Sample Church Evaluation by the Interfaith Coalition on Energy

The energy used by this church is described in the section of this report labeled "Energy Data." Those data are summarized in the table below:

ENERGY PERFORMANCE ANALYSIS

Building (area)	Energy	Units	Cost	BTU/SF/Yr	%E	$/SF/Yr	%$
Church 3,100	Ch.electric.	12,925	$1,550	14,230	25%	$0.50	41%
	Outside ltg.	1,640	$470	1,806	3%	$0.15	12%
	Natural Gas	1,279	$1,741	41,258	72%	$0.56	46%
	All sources		$3,761	57,294	100%	$1.21	100%
Parish House 11,100	Electricity	67,500	$11,894	20,755	47%	$1.07	77%
	Natural Gas	2,554	$3,560	23,009	53%	$0.32	23%
	All sources		$15,454	43,764	100%	$1.39	100%
All buildings 14,200	Electricity	82,065	$13,914	19,724	42%	$0.98	72%
	Natural Gas	3,833	$5,301	26,993	58%	$0.37	28%
	All sources		$19,215	46,717	100%	$1.35	100%

The church spent about $19,200 for energy last year. About three quarters of that was for electricity and one quarter for gas. About a fifth of the total dollars was for the church and four fifths for the parish house.

Per square foot, the church used about 80% more natural gas than the parish house and about 30% less electricity.

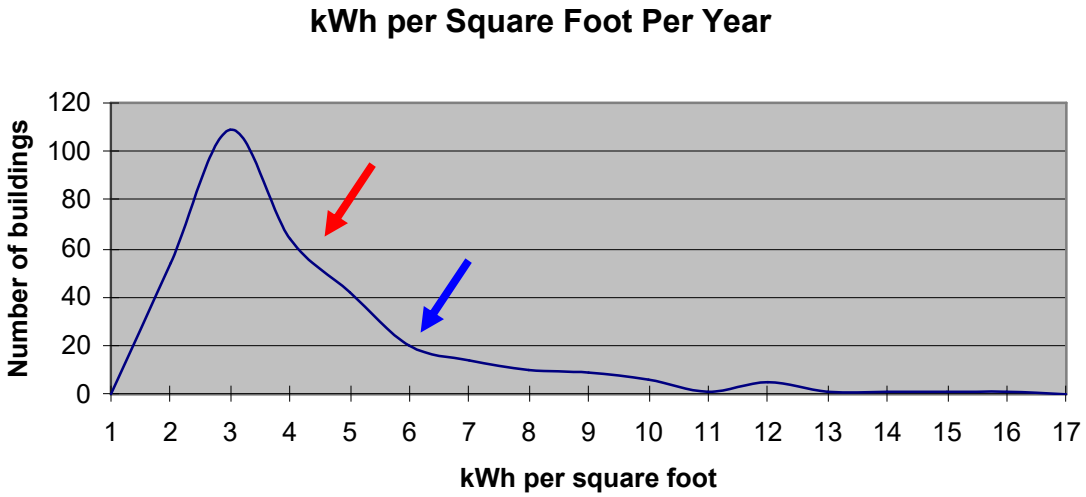
The table on the following page compares the electricity and fuel used annually per square foot at the church with that used by similar religious buildings in and around Philadelphia:

