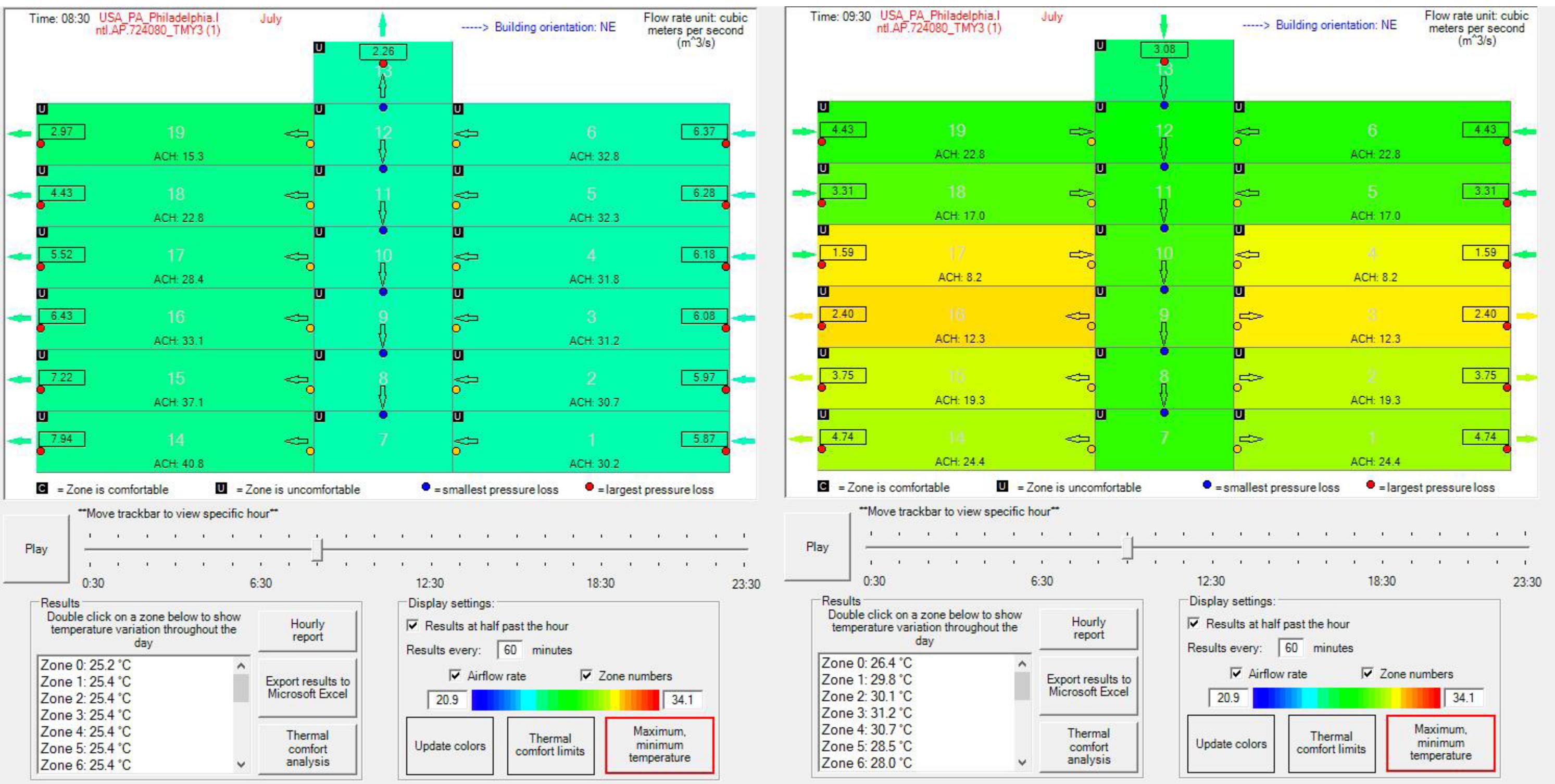
Central Altrium-Simulation Result



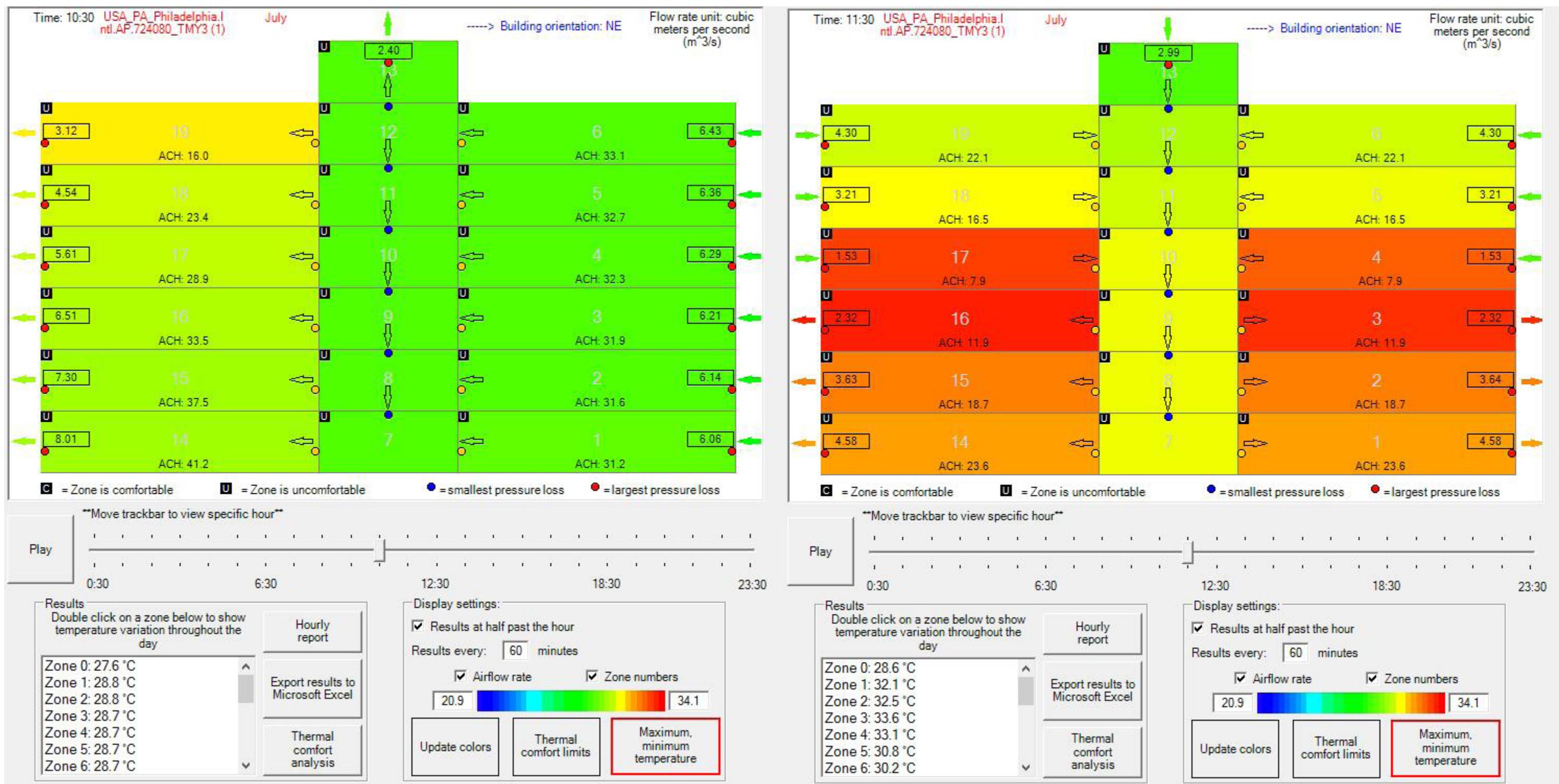
Central Altrium-Simulation Result



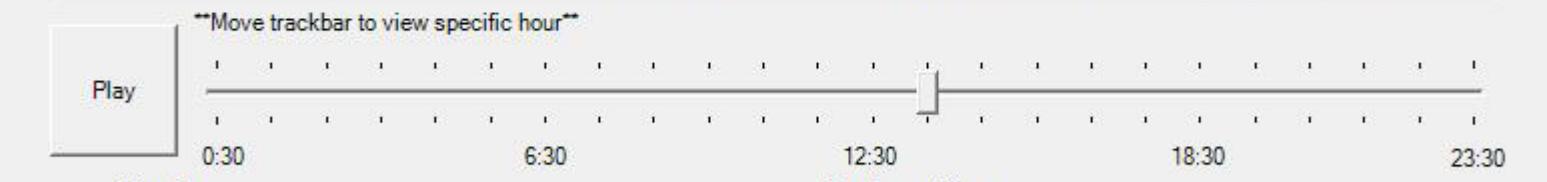
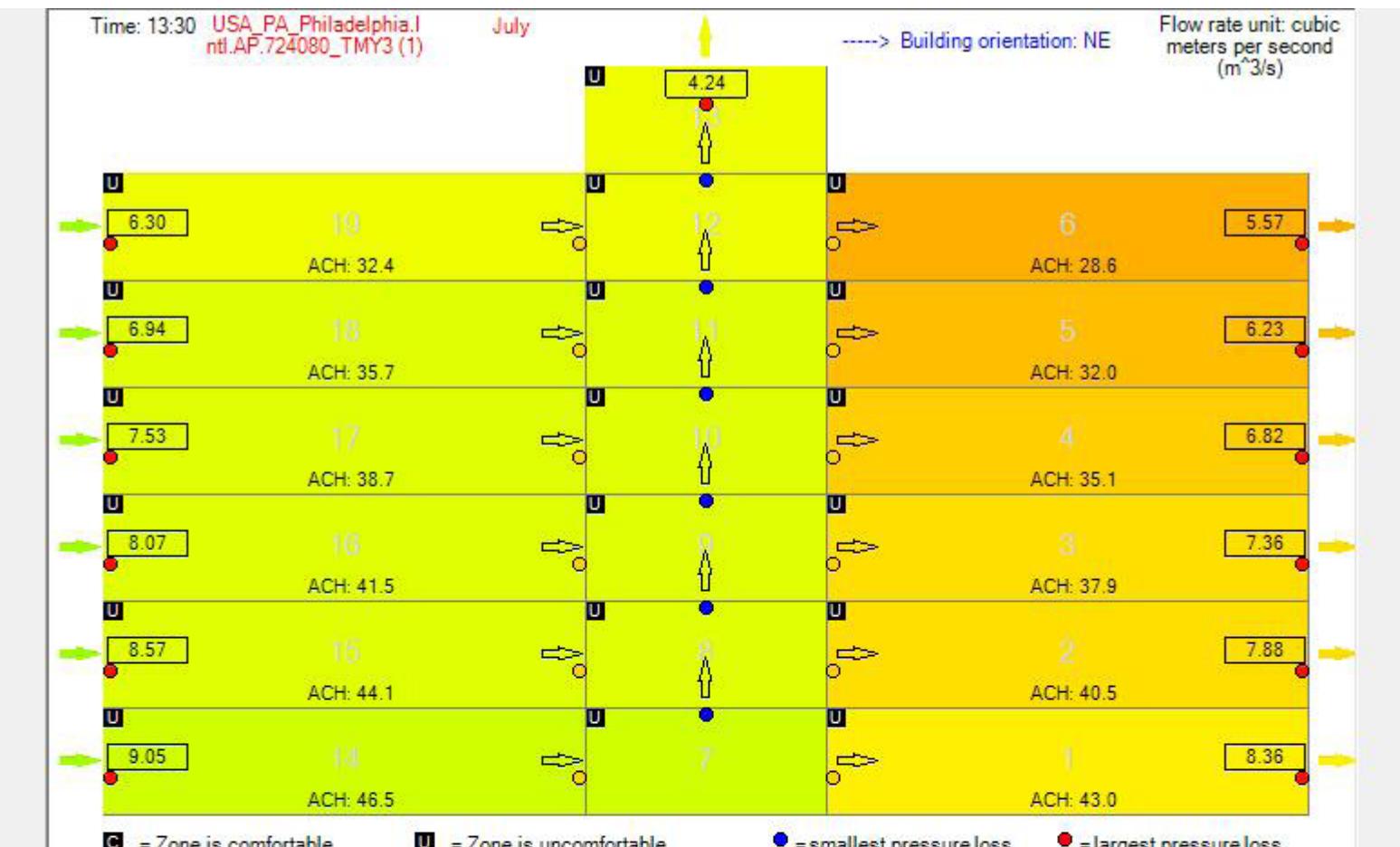
Central Altrium-Simulation Result



Central Altrium-Simulation Result



Central Altrium-Simulation Result



Results
Double click on a zone below to show temperature variation throughout the day

Zone 0: 29.3 °C
Zone 1: 31.3 °C
Zone 2: 31.3 °C
Zone 3: 31.4 °C
Zone 4: 31.6 °C
Zone 5: 31.9 °C
Zone 6: 32.6 °C

Hourly report
Export results to Microsoft Excel
Thermal comfort analysis

Display settings:
 Results at half past the hour
Results every: 60 minutes
 Airflow rate Zone numbers
20.9
34.1
Update colors Thermal comfort limits Maximum, minimum temperature

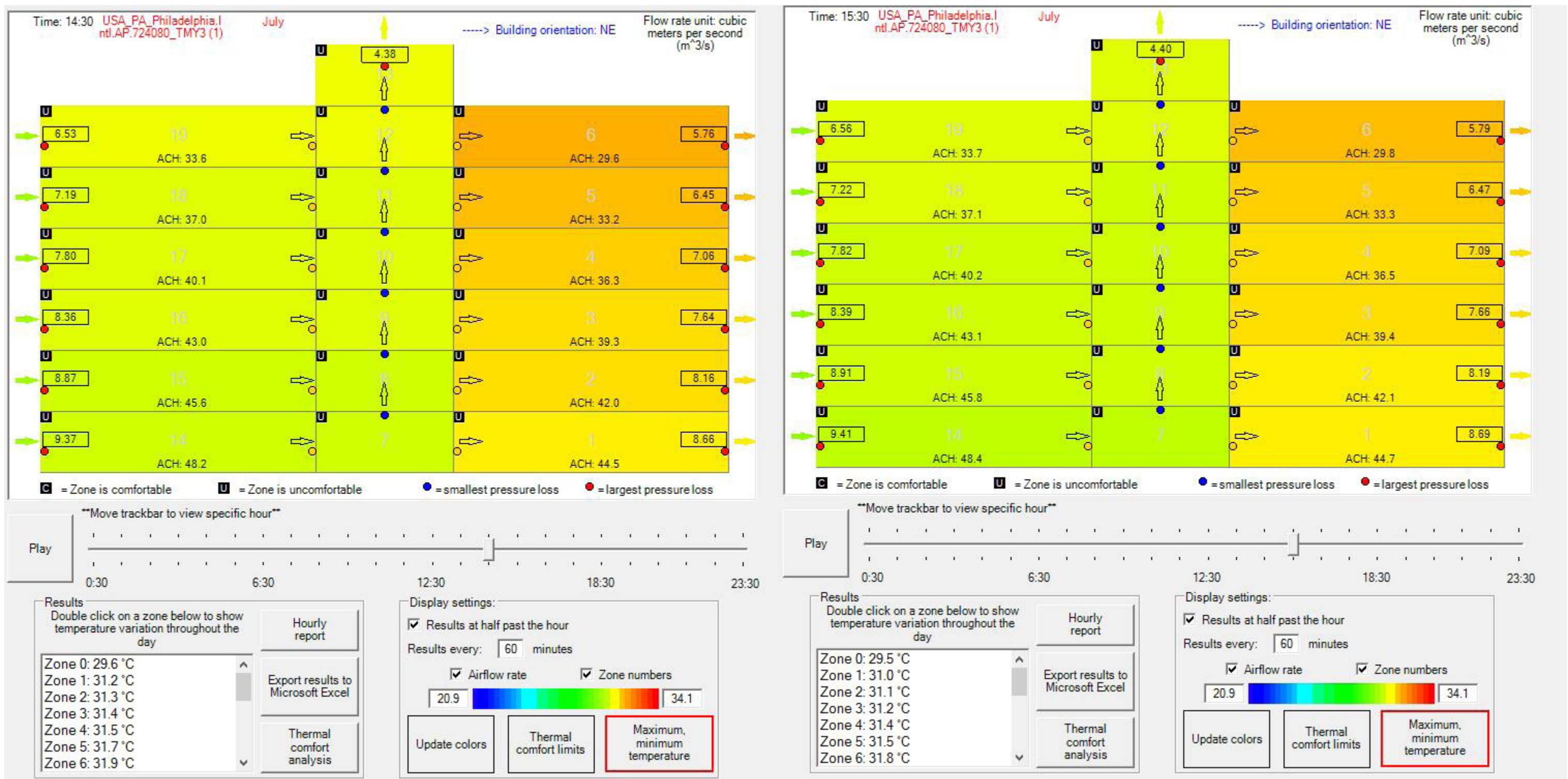
Results
Double click on a zone below to show temperature variation throughout the day

Zone 0: 29.6 °C
Zone 1: 31.2 °C
Zone 2: 31.3 °C
Zone 3: 31.4 °C
Zone 4: 31.5 °C
Zone 5: 31.7 °C
Zone 6: 31.9 °C

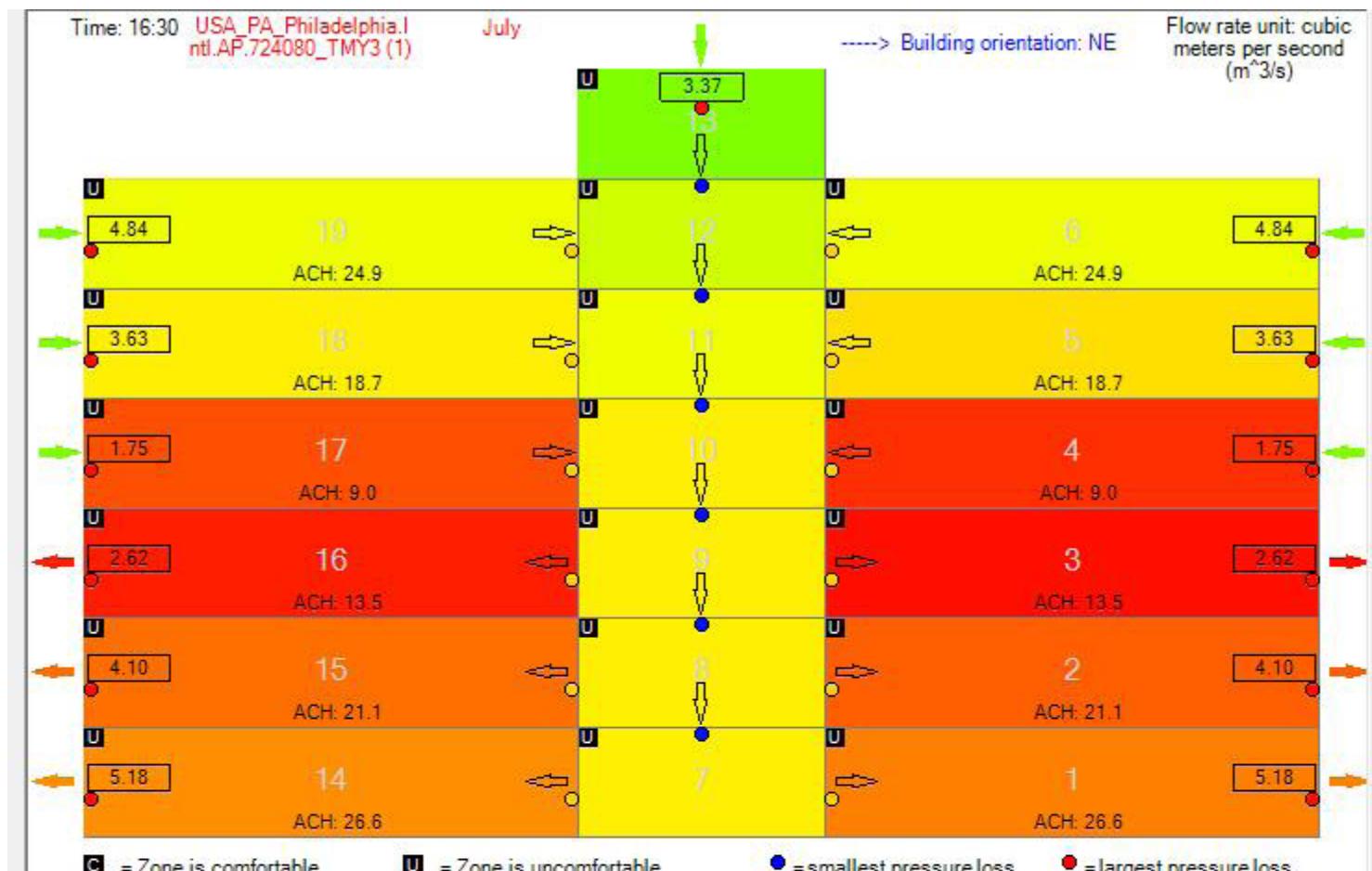
Hourly report
Export results to Microsoft Excel
Thermal comfort analysis

Display settings:
 Results at half past the hour
Results every: 60 minutes
 Airflow rate Zone numbers
20.9
34.1
Update colors Thermal comfort limits Maximum, minimum temperature

Central Altrium-Simulation Result



Central Altrium-Simulation Result



Results

Double click on a zone below to show temperature variation throughout the day

Zone 0: 29.2 °C	Hourly report
Zone 1: 32.6 °C	Export results to Microsoft Excel
Zone 2: 33.0 °C	Thermal comfort analysis
Zone 3: 34.0 °C	
Zone 4: 33.6 °C	
Zone 5: 31.3 °C	
Zone 6: 30.8 °C	

Display settings:

Results at half past the hour

Results every: 60 minutes

Airflow rate Zone numbers

20.9 34.1

Update colors Thermal comfort limits Maximum, minimum temperature



Results

Double click on a zone below to show temperature variation throughout the day

Zone 0: 28.3 °C	Hourly report
Zone 1: 30.3 °C	Export results to Microsoft Excel
Zone 2: 30.4 °C	Thermal comfort analysis
Zone 3: 30.5 °C	
Zone 4: 30.6 °C	
Zone 5: 30.9 °C	
Zone 6: 31.7 °C	

Display settings:

