

Energy Savings Assessment

PREPARED FOR
Steve Palermo

ASSESSMENT SITE
Churchhill School
301 E 29th Street
New York, NY 10016

ASSESSMENT PERFORMED BY
Atlantic-Westchester, Inc.
264 Adams Street
Bedford Hills, NY 10507

ASSESSMENT DATES
10/19/2011 – 10/26/2011

REPORT ID
177152

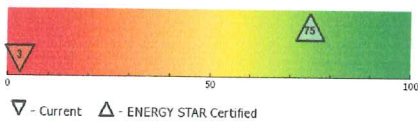


Executive Summary

Your Building's Energy Performance Benchmarks



Energy Use

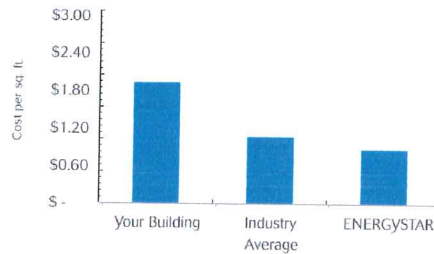


Your building's ENERGY STAR® Energy Performance Rating is **3**. Its Energy Use Index is **86.47 kbtu per sq. ft.**

Your building's ENERGY STAR score of 3 ranks you below average versus your peers, and falls well below the minimum rating of 75 that is required for ENERGY STAR certification.



Cost

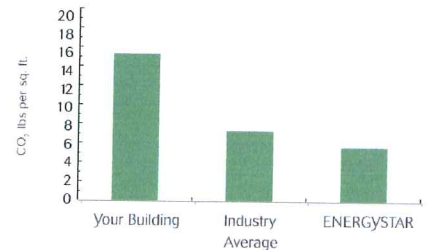


Your building's annual cost per square foot is **\$1.88 per sq. ft.** overall.

Your building's cost per square foot is \$0.85 more than the industry average. Your annual cost can be reduced by \$65,919 or 44.9% by achieving an ENERGY STAR score of 50.



Carbon Footprint



Your building's annual carbon footprint is **540 metric tons of CO₂** or **15.26 lbs per sq. ft.**

Your building's carbon emissions are 110.6% more than the industry average, and can be reduced by 8 lbs per sq. ft. by achieving an ENERGY STAR score of 50.

You could save up to **\$65,919** annually or **\$329,595** over 5 years by raising your ENERGY STAR score to the level of 50.

While a more detailed energy audit is required to quantify actual savings, the savings potential can be estimated by comparing the performance of your building to the ENERGY STAR database.

Key Findings

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-
-
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How Does Your Building Use Electricity Today?

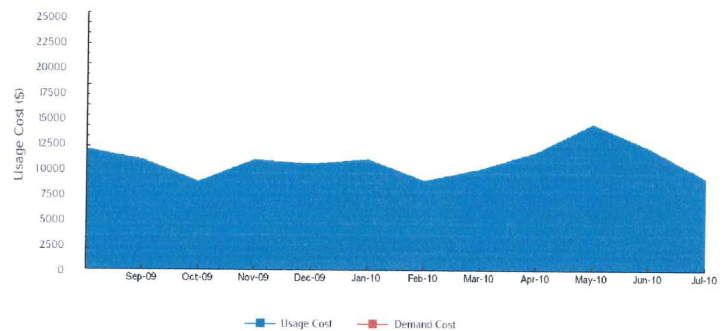
This page shows how electricity use in your building compares to outside weather and helps identify performance issues in the building. Typically your consumption should track the weather pattern for the type of heating or cooling equipment operating in your building. Overall flat consumption can be indicative of 1) simultaneous heating and cooling, 2) extended fan operation, 3) extensive reheat, and 4) an inefficient lighting system. Be aware, some variation can be caused by estimated meter readings which are "fixed" the next time the meter is actually read.

