KANE COUNTY

Energy Efficiency Study

April, 2010



Judicial Center, January 2010

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EXECUTIVE SUMMARY

This study identifies and prioritizes Kane County building facilities for potential energy efficiency upgrades and evaluates potential savings opportunities for Kane County. The results will allow Kane County to utilize EECBG and other funding sources to reduce energy costs in its facilities.

In late 2009, Kane County engaged Patrick Engineering Inc. (Patrick) to assist with the energy efficiency project. During the first task, Patrick analyzed the majority of County-owned facilities' bills in order to prioritize those sites that would benefit most from a more detailed assessment. Utility data and resulting usage profiles were uploaded to the Energy Star website to compare with other facilities of similar functions. The required information for Energy Star includes space type (office, warehouse, etc.), square footage, number of employees, number of computers, a minimum of one year of utility data (electricity, natural gas, water), operating hours, and the percent of the area which is heated/cooled.

Following the utility assessment, Patrick performed five (5) detailed facility energy audits. In addition, Patrick reviewed and incorporated the previous SEDAC study of Building A.

The energy audits determined the energy use profile, the building occupancy use profiles, identified and listed the major equipment such as motors and accompanying drive systems, the HVAC system operation, the lighting system, and envelope types. The systems that can be improved with higher efficiency retrofits were identified. In addition, a high-level conceptual economic assessment for wind energy, solar energy and ground source heat pump systems was performed.

The audits generated a list of energy cost reduction (ECRMs) measures. The ECRMs are identified in this report with estimated costs, descriptions, potential savings, and resulting simple payback for each.

Kane County Buildings Ranking. The utility data for 13 Kane County operated buildings were tabulated and analyzed for energy consumption and cost per square foot and for total BTU and dollars for each building. The following table shows the results.

Facility Energy Use and Cost						
Location	Overall Rank	BTU per Sq. Ft. Rank	MMBTUs Rank	$$ Rank	$/Sq. Ft. Rank	Sq. Ft. Rank
Jail	1	3	1	1	2	1
Judicial Center	2	5	2	2	4	2
Juvenile Justice Center	3	2	4	4	1	4
ROE	4	1	6	7	3	7
Buildings C and B-I (Clerk & IT)	5	6	3	3	7	3
3rd. Street Courthouse	6	9	5	5	9	5
Diagnostic Center	7	4	10	10	5	10
Circuit Court Clerk Building	8	11	7	8	12	8
Old Corrections	9	14	8	6	14	6
Health Dept.-Aurora (1240)	10	12	9	9	11	9
New Child Advocacy	11	7	12	12	6	12
Health Dept.-Aurora (1330)	12	13	13	11	10	11
Building Mgmt 401	13	8	14	14	8	14

This analysis and input from Kane County staff on future building use resulted in the following five (5) buildings being selected for a detailed energy audit:

1. Building B & I
2. Building C
3. 3rd Street Courthouse
4. Juvenile Justice Center
5. Judicial Center

A description of the buildings studied are covered in their respective section of the following report.

Utility Information. Electricity is supplied to the five buildings as listed:

1. Building B & I - Geneva Municipal Electric, Medium or Large General Service
2. Building C - Geneva Municipal Electric, Medium or Large General Service
3. 3rd Street Courthouse - Geneva Municipal Electric, Medium General Service
4. Juvenile Justice Center - Mid-American Supply with ComEd distribution
5. Judicial Center - Mid-American Supply with ComEd distribution

Natural gas is supplied by Vanguard with NICOR as the local distribution company.

Energy Cost Reduction Measures. It has been shown that engaging in energy efficiency strategies is a proven method of controlling costs. Energy Cost Reduction Measures (ECRMs) are the result of identifying equipment that can be replaced with more efficient equipment and operation methods that can be modified to reduce the amount of energy used by these sources.

The following is a list of measures and their identification number. All may not apply to all the buildings.