Results at half past the hour

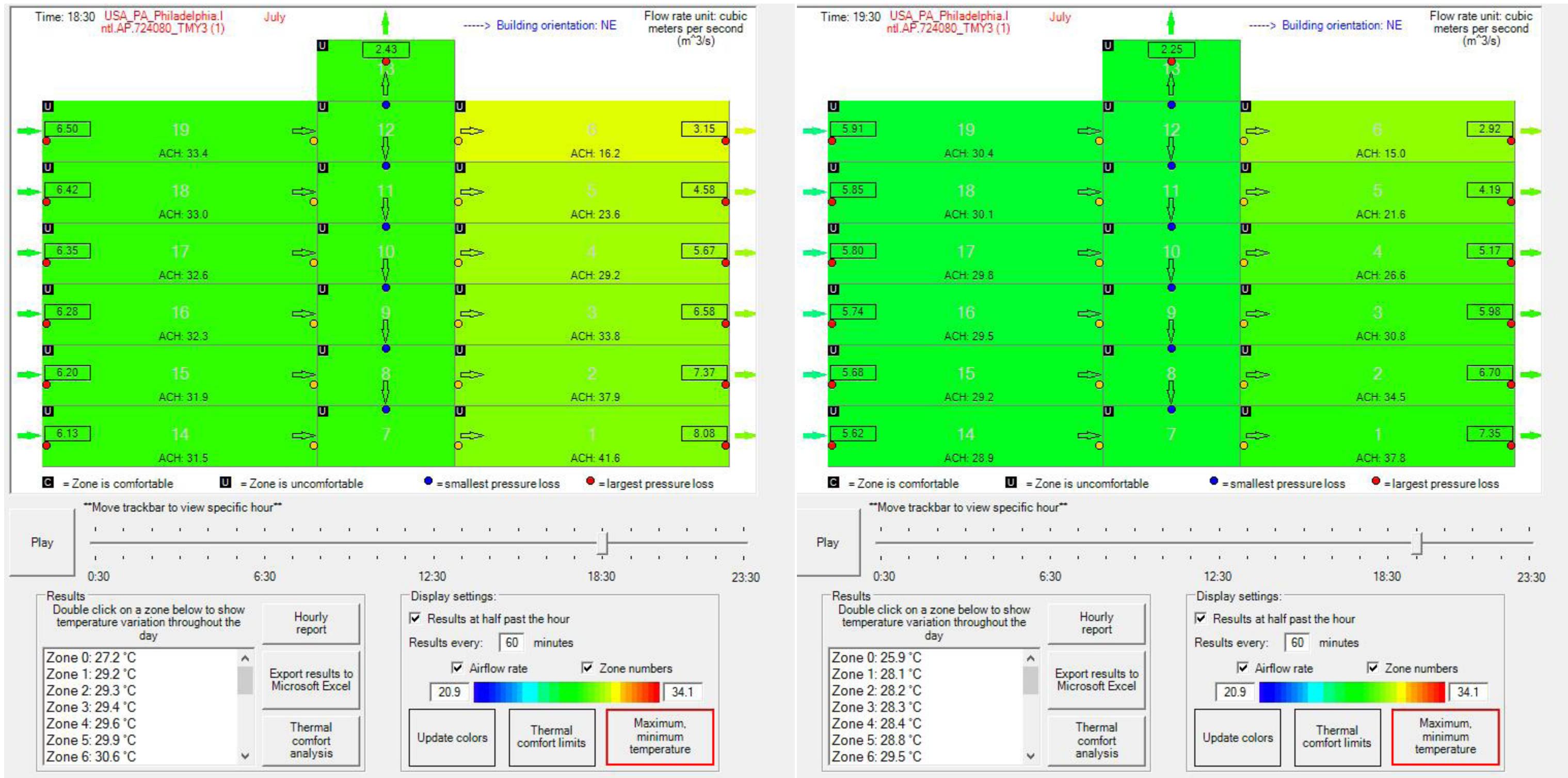
Results every: 60 minutes

Airflow rate Zone numbers

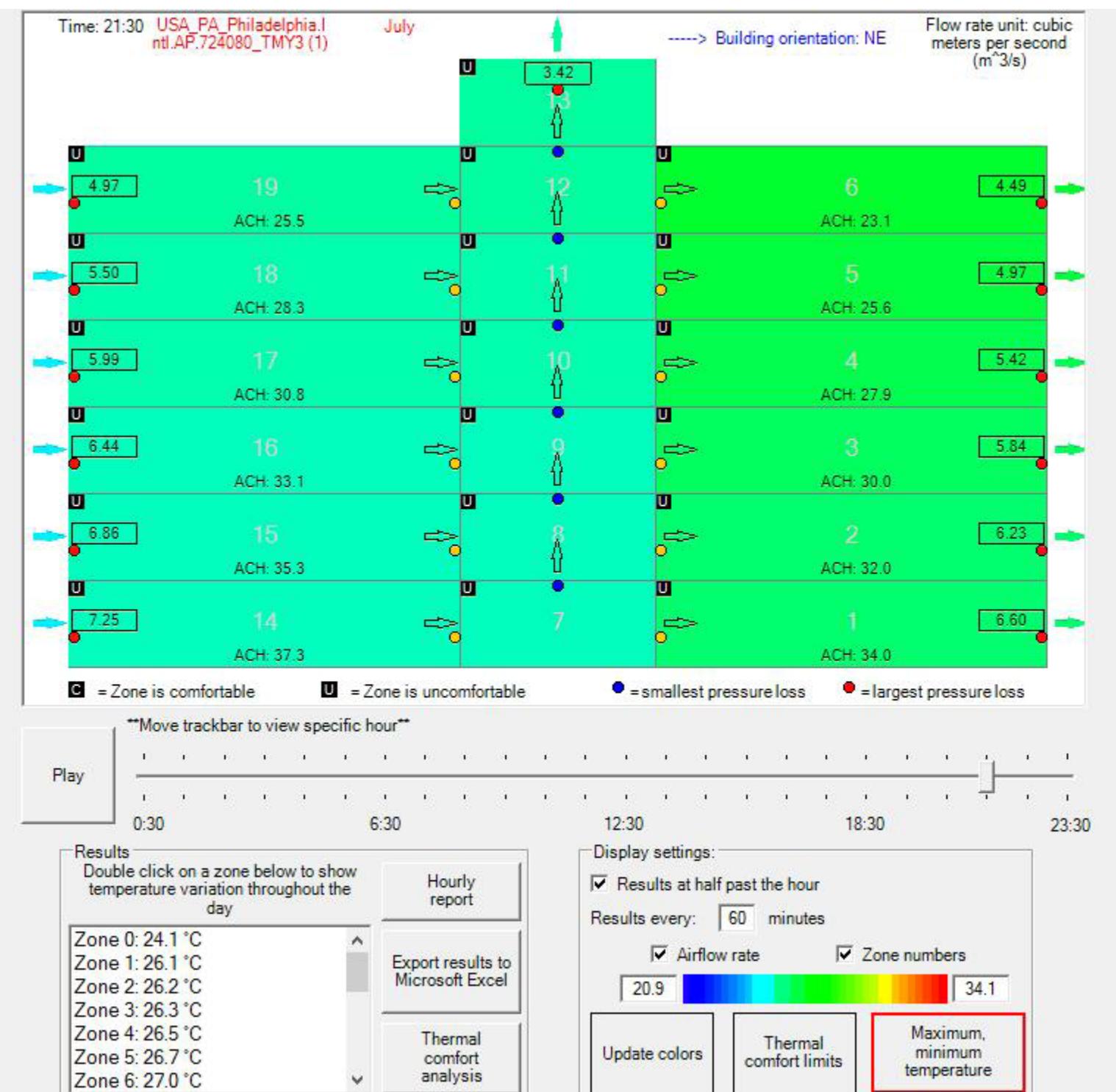
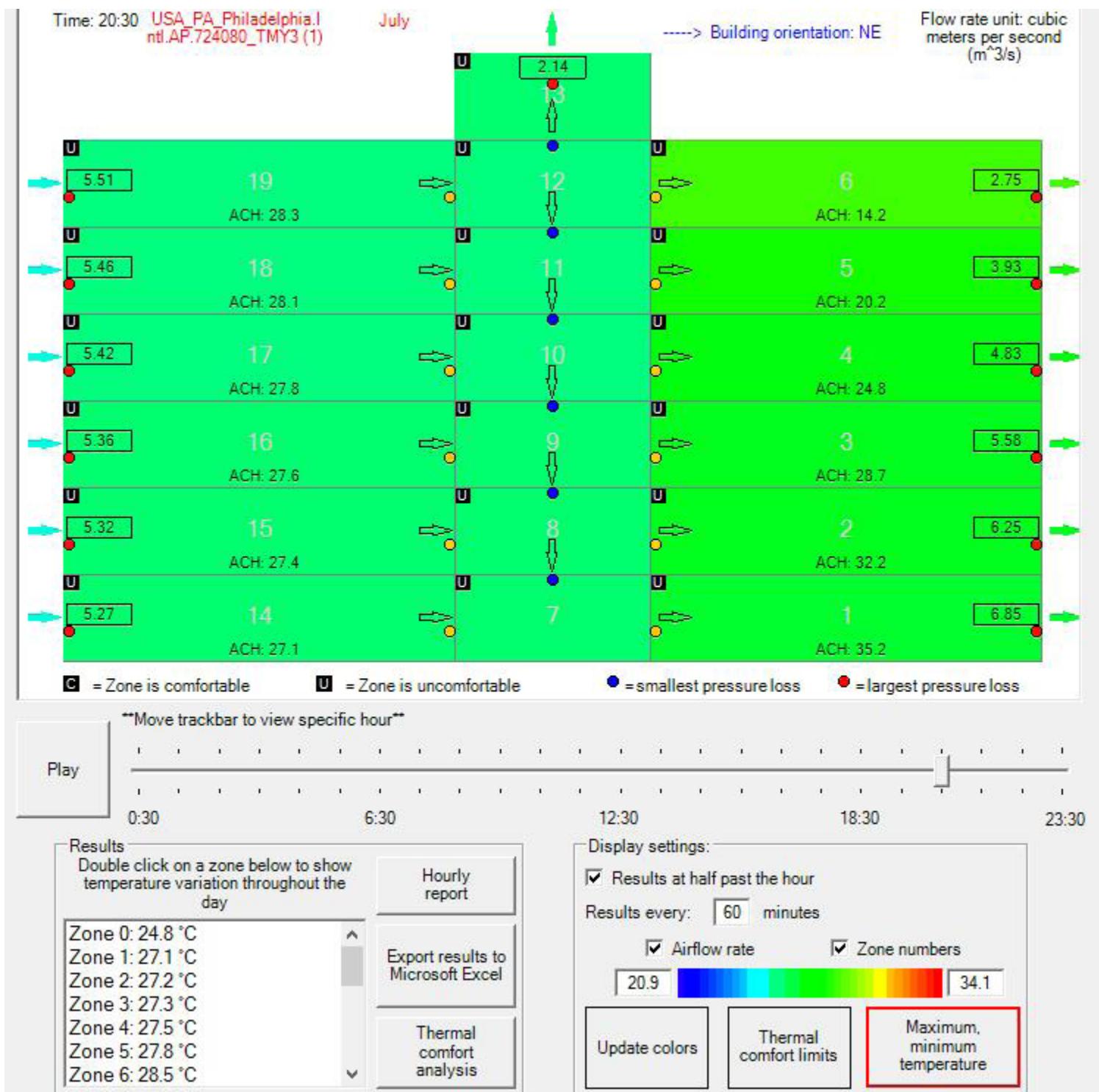
20.9 34.1

Update colors Thermal comfort limits Maximum, minimum temperature

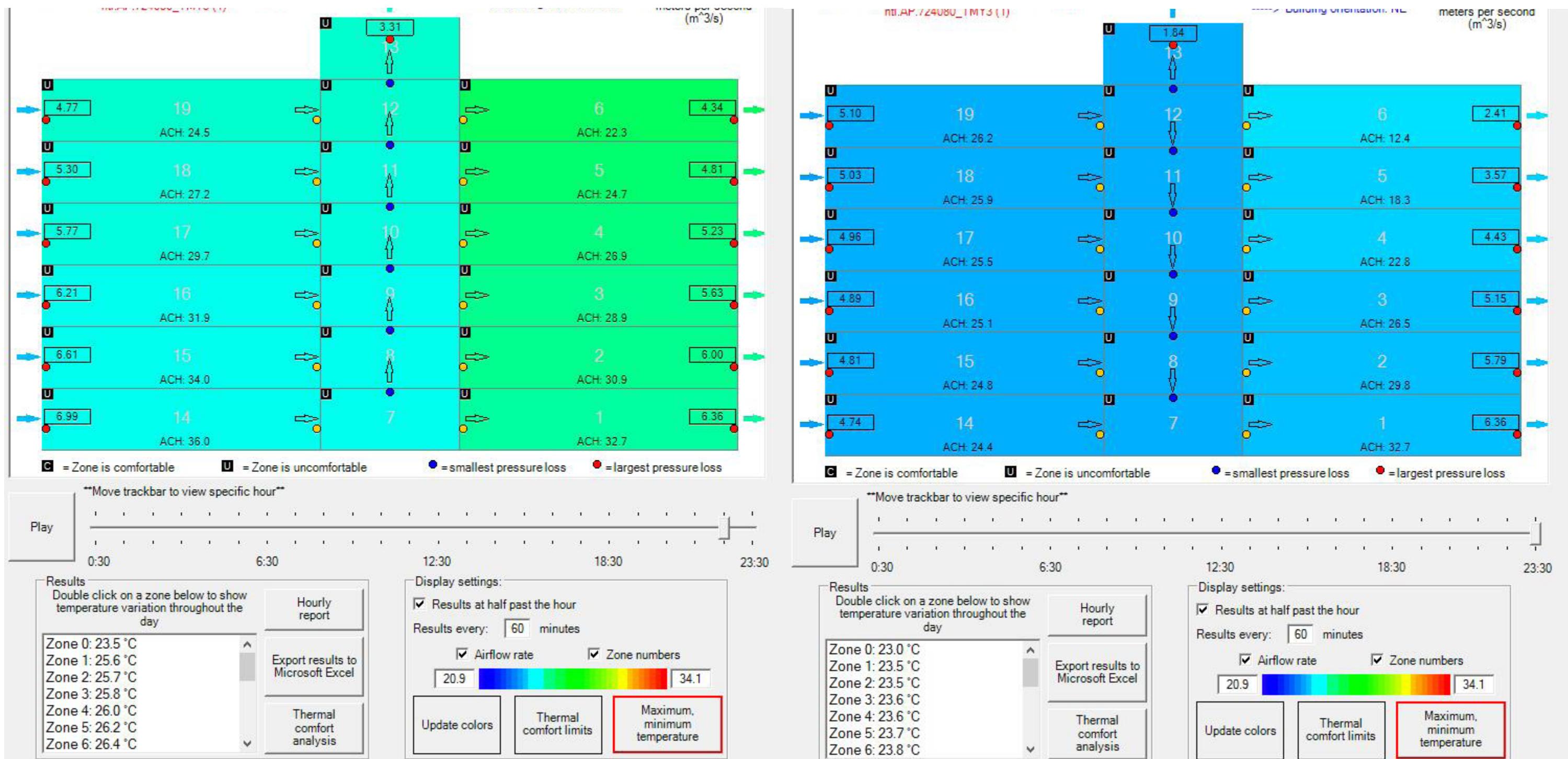
Central Altrium-Simulation Result



Central Altrium-Simulation Result



Central Altrium-Simulation Result



Central Altrium-Hourly Report & Thermal Comfort Results

This is a transient simulation.
 The simulated city is: USA_PA_Philadelphia.Intl.AP.724080_TMY3 (1).
 The building type is central atrium.
 The building orientation is: 45 degrees.

Temperatures are reported in °C.
 Humidity ratios are reported in g(water) / kg(air).
 Airflows are reported in kg/s.

Month: July

Hour 00:30

Zone	Temperature	HR	Airflow from ambient	Airflow to
		Comfortable?		
0	22.50	14.00	-	-
False - humidity is high				
1	22.85	14.02	-	7.19
False - humidity is high				
2	22.87	14.02	-	6.77
False - humidity is high				
3	22.89	14.02	-	6.33
False - humidity is high				
4	22.92	14.02	-	5.85
False - humidity is high				
5	22.95	14.02	-	5.33
False - humidity is high				
6	23.00	14.02	-	4.75
False - humidity is high				
7	22.67	14.01	-	-
False - humidity is high				
8	22.68	14.01	-	-
False - humidity is high				
9	22.69	14.01	-	-
False - humidity is high				
10	22.70	14.01	-	-
False - humidity is high				
11	22.72	14.01	-	-
False - humidity is high				
12	22.73	14.01	-	-
False - humidity is high				
13	22.74	14.01	-	3.60
False - humidity is high				
14	22.67	14.01	7.73	-
False - humidity is high				
15	22.67	14.01	7.33	-
False - humidity is high				
16	22.68	14.01	6.91	-
False - humidity is high				
17	22.70	14.01	6.45	-
False - humidity is high				
18	22.71	14.01	5.96	-
False - humidity is high				
19	22.73	14.01	5.43	-
False - humidity is high				

CoolVent Thermal Comfort Results USA_PA_Philadelphia.Intl.AP.724080_TMY3 (1)

2010 ASHRAE Standard 55 Thermal Comfort Model

Temperature Pie Charts



The pie charts represent temperature concerns for comfort in non-atrium zones of the building.

Red represents the percent of total occupied hours that a given zone is too hot.
 Blue represents the percent of total occupied hours that a given zone is too cold.
 Humidity concerns are not addressed in the pie charts.

Central Altrium-Hourly Report

Hour 01:30

Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?	Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?
0	22.02	13.60	-	-	False - humidity is high	0	21.33	13.50	-	-	False - humidity is high
1	22.37	13.62	-	7.13	False - humidity is high	1	21.57	13.51	5.46	-	False - humidity is high
2	22.39	13.62	-	6.72	False - humidity is high	2	21.56	13.51	5.55	-	False - humidity is high
3	22.41	13.62	-	6.27	False - humidity is high	3	21.56	13.51	5.63	-	False - humidity is high
4	22.44	13.62	-	5.80	False - humidity is high	4	21.56	13.51	5.72	-	False - humidity is high
5	22.48	13.62	-	5.28	False - humidity is high	5	21.55	13.51	5.80	-	False - humidity is high
6	22.52	13.62	-	4.71	False - humidity is high	6	21.55	13.51	5.89	-	False - humidity is high
7	22.19	13.61	-	-	False - humidity is high	7	21.57	13.51	-	-	False - humidity is high
8	22.20	13.61	-	-	False - humidity is high	8	21.57	13.51	-	-	False - humidity is high
9	22.21	13.61	-	-	False - humidity is high	9	21.56	13.51	-	-	False - humidity is high
10	22.22	13.61	-	-	False - humidity is high	10	21.56	13.51	-	-	False - humidity is high
11	22.24	13.61	-	-	False - humidity is high	11	21.56	13.51	-	-	False - humidity is high
12	22.26	13.61	-	-	False - humidity is high	12	21.56	13.51	-	-	False - humidity is high
13	22.26	13.61	-	3.57	False - humidity is high	13	21.57	13.51	-	2.11	False - humidity is high
14	22.19	13.61	7.67	-	False - humidity is high	14	21.74	13.52	-	7.33	False - humidity is high
15	22.20	13.61	7.27	-	False - humidity is high	15	21.75	13.52	-	6.67	False - humidity is high
16	22.21	13.61	6.85	-	False - humidity is high	16	21.77	13.52	-	5.94	False - humidity is high
17	22.22	13.61	6.40	-	False - humidity is high	17	21.81	13.52	-	5.11	False - humidity is high
18	22.24	13.61	5.91	-	False - humidity is high	18	21.86	13.53	-	4.11	False - humidity is high
19	22.26	13.61	5.38	-	False - humidity is high	19	22.01	13.53	-	2.76	False - humidity is high

Hour 02:30

Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?	Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?
0	21.68	13.70	-	-	False - humidity is high	0	21.01	13.30	-	-	False - humidity is high
1	22.08	13.72	-	7.39	False - humidity is high	1	21.42	13.32	-	7.06	False - humidity is high
2	22.09	13.72	-	6.73	False - humidity is high	2	21.43	13.32	-	6.43	False - humidity is high
3	22.11	13.72	-	5.99	False - humidity is high	3	21.45	13.32	-	5.73	False - humidity is high
4	22.14	13.72	-	5.15	False - humidity is high	4	21.48	13.32	-	4.92	False - humidity is high
5	22.20	13.73	-	4.14	False - humidity is high	5	21.54	13.33	-	3.96	False - humidity is high
6	22.34	13.73	-	2.78	False - humidity is high	6	21.68	13.33	-	2.67	False - humidity is high
7	21.91	13.71	-	-	False - humidity is high	7	21.24	13.31	-	-	False - humidity is high
8	21.91	13.71	-	-	False - humidity is high	8	21.24	13.31	-	-	False - humidity is high
9	21.90	13.71	-	-	False - humidity is high	9	21.24	13.31	-	-	False - humidity is high
10	21.90	13.71	-	-	False - humidity is high	10	21.23	13.31	-	-	False - humidity is high
11	21.90	13.71	-	-	False - humidity is high	11	21.23	13.31	-	-	False - humidity is high
12	21.90	13.71	-	-	False - humidity is high	12	21.23	13.31	-	-	False - humidity is high
13	21.90	13.71	-	2.13	False - humidity is high	13	21.24	13.31	-	2.04	False - humidity is high
14	21.91	13.71	5.49	-	False - humidity is high	14	21.24	13.31	5.26	-	False - humidity is high
15	21.91	13.71	5.58	-	False - humidity is high	15	21.24	13.31	5.34	-	False - humidity is high
16	21.90	13.71	5.67	-	False - humidity is high	16	21.24	13.31	5.43	-	False - humidity is high
17	21.90	13.71	5.76	-	False - humidity is high	17	21.23	13.31	5.51	-	False - humidity is high
18	21.90	13.71	5.85	-	False - humidity is high	18	21.23	13.31	5.59	-	False - humidity is high
19	21.89	13.71	5.93	-	False - humidity is high	19	21.23	13.31	5.67	-	False - humidity is high

Central Altrium-Hourly Report

Hour 05:30

Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?	Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?
0	21.24	13.30	-	-	False - humidity is high	0	22.34	13.60	-	-	False - humidity is high
1	21.60	13.32	-	7.15	False - humidity is high	1	22.51	13.61	5.76	-	False - humidity is high
2	21.61	13.32	-	6.51	False - humidity is high	2	22.51	13.61	5.86	-	False - humidity is high
3	21.63	13.32	-	5.80	False - humidity is high	3	22.51	13.61	5.96	-	False - humidity is high
4	21.66	13.32	-	4.98	False - humidity is high	4	22.51	13.61	6.06	-	False - humidity is high
5	21.71	13.33	-	4.00	False - humidity is high	5	22.50	13.61	6.16	-	False - humidity is high
6	21.85	13.33	-	2.69	False - humidity is high	6	22.50	13.61	6.25	-	False - humidity is high
7	21.45	13.31	-	-	False - humidity is high	7	22.49	13.61	-	-	False - humidity is high
8	21.44	13.31	-	-	False - humidity is high	8	22.49	13.61	-	-	False - humidity is high
9	21.44	13.31	-	-	False - humidity is high	9	22.49	13.61	-	-	False - humidity is high
10	21.44	13.31	-	-	False - humidity is high	10	22.48	13.61	-	-	False - humidity is high
11	21.44	13.31	-	-	False - humidity is high	11	22.48	13.61	-	-	False - humidity is high
12	21.43	13.31	-	-	False - humidity is high	12	22.48	13.61	-	-	False - humidity is high
13	21.41	13.31	-	2.05	False - humidity is high	13	22.43	13.61	-	2.21	False - humidity is high
14	21.46	13.31	5.31	-	False - humidity is high	14	22.66	13.62	-	7.79	False - humidity is high
15	21.46	13.31	5.40	-	False - humidity is high	15	22.67	13.62	-	7.08	False - humidity is high
16	21.45	13.31	5.49	-	False - humidity is high	16	22.69	13.62	-	6.30	False - humidity is high
17	21.45	13.31	5.57	-	False - humidity is high	17	22.73	13.62	-	5.41	False - humidity is high
18	21.45	13.31	5.66	-	False - humidity is high	18	22.78	13.62	-	4.34	False - humidity is high
19	21.44	13.31	5.74	-	False - humidity is high	19	22.93	13.63	-	2.90	False - humidity is high

Hour 05:30

Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?	Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?
0	21.24	13.30	-	-	False - humidity is high	0	23.88	13.90	-	-	False - humidity is high
1	21.60	13.32	-	7.15	False - humidity is high	1	24.38	13.93	-	5.21	False - humidity is high
2	21.61	13.32	-	6.51	False - humidity is high	2	24.44	13.93	-	4.12	False - humidity is high
3	21.63	13.32	-	5.80	False - humidity is high	3	24.60	13.94	-	2.63	False - humidity is high
4	21.66	13.32	-	4.98	False - humidity is high	4	24.49	13.93	1.78	-	False - humidity is high
5	21.71	13.33	-	4.00	False - humidity is high	5	24.17	13.92	3.65	-	False - humidity is high
6	21.85	13.33	-	2.69	False - humidity is high	6	24.10	13.91	4.85	-	False - humidity is high
7	21.45	13.31	-	-	False - humidity is high	7	24.17	13.92	-	-	False - humidity is high
8	21.44	13.31	-	-	False - humidity is high	8	24.18	13.92	-	-	False - humidity is high
9	21.44	13.31	-	-	False - humidity is high	9	24.19	13.92	-	-	False - humidity is high
10	21.44	13.31	-	-	False - humidity is high	10	24.19	13.92	-	-	False - humidity is high
11	21.44	13.31	-	-	False - humidity is high	11	24.12	13.91	-	-	False - humidity is high
12	21.43	13.31	-	-	False - humidity is high	12	24.07	13.91	-	-	False - humidity is high
13	21.41	13.31	-	2.05	False - humidity is high	13	23.84	13.90	3.38	-	False - humidity is high
14	21.46	13.31	5.31	-	False - humidity is high	14	24.48	13.93	-	5.21	False - humidity is high
15	21.46	13.31	5.40	-	False - humidity is high	15	24.57	13.93	-	4.12	False - humidity is high
16	21.45	13.31	5.49	-	False - humidity is high	16	24.80	13.94	-	2.63	False - humidity is high
17	21.45	13.31	5.57	-	False - humidity is high	17	24.78	13.93	1.78	-	False - humidity is high
18	21.45	13.31	5.66	-	False - humidity is high	18	24.32	13.92	3.65	-	False - humidity is high
19	21.44	13.31	5.74	-	False - humidity is high	19	24.21	13.91	4.85	-	False - humidity is high