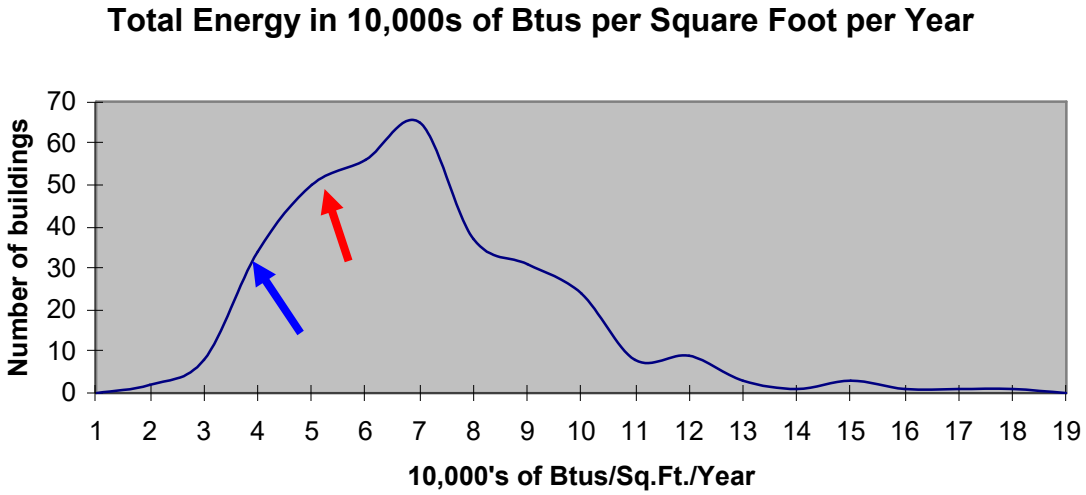
ENERGY PERFORMANCE COMPARISON

Item	The Church	Averages 340 Bldgs.	Percent of Average
Floor area	14,200	20,700	69%
Electric kWh/SF/Yr	5.7	2.9	196%
Peak watts per Sq.Ft.*	2.8	1.7	167%
Hours use of demand *	245	145	169%
Htg. Capacity (BTU/SF)	49	73	67%
Fuel BTU/SF/Yr	26,993	56,250	48%

* Based on parish house electricity only.

The two charts below show the same data graphically. Red arrows are for the church. Blue arrows are for the parish house:





The table below shows the natural gas input to the heating systems prorated per square foot of heated floor area:

Per Square Foot Heating System Input Capacity

Space	Area	Btus input/hr.	Btus per Sq.Ft.
Church	3,100	250,000	81
Parish House	11,100	446,000	40
Total	14,200	696,000	49

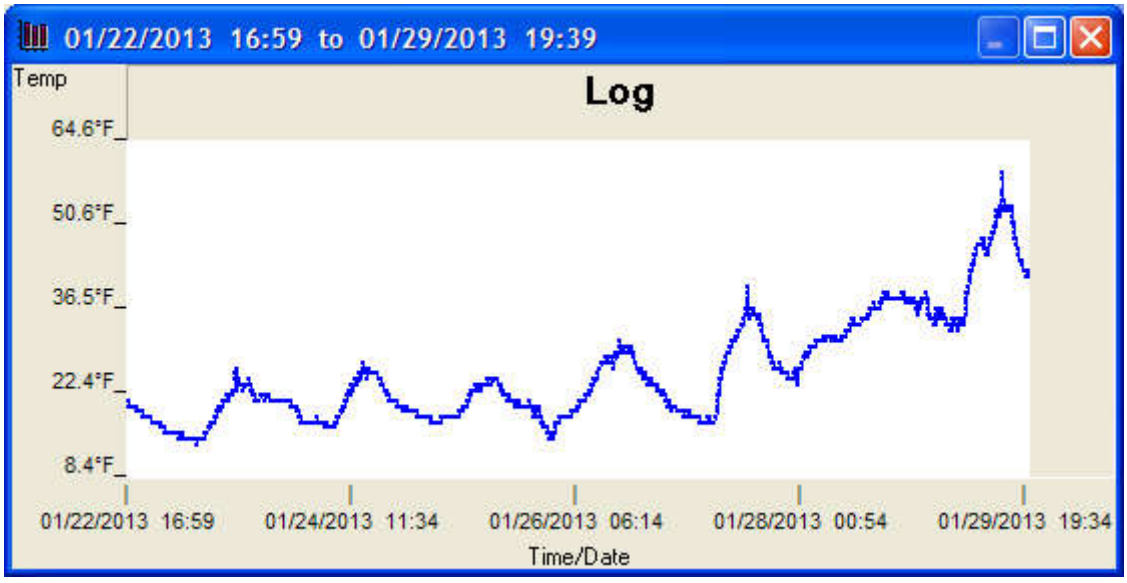
The prorated heating capacity for the church is about twice that of the parish house. The church is about average. The parish house is below average.
Prorated per square foot, the chiller cools about 370 square feet per ton. The two air conditioning systems in the church cool about

310 square feet. Both buildings use about a quarter of their electricity for air conditioning.