L-1 Linear Fluorescent Upgrade T12 to T8
L-2 Incandescents to CFLs
L-3 LED Exit Lights
L-4 Occupancy Sensors
L-5 Exterior Lighting Improvements
L-6 Photocells on exterior lights
L-7 Daylight Harvesting
L-8 High Bay Lighting
L-9 Bi-Level Stairwell Lighting
L-10 Halogen Light Replacement
H-1 Boiler Replacement
H-2 Steam Trap Repair/Replacement
H-3 Radiator Controls
C-1 Air Conditioning Equipment Upgrades/Replacement
C-2 Economizer Controls
C-3 Condenser Fan Control
K-1 Temperature Setback/Set Forward
K-2 Outside Air Control
K-3 CO_2/Demand Response Control
K-4 Energy/Facility Management System
K-5 Vending Mizer
K-6 Exhaust Fan Control
W-1 Storm Windows
W-2 Reflective Film
DW-1 Hot Water Temperature Reset
DW-2 Use Reduction Devices
I-1 Attic Insulation
OM-1 Plug Load Minimization
O-1 Master Meter
OM-1 Plug Loads
RN-1 Solar Photovoltaic System
RN-2 Wind Energy System
RN-3 Geothermal Energy
RN-4 Solar Thermal

Patrick has identified many ECRMs for this report. While many of them are feasible and low cost, 60 measures were analyzed for payback and 54 are recommended for implementation.

The following table highlights the recommended ECRMs. A more detailed description of each measure can be found under the Energy Cost Reduction Measures section of each building in the body of this report.

The costs listed for the ECRMs are engineers' estimates only, and are based on various sources and must not be confused with actual price quotes or bids. Factors unknown to the report authors will have an impact on the actual installed costs.

Summary of Juvenile Justice Center ECRMs								
ECRM #	ECRM Description	Natural Gas Savings (therm/yr)	Electrical Savings (kWh/yr)	Monetary Savings ($/yr)	Project Cost ($)	Simple Payback (yrs)	Potential Incentive $	Adjusted Simple Payback (yrs)
L-1	Linear Fluorescent Lighting Retrofit	-4,632	164,585	$9,721	$35,241	3.6	$18,273	1.7
L-2	Incandescent Lamp Replacement	-93	3,287	$194	$310	1.6	$24	1.5
L-3	Exit Sign Retrofit/ Replacement	-33	1,169	$69	$3,120	45.2	$528	37.5
L-4	Occupancy Sensors	-384	13,646	$806	$9,365	11.6	$3,427	2.2
L-5	Exterior Lighting Retrofit	0	27,711	$2,383	$12,960	5.4	$2,217	4.5
L-8	High Bay Lighting Replacement	-151	5,358	$316	$2,700	8.5	$928	5.6
L-9	Bi-Level Stairwell Lighting	-113	4,021	$238	$2,850	12.0	$375	10.4
K-1	Night Shutdown of HVAC	10,500	37,750	$13,300	$21,600	1.6	$3,020	1.4
K-3	Outside Air Control	10,100	46,800	10,690	24,000	2.2	$3,744	1.9
K-5	Vending Machine	-107	4,111	$246	$620	2.5	$330	1.2
OM-1	Plug Loads	-94	4,100	$260	$0	0.0		0.0
Raw Totals		13,546	364,004	$41,264	$112,766	2.7	$32,866	1.9
Totals with Mobilization/Demob, Unknowns, Contingencies = 20%				$41,264	$135,319	3.3	$32,866	2.5

Summary of Judicial Center ECRMs								
ECRM #	ECRM Description	Natural Gas Savings (therm/yr)	Electrical Savings (kWh/yr)	Monetary Savings ($/yr)	Project Cost ($)	Simple Payback (yrs)	Potential Incentive $	Adjusted Simple Payback (yrs)
L-1	Linear Fluorescent Lighting Retrofit	-1,451	55,522	$3,325	$21,003	6.3	$3,261	5.3
L-2	Incandescent Lamp Replacement	-202	7,744	$464	$585	1.3	$59	1.1
L-3	Exit Sign Retrofit/ Replacement	-68	2,592	$155	$600	3.9	$440	1.0
L-4	Occupancy Sensors	-1,011	38,680	$2,317	$19,430	8.4	$6,411	2.2
L-5	Exterior Lighting Retrofit	0	29,395	$2,499	$10,620	4.3	$2,352	3.3
L-6	Install Photocell on Exterior Lighting	0	4,092	$348	$680	2.0	$327	1.0
L-7	Daylight Harvesting	-648	24,823	$1,487	$13,320	9.0		9.0
L-9	Bi-Level Stairwell Lighting	-728	11,707	$728	$3,040	4.2	$400	3.6
L-10	Halogen Light Replacement	-65	2,499	$153	$7,200	47.1	$540	43.5
K-3	Outside Air Control	31,700	95,000	$38,000	$25,000	0.7		0.7
K4	Replace EMS System	3,143	13,236	$4,142	$400,000	96.6	$1,059	96.3
K-5	Vending Machine	-153	5,860	$351	$960	2.7	$490	1.3
OM-1	Plug Loads	-690	26,421	$1,583	$0	0.0	$0	0.0
Raw Totals		27,996	387,684	$59,751	$502,438	8.4	$15,339	8.2
Totals with Mobilization, Unknowns, Contingencies = 20%				$59,751	$602,926	10.1	$15,339	9.8