Central Altrium -Hourly Report

Hour 08:30

Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?
0	25.21	14.10	-	-	False - humidity is high
1	25.39	14.11	6.93	-	False - humidity is high
2	25.38	14.11	7.05	-	False - humidity is high
3	25.38	14.11	7.17	-	False - humidity is high
4	25.38	14.11	7.29	-	False - humidity is high
5	25.38	14.11	7.41	-	False - humidity is high
6	25.37	14.11	7.52	-	False - humidity is high
7	25.37	14.11	-	-	False - humidity is high
8	25.37	14.11	-	-	False - humidity is high
9	25.37	14.11	-	-	False - humidity is high
10	25.36	14.11	-	-	False - humidity is high
11	25.36	14.11	-	-	False - humidity is high
12	25.36	14.11	-	-	False - humidity is high
13	25.33	14.11	-	2.66	False - humidity is high
14	25.58	14.12	-	9.37	False - humidity is high
15	25.59	14.12	-	8.53	False - humidity is high
16	25.62	14.12	-	7.59	False - humidity is high
17	25.66	14.12	-	6.51	False - humidity is high
18	25.73	14.12	-	5.22	False - humidity is high
19	25.91	14.13	-	3.49	False - humidity is high

Hour 10:30

Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?
0	27.64	14.30	-	-	False - humidity is high
1	28.49	14.34	7.12	-	False - humidity is high
2	28.48	14.34	7.22	-	False - humidity is high
3	28.46	14.34	7.32	-	False - humidity is high
4	28.45	14.34	7.42	-	False - humidity is high
5	28.44	14.34	7.52	-	False - humidity is high
6	28.43	14.34	7.61	-	False - humidity is high
7	28.47	14.34	-	-	False - humidity is high
8	28.46	14.34	-	-	False - humidity is high
9	28.45	14.34	-	-	False - humidity is high
10	28.44	14.34	-	-	False - humidity is high
11	28.43	14.34	-	-	False - humidity is high
12	28.42	14.34	-	-	False - humidity is high
13	28.39	14.34	-	2.80	False - humidity is high
14	29.18	14.38	-	9.48	False - humidity is high
15	29.24	14.38	-	8.63	False - humidity is high
16	29.32	14.38	-	7.69	False - humidity is high
17	29.46	14.39	-	6.62	False - humidity is high
18	29.69	14.40	-	5.34	False - humidity is high
19	30.27	14.43	-	3.64	False - humidity is high

Central Altrium-Hourly Report

Hour 11:30

Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?	Hour 12:30	Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?
0 and temperature is high	28.65	14.30	-	-	False - humidity is high	0 and temperature is high	29.28	14.00	-	-	-	False - humidity is high
1 and temperature is high	31.25	14.43	-	5.48	False - humidity is high	1 and temperature is high	30.80	14.07	-	-	9.68	False - humidity is high
2 and temperature is high	31.55	14.45	-	4.34	False - humidity is high	2 and temperature is high	30.85	14.08	-	-	8.82	False - humidity is high
3 and temperature is high	32.35	14.49	-	2.77	False - humidity is high	3 and temperature is high	30.92	14.08	-	-	7.86	False - humidity is high
4 and temperature is high	31.94	14.47	1.85	-	False - humidity is high	4 and temperature is high	31.04	14.09	-	-	6.77	False - humidity is high
5 and temperature is high	30.24	14.38	3.83	-	False - humidity is high	5 and temperature is high	31.25	14.10	-	-	5.46	False - humidity is high
6 and temperature is high	29.84	14.36	5.12	-	False - humidity is high	6 and temperature is high	31.78	14.12	-	-	3.72	False - humidity is high
7 and temperature is high	30.14	14.37	-	-	False - humidity is high	7 and temperature is high	30.16	14.04	-	-	-	False - humidity is high
8 and temperature is high	30.14	14.37	-	-	False - humidity is high	8 and temperature is high	30.14	14.04	-	-	-	False - humidity is high
9 and temperature is high	30.15	14.37	-	-	False - humidity is high	9 and temperature is high	30.13	14.04	-	-	-	False - humidity is high
10 and temperature is high	30.15	14.37	-	-	False - humidity is high	10 and temperature is high	30.12	14.04	-	-	-	False - humidity is high
11 and temperature is high	29.82	14.36	-	-	False - humidity is high	11 and temperature is high	30.11	14.04	-	-	-	False - humidity is high
12 and temperature is high	29.56	14.34	-	-	False - humidity is high	12 and temperature is high	30.10	14.04	-	-	-	False - humidity is high
13 and temperature is high	28.63	14.30	3.56	-	False - humidity is high	13 and temperature is high	30.10	14.04	-	-	2.86	False - humidity is high
14 and temperature is high	31.34	14.43	-	5.48	False - humidity is high	14 and temperature is high	30.16	14.04	7.27	-	-	False - humidity is high
15 and temperature is high	31.67	14.45	-	4.34	False - humidity is high	15 and temperature is high	30.15	14.04	7.38	-	-	False - humidity is high
16 and temperature is high	32.53	14.49	-	2.77	False - humidity is high	16 and temperature is high	30.14	14.04	7.48	-	-	False - humidity is high
17 and temperature is high	32.22	14.47	1.85	-	False - humidity is high	17 and temperature is high	30.13	14.04	7.58	-	-	False - humidity is high
18 and temperature is high	30.37	14.38	3.83	-	False - humidity is high	18 and temperature is high	30.12	14.04	7.68	-	-	False - humidity is high
19 and temperature is high	29.94	14.36	5.12	-	False - humidity is high	19 and temperature is high	30.11	14.04	7.78	-	-	False - humidity is high

Central Altrium-Hourly Report

Hour 13:30

Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?	Hour 14:30	Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?
0 and temperature is high	29.62	13.60	-	-	False - humidity is high	0 and temperature is high	29.61	13.80	-	-	-	False - humidity is high
1 and temperature is high	30.83	13.66	-	9.88	False - humidity is high	1 and temperature is high	30.83	13.86	-	-	10.24	False - humidity is high
2 and temperature is high	30.89	13.66	-	9.31	False - humidity is high	2 and temperature is high	30.90	13.86	-	-	9.65	False - humidity is high
3 and temperature is high	30.98	13.67	-	8.70	False - humidity is high	3 and temperature is high	30.99	13.87	-	-	9.01	False - humidity is high
4 and temperature is high	31.07	13.67	-	8.05	False - humidity is high	4 and temperature is high	31.09	13.87	-	-	8.34	False - humidity is high
5 and temperature is high	31.20	13.68	-	7.34	False - humidity is high	5 and temperature is high	31.21	13.88	-	-	7.60	False - humidity is high
6 and temperature is high	31.36	13.69	-	6.56	False - humidity is high	6 and temperature is high	31.38	13.88	-	-	6.79	False - humidity is high
7 and temperature is high	30.19	13.63	-	-	False - humidity is high	7 and temperature is high	30.18	13.83	-	-	-	False - humidity is high
8 and temperature is high	30.22	13.63	-	-	False - humidity is high	8 and temperature is high	30.21	13.83	-	-	-	False - humidity is high
9 and temperature is high	30.26	13.63	-	-	False - humidity is high	9 and temperature is high	30.25	13.83	-	-	-	False - humidity is high
10 and temperature is high	30.30	13.63	-	-	False - humidity is high	10 and temperature is high	30.29	13.83	-	-	-	False - humidity is high
11 and temperature is high	30.35	13.64	-	-	False - humidity is high	11 and temperature is high	30.34	13.84	-	-	-	False - humidity is high
12 and temperature is high	30.41	13.64	-	-	False - humidity is high	12 and temperature is high	30.40	13.84	-	-	-	False - humidity is high
13 and temperature is high	30.40	13.64	-	4.98	False - humidity is high	13 and temperature is high	30.40	13.84	-	-	5.16	False - humidity is high
14 and temperature is high	30.20	13.63	10.67	-	False - humidity is high	14 and temperature is high	30.18	13.83	11.04	-	-	False - humidity is high
15 and temperature is high	30.23	13.63	10.11	-	False - humidity is high	15 and temperature is high	30.21	13.83	10.47	-	-	False - humidity is high
16 and temperature is high	30.27	13.63	9.51	-	False - humidity is high	16 and temperature is high	30.25	13.83	9.85	-	-	False - humidity is high
17 and temperature is high	30.31	13.63	8.88	-	False - humidity is high	17 and temperature is high	30.29	13.83	9.20	-	-	False - humidity is high
18 and temperature is high	30.37	13.64	8.20	-	False - humidity is high	18 and temperature is high	30.35	13.84	8.49	-	-	False - humidity is high
19 and temperature is high	30.44	13.64	7.45	-	False - humidity is high	19 and temperature is high	30.42	13.84	7.72	-	-	False - humidity is high

Central Altrium-Hourly Report

Hour 15:30					Hour 16:30						
Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?	Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?
0 and temperature is high	29.46	13.90	-	-	False - humidity is high	0 and temperature is high	29.21	13.60	-	-	False - humidity is high
1 and temperature is high	30.68	13.96	-	10.28	False - humidity is high	1 and temperature is high	31.79	13.72	-	6.16	False - humidity is high
2 and temperature is high	30.75	13.96	-	9.69	False - humidity is high	2 and temperature is high	32.09	13.73	-	4.88	False - humidity is high
3 and temperature is high	30.83	13.97	-	9.05	False - humidity is high	3 and temperature is high	32.92	13.77	-	3.11	False - humidity is high
4 and temperature is high	30.93	13.97	-	8.37	False - humidity is high	4 and temperature is high	32.62	13.75	2.08	-	False - humidity is high
5 and temperature is high	31.06	13.98	-	7.63	False - humidity is high	5 and temperature is high	30.86	13.67	4.32	-	False - humidity is high
6 and temperature is high	31.22	13.98	-	6.81	False - humidity is high	6 and temperature is high	30.45	13.65	5.75	-	False - humidity is high
7 and temperature is high	30.02	13.93	-	-	False - humidity is high	7 and temperature is high	30.64	13.67	-	-	False - humidity is high
8 and temperature is high	30.05	13.93	-	-	False - humidity is high	8 and temperature is high	30.64	13.67	-	-	False - humidity is high
9 and temperature is high	30.08	13.93	-	-	False - humidity is high	9 and temperature is high	30.63	13.67	-	-	False - humidity is high
10 and temperature is high	30.12	13.93	-	-	False - humidity is high	10 and temperature is high	30.63	13.67	-	-	False - humidity is high
11 and temperature is high	30.17	13.94	-	-	False - humidity is high	11 and temperature is high	30.32	13.65	-	-	False - humidity is high
12 and temperature is high	30.22	13.94	-	-	False - humidity is high	12 and temperature is high	30.08	13.64	-	-	False - humidity is high
13 and temperature is high	30.22	13.94	-	5.17	False - humidity is high	13 and temperature is high	29.22	13.60	4.01	-	False - humidity is high
14 and temperature is high	30.02	13.93	11.09	-	False - humidity is high	14 and temperature is high	31.65	13.72	-	6.16	False - humidity is high
15 and temperature is high	30.05	13.93	10.51	-	False - humidity is high	15 and temperature is high	31.91	13.73	-	4.88	False - humidity is high
16 and temperature is high	30.09	13.93	9.89	-	False - humidity is high	16 and temperature is high	32.63	13.77	-	3.12	False - humidity is high
17 and temperature is high	30.13	13.93	9.24	-	False - humidity is high	17 and temperature is high	32.20	13.75	2.08	-	False - humidity is high
18 and temperature is high	30.19	13.94	8.53	-	False - humidity is high	18 and temperature is high	30.65	13.67	4.32	-	False - humidity is high
19 and temperature is high	30.26	13.94	7.76	-	False - humidity is high	19 and temperature is high	30.29	13.65	5.75	-	False - humidity is high

Central Altrium-Hourly Report

Hour 17:30

Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?	Hour 18:30	Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?
0 and temperature is high	28.32	13.40	-	-	False - humidity is high	0 and temperature is high	27.20	13.70	-	-	-	False - humidity is high
1 and temperature is high	29.85	13.47	-	10.16	False - humidity is high	1 and temperature is high	28.77	13.78	-	-	9.57	False - humidity is high
2 and temperature is high	29.91	13.47	-	9.25	False - humidity is high	2 and temperature is high	28.83	13.78	-	-	8.72	False - humidity is high
3 and temperature is high	29.99	13.48	-	8.24	False - humidity is high	3 and temperature is high	28.91	13.78	-	-	7.77	False - humidity is high
4 and temperature is high	30.12	13.48	-	7.09	False - humidity is high	4 and temperature is high	29.04	13.79	-	-	6.69	False - humidity is high
5 and temperature is high	30.35	13.49	-	5.72	False - humidity is high	5 and temperature is high	29.27	13.80	-	-	5.40	False - humidity is high
6 and temperature is high	30.93	13.52	-	3.89	False - humidity is high	6 and temperature is high	29.84	13.82	-	-	3.69	False - humidity is high
7 and temperature is high	29.15	13.44	-	-	False - humidity is high	7 and temperature is high	28.07	13.74	-	-	-	False - humidity is high
8 and temperature is high	29.14	13.44	-	-	False - humidity is high	8 and temperature is high	28.06	13.74	-	-	-	False - humidity is high
9 and temperature is high	29.13	13.44	-	-	False - humidity is high	9 and temperature is high	28.05	13.74	-	-	-	False - humidity is high
10 and temperature is high	29.12	13.44	-	-	False - humidity is high	10 and temperature is high	28.04	13.74	-	-	-	False - humidity is high
11 and temperature is high	29.11	13.44	-	-	False - humidity is high	11 and temperature is high	28.03	13.74	-	-	-	False - humidity is high
12 and temperature is high	29.10	13.44	-	-	False - humidity is high	12 and temperature is high	28.02	13.74	-	-	-	False - humidity is high
13 and temperature is high	29.13	13.44	-	2.98	False - humidity is high	13 and temperature is high	28.05	13.74	-	-	2.83	False - humidity is high
14 and temperature is high	29.15	13.44	7.61	-	False - humidity is high	14 and temperature is high	28.06	13.74	7.20	-	-	False - humidity is high
15 and temperature is high	29.14	13.44	7.72	-	False - humidity is high	15 and temperature is high	28.05	13.74	7.30	-	-	False - humidity is high
16 and temperature is high	29.12	13.44	7.84	-	False - humidity is high	16 and temperature is high	28.04	13.74	7.40	-	-	False - humidity is high
17 and temperature is high	29.11	13.44	7.94	-	False - humidity is high	17 and temperature is high	28.03	13.74	7.50	-	-	False - humidity is high
18 and temperature is high	29.10	13.44	8.05	-	False - humidity is high	18 and temperature is high	28.02	13.74	7.59	-	-	False - humidity is high
19 and temperature is high	29.09	13.44	8.16	-	False - humidity is high	19 and temperature is high	28.01	13.74	7.69	-	-	False - humidity is high

Central Altrium-Hourly Report

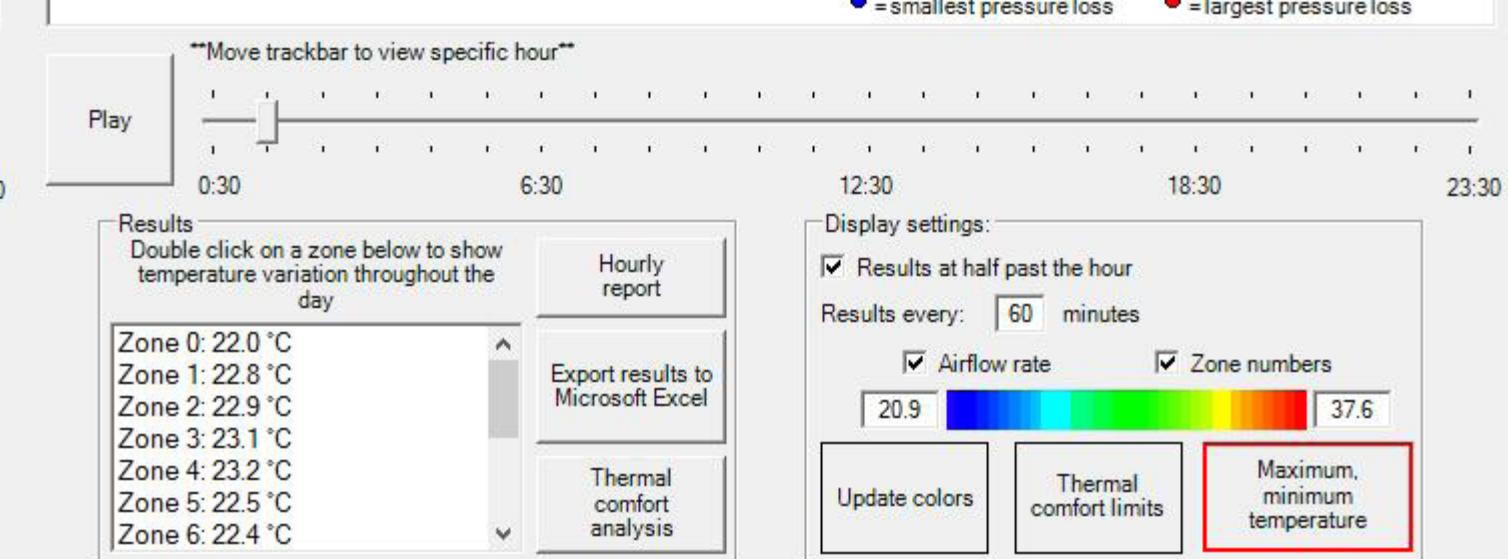
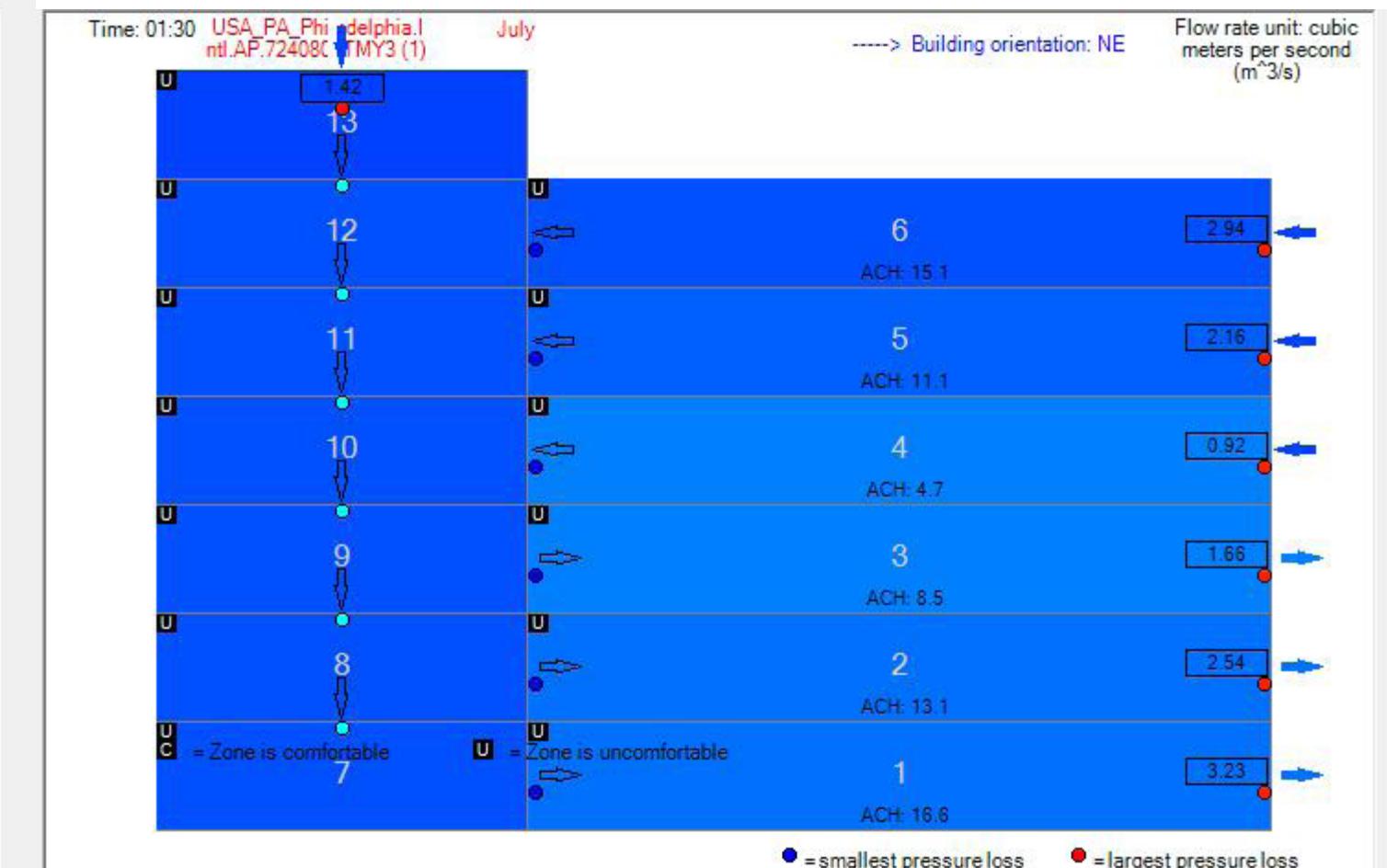
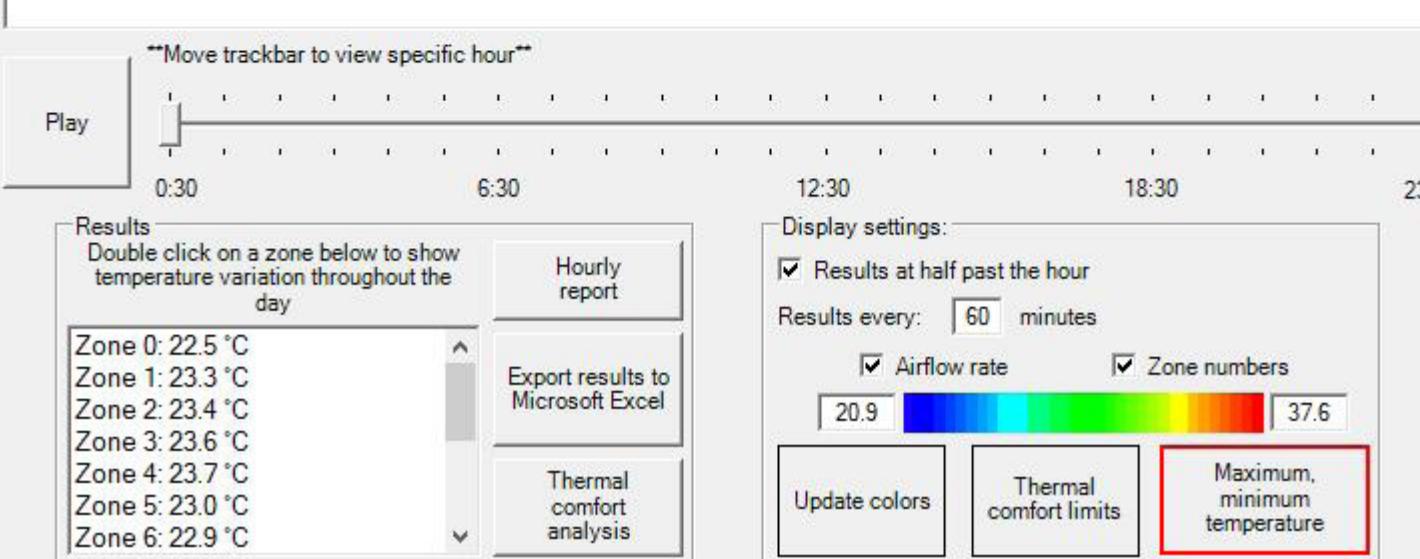
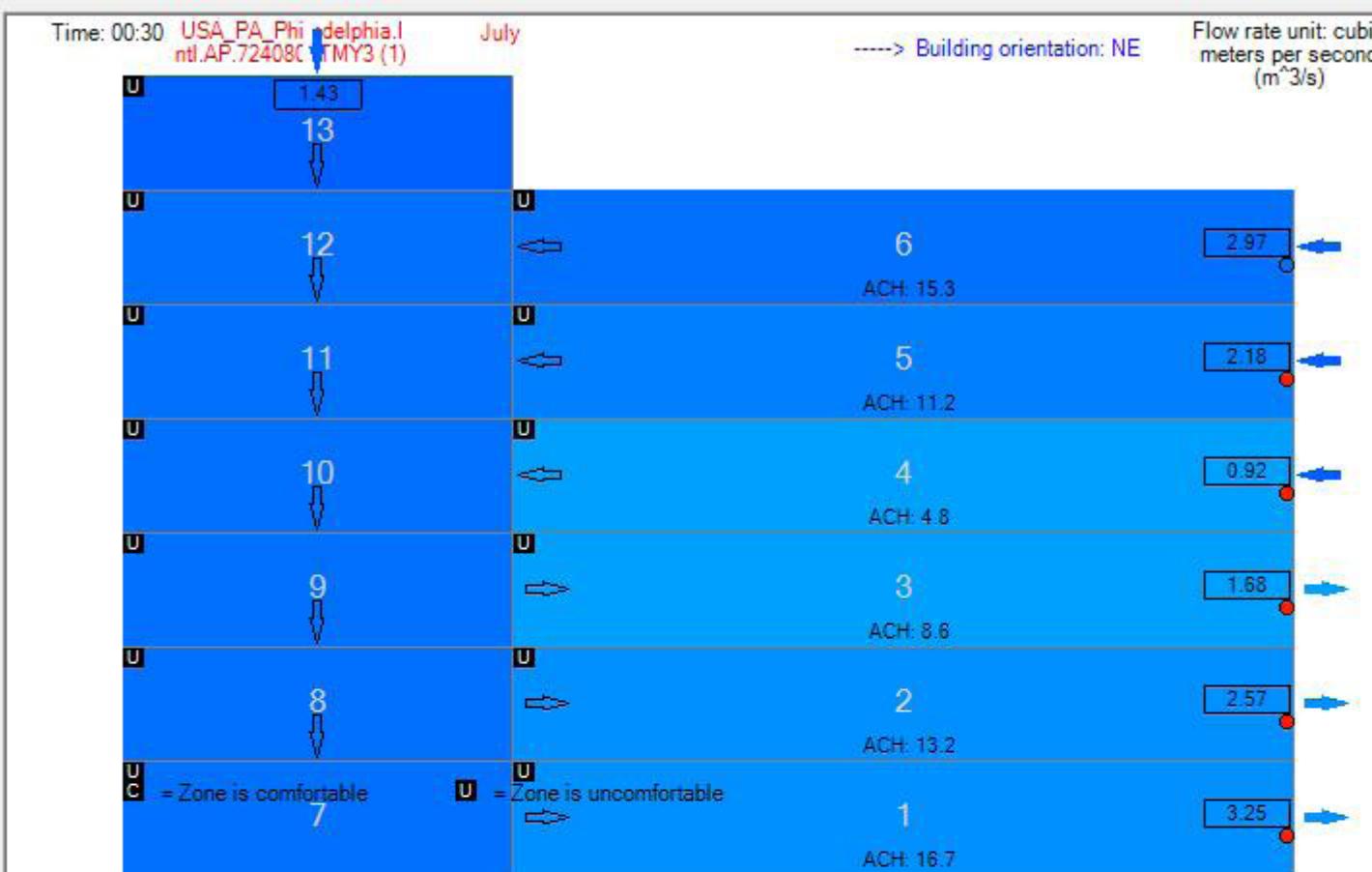
Hour 19:30

Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?	Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?
0	25.88	14.00	-	-	False - humidity is high	0	23.51	14.00	-	-	False - humidity is high
1	26.31	14.02	-	8.78	False - humidity is high	1	23.84	14.02	-	7.61	False - humidity is high
2	26.32	14.02	-	7.99	False - humidity is high	2	23.86	14.02	-	7.16	False - humidity is high
3	26.34	14.02	-	7.12	False - humidity is high	3	23.88	14.02	-	6.69	False - humidity is high
4	26.38	14.02	-	6.11	False - humidity is high	4	23.91	14.02	-	6.18	False - humidity is high
5	26.44	14.02	-	4.91	False - humidity is high	5	23.94	14.02	-	5.63	False - humidity is high
6	26.59	14.03	-	3.29	False - humidity is high	6	23.99	14.02	-	5.01	False - humidity is high
and temperature is high											
7	26.13	14.01	-	-	False - humidity is high	7	23.67	14.01	-	-	False - humidity is high
8	26.12	14.01	-	-	False - humidity is high	8	23.68	14.01	-	-	False - humidity is high
9	26.12	14.01	-	-	False - humidity is high	9	23.69	14.01	-	-	False - humidity is high
10	26.12	14.01	-	-	False - humidity is high	10	23.70	14.01	-	-	False - humidity is high
11	26.11	14.01	-	-	False - humidity is high	11	23.72	14.01	-	-	False - humidity is high
12	26.11	14.01	-	-	False - humidity is high	12	23.73	14.01	-	-	False - humidity is high
13	26.15	14.01	-	2.52	False - humidity is high	13	23.74	14.01	-	3.80	False - humidity is high
14	26.11	14.01	6.52	-	False - humidity is high	14	23.67	14.01	8.17	-	False - humidity is high
15	26.11	14.01	6.63	-	False - humidity is high	15	23.68	14.01	7.75	-	False - humidity is high
16	26.10	14.01	6.74	-	False - humidity is high	16	23.69	14.01	7.30	-	False - humidity is high
17	26.10	14.01	6.84	-	False - humidity is high	17	23.70	14.01	6.82	-	False - humidity is high
18	26.10	14.01	6.95	-	False - humidity is high	18	23.71	14.01	6.30	-	False - humidity is high
19	26.09	14.01	7.05	-	False - humidity is high	19	23.73	14.01	5.74	-	False - humidity is high

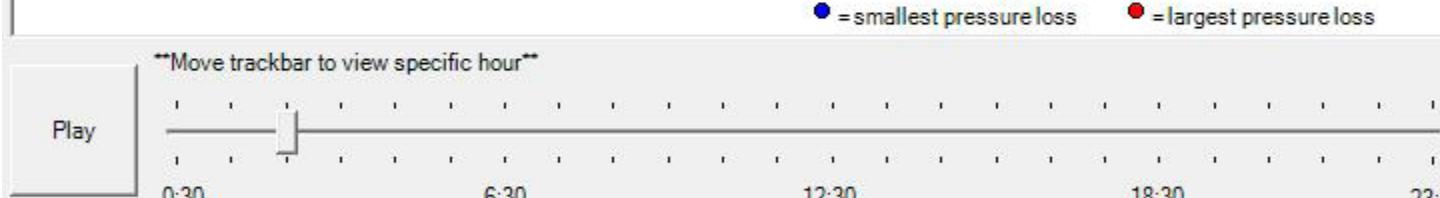
Hour 20:30

Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?	Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?
0	24.80	14.10	-	-	False - humidity is high	0	22.98	13.80	-	-	False - humidity is high
1	25.18	14.12	-	8.21	False - humidity is high	1	23.38	13.82	-	7.51	False - humidity is high
2	25.19	14.12	-	7.47	False - humidity is high	2	23.40	13.82	-	6.83	False - humidity is high
3	25.21	14.12	-	6.65	False - humidity is high	3	23.41	13.82	-	6.08	False - humidity is high
4	25.24	14.12	-	5.71	False - humidity is high	4	23.45	13.82	-	5.23	False - humidity is high
5	25.29	14.12	-	4.59	False - humidity is high	5	23.50	13.83	-	4.20	False - humidity is high
6	25.43	14.13	-	3.08	False - humidity is high	6	23.64	13.83	-	2.82	False - humidity is high
7	25.02	14.11	-	-	False - humidity is high	7	23.22	13.81	-	-	False - humidity is high
8	25.02	14.11	-	-	False - humidity is high	8	23.21	13.81	-	-	False - humidity is high
9	25.02	14.11	-	-	False - humidity is high	9	23.21	13.81	-	-	False - humidity is high
10	25.01	14.11	-	-	False - humidity is high	10	23.21	13.81	-	-	False - humidity is high
11	25.01	14.11	-	-	False - humidity is high	11	23.20	13.81	-	-	False - humidity is high
12	25.01	14.11	-	-	False - humidity is high	12	23.20	13.81	-	-	False - humidity is high
13	25.03	14.11	-	2.35	False - humidity is high	13	23.22	13.81	-	2.16	False - humidity is high
14	25.01	14.11	6.09	-	False - humidity is high	14	23.21	13.81	5.58	-	False - humidity is high
15	25.01	14.11	6.19	-	False - humidity is high	15	23.21	13.81	5.67	-	False - humidity is high
16	25.01	14.11	6.30	-	False - humidity is high	16	23.20	13.81	5.76	-	False - humidity is high
17	25.00	14.11	6.40	-	False - humidity is high	17	23.20	13.81	5.85	-	False - humidity is high
18	25.00	14.11	6.49	-	False - humidity is high	18	23.20	13.81	5.94	-	False - humidity is high
19	25.00	14.11	6.59	-	False - humidity is high	19	23.19	13.81	6.03	-	False - humidity is high

Ventilation Shaft-Simulation Result



Ventilation Shaft-Simulation Result



Results
Double click on a zone below to show temperature variation throughout the day

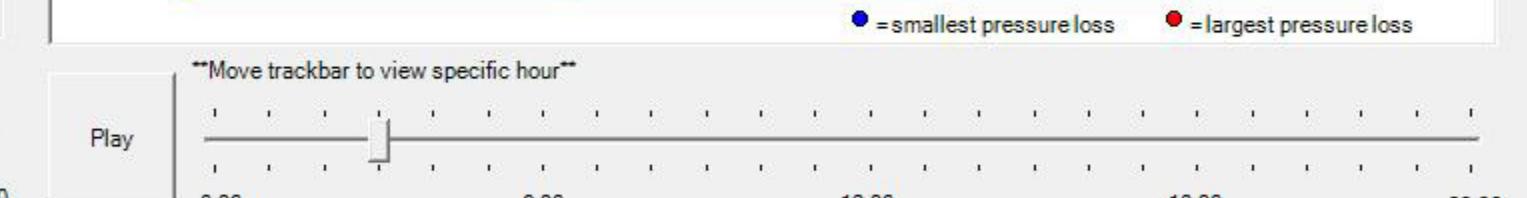
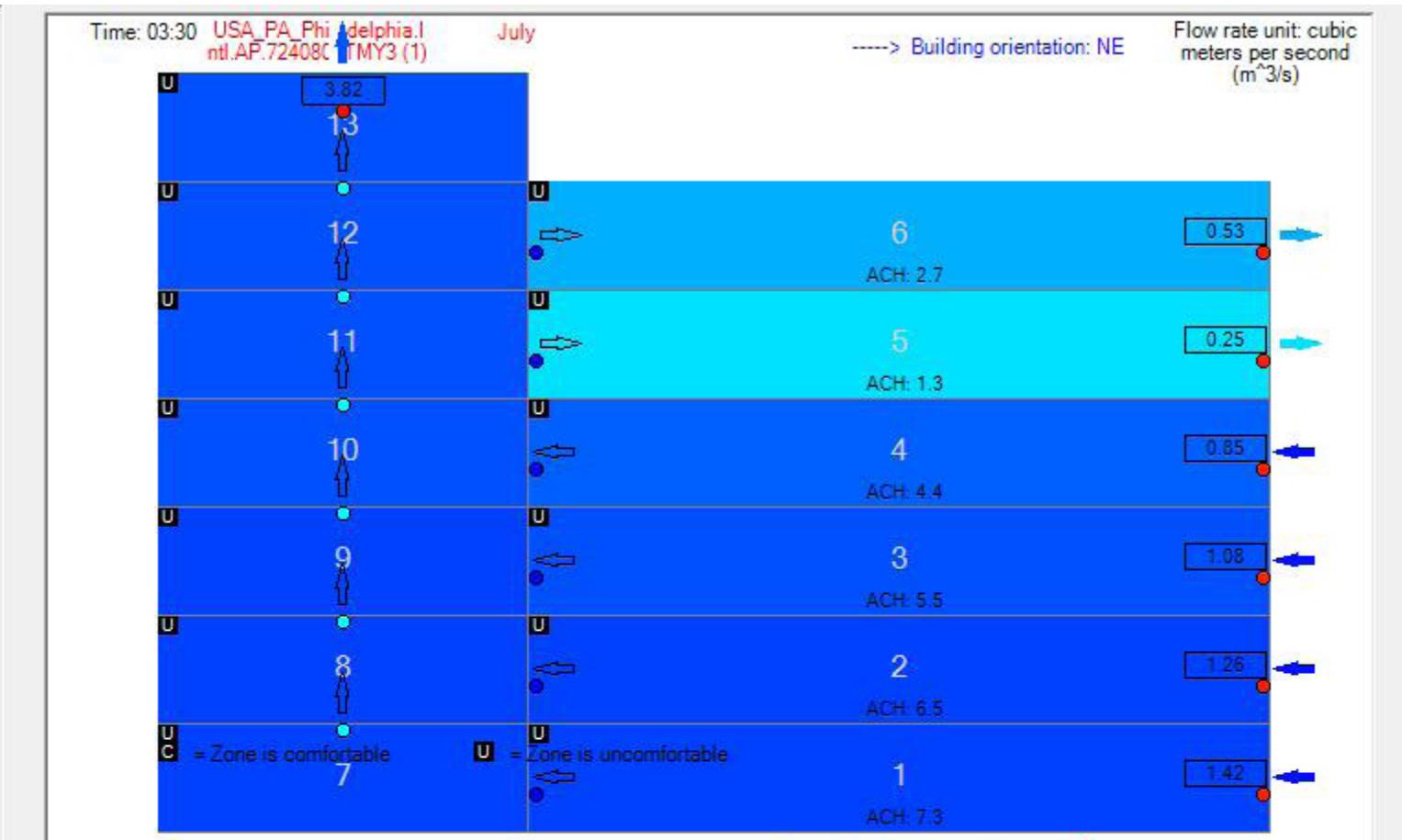
Zone 0: 21.7 °C
Zone 1: 22.3 °C
Zone 2: 22.4 °C
Zone 3: 22.6 °C
Zone 4: 22.7 °C
Zone 5: 22.1 °C
Zone 6: 22.0 °C

Display settings:

Results at half past the hour
 Results every: minutes

Airflow rate Zone numbers

20.9



Results
Double click on a zone below to show temperature variation throughout the day

Zone 0: 21.3 °C
Zone 1: 22.1 °C
Zone 2: 22.2 °C
Zone 3: 22.4 °C
Zone 4: 22.7 °C
Zone 5: 24.8 °C
Zone 6: 24.0 °C

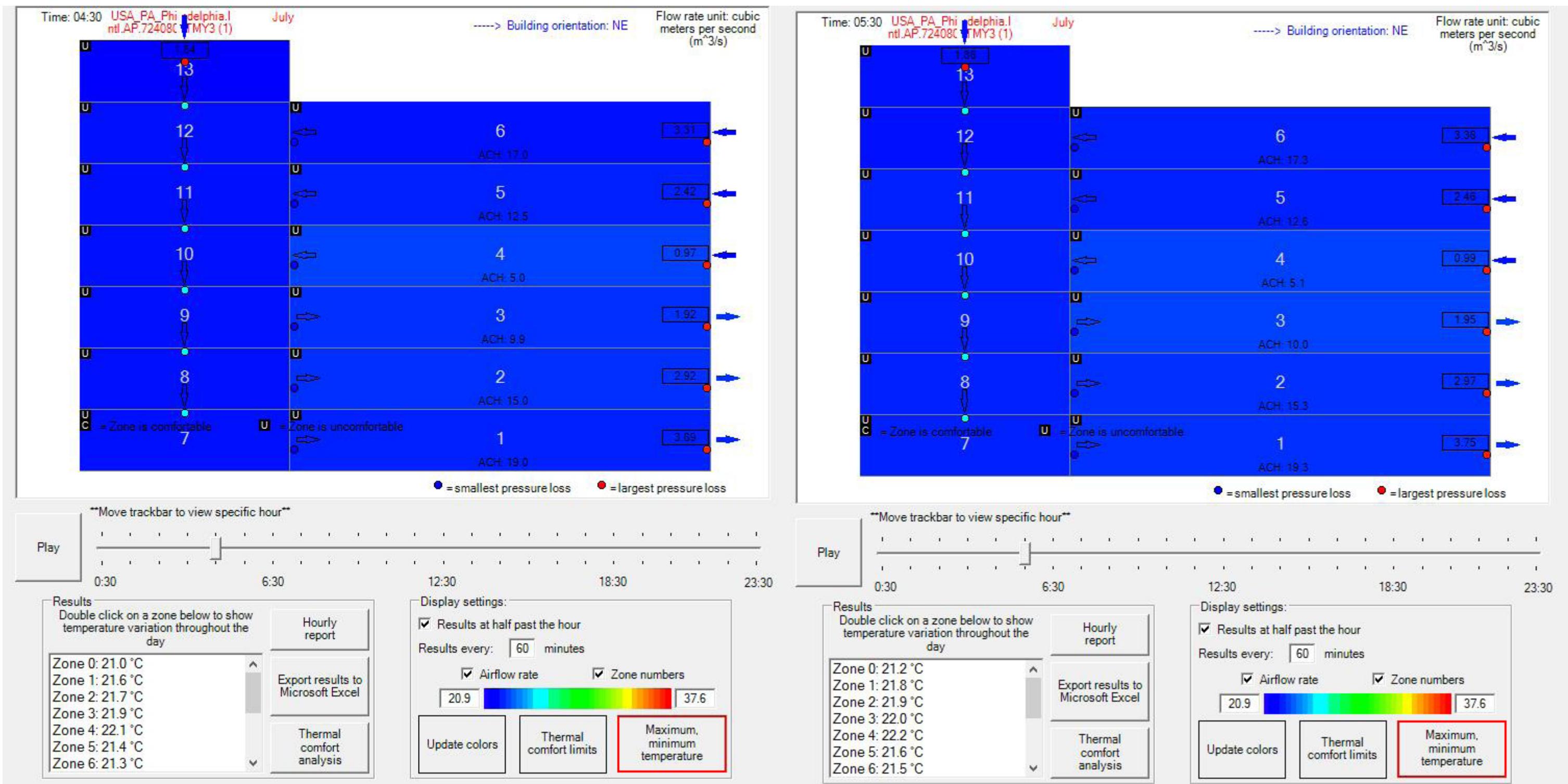
Display settings:

Results at half past the hour
 Results every: minutes

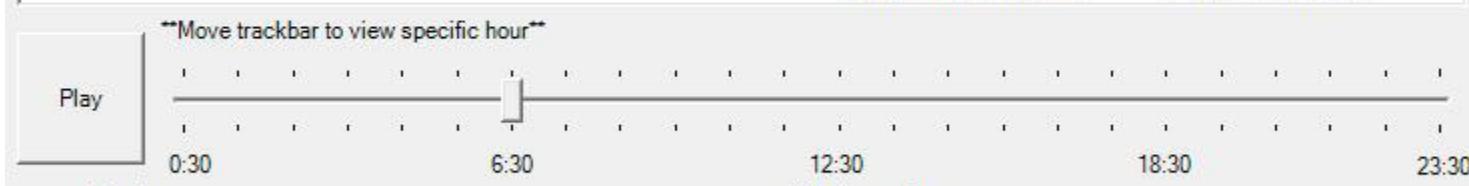
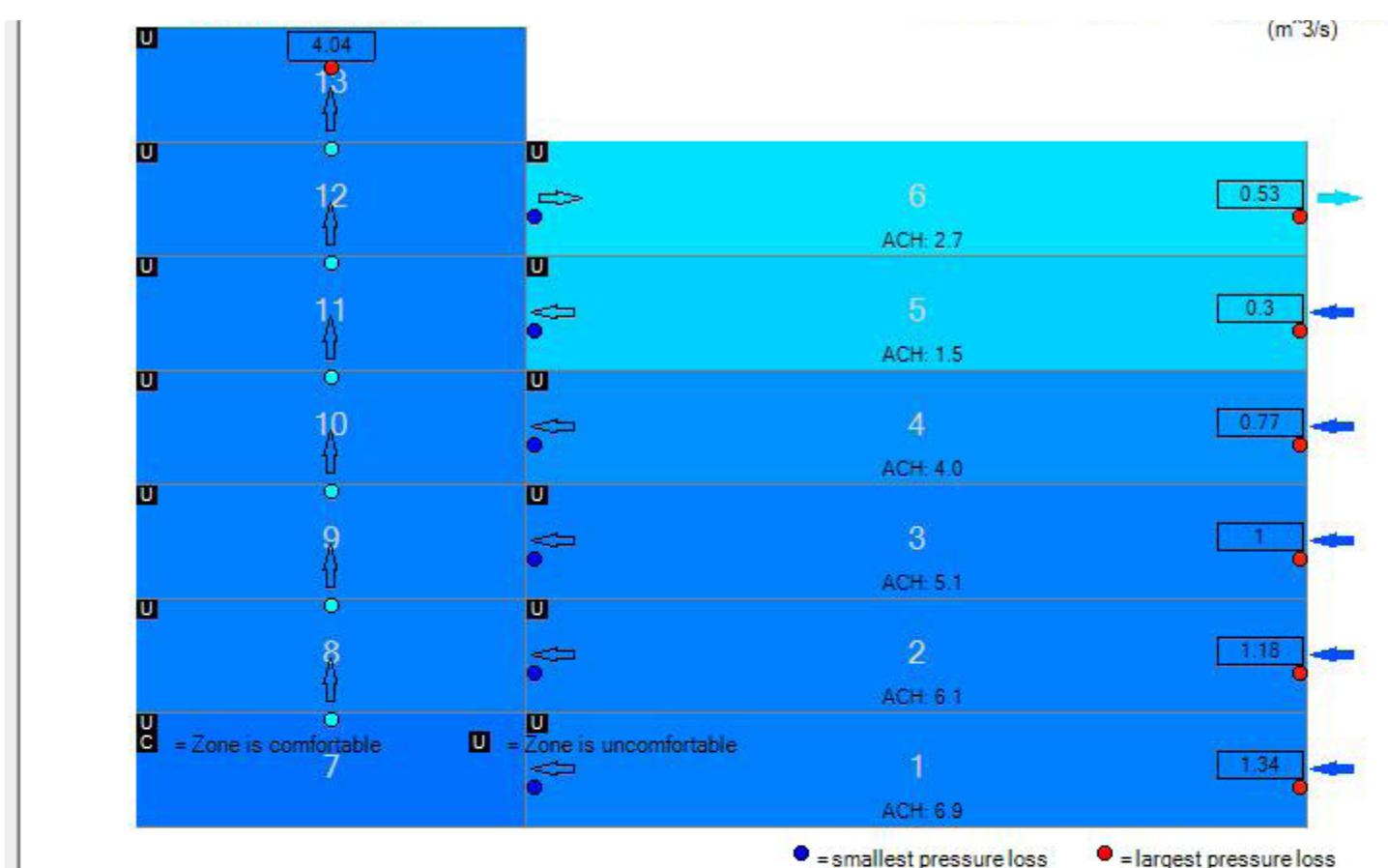
Airflow rate Zone numbers