Chesapeake Gas has two years of gas consumption data on their invoices. I compared the consumption from last year and the year before to heating degree days in Dover. Degree days are a rough way to judge outside temperature. The technique assumes that building occupants are comfortable at 70°F and that 5° of that comes from internal heat gain, such as people, lights, computers, appliances and so on. For each day, the maximum and minimum temperatures are averaged. One degree day is one degree below 65°. If the average temperature is 50°, then that day has 15 degree days. The gas used per heating degree day was about the same for each building each year.

Temperature recorders were installed in several locations. They began recording at and ended just over a week later. The following are the downloaded results. The lines in these graphs can have three colors. **Red lines** show temperatures over 73.4˚F. **Blue lines** show temperatures below 60.8˚F, and **black lines** show temperatures from 60.8˚F to 73.4˚F. The range of the vertical temperature axis varies from chart to chart. The accuracy of these recorders is 2.7°F.

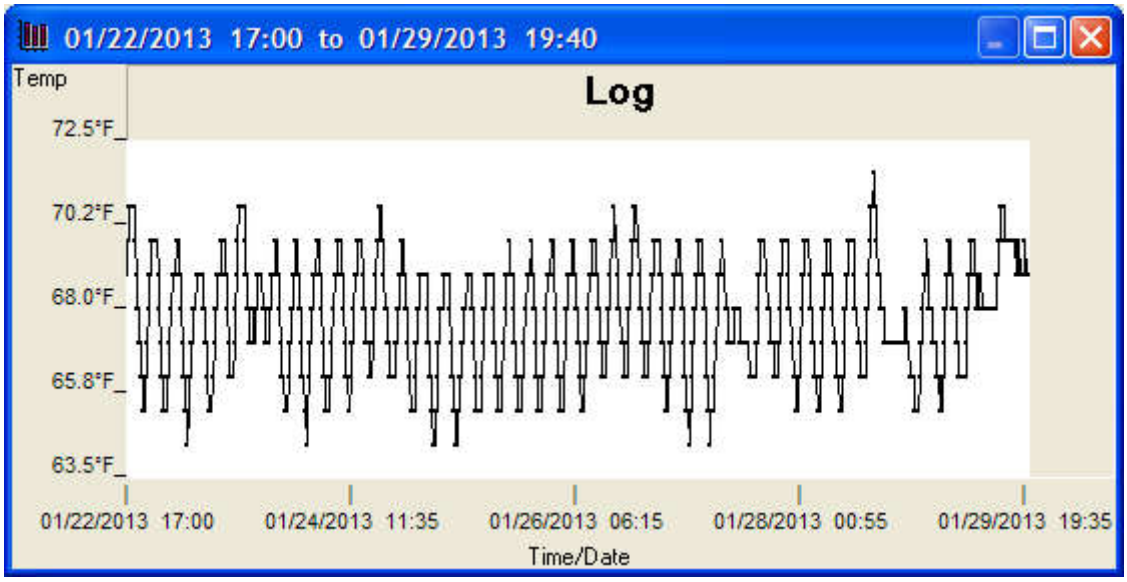
Blue recorder - Outside



. Tues. Wed. Thurs. Fri. Sat. Sun. Mon Tues.

The lowest outside temperature was 14°F at 6:30am on Wednesday 1/23. The highest was 59° at 1:30pm on Tuesday 1/29. The temperature peaks were typically in the mid afternoon.