Summary Of Building C ECRMs								
ECRM #	ECRM Description	Natural Gas Savings (therm/yr)	Electrical Savings (kWh/yr)	Monetary Savings ($/yr)	Project Cost ($)	Simple Payback (yrs)	Potential Incentive $	Adjusted Simple Payback (yrs)
L-1	Linear Fluorescent Lighting Retrofit	-1,098	38,812	$2,100	$11,029	5.3	$4,732	3.0
L-2	Incandescent Lamp Replacement	-11	403	$22	$9	0.4	$1.50	0.3
L-3	Exit Sign Retrofit/ Replacement	-74	2,617	$142	$540	3.8	$396	1.0
L-4	Occupancy Sensors	-420	14,838	$803	$3,700	4.6	$3,021	1.0
L-5	Exterior Lighting Retrofit	0	8,038	$635	$3,420	5.4	$643	4.4
L-6	Install Photocell on Exterior Lighting	0	1,812	$143	$1,360	9.5	$145	8.5
L-9	Bi-level Stairwell Lighting	-97	3,422	$270	$1,520	5.6	$200	4.9
K-4	Energy Management System	3,733	17,653	$4,679	$81,230	17.4	$1,412	17.1
K-5	Vending Machine Control	-40	1,440	$86	$260	3.0	$130	1.5
OM-1	Plug Loads	-250	8,852	$479	$0	0.0	$0	0.0
Raw Totals		504	141,707	$11,731	$103,068	8.8	$10,681	7.9
Totals with Mobilization, Unknowns, Contingencies = 20%				$11,731	$123,682	10.5	$10,681	9.6

Summary Of Building B & I ECRMs								
ECRM #	ECRM Description	Natural Gas Savings (therm/yr)	Electrical Savings (kWh/yr)	Monetary Savings ($/yr)	Project Cost ($)	Simple Payback (yrs)	Potential Incentive $	Adjusted Simple Payback (yrs)
L-1	Linear Fluorescent Lighting Retrofit	-708	25,039	$1,355	$6,169	4.6	$2,714	2.5
L-2	Incandescent Lamp Replacement	-16	572	$31	$66	2.1	$9	1.8
L-3	Exit Sign Retrofit/ Replacement	-8	291	$16	$780	49.6	$132	41.2
L-4	Occupancy Sensors	-505	17,841	$965	$2,700	2.8	$2,225	0.8
L-5	Exterior Lighting Retrofit	0	1,177	$93	$720	7.7	$94	6.7
L-6	Install Photocell on Exterior Lighting	0	187	$15	$340	22.7	$15	21.7
K-4	Energy Management System	3,620	16,021	$4,451	$90,000	20.2	$1,282	19.9
OM-1	Plug Loads	-250	8,852	$479	$0	0.0	$0	0.0
Raw Totals		1,916	77,669	$7,822	$100,775	12.9	$6,470	12.1
Totals with Mobilization, Unknowns, Contingencies = 20%				$7,822	$120,930	15.5	$6,470	14.6

Summary Of 3rd Street Courthouse ECRMs								
ECRM #	ECRM Description	Natural Gas Savings (therm/yr)	Electrical Savings (kWh/yr)	Monetary Savings ($/yr)	Project Cost ($)	Simple Payback (yrs)	Potential Incentive $	Adjusted Simple Payback (yrs)
L-1	Linear Fluorescent Lighting Retrofit	-1,721	61,872	$4,183	$26,309	6.3	$8,305	4.3
L-2	Incandescent Lamp Replacement	-373	13,410	$907	$355	0.4	$95	0.3
L-3	Exit Sign Retrofit/ Replacement	-9	332	$22	$910	40.6	$154	33.7
L-4	Occupancy Sensors	-381	13,683	$925	$4,940	5.3	$3,367	1.2
L-5	Exterior Lighting Retrofit	0	14,207	$1,350	$7,050	5.2	$1,137	4.4
L-6	Install Photocell on Exterior Lighting	0	1,774	$151	$1,020	6.8	$229	5.2
K-3	Outside Air Control	1,761	4,984	$2,206	$20,400	9.2	$399	9.1
K-6	Rotunda Exhaust Fan Control	0	1,150	$110	$70	0.6	$158	0.6
I-1	Attic Insulation	7,250	1,975	$7,732	$32,929	4.3	$260	4.2
OM-1	Plug Loads	-90	3,246	$220	$0	0.0	$0	0.0
Raw Totals		5,841	134,835	$19,035	$93,983	4.9	$13,843	4.2
Totals with Mobilization, Unknowns, Contingencies = 20%				$19,035	$112,780	5.9	$13,843	5.2