Utility Bill Analysis

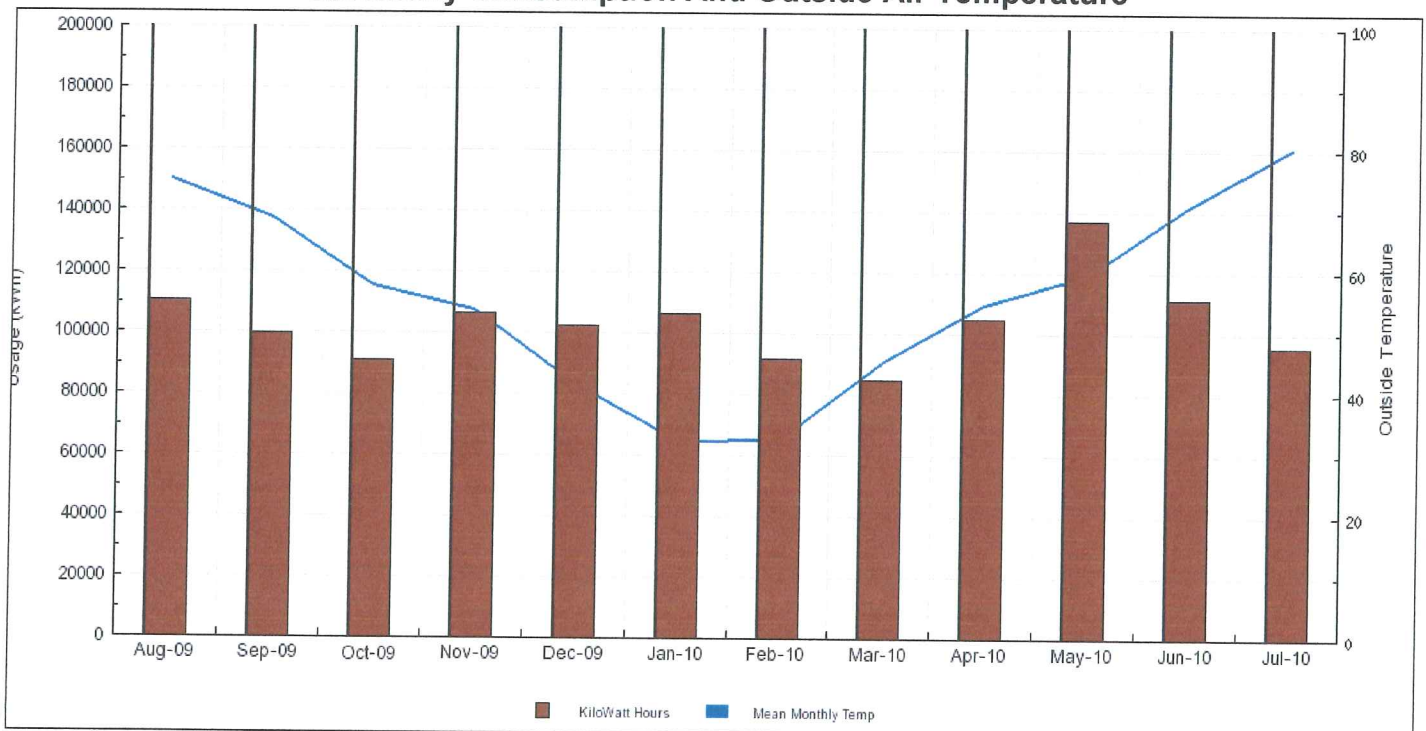
Electricity Consumption

- Electricity comprises 87% of your total utility cost, and 63% of your total utility consumption.
- Your Total Spend on Electricity is \$128,276.57, so when considering savings opportunities, remember you can only save some percentage of that total.
- There are no demand costs for this building.

Monthly Electricity Costs



Electricity Consumption And Outside Air Temperature



How Does Your Building Use Natural Gas Today?

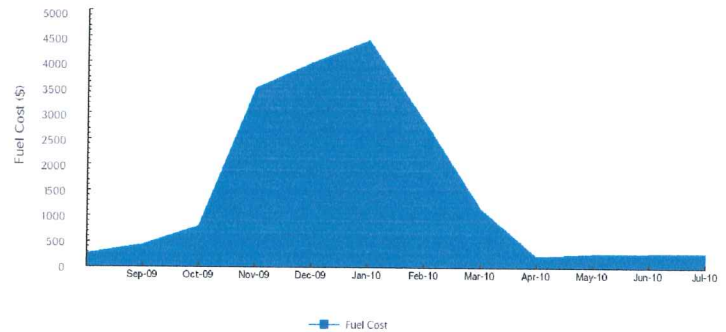
This page shows how Fuel is used in your building relative to outside weather and helps identify performance issues in the building. Typically your consumption should track the weather pattern for the type of heating equipment operating in your building. Overall excessive consumption can be indicative of 1) simultaneous heating and cooling, 2) extensive reheat, and 3) heating in warmer months. Be aware, some variation can be caused by estimated meter readings which are "fixed" the next time the meter is actually read

Utility Bill Analysis

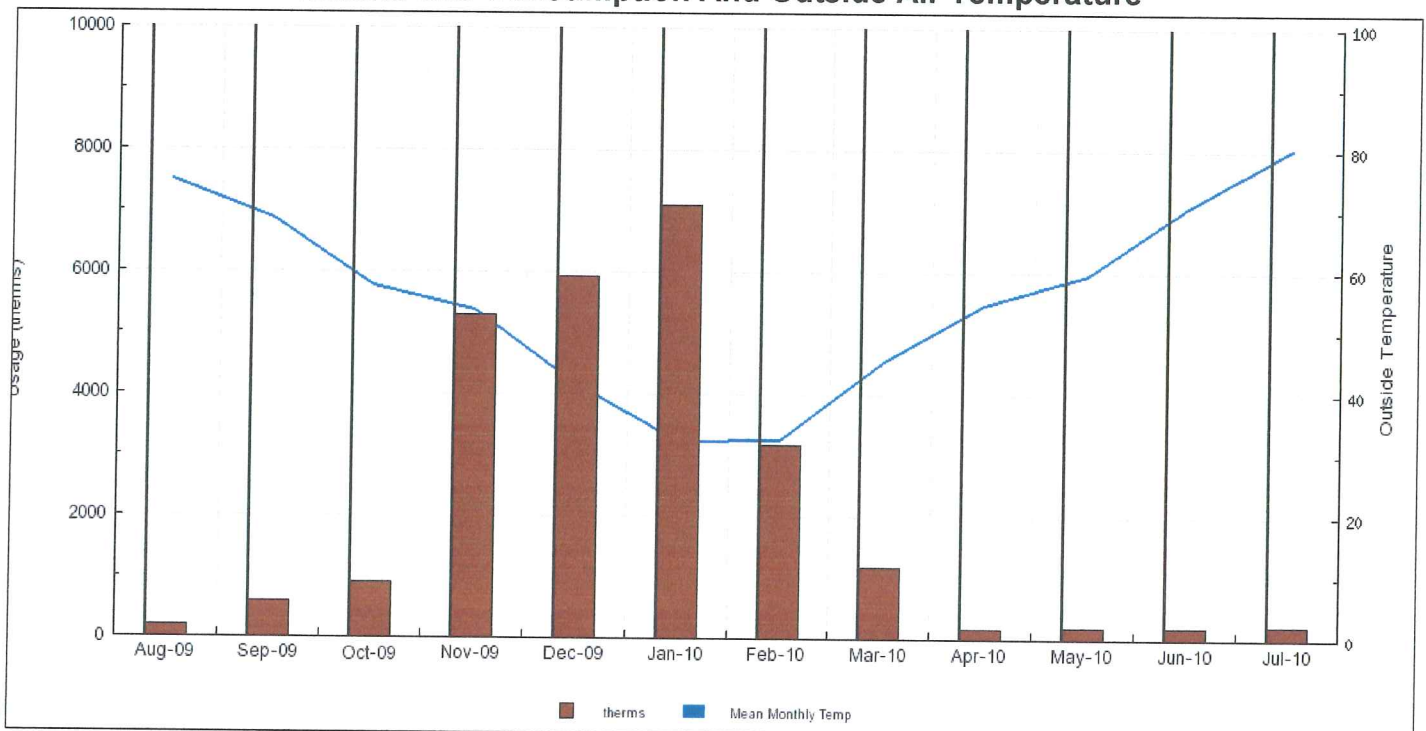
Natural Gas Consumption

- Fuel comprises 13% of your total utility cost, and 37% of your total utility consumption.
- Your Total Spend on Natural Gas is \$18,504.05, so when considering savings opportunities, remember you can only save some percentage of that total.
- Demand costs do not apply to this meter type.