20.9

Ventilation Shaft-Simulation Result



Ventilation Shaft-Simulation Result

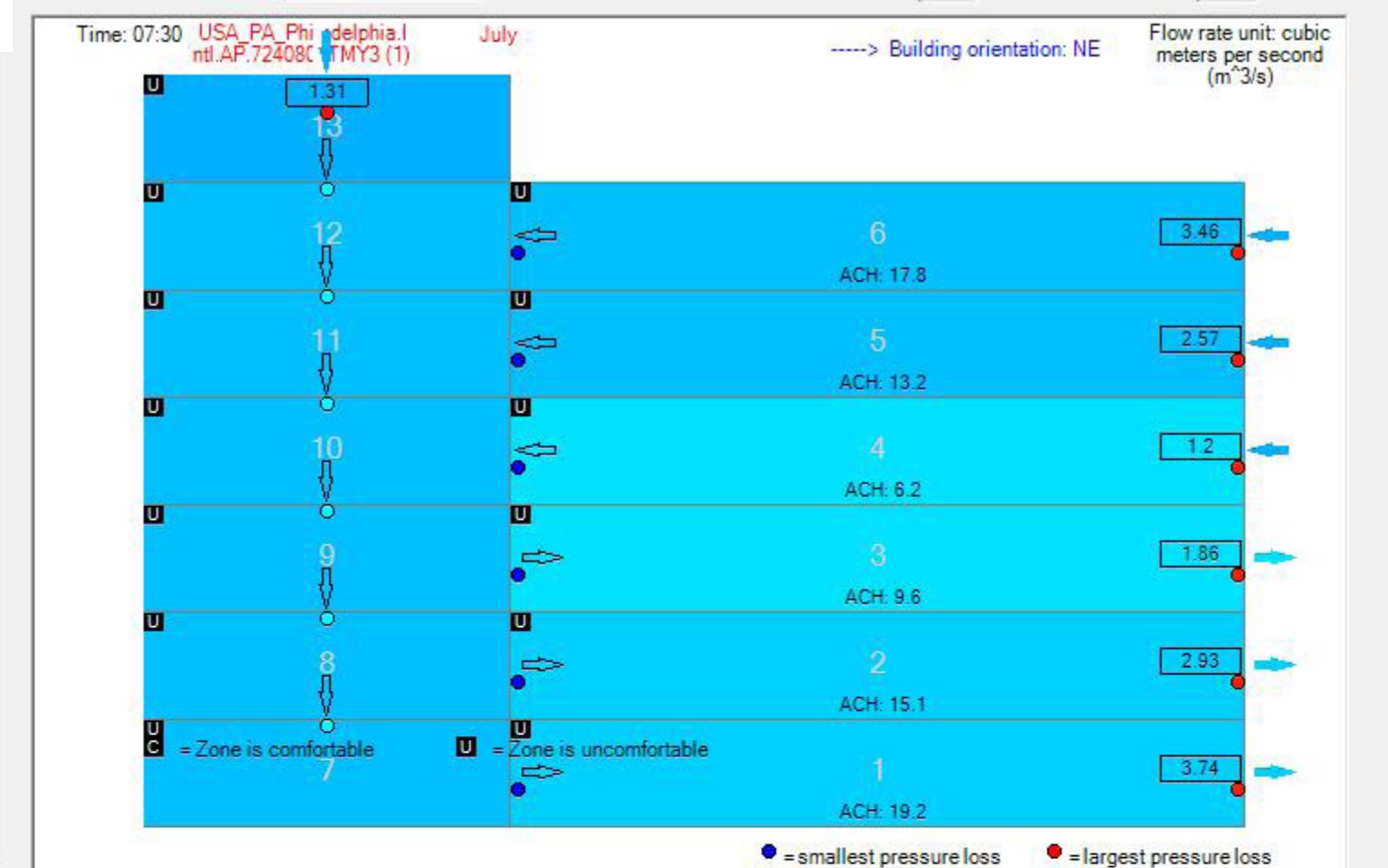


Results
Double click on a zone below to show temperature variation throughout the day

Zone 0: 22.3 °C
Zone 1: 23.0 °C
Zone 2: 23.1 °C
Zone 3: 23.2 °C
Zone 4: 23.5 °C
Zone 5: 24.4 °C
Zone 6: 24.6 °C

Hourly report
Export results to Microsoft Excel
Thermal comfort analysis

Display settings:
 Results at half past the hour
 Results every: 60 minutes
 Airflow rate Zone numbers
 20.9 37.6
 Update colors Thermal comfort limits Maximum, minimum temperature



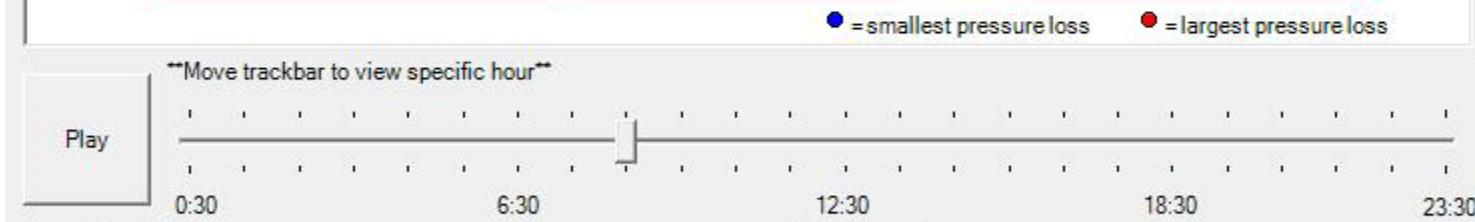
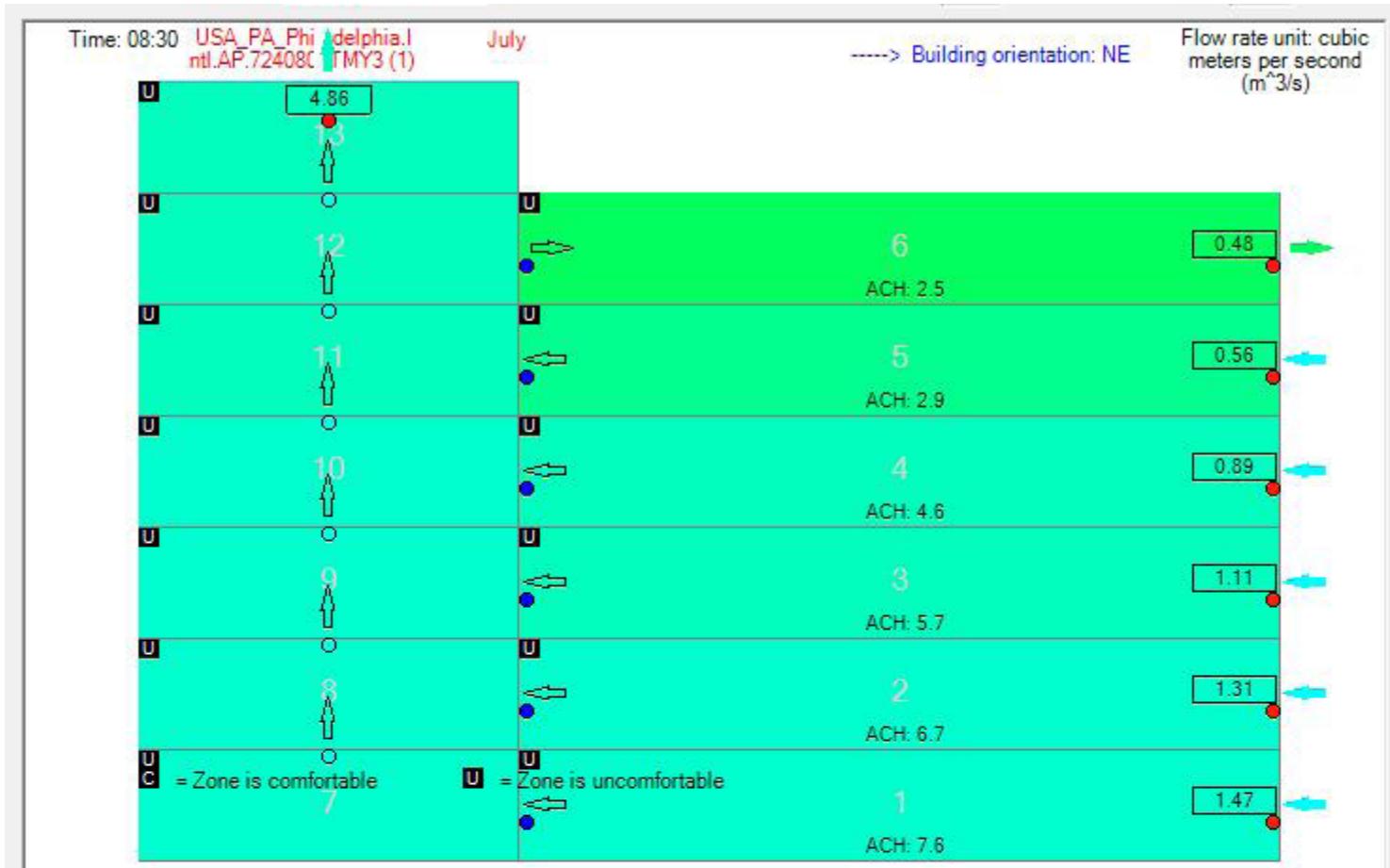
Results
Double click on a zone below to show temperature variation throughout the day

Zone 0: 23.9 °C
Zone 1: 24.4 °C
Zone 2: 24.5 °C
Zone 3: 24.7 °C
Zone 4: 24.6 °C
Zone 5: 24.2 °C
Zone 6: 24.1 °C

Hourly report
Export results to Microsoft Excel
Thermal comfort analysis

Display settings:
 Results at half past the hour
 Results every: 60 minutes
 Airflow rate Zone numbers
 20.9 37.6
 Update colors Thermal comfort limits Maximum, minimum temperature

Ventilation Shaft-Simulation Result

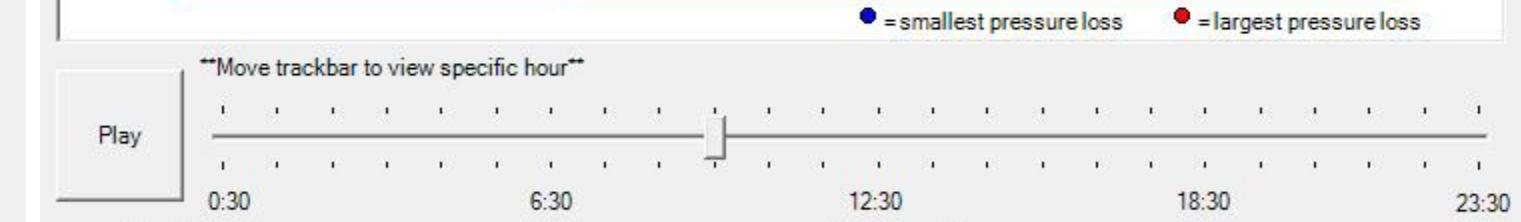
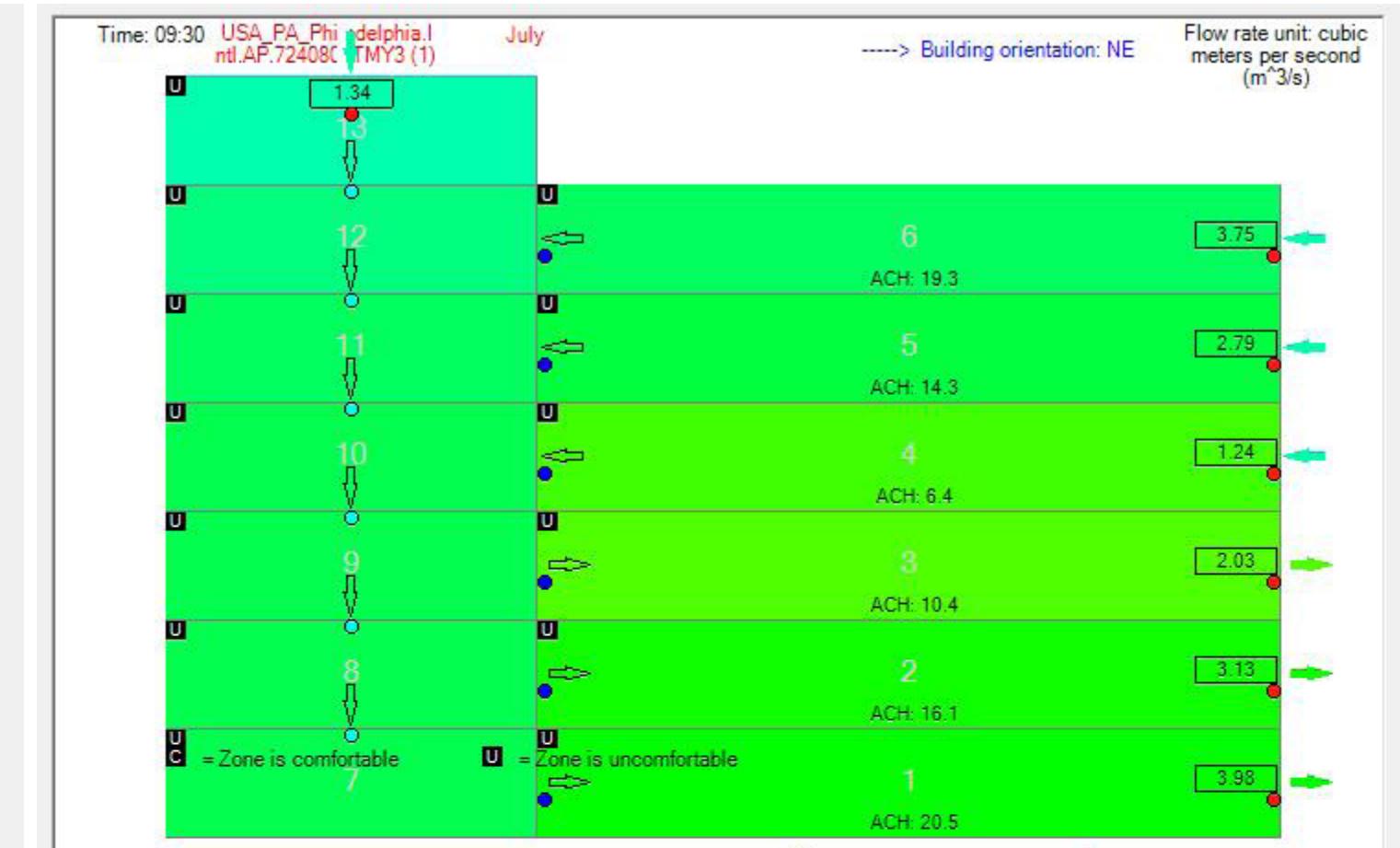


Results
Double click on a zone below to show temperature variation throughout the day

Zone 0: 25.2 °C
Zone 1: 25.9 °C
Zone 2: 26.0 °C
Zone 3: 26.1 °C
Zone 4: 26.4 °C
Zone 5: 26.9 °C
Zone 6: 27.9 °C

Hourly report
Export results to Microsoft Excel
Thermal comfort analysis

Display settings:
 Results at half past the hour
 Results every: 60 minutes
 Airflow rate Zone numbers
 20.9
 37.6
 Update colors Thermal comfort limits Maximum, minimum temperature



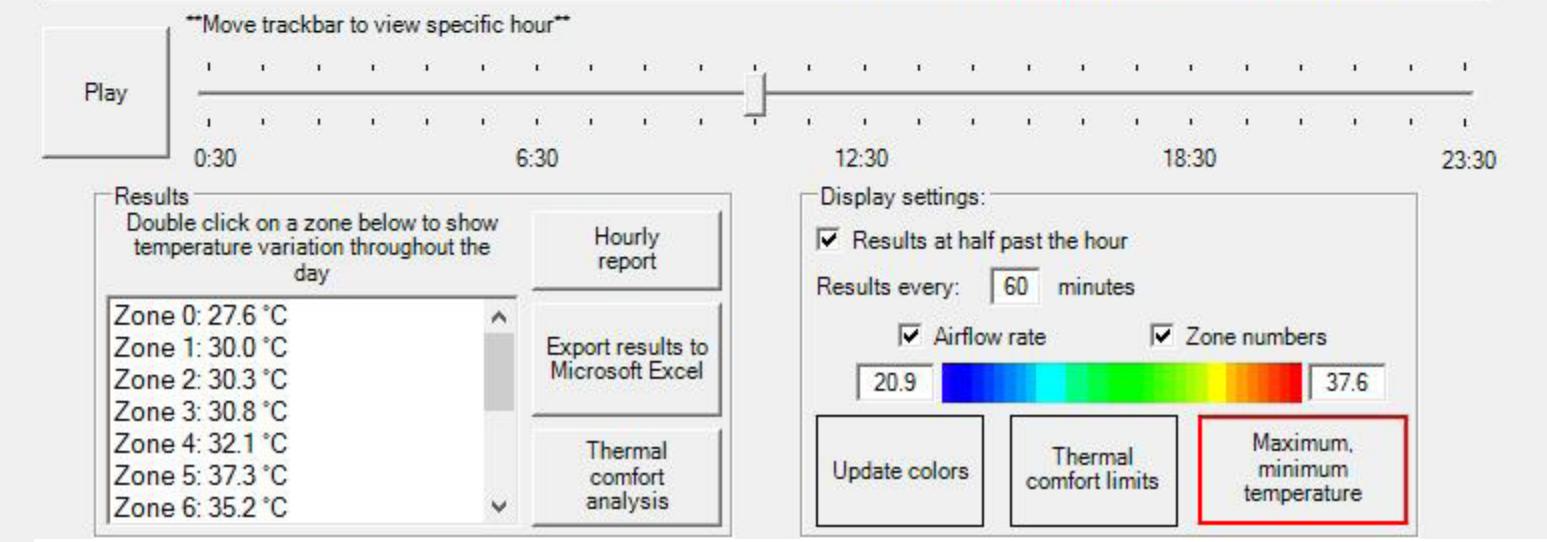
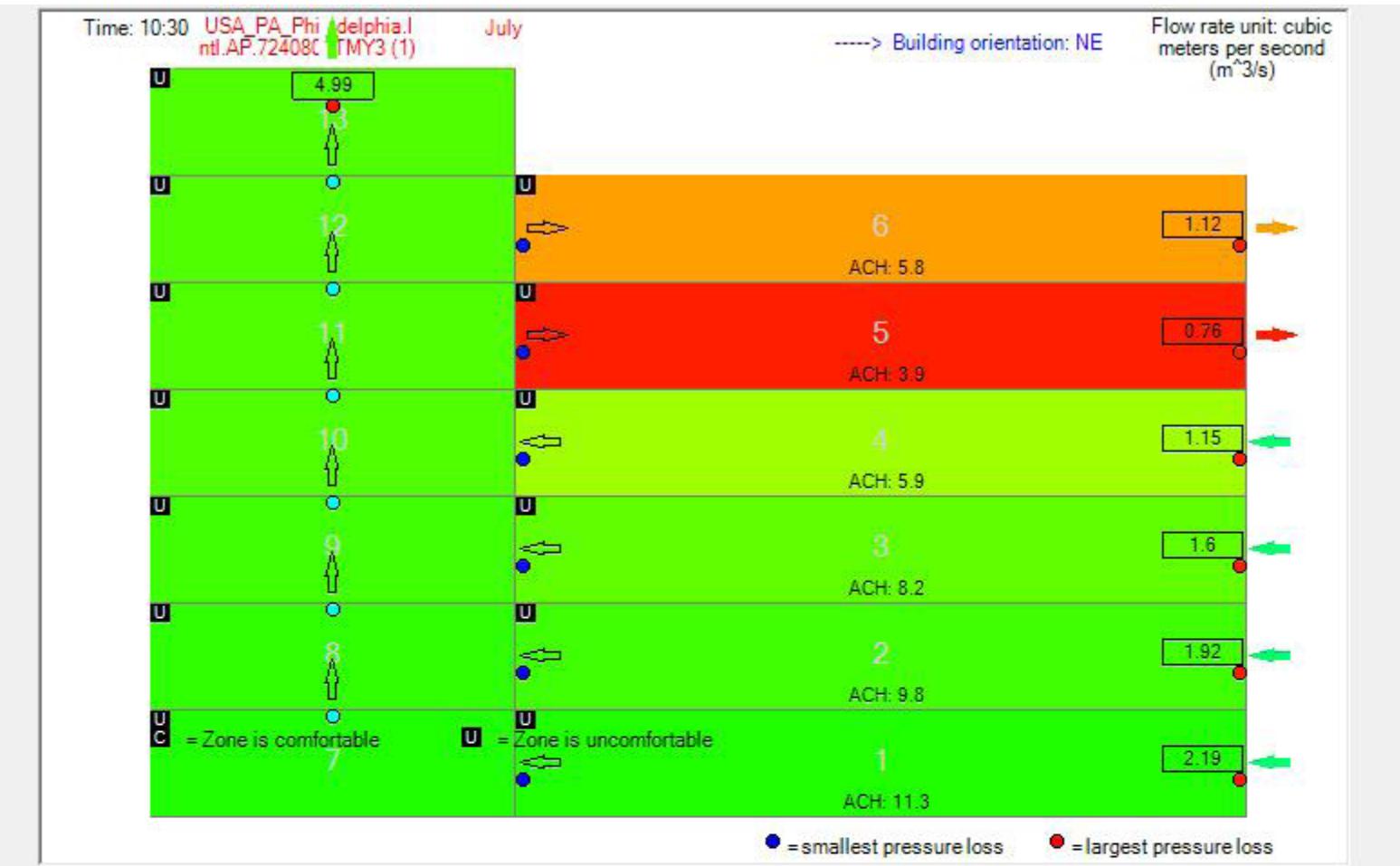
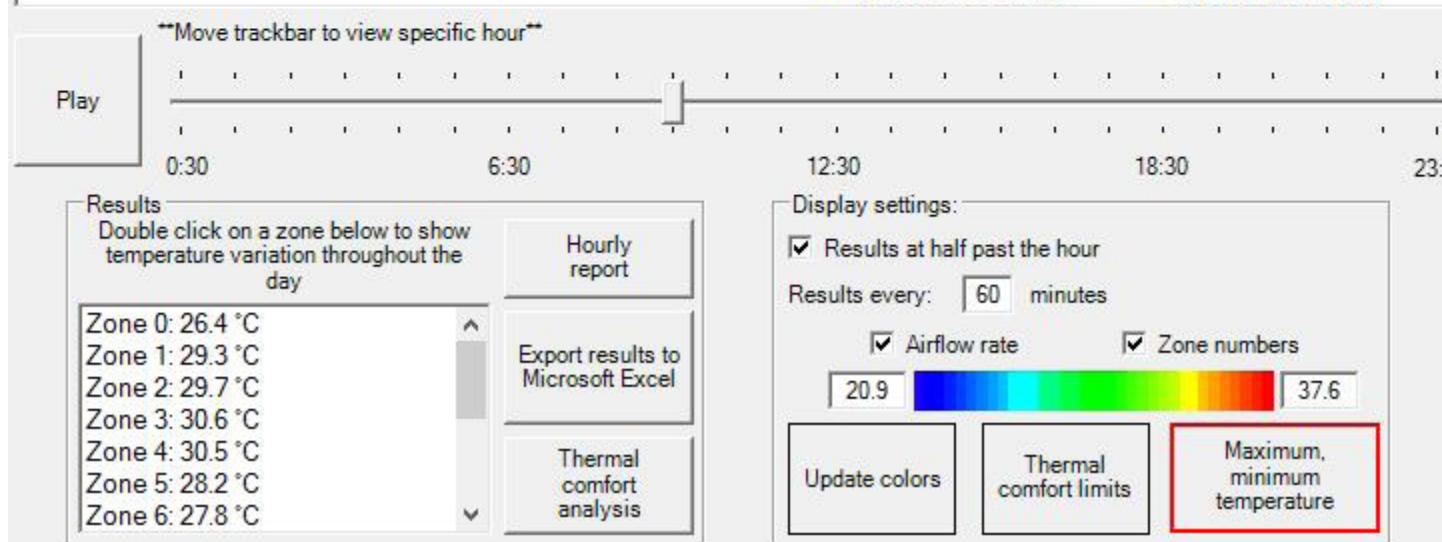
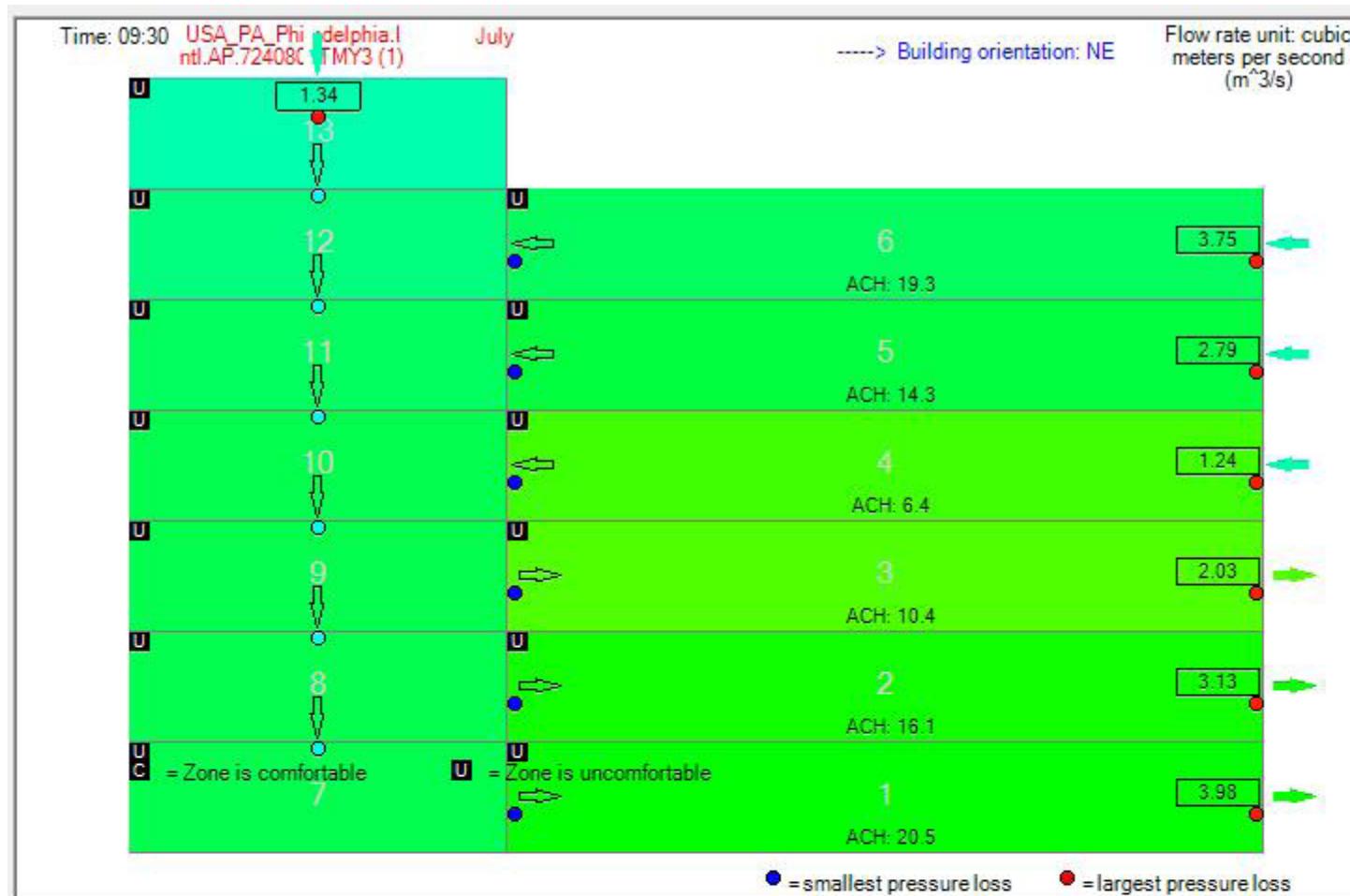
Results
Double click on a zone below to show temperature variation throughout the day