Summary Of Building A ECRMs (SEDAC)								
ECRM #	ECRM Description	Natural Gas Savings (therm/yr)	Electrical Savings (kWh/yr)	Monetary Savings ($/yr)	Project Cost ($)	Simple Payback (yrs)	Potential Incentive $	Adjusted Simple Payback (yrs)
L-3-A	LED exit signs	-62	2,544	$146	$450	3.1	$330	0.8
L-4	Occupancy Sensors	-158	5,345	$283	$2,100	7.4	$509	5.6
K-4	Energy Management System	8,153	77,246	$13,277	$22,000	1.7	$6,180	1.2
C-1	Upgrade cooling equipment	0	58,293	$4,605	$20,400	4.4	$1,254	4.2
Raw Totals		7,933	143,428	$18,312	$44,950	2.5	$8,273	2.0
Totals with Mobilization, Unknowns, Contingencies = 20%				$18,312	$53,940	2.9	$8,273	2.5

Summary Of ECRMs							
ECRM Description	Natural Gas Savings (therm/yr)	Electrical Savings (kWh/yr)	Monetary Savings ($/yr)	Project Cost ($)	Simple Payback (yrs)	Potential Incentive $	Adjusted Simple Payback (yrs)
	57,735	1,249,326	157,913	$1,149,575	7.3	$87,471	6.7

Implementing all of the above ECRMs would save an estimated $157,000 in annual energy savings. Making the recommended changes would also reduce vulnerability to fuel price fluctuations.

Other Complex ECRMs								
ECRM #	ECRM Description	Natural Gas Savings (therm/yr)	Electrical Savings (kWh/yr)	Monetary Savings ($/yr)	Project Cost ($)	Simple Payback (yrs)	Potential Incentive $	Adjusted Simple Payback (yrs)
RN-1	100KW Solar Photovoltaic System	0	148,156	$12,593	$550,000	43.7	$50,000	39.7
RN-2	Wind Energy	0	504,828	$43,415	$990,000	22.8	$50,000	21.7
RN-3	Geothermal Energy	47,281	-79,800	$38,385	$1,045,600	27.2	$14,402	26.9
RN-4	Solar Thermal for Hot Water	5,186	0	$4,963	$110,000	22.2	$33,000	15.5
Totals		52,467	573,184	$99,356	$2,695,600	27.1	$147,402	25.6

OTHER ITEMS CONSIDERED

In addition to the recommended ECRMs presented for all the Kane County buildings analyzed, the feasibility of several other ideas was evaluated.

Packaged Rooftop Unit Upgrades. Packaged rooftop HVAC units on the Juvenile Justice Center and other buildings could be replaced with more efficient units. For example, existing units at the JJC are operating at approximately 75% AFUE heating and 9.5 SEER cooling efficiencies. Replacement of the 10 units with units rated at 92% AFUE and 14 SEER efficiencies would save about $17,800 in heating and cooling costs annually. However, replacement costs for these units are estimated at $425,000, giving a simple payback of 23.7 years.

This long payback indicates that replacement of the rooftop units is not economically justified based on energy savings alone. However, units that require significant repairs or removal should be replaced with the most efficient units available. The energy savings from specifying high efficiency units would rapidly payback the incremental cost over a standard efficiency replacement.

Dimmable Compact Fluorescent Lamps (CFLs). Most of the courtrooms in the Judicial Center as well as some occasional fixtures throughout the county buildings have incandescent lamps on dimmers. While there are dimmable CFLs on the market, at this time there remains concern over the reliability of these CFLs. Due to the sensitivity of the judges to the lighting level and the control they have of the lighting level, Patrick recommends not to replace incandescent lamps at this time.

Photoluminescent Exit Signs. Photoluminescent exit signs use a number of chemically treated layers to create constant light that lasts for years without a power source. This technology is used in many military applications and is not the typical "glow in the dark" plastic that is thought of. The quality products carry UL listings and long warranties. However, due to the relatively high price for those products (approximately $120 per sign) and the fact that most of

the exit signs in the county buildings are low energy consuming LED exits signs already, the payback per sign was in the neighborhood of 30 years. With advertised life expectancies of 25 to 35 years, the signs do eventually pay for themselves.