Monthly Natural Gas Costs



Natural Gas Consumption And Outside Air Temperature



Building Comfort and Ventilation Analysis

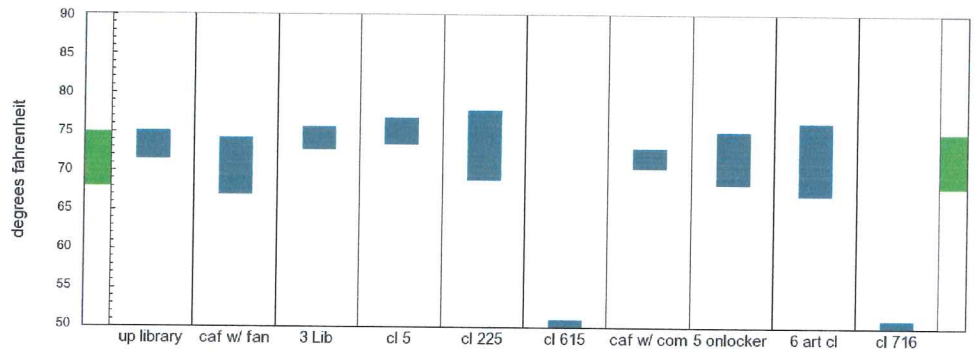
This page shows the min/max range of temperature, humidity, and carbon dioxide levels measured during occupied periods. Reducing the range is critical to achieving a building under control that is properly ventilated which allows tenants to be comfortable and productive. The action ratings are based on the worst case found when comparing measured data during occupied hours against established industry guidelines (ENERGY STAR, BOMA, ASHRAE, DOE).

Temperature Findings



Your building is controlled well with little opportunity for savings.

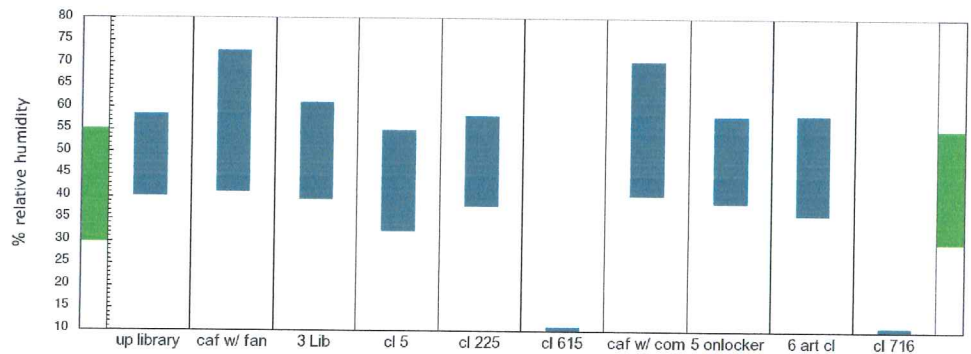
- 3 space(s) were too warm at times
- 2 space(s) were too cool at times
- 3 space(s) had excessive temperature variation



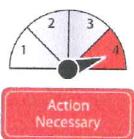
Relative Humidity Findings



- 5 space(s) had high relative humidity at times
- 0 space(s) had low relative humidity at times

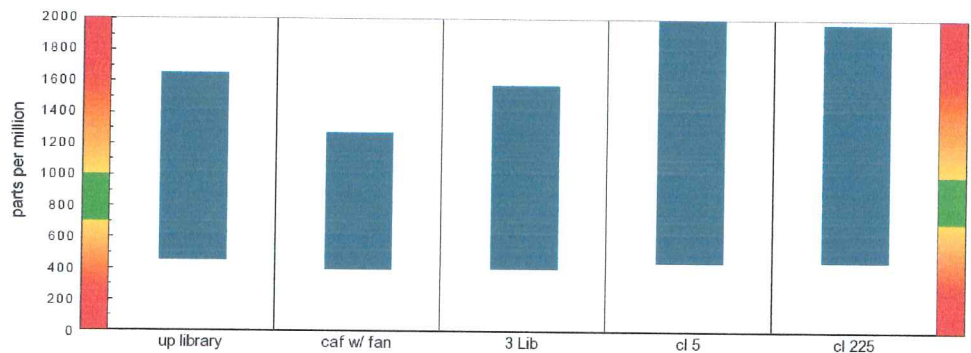


Carbon Dioxide Findings



Your building does not have enough fresh air ventilation.

- 5 space(s) had elevated carbon dioxide levels
- 5 space(s) had low carbon dioxide levels



Temperature



[Sensor Range: 32 to 100 °F; Resolution: 0.1 °F; Calibration Accuracy: ± 1°F]

The ideal temperature is between 68 °F and 75 °F during the heating season and 72 °F and 78 °F during the cooling season, with variation of less than 3 °F. Lowering the heating setpoint and raising the cooling setpoint can save significant energy while maintaining a comfortable and productive working environment.

Sources: ASHRAE Standard 55 – 1992, BOMA, ENERGY STAR, DOE

Alert Lvl	
	Occupied/Unoccupied Heating Setpoint is 69 / 60
	Occupied/Unoccupied Cooling Setpoint is 73 / 78

Energy Savings Opportunities

Our findings indicate there are several ways to save money by operating your building differently:

Energy Recommendations Based on Measurements

- Calibrate thermostat(s) to reduce temperature variation
- Verify the controls system is shutting the heating & cooling equipment off
- Move thermostat(s) to reduce temperature variation
- Balance air flow within duct system to reduce temperature variation

