

Ceiling Fan Test

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Purpose

It has been proposed that some benefit is provided by running the ceiling fan 24 hours a day. Specifically, it's supposed to keep the lower elevation of the house warmer and reduce the amount of heat wasted near the ceiling. The purpose of this study is to determine if the proposal is true.

Dining Room Temperature at 49 Inches Elevation

I placed two thermometers at the same location, 49 inches above the floor in the dining room. I used both thermometers so that I could verify that they both provide the same reading. That verification was needed for the next segment of the study. I ran the fan on low speed, blowing up, for 12 hours. After that, I turned the fan off for 12 hours. I recorded the temperature at the test location at intervals during the 24 hours of the test. The results are shown in Figure 1.

The temperature with the fan on was almost always cooler than the temperature with the fan off. That's the opposite of what was predicted. The fan was supposed to blow warm air from near the ceiling down to the lower elevation. That doesn't seem to be the what happens. If warm air was being blown down from the ceiling, then the temperature at the test location would be warmer with the fan on and cooler with the fan off.

Running the fan 24 hours a day doesn't increase the air temperature at elevation 49 inches.

Dining Room Temperature at Two Elevations

I placed one thermometer at 31 1/2 inches above the floor and the other thermometer at 97 inches above the floor. I ran the fan on low speed, blowing up, for 12 hours. After that, I turned the fan off for 12 hours. I recorded the temperature at the two test locations at intervals during the 24 hours of the test. The results are shown in Figure 2.

Fan Off, High Elevation Temperature vs. Low Elevation Temperature

(Red and Yellow Lines in Figure 2)

With the fan off, high elevation temperature was sometimes warmer than low elevation temperature and sometimes equal to low elevation temperature. At one reading, the high elevation temperature was cooler than the low elevation temperature. With one exception, the temperature difference between the high elevation and the low elevation was never more than 1°F.

The absence of fan operation doesn't appear to cause significant or consistent stratification of air temperature.

Fan On, High Elevation Temperature vs. Low Elevation Temperature

(Black and Green Lines in Figure 2)

With the fan on, the high elevation temperature was, without exception, equal to or warmer than the low elevation temperature. That contradicts the prediction that fan operation will prevent the accumulation of warm air near the ceiling. According to the

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prediction, fan operation should have assured that the temperature near the ceiling was the same as the temperature at lower elevations.

High Elevation Temperature, Fan On vs. Fan Off

(Black and Red Lines in Figure 2)

The high elevation temperature was sometimes warmer with the fan off and sometimes warmer with the fan on. Sometimes, the same temperature was recorded with the fan on as with the fan off. That contradicts the prediction that fan operation would prevent the accumulation of warm air near the ceiling and that the lack of fan operation would promote the accumulation of warm air near the ceiling.

Low Elevation Temperature, Fan On vs. Fan Off

(Green and Yellow Lines in Figure 2)

The low elevation temperature was sometimes warmer with the fan off and sometimes warmer with the fan on. Briefly, the same temperature was recorded with the fan off as with the fan on. Again, that contradicts the prediction that fan operation would prevent the accumulation of warm air near the ceiling and that lack of fan operation would promote the accumulation of warm air near the ceiling.

Temperature at the Thermostat

I located a thermometer at the thermostat. I ran the fan on low speed, blowing up, for 12 hours. After that, I turned the fan off for 12 hours. I recorded the temperature at the test location at intervals during the 24 hours of the test. The results are shown in Figure 3.

The temperature at the thermostat wouldn't be expected to go below the set point. When the temperature cools to the set point, the furnace turns on. Unless there's another source of heat input, the temperature at the thermostat wouldn't be expected to go above the set point. When the temperature warms above the set point, the furnace doesn't operate.

Sometimes the temperature at the thermostat increased by as much as 2°F. That suggests some other source of heat, in addition to the furnace. If that additional heat was being provided by the fan, then the temperature excursions should have occurred when the fan was on and not occurred when the fan was off. That wasn't the case. Sometimes the temperature at the thermostat was warmer with the fan on than with the fan off. Sometimes the temperature at the thermostat was warmer with the fan off than with the fan on. The prediction was that the operation of the fan would provide additional warm air to the thermostat. Since the variation in temperature at the thermostat doesn't correspond to the period of fan operation, the prediction is disproved.