Exterior LED Lighting Retrofit. LED pole and wall pack lighting has become much more popular in the last five years. Classic metal halide fixtures can be replaced with LED fixtures that draw less wattage and have a longer life than the typical metal halide.

Due to the long payback for the LED fixture retrofit, those options would not likely be covered by the State of Illinois, Department of Commerce and Economic Opportunity's (DCEO) Public Sector Energy Efficiency (PSEE) program. As this time, LED lights qualify for a $0.20 per kWh saved incentive for exterior lighting with "demonstration of breakthrough equipment and devices". If the county would like to pursue one of these options, the incentive can be explored further.

Exterior Induction Lighting Retrofit. Induction lighting works similar to standard fluorescent lighting, but without the metal contacts allowing for a much longer life of the system, up to 100,000 hours. Induction lighting is available in a range of color temperature, where LEDs tend toward the "cool" white light colors. Due to the substantially higher cost of the fixtures, the simple payback numbers were over 20 years.

Due to the long payback for the induction fixture retrofit, those options would not likely be covered by the PSEE program. Induction lighting currently qualifies for a $0.20 per kWh saved incentive for exterior lighting with "demonstration of breakthrough equipment and devices". If the county would like to pursue one of these options, the incentive can be explored further.

Photocells on Exterior Light Fixtures. The installation of photocells on the exterior lighting was explored for the Judicial Center. Because the timers on the lights are already adjusted periodically throughout the year to adjust for the change in daylight hours, the payback was undesirable.

There may be incentives available for photocells through the DCEO's PSEE program. The simple payback on the exterior photocells is too long to be eligible for custom incentives.

Low Flow Aerators on Sinks. Although not a big money saver, installing low flow aerators (1.75 GPM) on all sink faucets is a simple measure that would pay for itself in a short period of time. The cost savings includes consuming less water and less energy to heat the water.

Cool Roofs. The use of cool roof concepts (white roof, reflective material) was investigated but is only feasible as part of a roof replacement. This would reduce heat gains during the cooling season but would also reduce solar heat gain during the heating season. Net energy benefits would need to be calculated through the use of a energy modeling program.

Window Replacement. Replacing the current double pane windows with new low emissivity (low-e) windows would decrease the amount of heating and cooling energy lost through the window. The payback on window replacement is too long to be feasible for a total replacement. However, as windows require replacement, they should be replaced with low-e windows.

Window Quilts or Films. Consider installing window films to lower solar gain in the summer and reflect heat back into the building during the winter. Note that window films will lower the amount of light coming through the windows and may result in higher heating requirements.

Replace Hot Water Heater With an Energy Star Unit. The water heaters currently installed vary from natural gas fired to small electric units. On Demand (Instantaneous) water heaters dedicated to a specific service area will reduce storage losses and piping losses but can cost roughly $750 per unit installed. This should be evaluated as replacement of central domestic water heaters is needed or pumping systems need repair.

Maintain Mechanical Equipment. A simple, low cost way to reduce energy consumption is to maintain the facility's mechanical equipment. Kane County has a maintenance schedule with outside contractors for annual tune-ups that should be continued.