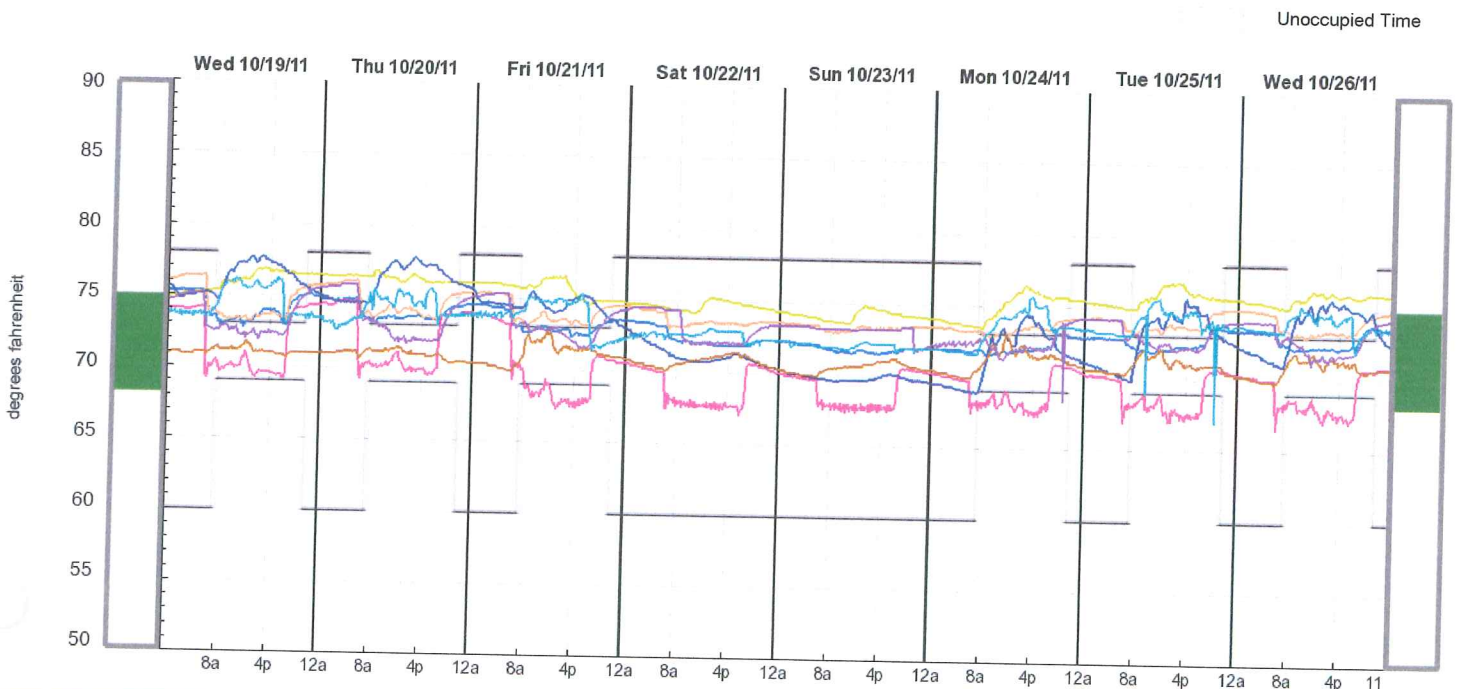
Further Comfort & Energy Recommendations

- Raise the cooling set point
- Increase the amount of cooling set back possible during the unoccupied times

Monitor Statistics

Monitor	Alert Lvl	Min °F	Max °F	Avg °F	%ToR*	SV [†]
up library		72	75	73	0%	2
caf w/ fan		67	74	69	28%	5
3 Lib		73	76	74	4%	2
cl 5		73	77	76	89%	2
cl 225		69	78	75	45%	4
cl 615		0	0	0	0%	0
caf w/ com		70	73	71	0%	2
5 onlocker		68	75	72	0%	6
6 art cl		67	76	74	24%	8
cl 716		0	0	0	0%	0

These statistics are for occupied times only based on 10 minute averages.
 * % Time out of Range [†] Spread Value is based on rolling 4hour per ASHRAE



Relative Humidity

[Sensor Range: 10 to 95 %; Resolution: 1%; Calibration Accuracy: ± 5%]



Optimum comfort and health is achieved when relative humidity is maintained between 30% and 55%. Readings outside these boundaries may indicate ventilation issues which contribute to an increase of energy used to condition the space.

Sources: ASHRAE Standard 55 – 1992, American Lung Association, Indoor Air Quality Association, BOMA, ENERGY STAR, DOE

Analysis and Recommendations

Our findings indicate areas in your building that may have issues worth investigating for possible energy savings, and especially if there are comfort complaints.

Possible Causes

- Excessive sources of humidity

Recommended Actions

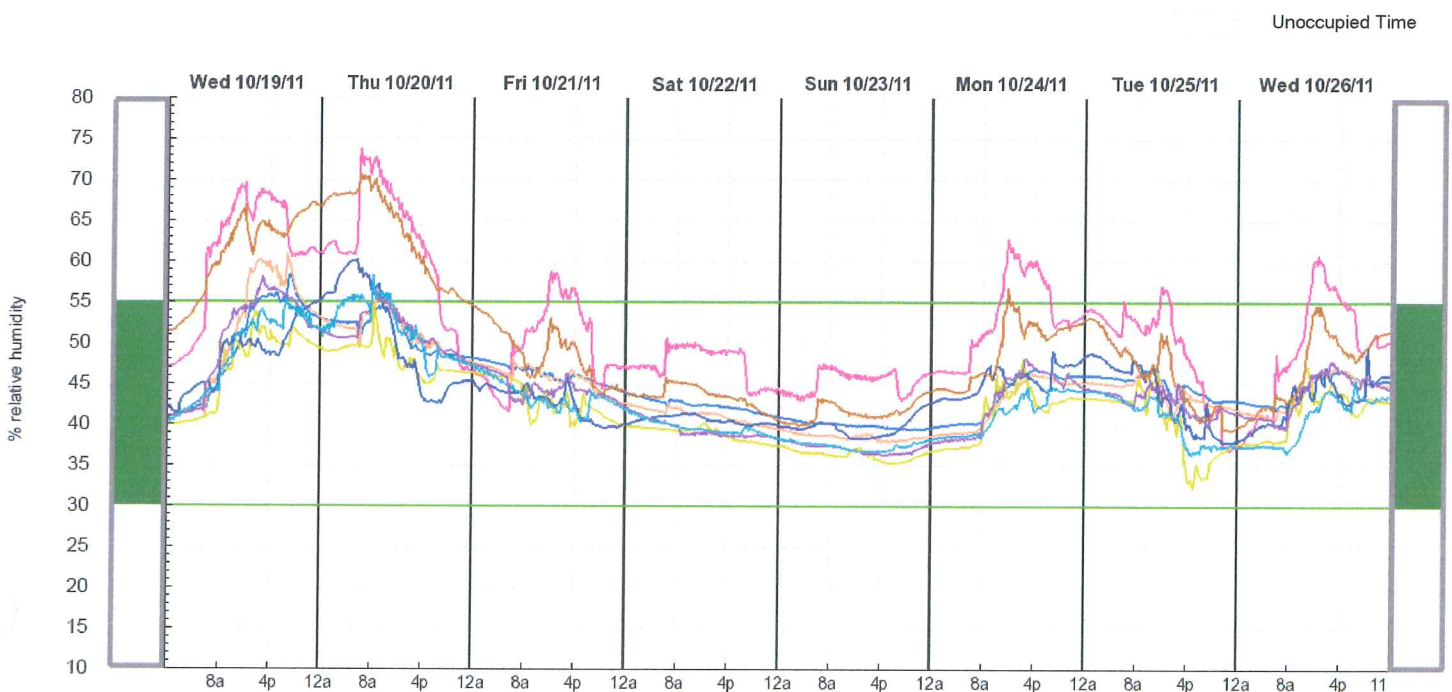
- Eliminate sources of humidity or install direct exhaust equipment in affected area

Monitor Statistics

Monitor	Alert Lvl	Min	Max	Avg	% ToR*
up library		40	58	47	7%
caf w/ fan		41	73	57	53%
3 Lib		40	61	48	13%
cl 5		32	55	44	0%
cl 225		38	58	45	3%
cl 615		0	0	0	0%
caf w/ com		40	70	53	34%
5 onlocker		39	58	47	10%
6 art cl		36	58	45	4%
cl 716		0	0	0	0%

These statistics are for occupied times only.