Conclusion

There isn't any benefit to be gained by running the fan 24 hours a day.

Figure 1. Dining Room Temperature at 49 Inches Elevation

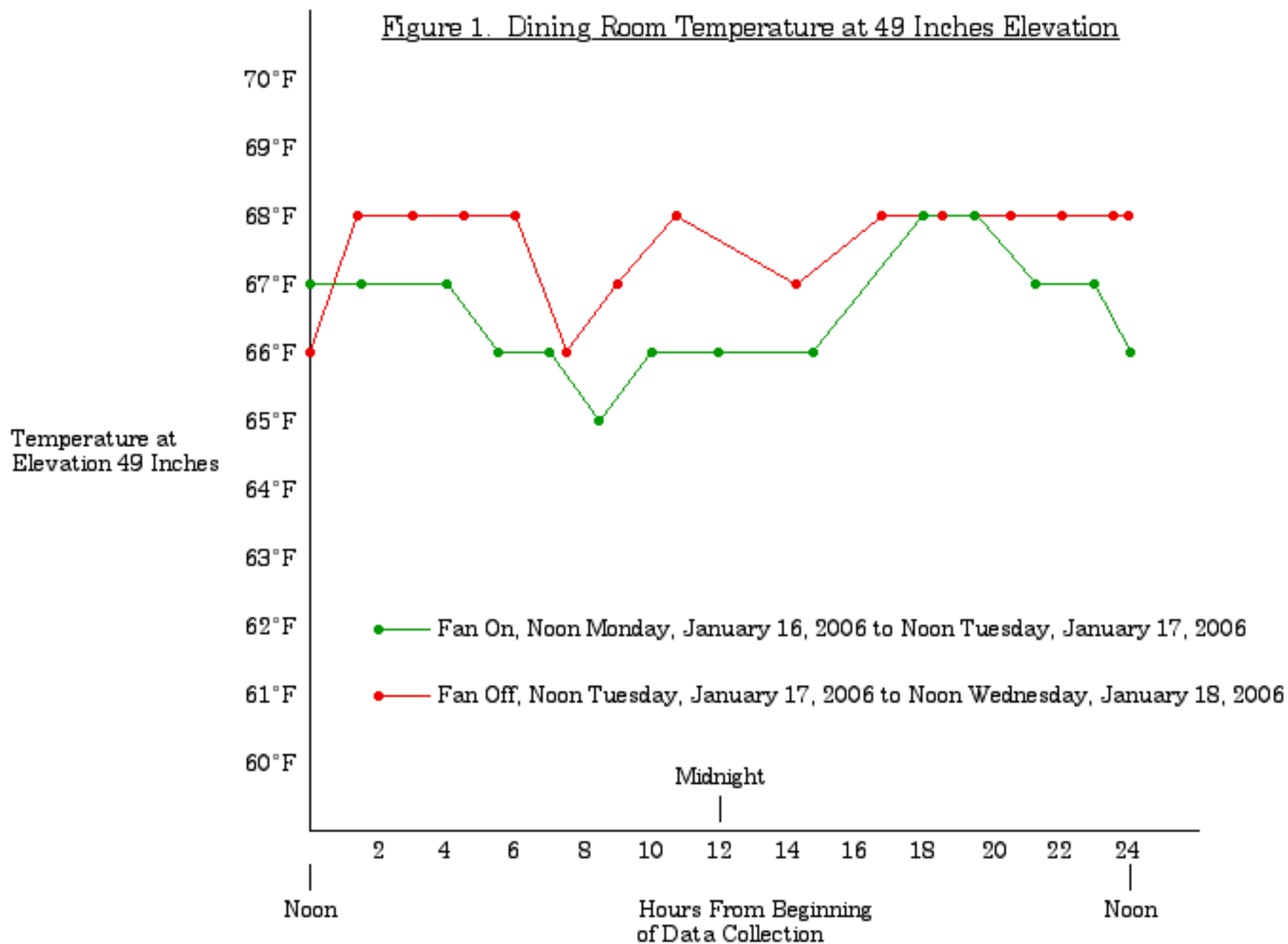


Figure 2. Dining Room Temperature at Two Elevations