Zone 0: 26.4 °C
Zone 1: 29.3 °C
Zone 2: 29.7 °C
Zone 3: 30.6 °C
Zone 4: 30.5 °C
Zone 5: 28.2 °C
Zone 6: 27.8 °C

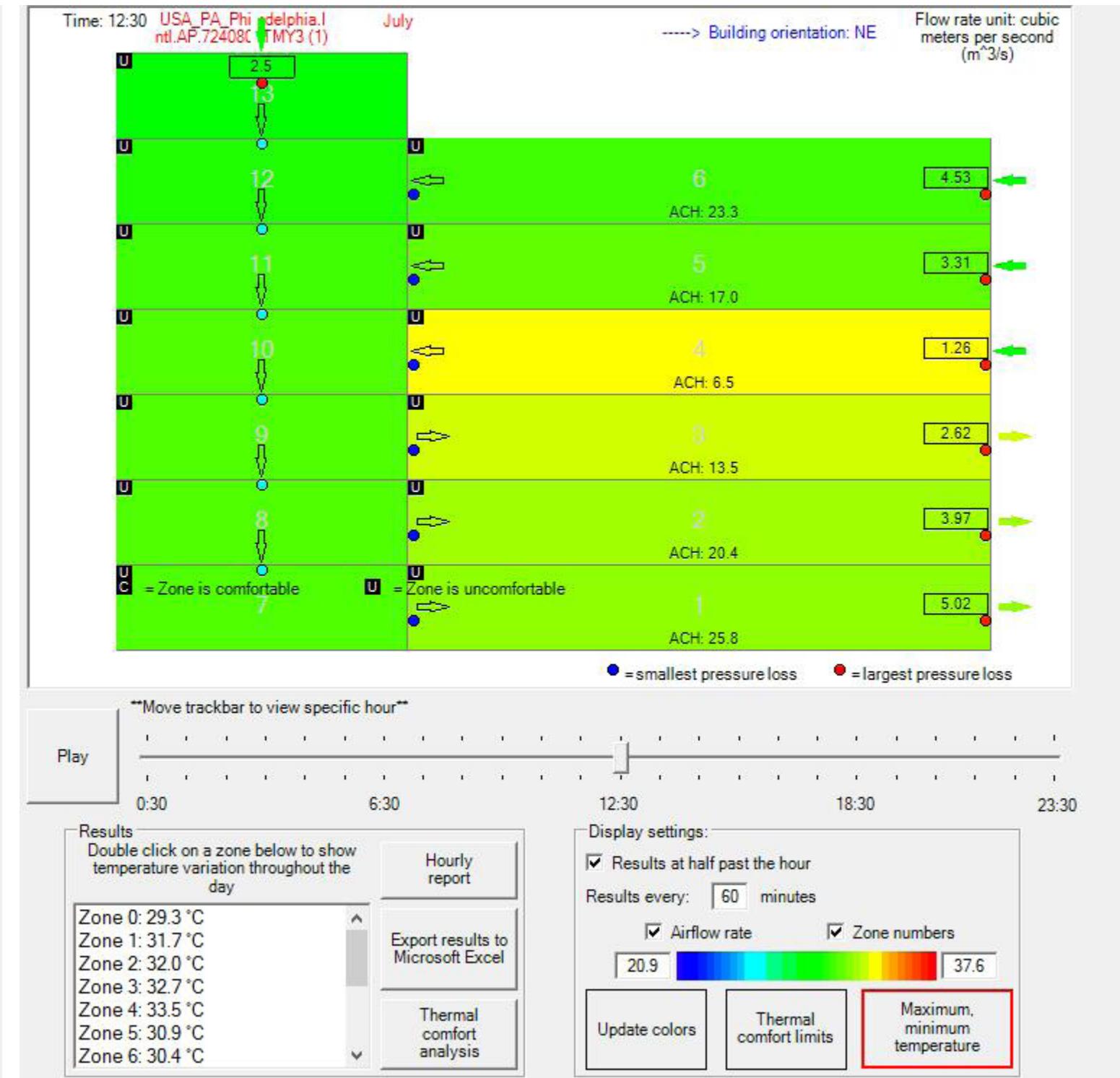
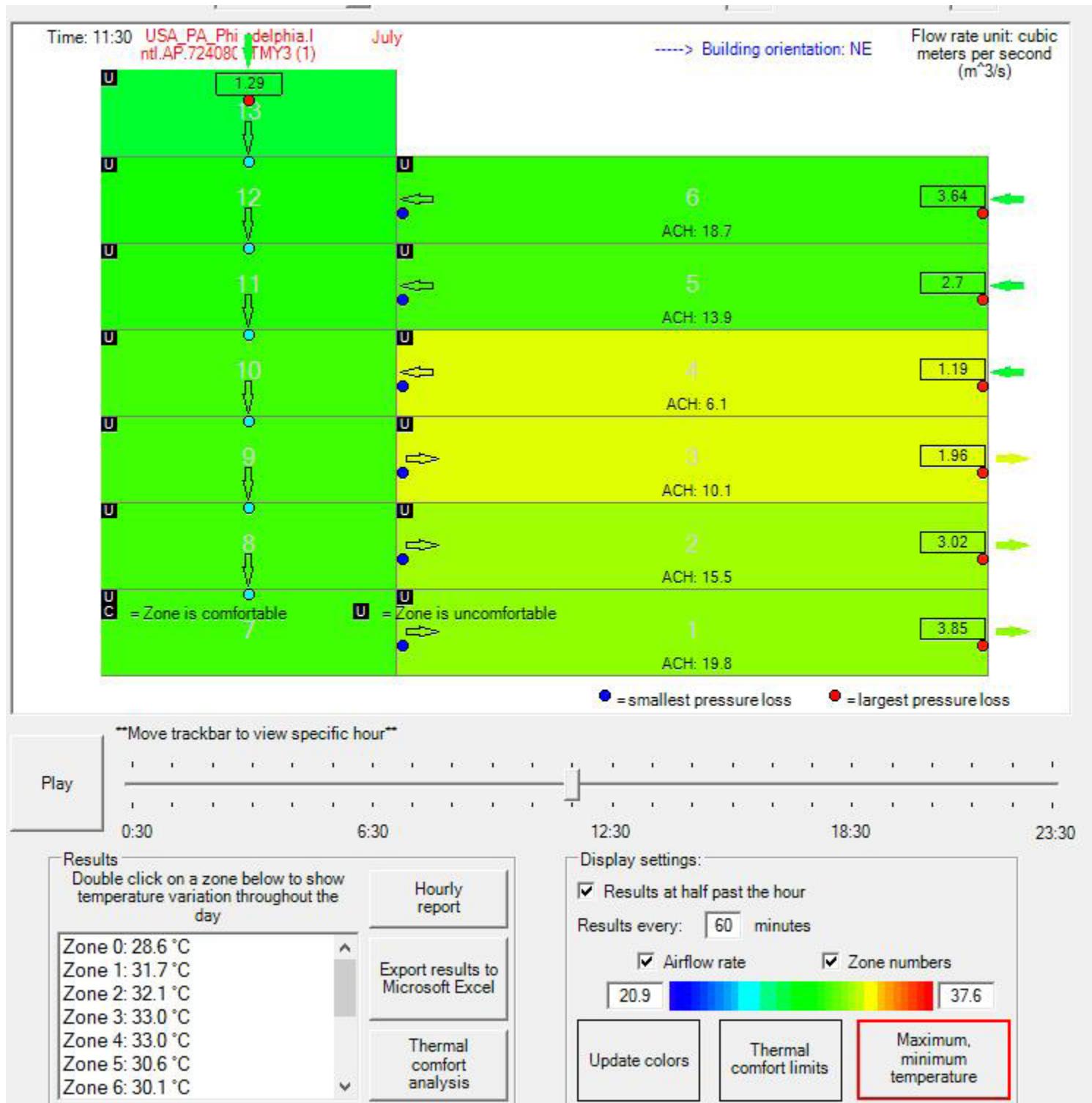
Hourly report
Export results to Microsoft Excel
Thermal comfort analysis

Display settings:
 Results at half past the hour
 Results every: 60 minutes
 Airflow rate Zone numbers
 20.9
 37.6
 Update colors Thermal comfort limits Maximum, minimum temperature

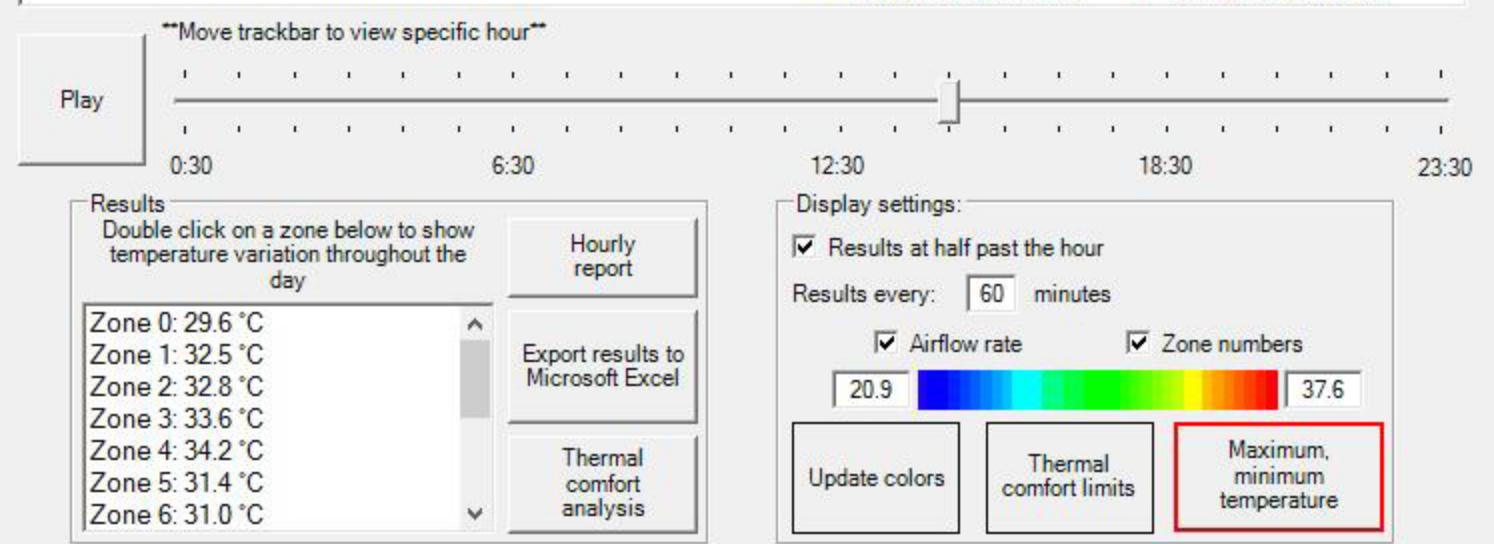
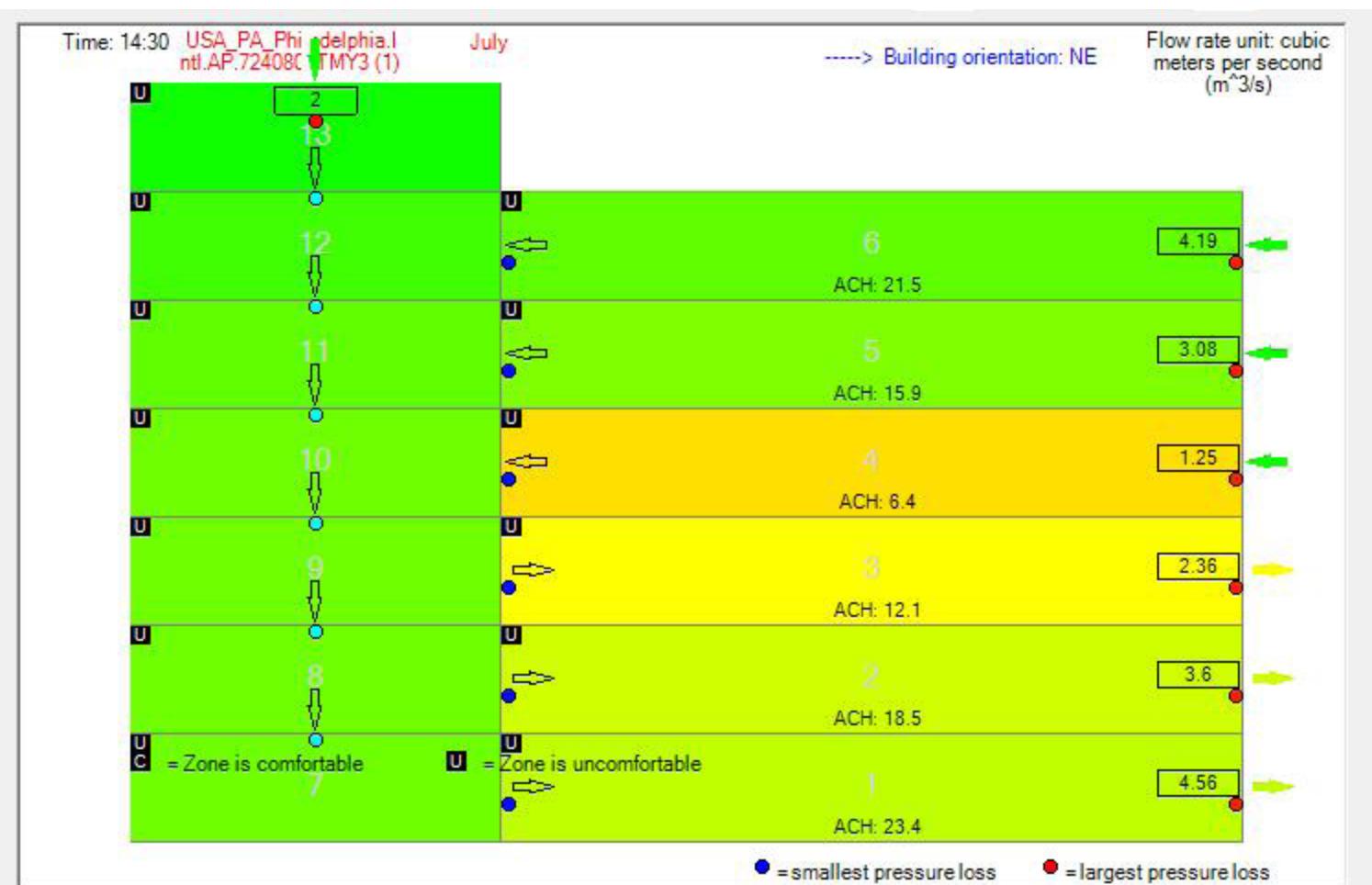
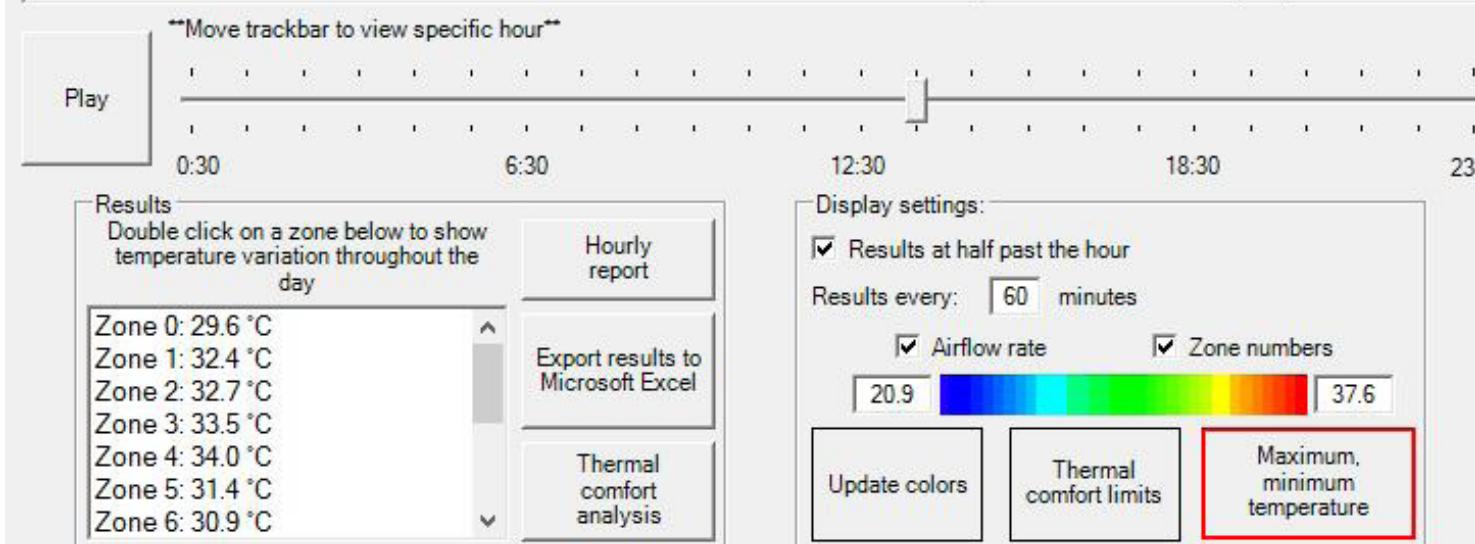
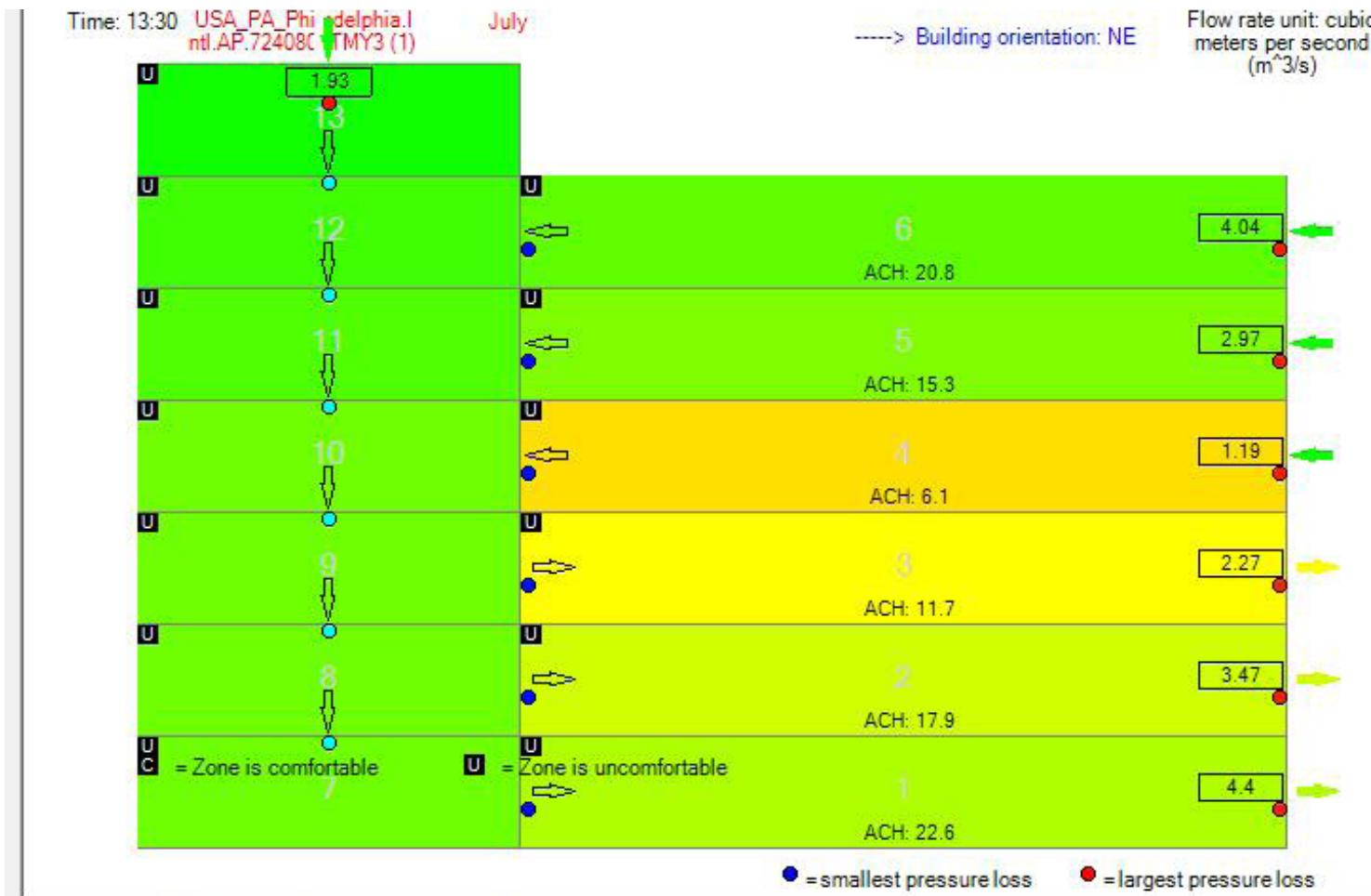
Ventilation Shaft-Simulation Result