* % Time out of Range



Carbon Dioxide

[Sensor Range: 0 to 2000 ppm; Resolution: 10 ppm; Calibration Accuracy: ± 100 ppm]



Monitoring carbon dioxide levels is an important aspect of ensuring a comfortable, healthy and energy efficient indoor environment. At levels above 1000 ppm, air becomes stale and less comfortable to breathe. Levels well below 1000 ppm may indicate excessive outside air, resulting in higher than necessary energy costs due to the need for conditioning of this additional outside air.

Sources: ASHRAE Standard 62-2001, U.S. Green Building Council, Indoor Air Quality Association, Health Canada, BOMA, ENERGY STAR, DOE

Monitor Statistics

Energy Savings Opportunities

Our findings indicate there are several ways to save money by operating your building differently:

Energy Recommendations Based on Measurements

- Verify dampers are not stuck open or leaky
- Reduce the amount of outside air ventilation
- Install demand control ventilation

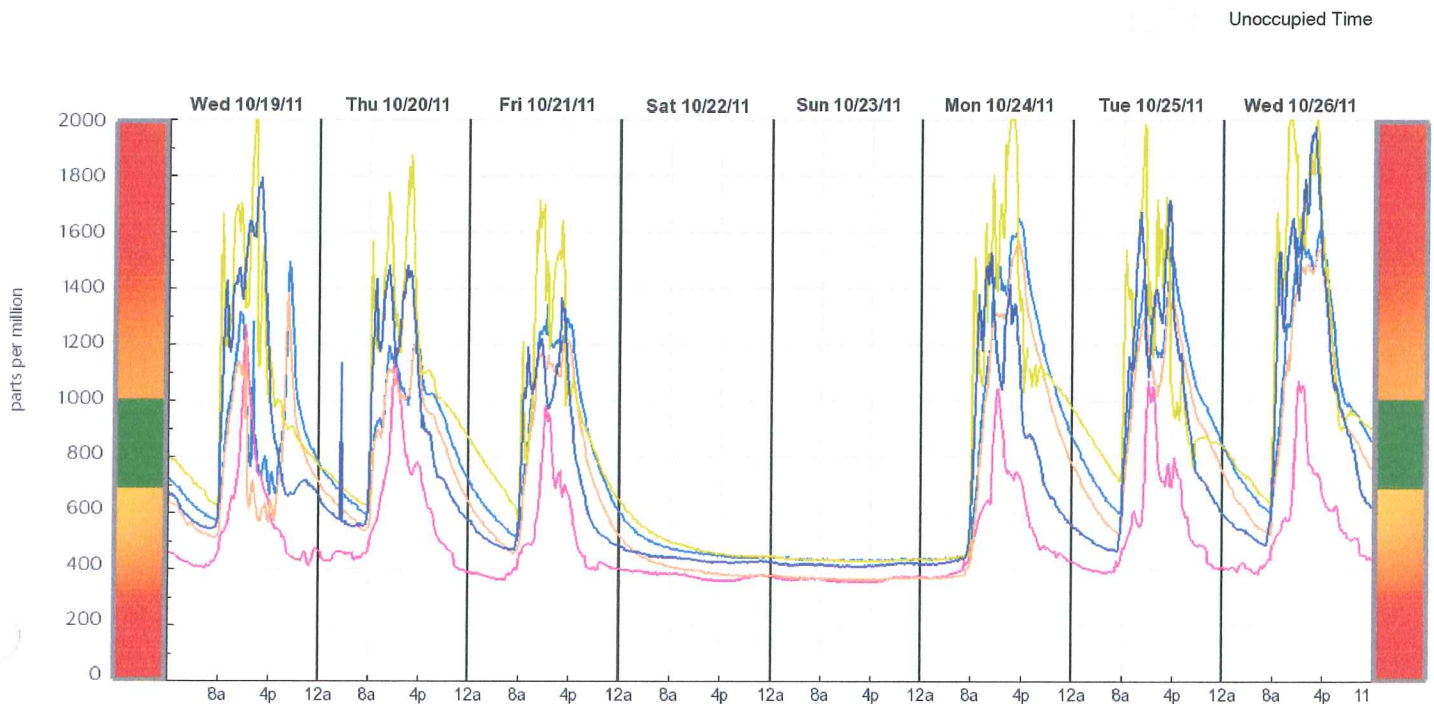
Comfort & Health Recommendations

- Increase the amount of ventilation into the building.

Monitor	Alert Lvl	Min	Max	Avg	% ToR*
up library		455	1648	1093	73%
caf w/ fan		395	1271	641	73%
3 Lib		403	1575	1009	70%
cl 5		447	2070	1253	74%
cl 225		452	1976	1090	73%

These statistics are for occupied times only.

* % Time out of Range



Lighting



Lighting controls and scheduling are some of the easiest low and no cost investments in energy efficiency. Controlling the artificial lights with occupancy or daylight controls and replacing inefficient bulbs can significantly reduce your electrical energy spend. In the graph below, artificial lights are represented by the sharp on/off of the curve, natural daylight by a gradual increase, and direct sunlight by the large spikes.