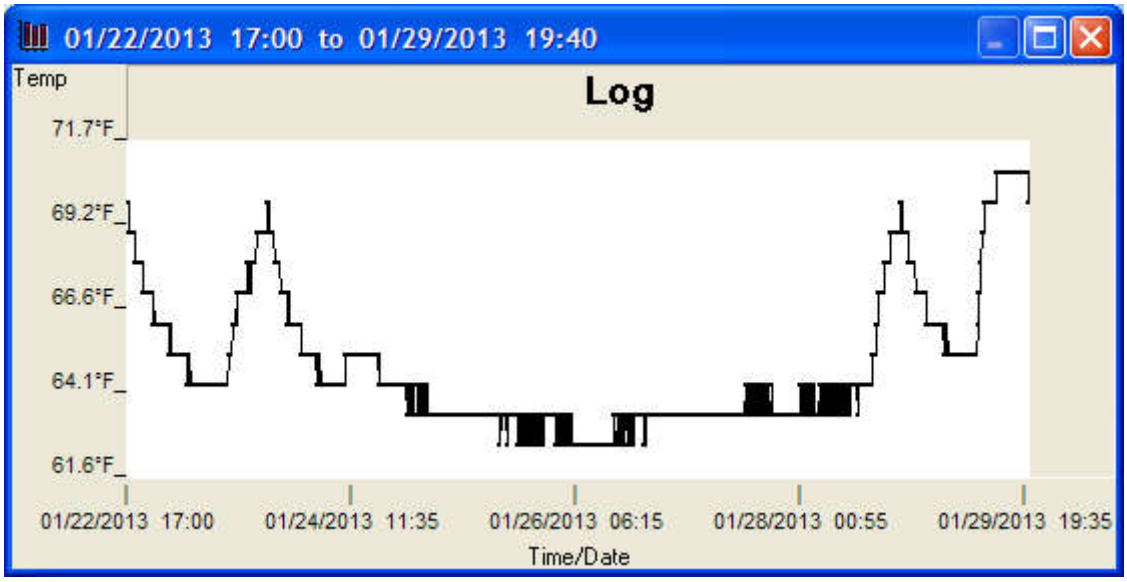
Recorder J9 – Parish Hall



. Tues. Wed. Thurs. Fri. Sat. Sun. Mon Tues.

The lowest temperature in the parish hall was 64°F at 10am on Sunday 1/27. The highest was 72° at 2pm on Monday 1/28. The chart shows the temperature fluctuated about 5° in four to five hour cycles. This probably indicates when the fan turned on and off. This could be fixed by adjusting the energy management controls.

Recorder 2 – Common Room



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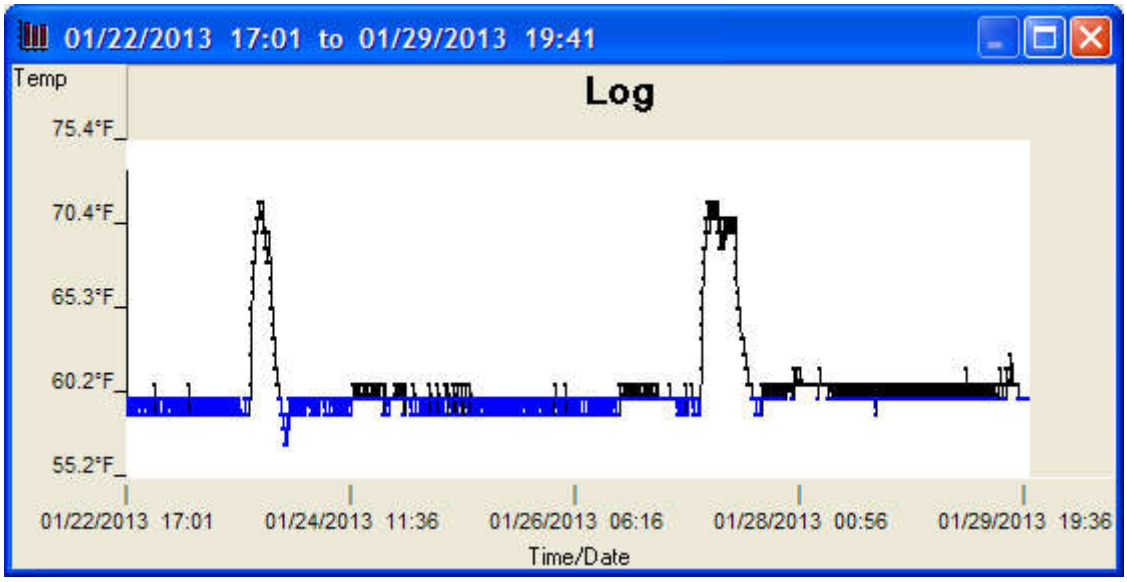
The lowest temperature in the Common Room was 63-64°F over the weekend. The highest was 71° at 7pm on Tuesday 1/29. Left to right, the temperature peaks were about 70° 5pm Tuesday, 8pm Wednesday, 7pm Monday and 1 to 7pm Tuesday.