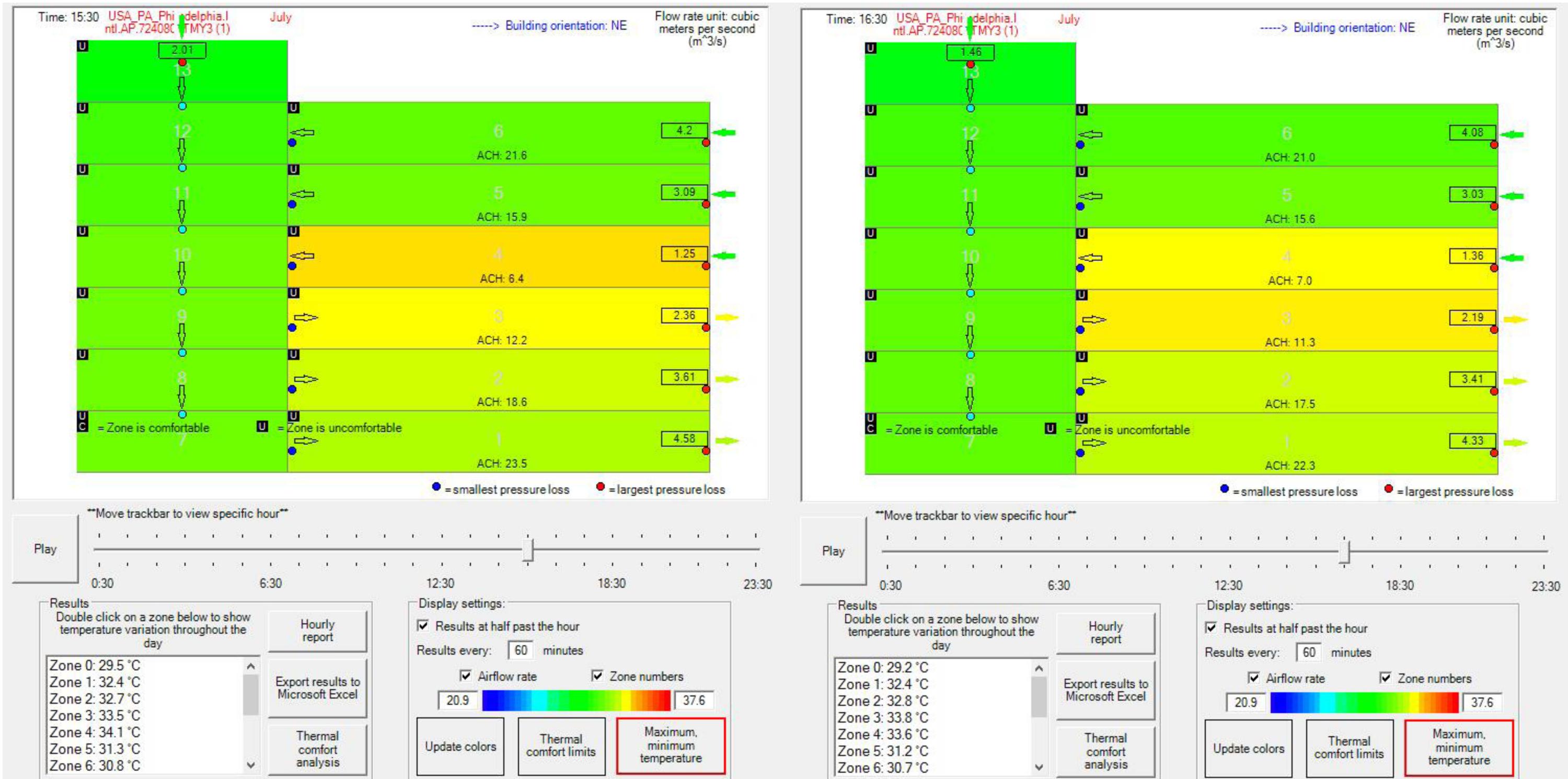
Ventilation Shaft-Simulation Result



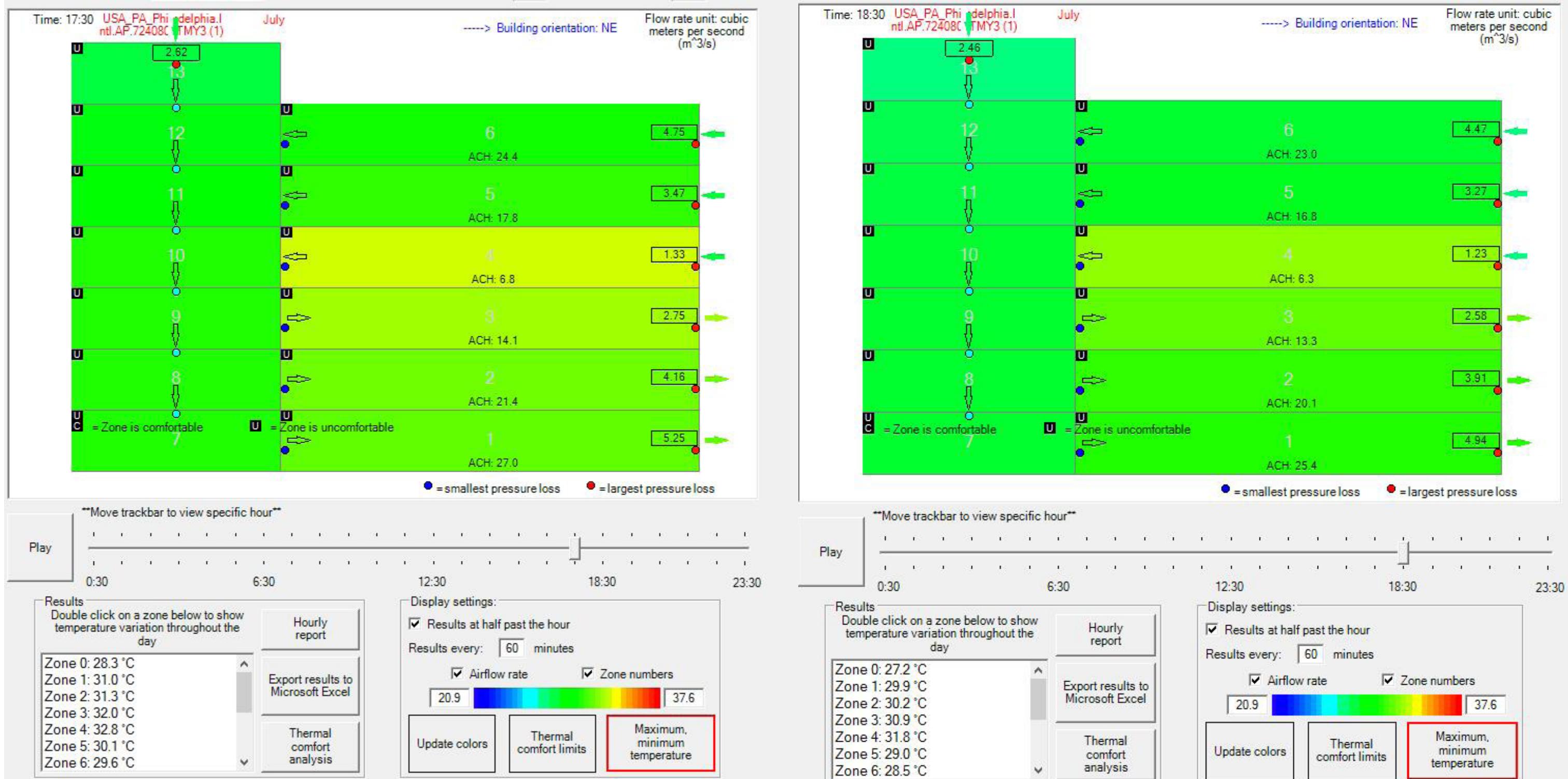
Ventilation Shaft-Simulation Result



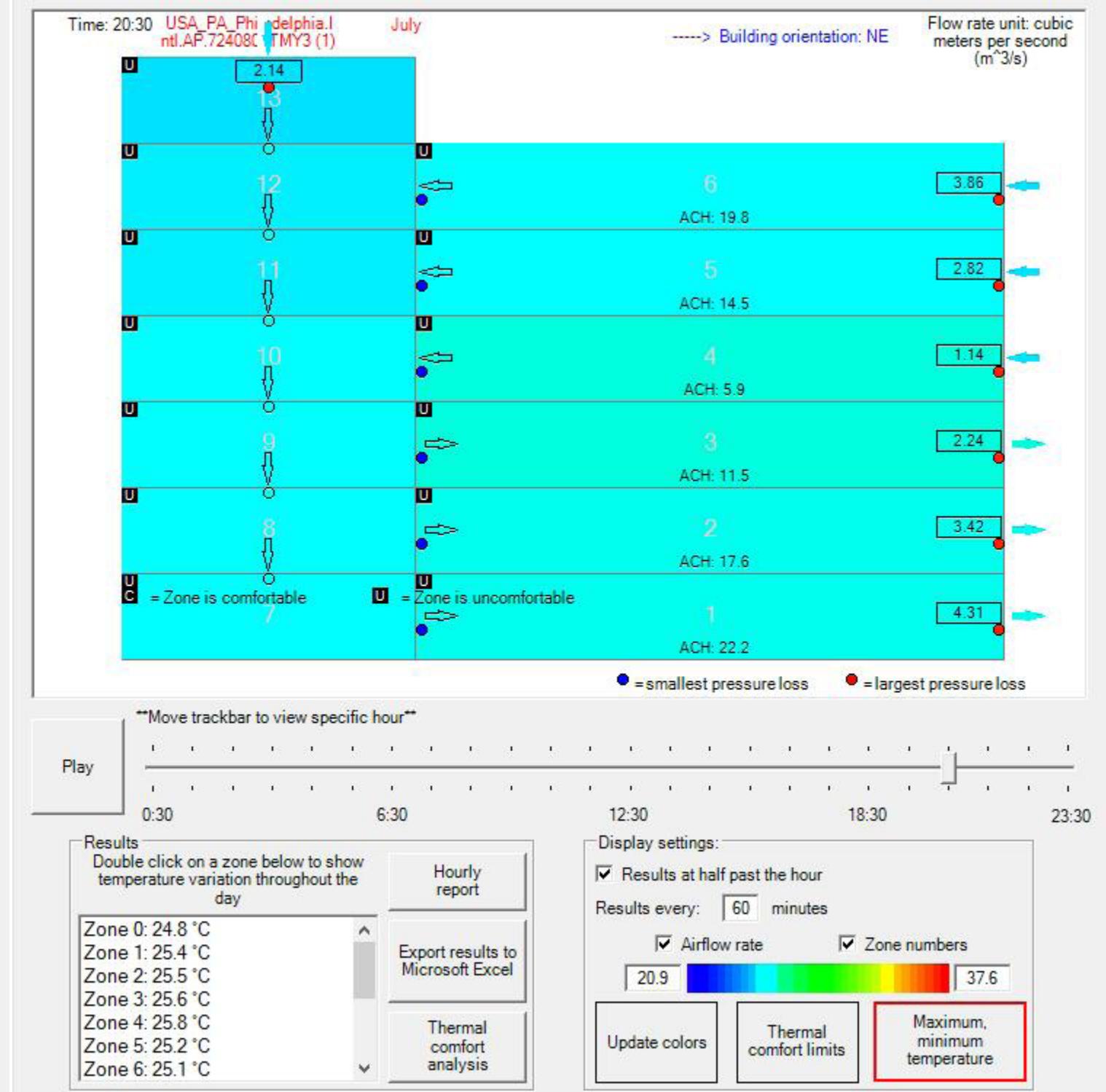
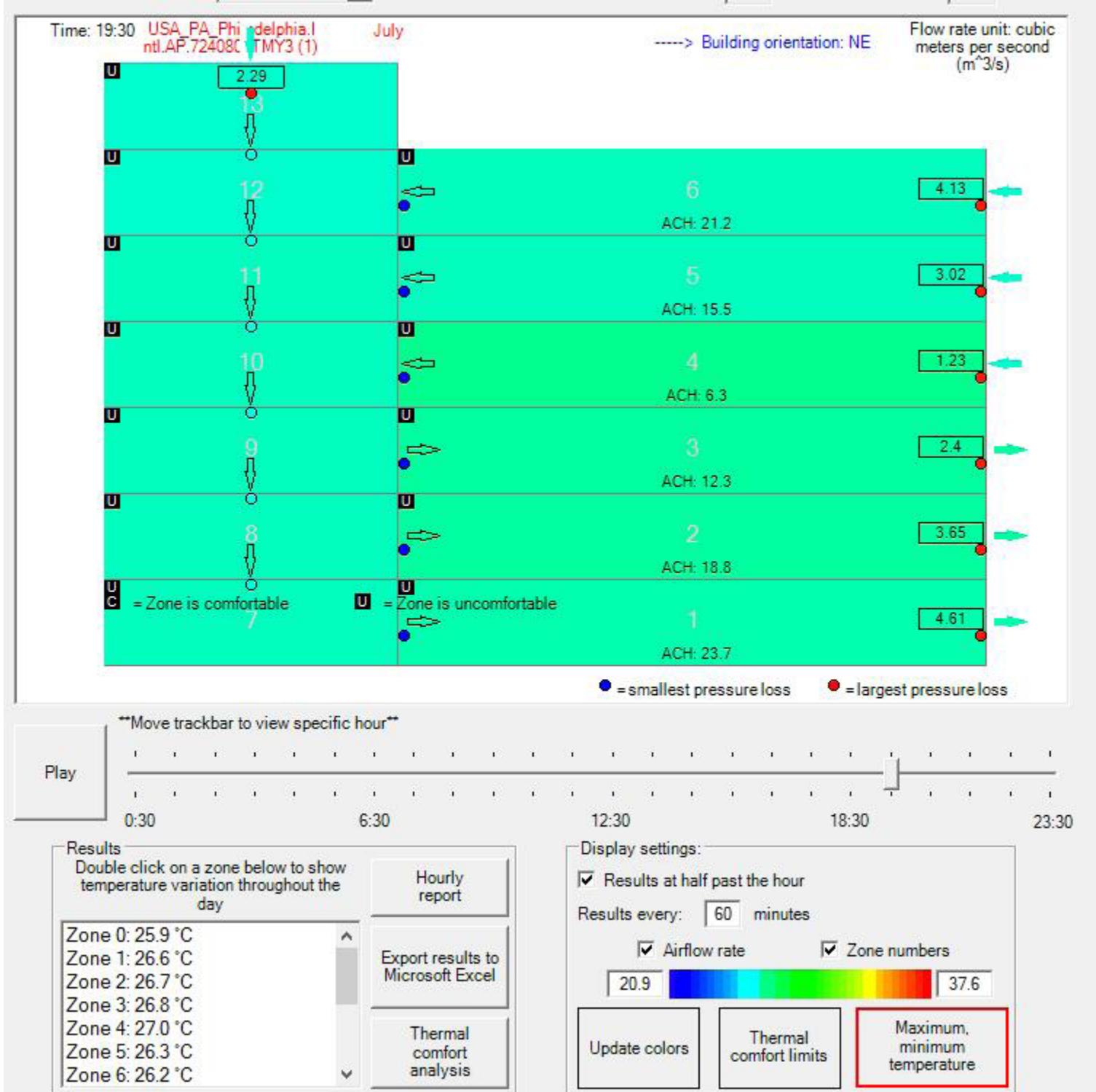
Ventilation Shaft-Simulation Result



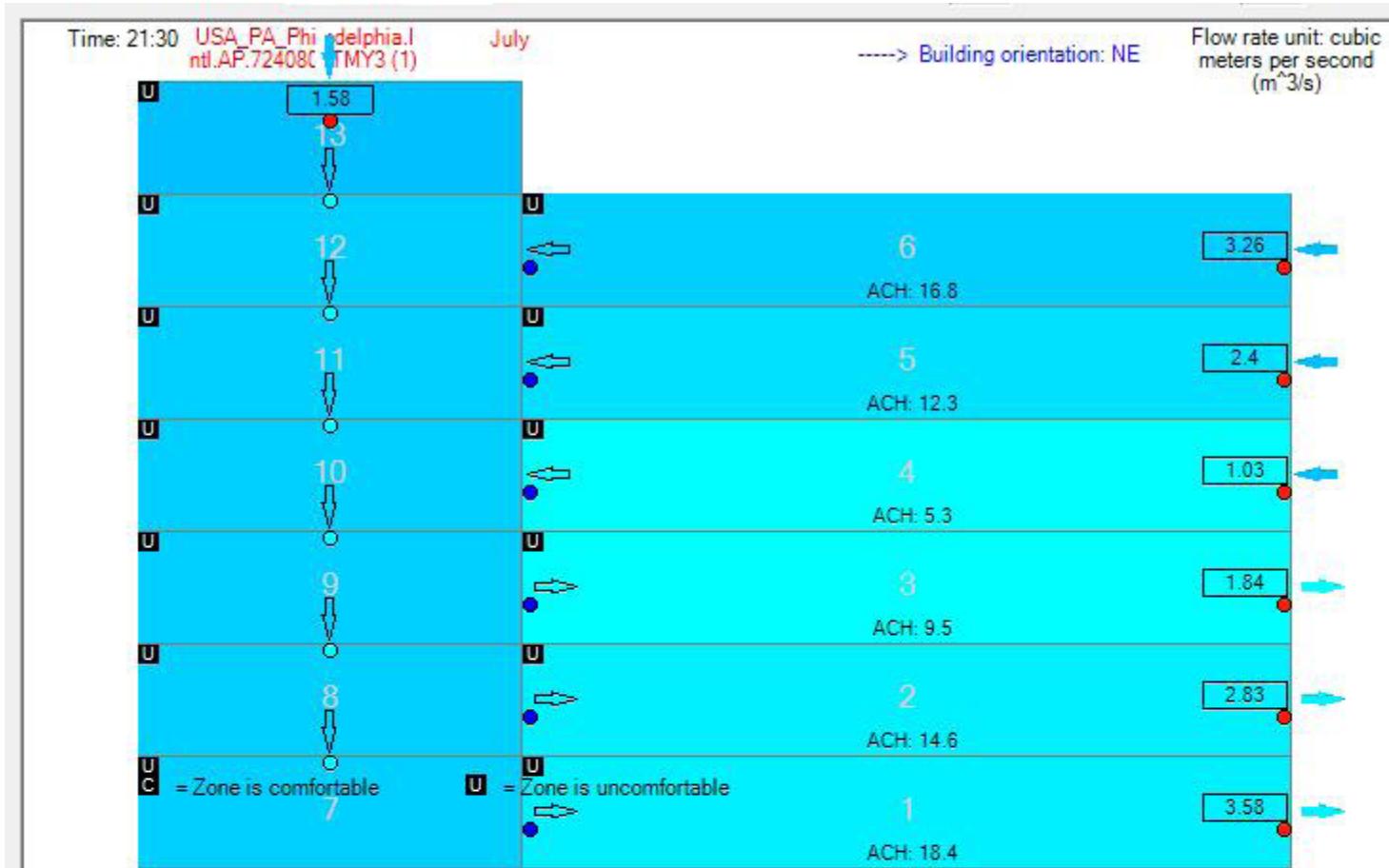
Ventilation Shaft-Simulation Result



Ventilation Shaft-Simulation Result



Ventilation Shaft-Simulation Result

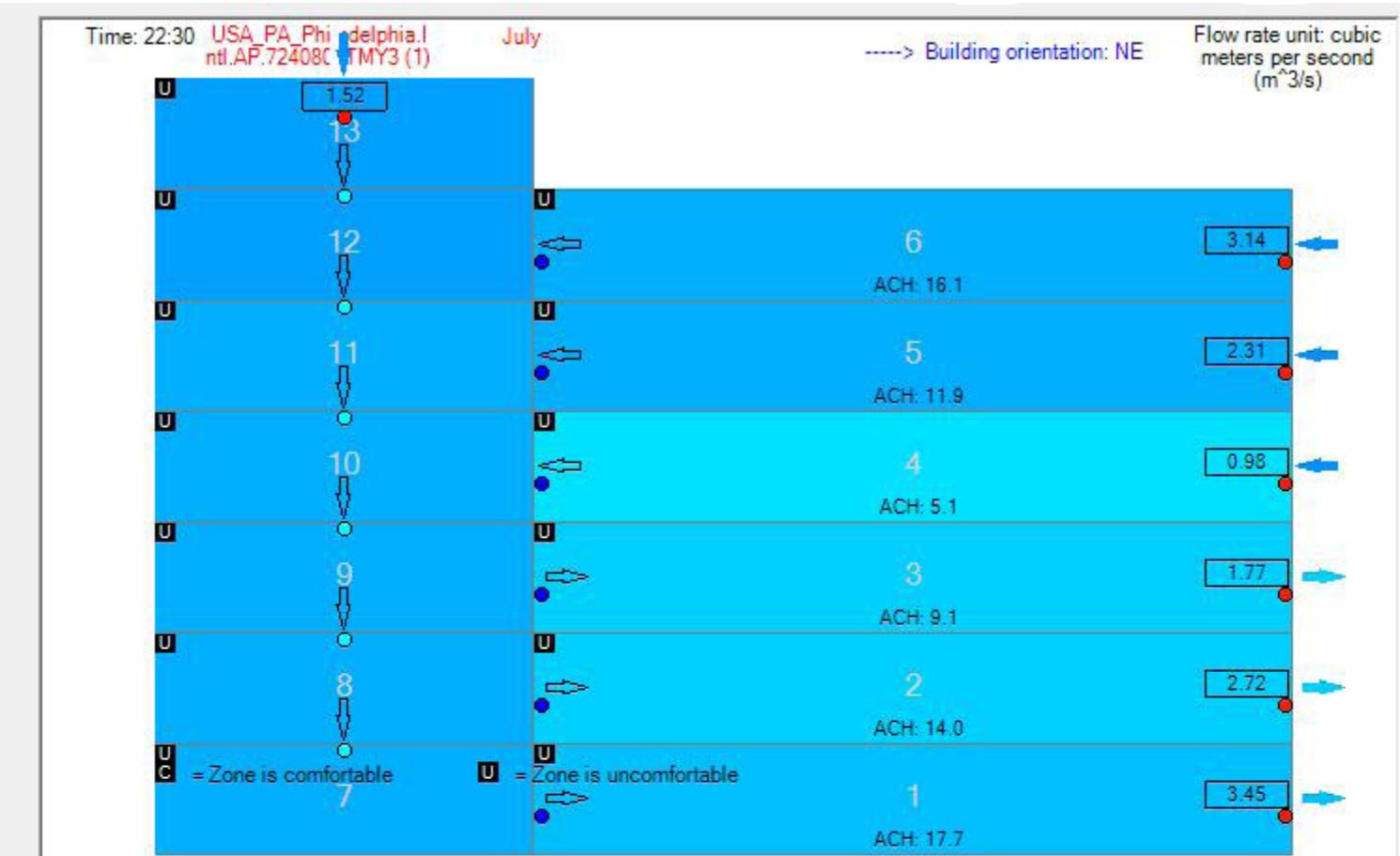


Results
Double click on a zone below to show temperature variation throughout the day

Zone 0: 24.1 °C
Zone 1: 24.8 °C
Zone 2: 24.9 °C
Zone 3: 25.1 °C
Zone 4: 25.2 °C
Zone 5: 24.6 °C
Zone 6: 24.5 °C

Hourly report Export results to Microsoft Excel Thermal comfort analysis

Display settings:
 Results at half past the hour
 Results every: 60 minutes
 Airflow rate Zone numbers
 20.9 37.6
 Update colors Thermal comfort limits Maximum, minimum temperature



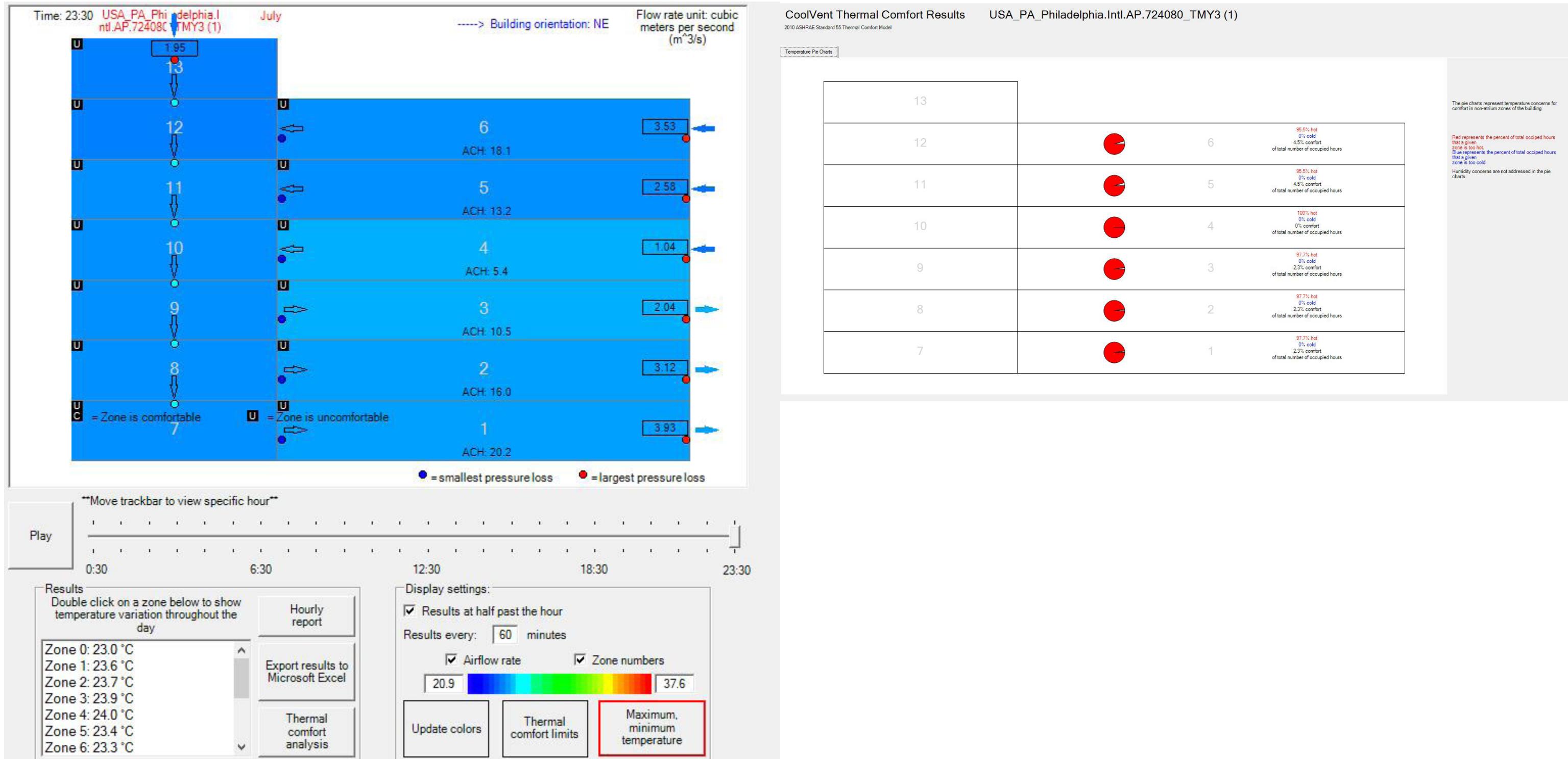
Results
Double click on a zone below to show temperature variation throughout the day

Zone 0: 23.5 °C
Zone 1: 24.2 °C
Zone 2: 24.3 °C
Zone 3: 24.5 °C
Zone 4: 24.6 °C
Zone 5: 24.0 °C
Zone 6: 23.9 °C

Hourly report Export results to Microsoft Excel Thermal comfort analysis

Display settings:
 Results at half past the hour
 Results every: 60 minutes
 Airflow rate Zone numbers
 20.9 37.6
 Update colors Thermal comfort limits Maximum, minimum temperature

Ventilation Shaft-Simulation Result



Ventilation Shaft-Hourly Report

This is a transient simulation.