Sources: BOMA, ENERGY STAR, DOE

Stated Schedule: 10 average occupied hours

Energy Savings Opportunities

Our findings indicate there are several ways to save money by operating your building differently:

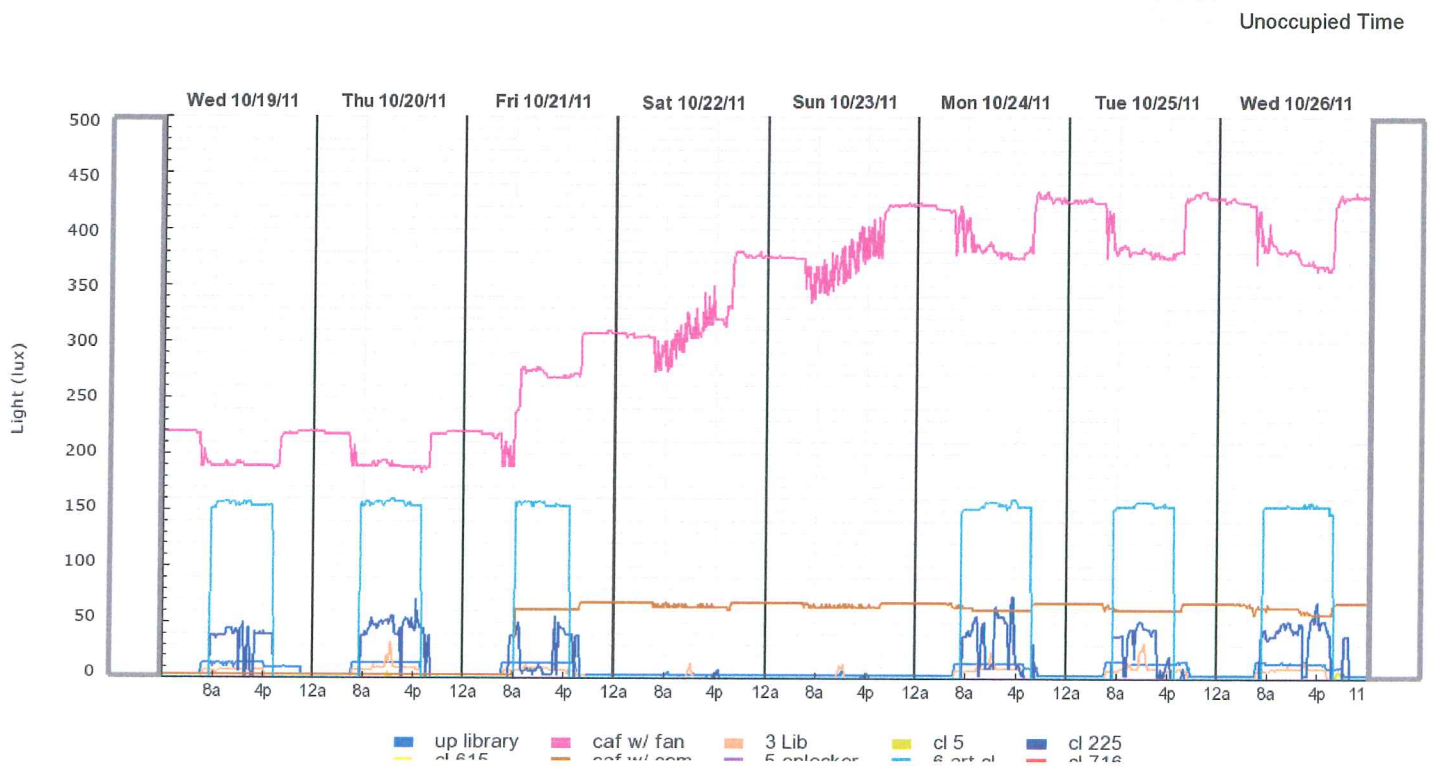
Energy Recommendations Based on Measurements

- Verify the light schedule & reduce unoccupied hours operation

Further Energy Recommendations

- Replace inefficient lamps with new high efficiency lamps
- Install occupancy sensors for individual zones
- Install daylight controls on the perimeter
- Reduce after hours use through coordination with the cleaning crews

Monitor	Alert Lvl	Measured On-Time
up library		14.89 hrs
caf w/ fan		23.97 hrs
3 Lib		5.04 hrs
cl 5		0.21 hrs
cl 225		5.44 hrs
cl 615		0 hrs
caf w/ com		16.97 hrs
5 onlocker		0.01 hrs
6 art cl		7.66 hrs
cl 716		0 hrs



Unoccupied Time

Power Monitoring

(Caf unit compress is attached to monitor # (20487))

The power monitor, or current sensor is used to track the operation of various pieces of equipment that cycle on and off by measuring equipment amperage over a period of time. This can help identify energy savings opportunities by detecting equipment that is running unnecessarily, short cycling, or operating at part load for significant periods of time.