31 1/2 Inches and 97 Inches

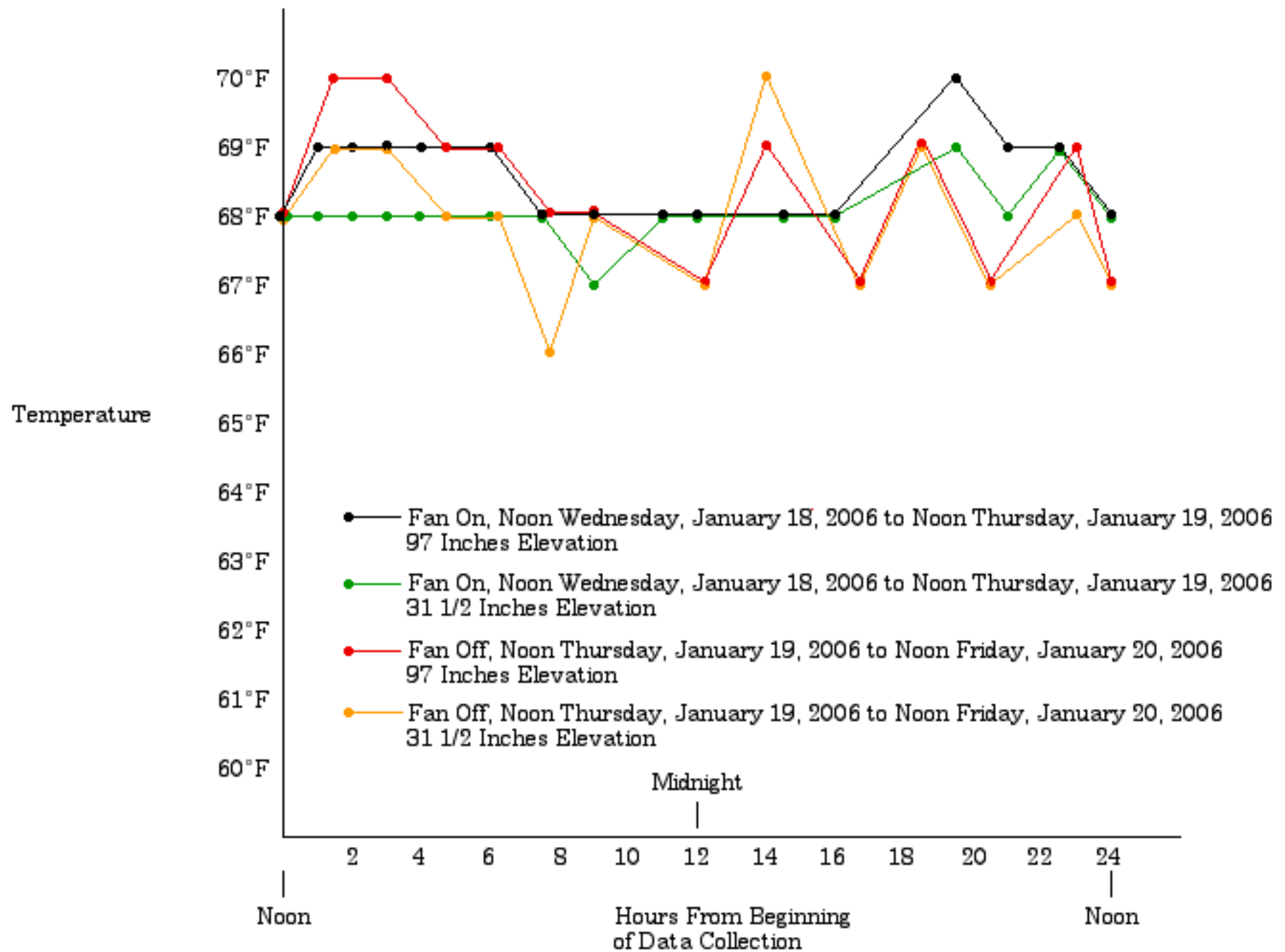
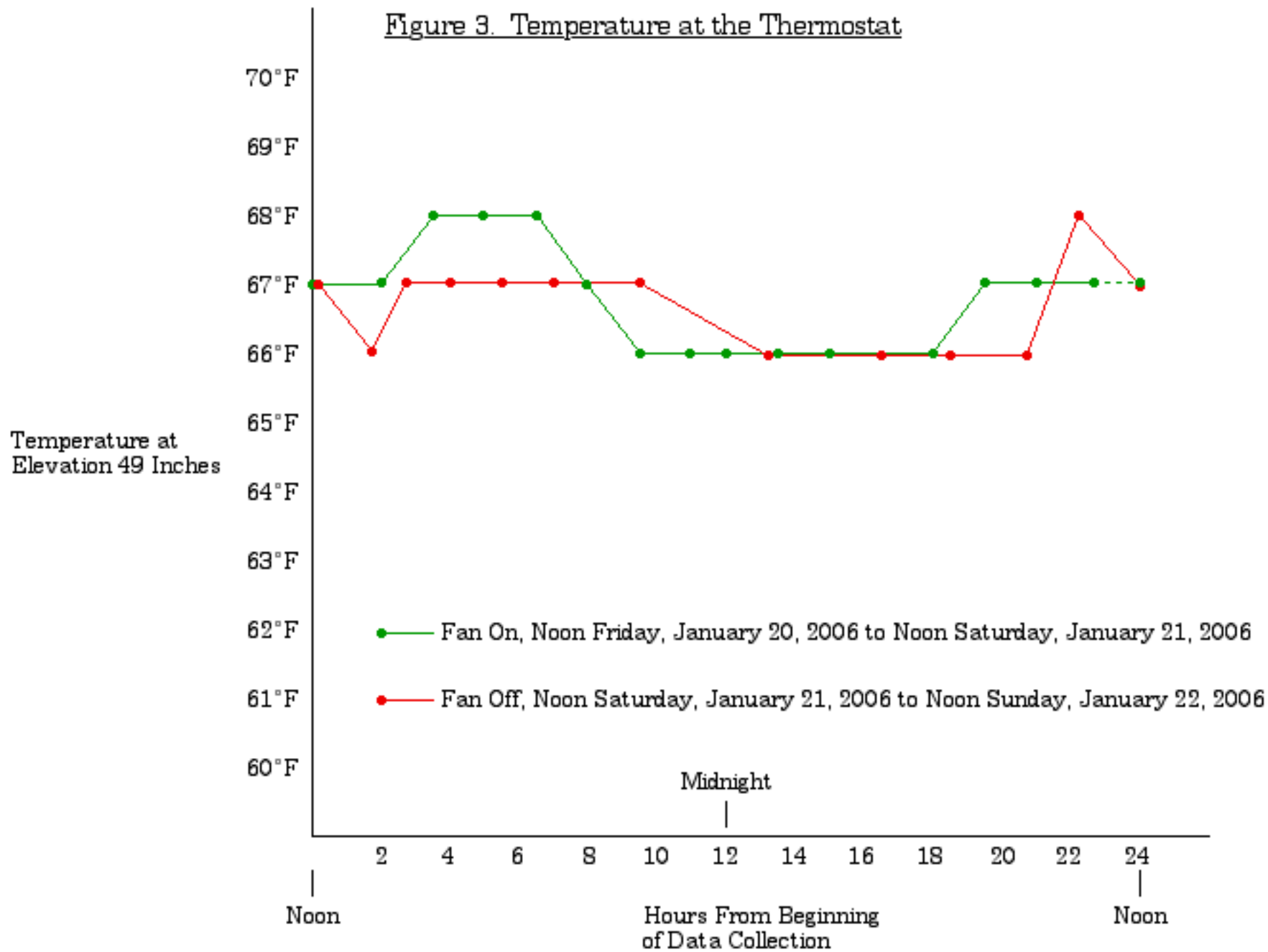