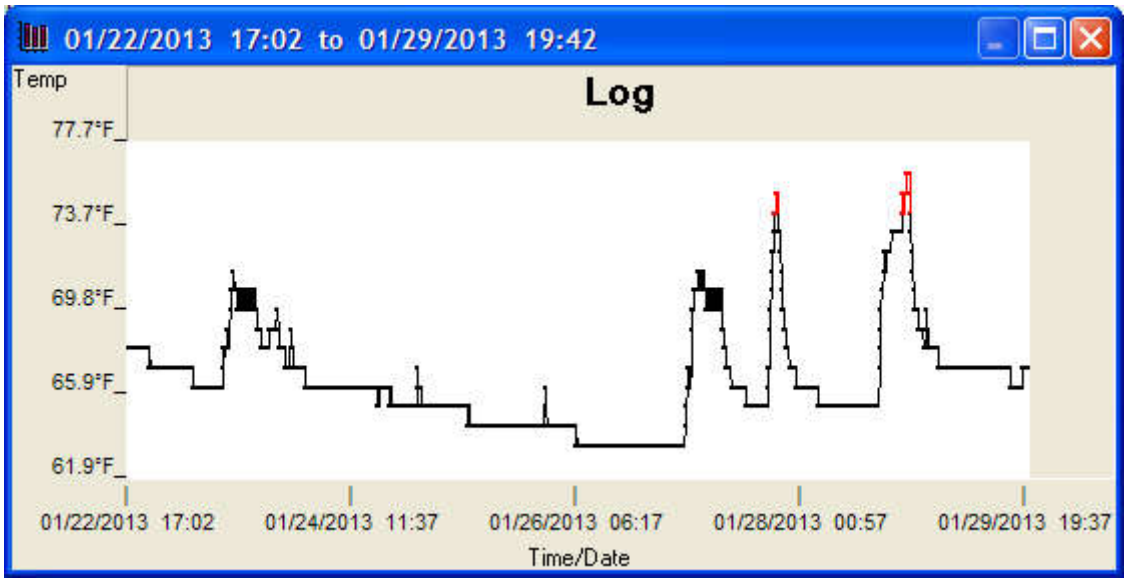
Recorder EO – Choir Room above the Common Room



Tues. Wed. Thurs. Fri. Sat. Sun. Mon Tues.

The temperature of the choir room was mostly flat at 60°. The lowest temperature in the Choir Room was 57°F at 11:30pm on Wednesday 1/23. The highest was 73° at 5pm on Tuesday 1/22. Left to right, the two other temperature peaks were about 71° at 8pm Wednesday, 7pm Monday and 6:30 to 11am on Sunday 1/27.