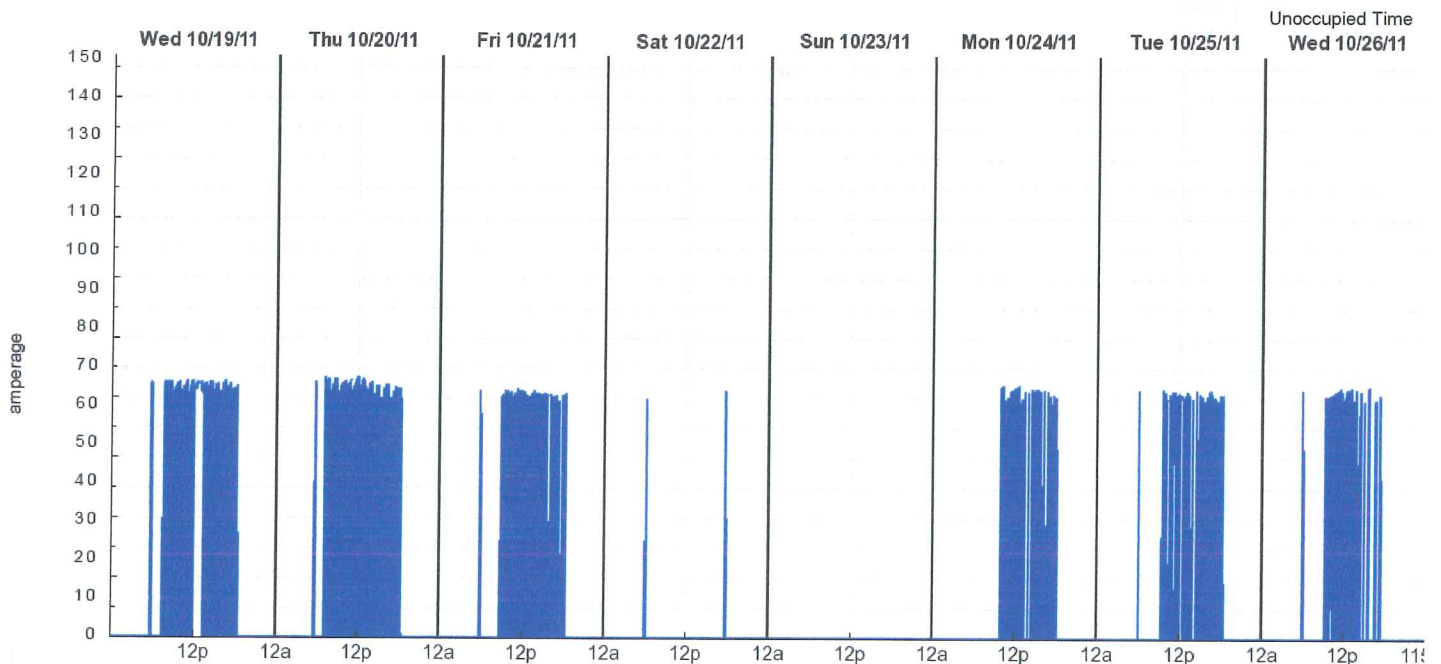
Equipment Cycles/Runtime

	Time (hours)	% of Total	Shortest (minutes)	Median (minutes)	Longest (minutes)
Total Runtime (hours)	26.6		2.0	9.4	82.1
Runtime During Occupied Periods (hours)	25.7	96%	2.0	56.9	2,414.0
Runtime During Unoccupied Periods (hours)	1.0	4%			
Cycles per hour			0.9		

Power Consumption

Nominal Voltage (volts)	Average Current (amps)	Total Runtime (hours)	Approximate Energy (kWh)
208	49.0	26.6	423.5

Amperage Measurements



Power Monitoring

(caf unit fan is attached to monitor # (20635))

The power monitor, or current sensor is used to track the operation of various pieces of equipment that cycle on and off by measuring equipment amperage over a period of time. This can help identify energy savings opportunities by detecting equipment that is running unnecessarily, short cycling, or operating at part load for significant periods of time.

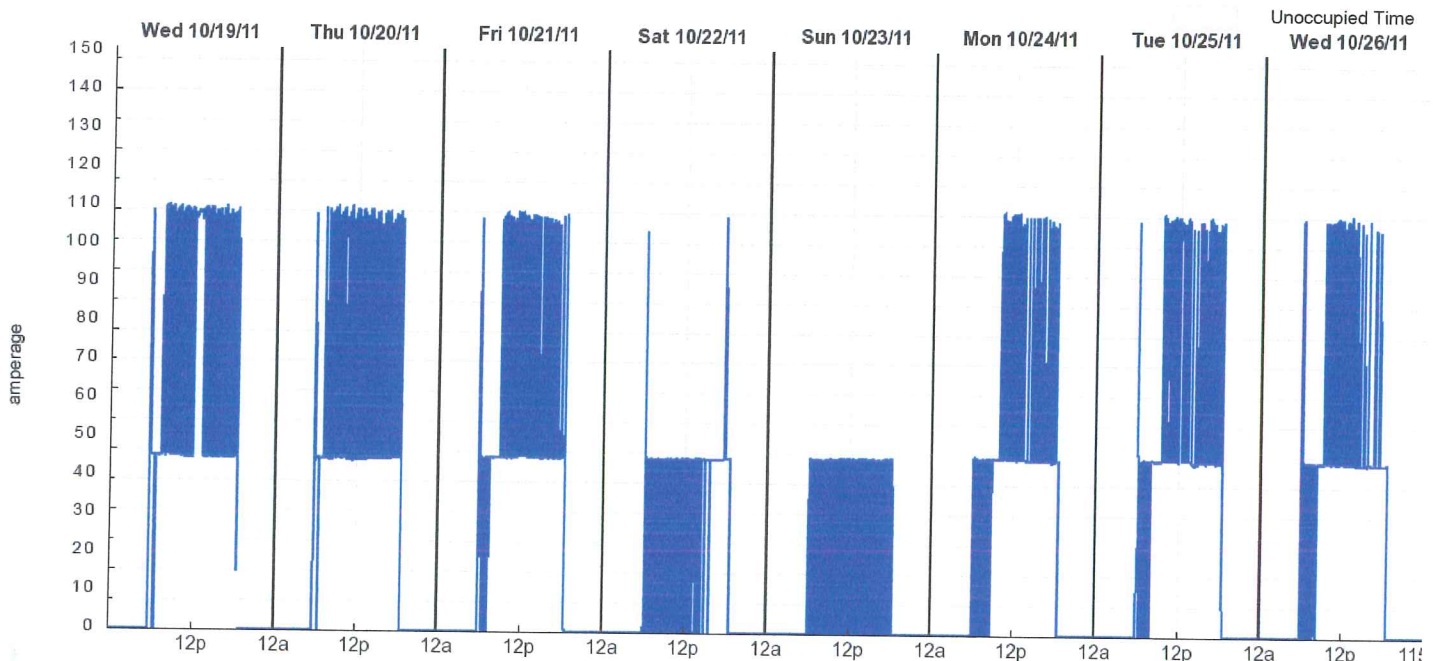
Equipment Cycles/Runtime

	Time (hours)	% of Total		Shortest (minutes)	Median (minutes)	Longest (minutes)
Total Runtime (hours)	89.4		ON Cycles	4.0	49.7	715.9
Runtime During Occupied Periods (hours)	64.5	72%	OFF Cycles	4.0	55.9	699.7
Runtime During Unoccupied Periods (hours)	25.0	28%	Cycles per hour	0.6		

Power Consumption

Nominal Voltage (volts)	Average Current (amps)	Total Runtime (hours)	Approximate Energy (kWh)
203	58.0	89.4	1,642.7

Amperage Measurements



Outdoor Conditions

Outdoor conditions recorded during the test period are included as part of this report.