Figure 3. Temperature at the Thermostat



Data: Ceiling Fan Test
Both Thermometers at 49 Inches

Monday, January 16, 2006

Both thermometers were hung at the same elevation with the bulbs 49 inches above the floor.

The fan is on, blowing up at the low speed.

Noon:

Thermometer Number 1 67°F

Thermometer Number 2 67°F

1:30 PM

Thermometer Number 1 65°F

Thermometer Number 2 65°F

4:00 PM

Thermometer Number 1 67°F

Thermometer Number 2 67°F

5:30 PM

Thermometer Number 1 66°F

Thermometer Number 2 66°F

7:00 PM

Thermometer Number 1 66°F

Thermometer Number 2 66°F

8:30 PM

Thermometer Number 1 65°F

Thermometer Number 2 65°F

10:00 PM

Thermometer Number 1 66°F

Thermometer Number 2 66°F

Data: Ceiling Fan Test
Both Thermometers at 49 Inches

Midnight

Thermometer Number 1

66°F

Thermometer Number 2

66°F

Tuesday, January 17, 2006

2:45 AM

Thermometer Number 1

66°F

Thermometer Number 2

66°F

6:00 AM

Thermometer Number 1

68°F

Thermometer Number 2

68°F

7:30 AM

Thermometer Number 1

68°F

Thermometer Number 2

68°F

9:15 AM

Thermometer Number 1

67°F

Thermometer Number 2

67°F

11:00 AM

Thermometer Number 1

67°F

Thermometer Number 2

67°F

Noon

Thermometer Number 1

66°F

Thermometer Number 2

66°F

1:20 PM

Thermometer Number 1

68°F

Thermometer Number 2

68°F

Data: Ceiling Fan Test
Both Thermometers at 49 Inches

| | |
|----------------------|---------|
| | 3:00 PM |
| Thermometer Number 1 | 68°F |
| Thermometer Number 2 | 68°F |

| | |
|----------------------|---------|
| | 4:30 PM |
| Thermometer Number 1 | 68°F |
| Thermometer Number 2 | 68°F |

| | |
|----------------------|---------|
| | 6:00 PM |
| Thermometer Number 1 | 68°F |
| Thermometer Number 2 | 68°F |

| | |
|----------------------|---------|
| | 7:30 PM |
| Thermometer Number 1 | 66°F |
| Thermometer Number 2 | 66°F |

| | |
|----------------------|---------|
| | 9:00 PM |
| Thermometer Number 1 | 67°F |
| Thermometer Number 2 | 67°F |

| | |
|----------------------|----------|
| | 10:45 PM |
| Thermometer Number 1 | 68°F |
| Thermometer Number 2 | 68°F |

Wednesday, January 18, 2006

| | |
|----------------------|---------|
| | 3:15 AM |
| Thermometer Number 1 | 67°F |
| Thermometer Number 2 | 67°F |

| | |
|----------------------|---------|
| | 4:45 AM |
| Thermometer Number 1 | 68°F |
| Thermometer Number 2 | 68°F |

Data: Ceiling Fan Test
Both Thermometers at 49 Inches

6:30 AM

Thermometer Number 1

68°F

Thermometer Number 2

68°F

8:30 AM

Thermometer Number 1

68°F

Thermometer Number 2

68°F

10:00 AM

Thermometer Number 1

68°F

Thermometer Number 2

68°F

11:30 AM

Thermometer Number 1

68°F

Thermometer Number 2

68°F

Noon

Thermometer Number 1

68°F

Thermometer Number 2

68°F

Data: Ceiling Fan Test
Thermometers at Different Elevations

Thermometer Number 1 was hung with the bulb at 31 1/2 inches above the floor.

Thermometer Number 2 was hung with the bulb at 97 inches above the floor.

The fan is on, blowing up at the low speed.

Wednesday, January 18, 2006

Noon:

Elevation 31 1/2 Inches

68°F

Elevation 97 Inches

68°F

1:00 PM

Elevation 31 1/2 Inches

68°F

Elevation 97 Inches

69°F

2:00 PM

Elevation 31 1/2 Inches

68°F

Elevation 97 Inches

69°F

3:00 PM

Elevation 31 1/2 Inches

68°F

Elevation 97 Inches

69°F

4:00 PM

Elevation 31 1/2 Inches

68°F

Elevation 97 Inches

69°F

6:00 PM

Elevation 31 1/2 Inches

68°F

Elevation 97 Inches

69°F

7:30 PM

Elevation 31 1/2 Inches

68°F

Elevation 97 Inches

68°F

Data: Ceiling Fan Test
Thermometers at Different Elevations

9:00 PM

Elevation 31 1/2 Inches

67°F

Elevation 97 Inches

68°F

11:00 PM

Elevation 31 1/2 Inches

68°F

Elevation 97 Inches

68°F

Thursday, January 19, 2006

Midnight

Elevation 31 1/2 Inches

68°F

Elevation 97 Inches

68°F

2:30 AM

Elevation 31 1/2 Inches

68°F

Elevation 97 Inches

68°F

4:00 AM

Elevation 31 1/2 Inches

68°F

Elevation 97 Inches

68°F

7:30 AM

Elevation 31 1/2 Inches

69°F

Elevation 97 Inches

70°F

9:00 AM

Elevation 31 1/2 Inches

68°F

Elevation 97 Inches

69°F

10:30 AM

Elevation 31 1/2 Inches

69°F

Elevation 97 Inches

69°F

Data: Ceiling Fan Test
Thermometers at Different Elevations

| | |
|-------------------------|------|
| <u>Fan Off</u> | Noon |
| Elevation 31 1/2 Inches | 68°F |
| Elevation 97 Inches | 68°F |

| | |
|-------------------------|---------|
| | 1:30 PM |
| Elevation 31 1/2 Inches | 69°F |
| Elevation 97 Inches | 70°F |

| | |
|-------------------------|---------|
| | 3:00 PM |
| Elevation 31 1/2 Inches | 69°F |
| Elevation 97 Inches | 70°F |

| | |
|-------------------------|---------|
| | 4:45 PM |
| Elevation 31 1/2 Inches | 68°F |
| Elevation 97 Inches | 69°F |

| | |
|-------------------------|---------|
| | 6:15 PM |
| Elevation 31 1/2 Inches | 68°F |
| Elevation 97 Inches | 69°F |

| | |
|-------------------------|---------|
| | 7:45 PM |
| Elevation 31 1/2 Inches | 66°F |
| Elevation 97 Inches | 68°F |

| | |
|-------------------------|---------|
| | 9:00 PM |
| Elevation 31 1/2 Inches | 68°F |
| Elevation 97 Inches | 68°F |

| | |
|---------------------------------|----------|
| <u>Friday, January 20, 2006</u> | 12:15 AM |
| Elevation 31 1/2 Inches | 67°F |
| Elevation 97 Inches | 67°F |

Data: Ceiling Fan Test
Thermometers at Different Elevations

2:00 AM

Elevation 31 1/2 Inches

70°F

Elevation 97 Inches

69°F

4:45 AM

Elevation 31 1/2 Inches

67°F

Elevation 97 Inches

67°F

6:30 AM

Elevation 31 1/2 Inches

69°F

Elevation 97 Inches

69°F

8:30 AM

Elevation 31 1/2 Inches

67°F

Elevation 97 Inches

67°F

11:00 AM

Elevation 31 1/2 Inches

68°F

Elevation 97 Inches

69°F

Noon

Elevation 31 1/2 Inches

67°F

Elevation 97 Inches

67°F

Data: Ceiling Fan Test
Temperature at the Thermostat

Friday, January 20, 2006

The fan is on, blowing up at the low speed.

Noon 67°F

2:00 PM 67°F

3:30 PM 68°F

5:00 PM 68°F

6:30 PM 68°F

8:00 PM 67°F

9:30 PM 66°F

11:00 PM 66°F

Nidnight 66°F

Saturday, January 21, 2006

1:30 AM 66°F

Data: Ceiling Fan Test
Temperature at the Thermostat

3:00 AM 66°F

6:00 AM 66°F

7:30 AM 67°F

9:00 AM 67°F

10:45 AM 67°F

Noon, Fan Off

12:15 PM 67°F

1:45 PM 66°F

2:45 PM 67°F

4:00 PM 67°F

5:30 PM 67°F

7:00 PM 67°F

Data: Ceiling Fan Test
Temperature at the Thermostat

9:30 PM 67°F

Sunday, January 22, 2006, Midnight

1:15 AM 66°F

4:30 AM 66°F

6:30 AM 66°F

8:45 AM 66°F

10:15 AM 68°F

Noon 67°F

Data: Ceiling Fan Test
Temperature at the Thermostat

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