The simulated city is: USA_PA_Philadelphia.Intl.AP.724080_TMY3 (1).

The building type is ventilation chimney.

The building orientation is: 45 degrees.

Temperatures are reported in °C.

Humidity ratios are reported in g(water) / kg(air).

Airflows are reported in kg/s.

Month: July

Hour 00:30

Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?
0	22.50	14.00	-	-	False - humidity is high
1	23.26	14.04	-	3.84	False - humidity is high
2	23.35	14.04	-	3.03	False - humidity is high
3	23.57	14.05	-	1.98	False - humidity is high
4	23.66	14.06	1.09	-	False - humidity is high
5	22.99	14.02	2.57	-	False - humidity is high
6	22.86	14.02	3.50	-	False - humidity is high
7	22.94	14.02	-	-	False - humidity is high
8	22.93	14.02	-	-	False - humidity is high
9	22.93	14.02	-	-	False - humidity is high
10	22.93	14.02	-	-	False - humidity is high
11	22.83	14.02	-	-	False - humidity is high
12	22.75	14.01	-	-	False - humidity is high
13	22.51	14.00	1.69	-	False - humidity is high

Hour 01:30

Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?
0	22.02	13.60	-	-	False - humidity is high
1	22.79	13.64	-	3.81	False - humidity is high
2	22.87	13.64	-	3.00	False - humidity is high
3	23.09	13.65	-	1.96	False - humidity is high
4	23.18	13.66	1.08	-	False - humidity is high
5	22.52	13.62	2.55	-	False - humidity is high
6	22.39	13.62	3.47	-	False - humidity is high
7	22.46	13.62	-	-	False - humidity is high
8	22.46	13.62	-	-	False - humidity is high
9	22.46	13.62	-	-	False - humidity is high
10	22.46	13.62	-	-	False - humidity is high
11	22.35	13.62	-	-	False - humidity is high
12	22.27	13.61	-	-	False - humidity is high
13	22.03	13.60	1.67	-	False - humidity is high

Hour 02:30

Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?
0	21.68	13.70	-	-	False - humidity is high
1	22.31	13.73	-	4.57	False - humidity is high
2	22.38	13.73	-	3.62	False - humidity is high
3	22.55	13.74	-	2.38	False - humidity is high
4	22.71	13.75	1.21	-	False - humidity is high
5	22.10	13.72	3.00	-	False - humidity is high
6	21.99	13.72	4.09	-	False - humidity is high
7	22.04	13.72	-	-	False - humidity is high
8	22.04	13.72	-	-	False - humidity is high
9	22.04	13.72	-	-	False - humidity is high
10	22.04	13.72	-	-	False - humidity is high
11	21.95	13.71	-	-	False - humidity is high
12	21.88	13.71	-	-	False - humidity is high
13	21.69	13.70	2.27	-	False - humidity is high

Ventilation Shaft-Hourly Report

Hour 03:30

Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?	Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?
0	21.33	13.50	-	-	False - humidity is high	0	21.24	13.30	-	-	False - humidity is high
1	22.09	13.54	1.68	-	False - humidity is high	1	21.81	13.33	-	4.43	False - humidity is high
2	22.19	13.54	1.49	-	False - humidity is high	2	21.88	13.34	-	3.50	False - humidity is high
3	22.35	13.55	1.27	-	False - humidity is high	3	22.05	13.35	-	2.30	False - humidity is high
4	22.67	13.56	1.00	-	False - humidity is high	4	22.20	13.35	1.17	-	False - humidity is high
5	24.81	13.75	-	0.30	False - humidity is high	5	21.62	13.32	2.90	-	False - humidity is high
6	23.96	13.65	-	0.62	False - humidity is high	6	21.52	13.32	3.96	-	False - humidity is high
7	22.09	13.54	-	-	False - humidity is high	7	21.56	13.32	-	-	False - humidity is high
8	22.14	13.54	-	-	False - humidity is high	8	21.56	13.32	-	-	False - humidity is high
9	22.20	13.54	-	-	False - humidity is high	9	21.56	13.32	-	-	False - humidity is high
10	22.29	13.55	-	-	False - humidity is high	10	21.56	13.32	-	-	False - humidity is high
11	22.29	13.55	-	-	False - humidity is high	11	21.48	13.31	-	-	False - humidity is high
12	22.29	13.55	-	-	False - humidity is high	12	21.42	13.31	-	-	False - humidity is high
13	22.29	13.55	-	4.51	False - humidity is high	13	21.24	13.30	2.20	-	False - humidity is high

Hour 04:30

Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?	Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?
0	21.01	13.30	-	-	False - humidity is high	0	22.34	13.60	-	-	False - humidity is high
1	21.65	13.33	-	4.36	False - humidity is high	1	22.99	13.64	1.58	-	False - humidity is high
2	21.73	13.34	-	3.45	False - humidity is high	2	23.08	13.64	1.39	-	False - humidity is high
3	21.91	13.35	-	2.27	False - humidity is high	3	23.23	13.65	1.18	-	False - humidity is high
4	22.07	13.35	1.15	-	False - humidity is high	4	23.51	13.67	0.91	-	False - humidity is high
5	21.44	13.32	2.86	-	False - humidity is high	5	24.42	13.78	0.35	-	False - humidity is high
6	21.32	13.32	3.91	-	False - humidity is high	6	24.60	13.76	-	0.63	False - humidity is high
7	21.37	13.32	-	-	False - humidity is high	7	22.98	13.64	-	-	False - humidity is high
8	21.37	13.32	-	-	False - humidity is high	8	23.02	13.64	-	-	False - humidity is high
9	21.37	13.32	-	-	False - humidity is high	9	23.08	13.64	-	-	False - humidity is high
10	21.37	13.32	-	-	False - humidity is high	10	23.15	13.65	-	-	False - humidity is high
11	21.28	13.31	-	-	False - humidity is high	11	23.23	13.66	-	-	False - humidity is high
12	21.21	13.31	-	-	False - humidity is high	12	23.23	13.66	-	-	False - humidity is high
13	21.01	13.30	2.17	-	False - humidity is high	13	23.22	13.66	-	4.77	False - humidity is high

Ventilation Shaft-Hourly Report

Hour 07:30

Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?
0	23.88	13.90	-	-	False - humidity is high
1	24.43	13.93	-	4.41	False - humidity is high
2	24.50	13.94	-	3.46	False - humidity is high
3	24.69	13.95	-	2.20	False - humidity is high
4	24.65	13.94	1.42	-	False - humidity is high
5	24.24	13.92	3.03	-	False - humidity is high
6	24.14	13.92	4.08	-	False - humidity is high
7	24.18	13.92	-	-	False - humidity is high
8	24.19	13.92	-	-	False - humidity is high
9	24.19	13.92	-	-	False - humidity is high
10	24.19	13.92	-	-	False - humidity is high
11	24.12	13.91	-	-	False - humidity is high
12	24.06	13.91	-	-	False - humidity is high
13	23.87	13.90	1.55	-	False - humidity is high

Hour 09:30

Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?
0	26.43	14.20	-	-	False - humidity is high
1	29.34	14.35	-	4.70	False - humidity is high
2	29.69	14.37	-	3.69	False - humidity is high
3	30.58	14.42	-	2.39	False - humidity is high
4	30.48	14.41	1.46	-	False - humidity is high
5	28.24	14.29	3.29	-	False - humidity is high
6	27.77	14.27	4.43	-	False - humidity is high
7	28.07	14.29	-	-	False - humidity is high
8	28.08	14.29	-	-	False - humidity is high
9	28.08	14.29	-	-	False - humidity is high
10	28.08	14.29	-	-	False - humidity is high
11	27.70	14.27	-	-	False - humidity is high
12	27.41	14.25	-	-	False - humidity is high
13	26.42	14.20	1.58	-	False - humidity is high

Hour 08:30

Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?
0	25.21	14.10	-	-	False - humidity is high
1	25.91	14.14	1.74	-	False - humidity is high
2	26.00	14.14	1.54	-	False - humidity is high
3	26.14	14.15	1.31	-	False - humidity is high
4	26.38	14.16	1.05	-	False - humidity is high
5	26.91	14.19	0.66	-	False - humidity is high
and temperature is high					
6	27.94	14.26	-	0.57	False - humidity is high
and temperature is high					
7	25.90	14.14	-	-	False - humidity is high
8	25.95	14.14	-	-	False - humidity is high
9	26.00	14.14	-	-	False - humidity is high
10	26.07	14.14	-	-	False - humidity is high
11	26.15	14.15	-	-	False - humidity is high
12	26.15	14.15	-	-	False - humidity is high
13	26.15	14.15	-	5.73	False - humidity is high

Ventilation Shaft-Hourly Report

Hour 10:30

Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?	Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?
0 and temperature is high	27.64	14.30	-	-	False - humidity is high	0 and temperature is high	28.65	14.30	-	-	False - humidity is high
1 and temperature is high	29.98	14.42	2.59	-	False - humidity is high	1 and temperature is high	31.74	14.46	-	4.54	False - humidity is high
2 and temperature is high	30.31	14.44	2.26	-	False - humidity is high	2 and temperature is high	32.10	14.48	-	3.56	False - humidity is high
3 and temperature is high	30.85	14.46	1.89	-	False - humidity is high	3 and temperature is high	33.04	14.52	-	2.31	False - humidity is high
4 and temperature is high	32.11	14.53	1.36	-	False - humidity is high	4 and temperature is high	32.96	14.52	1.41	-	False - humidity is high
5 and temperature is high	37.33	14.80	-	0.90	False - humidity is high	5 and temperature is high	30.56	14.40	3.19	-	False - humidity is high
6 and temperature is high	35.21	14.69	-	1.32	False - humidity is high	6 and temperature is high	30.07	14.37	4.29	-	False - humidity is high
7 and temperature is high	29.97	14.42	-	-	False - humidity is high	7 and temperature is high	30.39	14.39	-	-	False - humidity is high
8 and temperature is high	30.13	14.43	-	-	False - humidity is high	8 and temperature is high	30.40	14.39	-	-	False - humidity is high
9 and temperature is high	30.33	14.44	-	-	False - humidity is high	9 and temperature is high	30.40	14.39	-	-	False - humidity is high
10 and temperature is high	30.63	14.45	-	-	False - humidity is high	10 and temperature is high	30.40	14.39	-	-	False - humidity is high
11 and temperature is high	30.63	14.45	-	-	False - humidity is high	11 and temperature is high	30.00	14.37	-	-	False - humidity is high
12 and temperature is high	30.62	14.45	-	-	False - humidity is high	12 and temperature is high	29.69	14.35	-	-	False - humidity is high
13 and temperature is high	30.62	14.45	-	5.89	False - humidity is high	13 and temperature is high	28.64	14.30	1.52	-	False - humidity is high

Ventilation Shaft-Hourly Report

Hour 12:30

Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?
0 and temperature is high	29.28	14.00	-	-	False - humidity is high
1 and temperature is high	31.70	14.12	-	5.92	False - humidity is high
2 and temperature is high	31.97	14.13	-	4.68	False - humidity is high
3 and temperature is high	32.66	14.17	-	3.09	False - humidity is high
4 and temperature is high	33.48	14.21	1.49	-	False - humidity is high
5 and temperature is high	30.87	14.08	3.91	-	False - humidity is high
6 and temperature is high	30.44	14.06	5.34	-	False - humidity is high
7 and temperature is high	30.64	14.07	-	-	False - humidity is high
8 and temperature is high	30.64	14.07	-	-	False - humidity is high
9 and temperature is high	30.64	14.07	-	-	False - humidity is high
10 and temperature is high	30.64	14.07	-	-	False - humidity is high
11 and temperature is high	30.30	14.05	-	-	False - humidity is high
12 and temperature is high	30.03	14.04	-	-	False - humidity is high
13 and temperature is high	29.28	14.00	2.95	-	False - humidity is high

Hour 13:30

Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?
0 and temperature is high	29.62	13.60	-	-	False - humidity is high
1 and temperature is high	32.38	13.74	-	5.19	False - humidity is high
2 and temperature is high	32.71	13.75	-	4.10	False - humidity is high
3 and temperature is high	33.51	13.79	-	2.68	False - humidity is high
4 and temperature is high	34.04	13.82	1.41	-	False - humidity is high
5 and temperature is high	31.40	13.69	3.51	-	False - humidity is high
6 and temperature is high	30.93	13.67	4.77	-	False - humidity is high
7 and temperature is high	31.18	13.68	-	-	False - humidity is high
8 and temperature is high	31.18	13.68	-	-	False - humidity is high
9 and temperature is high	31.18	13.68	-	-	False - humidity is high
10 and temperature is high	31.18	13.68	-	-	False - humidity is high

Ventilation Shaft-Hourly Report

Hour 14:30

Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?	Hour 15:30	Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?
0 and temperature is high	29.61	13.80	-	-	False - humidity is high	0 and temperature is high	29.46	13.90	-	-	-	False - humidity is high
1 and temperature is high	32.47	13.93	-	5.38	False - humidity is high	1 and temperature is high	32.35	14.03	-	5.40	-	False - humidity is high
2 and temperature is high	32.80	13.95	-	4.25	False - humidity is high	2 and temperature is high	32.69	14.05	-	4.26	-	False - humidity is high
3 and temperature is high	33.63	13.99	-	2.78	False - humidity is high	3 and temperature is high	33.52	14.09	-	2.79	-	False - humidity is high
4 and temperature is high	34.17	14.01	1.47	-	False - humidity is high	4 and temperature is high	34.06	14.11	1.47	-	-	False - humidity is high
5 and temperature is high	31.45	13.89	3.64	-	False - humidity is high	5 and temperature is high	31.33	13.98	3.65	-	-	False - humidity is high
6 and temperature is high	30.96	13.86	4.94	-	False - humidity is high	6 and temperature is high	30.83	13.96	4.96	-	-	False - humidity is high
7 and temperature is high	31.23	13.88	-	-	False - humidity is high	7 and temperature is high	31.10	13.97	-	-	-	False - humidity is high
8 and temperature is high	31.23	13.88	-	-	False - humidity is high	8 and temperature is high	31.10	13.97	-	-	-	False - humidity is high
9 and temperature is high	31.23	13.88	-	-	False - humidity is high	9 and temperature is high	31.10	13.97	-	-	-	False - humidity is high
10 and temperature is high	31.23	13.88	-	-	False - humidity is high	10 and temperature is high	31.10	13.97	-	-	-	False - humidity is high
11 and temperature is high	30.83	13.86	-	-	False - humidity is high	11 and temperature is high	30.70	13.96	-	-	-	False - humidity is high
12 and temperature is high	30.53	13.84	-	-	False - humidity is high	12 and temperature is high	30.39	13.94	-	-	-	False - humidity is high
13 and temperature is high	29.61	13.80	2.36	-	False - humidity is high	13 and temperature is high	29.46	13.90	2.37	-	-	False - humidity is high

Ventilation Shaft-Hourly Report

Hour 16:30

Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?	Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?
0 and temperature is high	29.21	13.60	-	-	False - humidity is high	0 and temperature is high	28.32	13.40	-	-	False - humidity is high
1 and temperature is high	32.43	13.74	-	5.11	False - humidity is high	1 and temperature is high	30.96	13.51	-	6.20	False - humidity is high
2 and temperature is high	32.80	13.76	-	4.02	False - humidity is high	2 and temperature is high	31.26	13.53	-	4.91	False - humidity is high
3 and temperature is high	33.78	13.80	-	2.59	False - humidity is high	3 and temperature is high	32.00	13.56	-	3.24	False - humidity is high
4 and temperature is high	33.65	13.79	1.60	-	False - humidity is high	4 and temperature is high	32.85	13.60	1.57	-	False - humidity is high
5 and temperature is high	31.20	13.69	3.58	-	False - humidity is high	5 and temperature is high	30.06	13.48	4.09	-	False - humidity is high
6 and temperature is high	30.69	13.66	4.82	-	False - humidity is high	6 and temperature is high	29.60	13.46	5.60	-	False - humidity is high
7 and temperature is high	31.04	13.68	-	-	False - humidity is high	7 and temperature is high	29.82	13.46	-	-	False - humidity is high
8 and temperature is high	31.04	13.68	-	-	False - humidity is high	8 and temperature is high	29.82	13.46	-	-	False - humidity is high
9 and temperature is high	31.04	13.68	-	-	False - humidity is high	9 and temperature is high	29.82	13.46	-	-	False - humidity is high
10 and temperature is high	31.03	13.68	-	-	False - humidity is high	10 and temperature is high	29.81	13.46	-	-	False - humidity is high
11 and temperature is high	30.62	13.66	-	-	False - humidity is high	11 and temperature is high	29.44	13.45	-	-	False - humidity is high
12 and temperature is high	30.30	13.65	-	-	False - humidity is high	12 and temperature is high	29.15	13.44	-	-	False - humidity is high
13 and temperature is high	29.22	13.60	1.72	-	False - humidity is high	13 and temperature is high	28.33	13.40	3.09	-	False - humidity is high

Ventilation Shaft-Hourly Report

Hour 18:30

Zone	Temperature	HR
0 and temperature is high	27.20	13.70
1 and temperature is high	29.86	13.82
2 and temperature is high	30.16	13.84
3 and temperature is high	30.91	13.87
4 and temperature is high	31.82	13.91
5 and temperature is high	28.95	13.78
6 and temperature is high	28.48	13.76
7 and temperature is high	28.71	13.77
8 and temperature is high	28.70	13.77
9 and temperature is high	28.70	13.77
10 and temperature is high	28.70	13.77
11 and temperature is high	28.32	13.75
12 and temperature is high	28.03	13.74
13 and temperature is high	27.21	13.70

Airflow from ambient

Airflow to ambient

Comfortable?

Hour 19:30

Zone	Temperature	HR
0 and temperature is high	25.88	14.00
1 and temperature is high	26.58	14.03
2 and temperature is high	26.66	14.03
3 and temperature is high	26.85	14.04
4 and temperature is high	27.02	14.04
5	26.34	14.02
6	26.22	14.01
7	26.29	14.01
8	26.28	14.01
9	26.28	14.01
10	26.28	14.01
11	26.18	14.01
12	26.11	14.01
13	25.90	14.00

Airflow from ambient

Airflow to ambient

Comfortable?

| False - humidity is high |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| False - humidity is high |

1.45

5.83

4.61

3.05

1.45

-

-

3.86

-

-

-

3.56

-

-

5.27

-

-

-

4.87

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

-

Ventilation Shaft-Hourly Report

Hour 20:30

Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?	Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?
0	24.80	14.10	-	-	False - humidity is high	0	24.13	14.10	-	-	False - humidity is high
1	25.40	14.13	-	5.09	False - humidity is high	1	24.83	14.13	-	4.23	False - humidity is high
2	25.46	14.13	-	4.03	False - humidity is high	2	24.91	14.14	-	3.34	False - humidity is high
3	25.63	14.14	-	2.64	False - humidity is high	3	25.12	14.15	-	2.17	False - humidity is high
4	25.76	14.15	1.35	-	False - humidity is high	4	25.19	14.15	1.21	-	False - humidity is high
5	25.19	14.12	3.33	-	False - humidity is high	5	24.58	14.12	2.83	-	False - humidity is high
6	25.09	14.11	4.55	-	False - humidity is high	6	24.46	14.12	3.85	-	False - humidity is high
7	25.14	14.12	-	-	False - humidity is high	7	24.53	14.12	-	-	False - humidity is high
8	25.14	14.12	-	-	False - humidity is high	8	24.53	14.12	-	-	False - humidity is high
9	25.14	14.12	-	-	False - humidity is high	9	24.53	14.12	-	-	False - humidity is high
10	25.14	14.12	-	-	False - humidity is high	10	24.53	14.12	-	-	False - humidity is high
11	25.05	14.11	-	-	False - humidity is high	11	24.43	14.11	-	-	False - humidity is high
12	24.99	14.11	-	-	False - humidity is high	12	24.36	14.11	-	-	False - humidity is high
13	24.81	14.10	2.52	-	False - humidity is high	13	24.14	14.10	1.86	-	False - humidity is high

Hour 22:30

Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?	Zone	Temperature	HR	Airflow from ambient	Airflow to ambient	Comfortable?
0	23.51	14.00	-	-	False - humidity is high	0	22.98	13.80	-	-	False - humidity is high
1	24.23	14.04	-	4.07	False - humidity is high	1	23.61	13.83	-	4.64	False - humidity is high
2	24.32	14.04	-	3.21	False - humidity is high	2	23.68	13.83	-	3.68	False - humidity is high
3	24.52	14.05	-	2.09	False - humidity is high	3	23.86	13.84	-	2.41	False - humidity is high
4	24.60	14.05	1.16	-	False - humidity is high	4	24.00	13.85	1.23	-	False - humidity is high
5	23.98	14.02	2.73	-	False - humidity is high	5	23.40	13.82	3.04	-	False - humidity is high
6	23.86	14.02	3.70	-	False - humidity is high	6	23.29	13.81	4.16	-	False - humidity is high
7	23.92	14.02	-	-	False - humidity is high	7	23.34	13.82	-	-	False - humidity is high
8	23.92	14.02	-	-	False - humidity is high	8	23.34	13.82	-	-	False - humidity is high
9	23.92	14.02	-	-	False - humidity is high	9	23.34	13.82	-	-	False - humidity is high
10	23.92	14.02	-	-	False - humidity is high	10	23.34	13.82	-	-	False - humidity is high
11	23.82	14.02	-	-	False - humidity is high	11	23.25	13.81	-	-	False - humidity is high
12	23.75	14.01	-	-	False - humidity is high	12	23.18	13.81	-	-	False - humidity is high
13	23.52	14.00	1.79	-	False - humidity is high	13	22.99	13.80	2.30	-	False - humidity is high