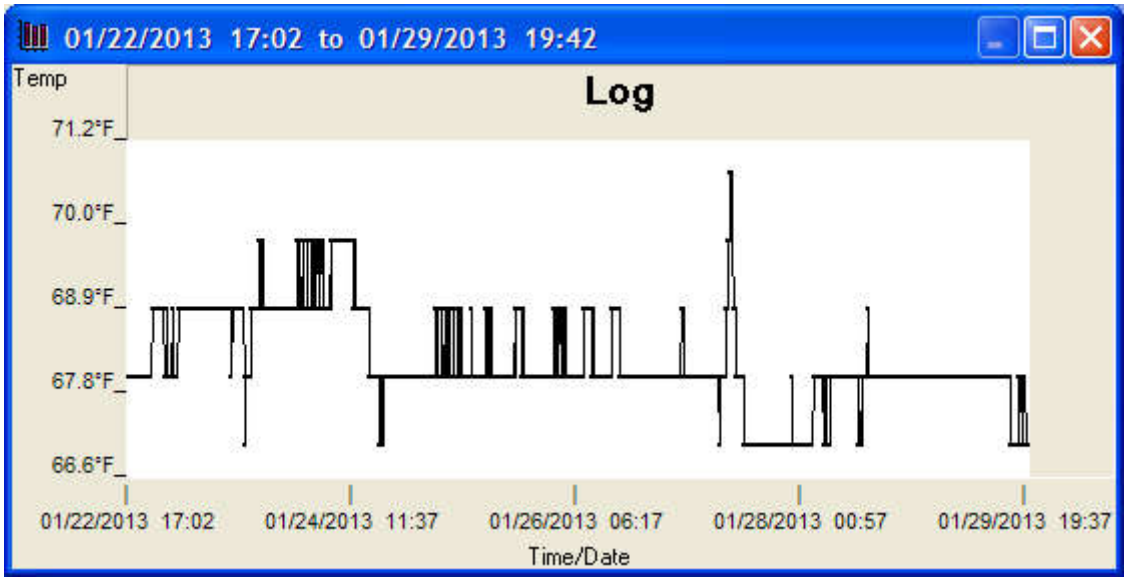
Recorder 45 – Basement below Common Room



Tues. Wed. Thurs. Fri. Sat. Sun. Mon Tues.

The temperature of the basement below the choir room varied between 60° and 57°F at 11:30pm on Wednesday 1/23. The highest was 76° at 9pm on Monday 1/28. The other temperature peaks were 71° during the afternoon of Wednesday 1/24, around 7 to 8pm on Saturday 1/26 and 74° at 8pm on Sunday when the room warmed 9° in 2 hours.