The outdoor data included in this report was recorded at: New York, NY 10016

Outdoor Temperature

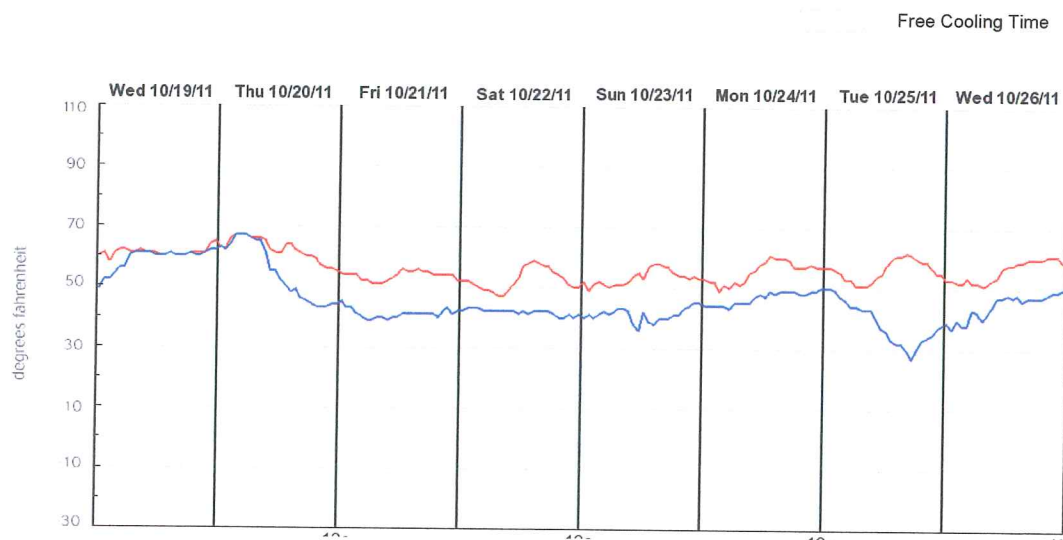
Test Period Avg: 10/19/11 – 10/26/11 56 °F	Heating Degree Days 9	Cooling Degree Days 0
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Outdoor Temperature and Dewpoint

A major factor in the total cost of heating and cooling a building is the heat lost (during heating season) or gained (during cooling season) due to the difference between indoor and outdoor temperatures. The amount of energy consumed to compensate for the difference between outdoor temperature and the desired indoor temperature is driven by three primary factors:

- Heat lost or gained due to conduction through walls, ceilings, and windows.
- Energy required to heat, cool, and dehumidify outside air entering the building, either through infiltration or mechanical ventilation.
- Heat gain due to solar load.

This chart shows the outdoor temperature and dewpoint during the test period at the test location.



More aggressive temperature setbacks during unoccupied periods may provide energy savings with no impact on occupant comfort. Proper ventilation control and use of an economizer for free cooling may also contribute significantly to energy savings.

Building and Monitor Placement Information

General Information

Contact Information	
Building Name	Churchhill School
Contact	Steve Palermo
Address	301 E 29th Street New York, NY 10016
Building Information	
Building Background	Building Usage: K-12 School Building Size (sq ft): 78000 # of Stories: 7 Building Status: Existing Construction type: Masonry LEED Cert.: None Domestic Hot Water: Gas or Other Fuel Economizer: Yes
Additional Systems	Humidification: No Demand Control Ventilation: No Dehumidification: No

Monitor Placement

Building Area	Monitor Serial #
up library	20657
caf w/ fan	20635
3 Lib	20626
cl 5	20621
cl 225	20615
cl 615	20489
caf w/ com	20487
5 onlocker	20484
6 art cl	20460
cl 716	20458

HVAC Equipment

Current Heating System				
System Type	Number of Systems	BTU Capacity	Efficiency Rating	Efficiency Units
Water Source Heat Pump with Boiler	1	3682000	4	COP
Boiler	1	3191000	75	AFUE
Current Cooling System				
System Type	Number of Systems	Tonnage Capacity	Efficiency Rating	Efficiency Units
DX / Packaged Unit	1	11	12	COP
Water Source Heat Pump with Cooling Tower	1	300	12	SEER

Building Description

K-12 School			
Gross Floor Area	78000	Open Weekends	No
Number of PCs	95	Walk-in Refrigeration/Freezer Units	0
Cooking Facility	No	% Air-Conditioned	100
% Heated	90	High School	Yes

Building Utility Information

Electric Utility Information

Date	Electric Usage		Electric Demand	
	kWh	Cost	KW	Cost
8/20/09	110,200	\$11,745	341	\$0
9/21/09	99,680	\$10,705	359	\$0
10/20/09	90,880	\$8,619	235	\$0
11/19/09	106,560	\$10,734	300	\$0
12/21/09	102,200	\$10,307	318	\$0
1/22/10	106,240	\$10,820	275	\$0
2/23/10	91,560	\$8,703	246	\$0
3/24/10	85,000	\$9,889	332	\$0
4/21/10	104,680	\$11,540	374	\$0
5/20/10	136,880	\$14,284	370	\$0
6/21/10	111,440	\$11,902	336	\$0
7/21/10	95,440	\$9,028	286	\$0
TOTAL:	1,240,760	\$128,277	3,771	\$0

Fuel Utility Information

Date	Fuel Usage	
	Usage	Cost
8/20/09	196	\$262
9/21/09	583	\$447
10/20/09	904	\$802
11/19/09	5,291	\$3,495
12/21/09	5,930	\$3,992
1/22/10	7,105	\$4,427
2/23/10	3,176	\$2,837
3/24/10	1,161	\$1,153
4/21/10	165	\$229
5/20/10	187	\$274
6/21/10	200	\$287
7/21/10	217	\$298
TOTAL:	25,115	\$18,504

Roles and Responsibilities for an Effective Assessment

This assessment was conducted using a combination of on-site visual inspections, input generated through conversations with building maintenance personnel, and measurements made with the BuildingAdvice system. The overall accuracy of this assessment is enhanced by ensuring that accurate input is provided through each step.

Due to potential changes in occupancy, operations, and variable weather conditions, implementation of the proposed energy conservation measures does not guarantee a reduction in energy usage.

Key participants in this process – the building owner / maintenance personnel, the firm conducting the assessment, and AirAdvice all play a critical role in an effective assessment.

The building owner / maintenance personnel are responsible for providing:



1. Knowledgeable and accurate input as to the physical and operating parameters of the building under evaluation
2. Honest responses to questions about complaints and/or knowledge of issues
3. Commitment to provide resources necessary to address issues identified and correct problems noted in the visual inspection and monitoring

The firm conducting this assessment is responsible for:



1. Conducting a thorough interview of individuals knowledgeable about the building's performance
2. Following appropriate industry standards for inspection techniques, measurement techniques, and recommendations
3. Maintaining BuildingAdvice and other test equipment used in the assessment within calibration specifications recommended by manufacturers

AirAdvice is responsible for providing:



1. Monitoring equipment that performs within stated specifications
2. Web-based systems with a high degree of reliability and availability
3. Systems that ensure users are notified when calibration of units is necessary

Confidentiality of the data is preserved on behalf of the user of the BuildingAdvice system and their clients. AirAdvice will not disclose individual building information or test data without the client's written permission. AirAdvice may use aggregated data from the multiple buildings for reporting on industry findings and trends.