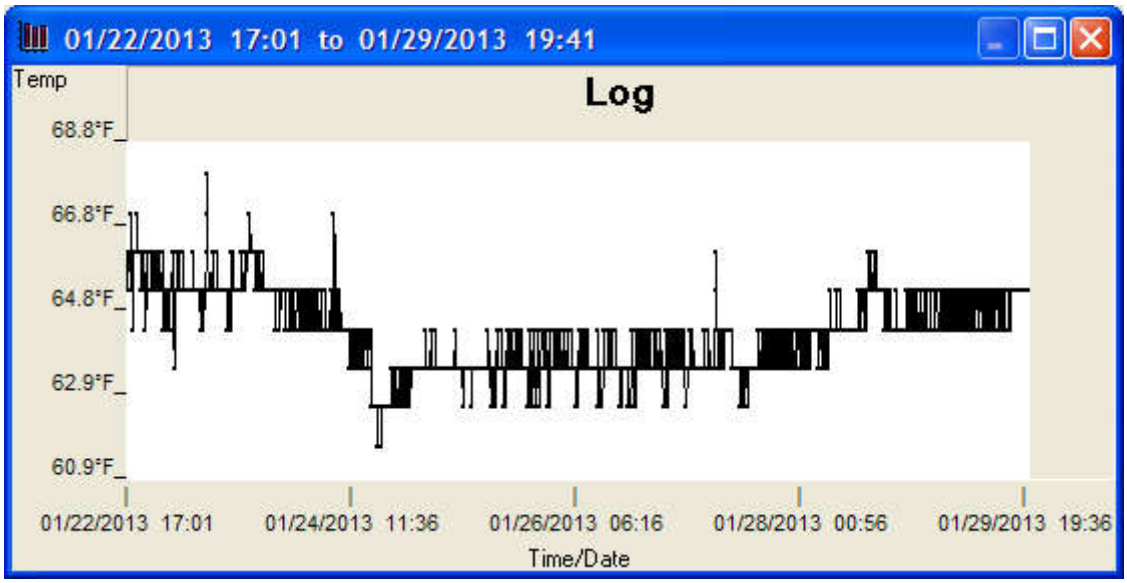
Recorder R3 – Under church pew



. **Tues. Wed. Thurs. Fri. Sat. Sun. Mon Tues.**

These final three charts were all from the church. The temperature under the pew varied 3½° between 67½° and 71°.with flat lines at 68°. The highest temperature was 71° at 11:30am on Sunday 1/27.

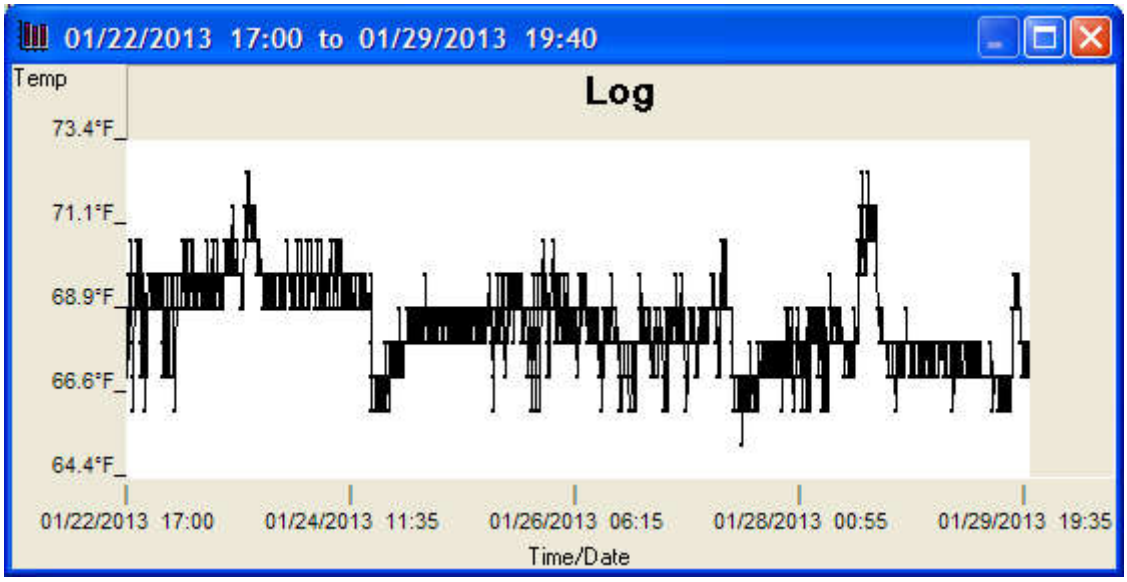
Recorder NN – Nave behind lay reader



. **Tues. Wed. Thurs. Fri. Sat. Sun. Mon Tues.**

The temperature behind the lay reader varied 6° with flat lines mostly at 64°. The highest temperature was 68° at 8:30am on Wednesday 1/23.

Recorder P8 – Church balcony



. **Tues. Wed. Thurs. Fri. Sat. Sun. Mon Tues.**

The temperature behind the lay reader varied 8° with flat lines mostly between 67° and 70°. The highest temperature was 73° at 1pm on Monday 1/28. The flat lines in the chart from the recorder under the pew were about 68° hinting that there is little temperature stratification in the church.

Overall, temperature control is poor. In the parish house, this is probably due to the broken Dell computer. The circulators in the parish house have energy management devices on them, perhaps to turn them off. Even at 14° to 23° outside, the charts show that all but one of the minimum temperatures was lower than 62° to 67° in either building.