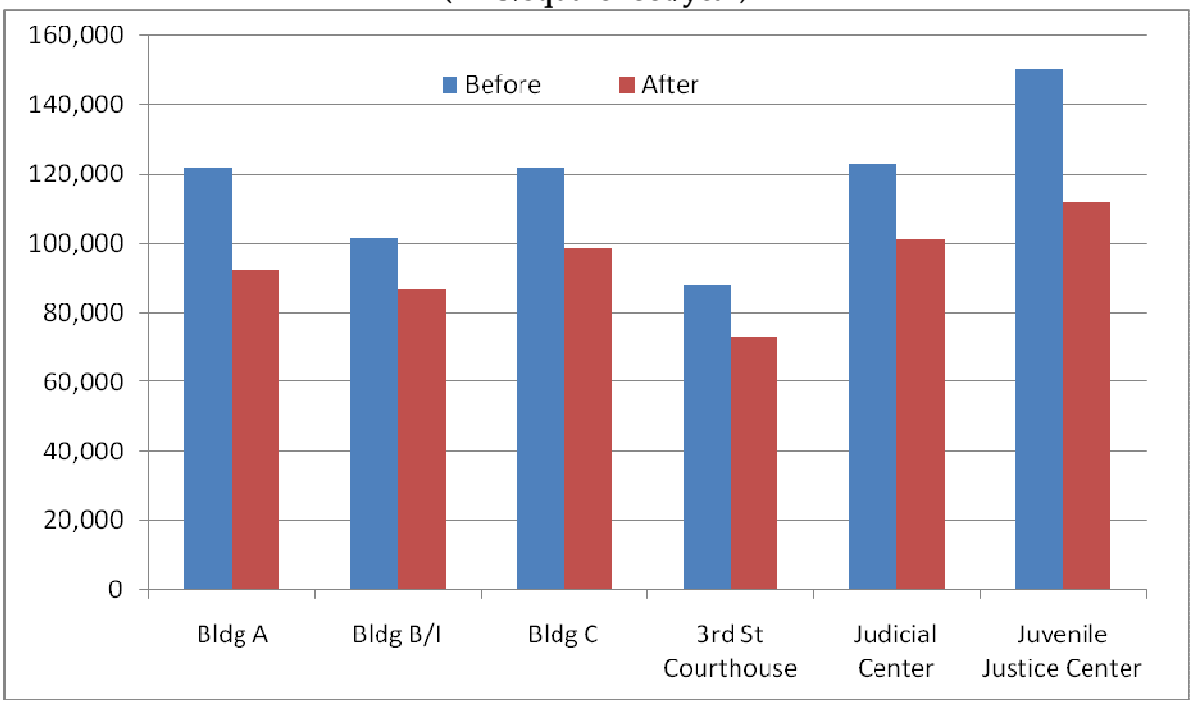
CONCLUSION AND RECOMMENDED FURTHER ANALYSIS

Engaging in energy efficiency strategies is a proven method of controlling costs. There are many opportunities at Kane County to reduce the energy usage and increase cost savings.

It is recommended that a retro-commissioning study be done on selected buildings to insure the controls are working properly and the device controlled is responding as designed.

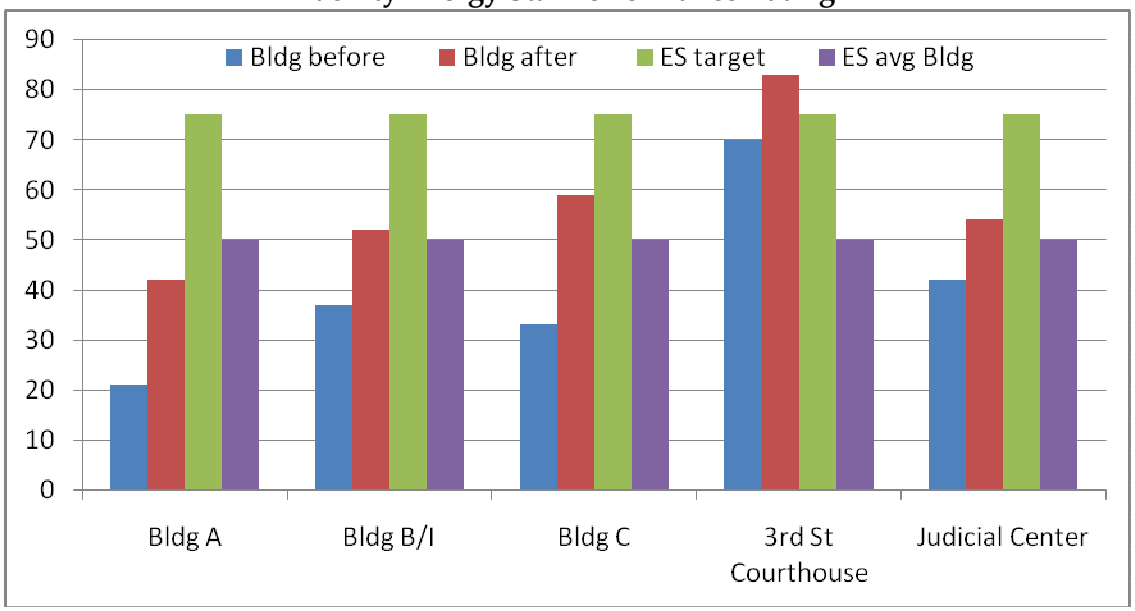
The other items considered and improvements in technologies, including induction lighting, cold cathode lights, LED lamps and controls should be monitored for potential implementation as paybacks are improved.

Facility Energy Use Index
(BTU/square foot/year)

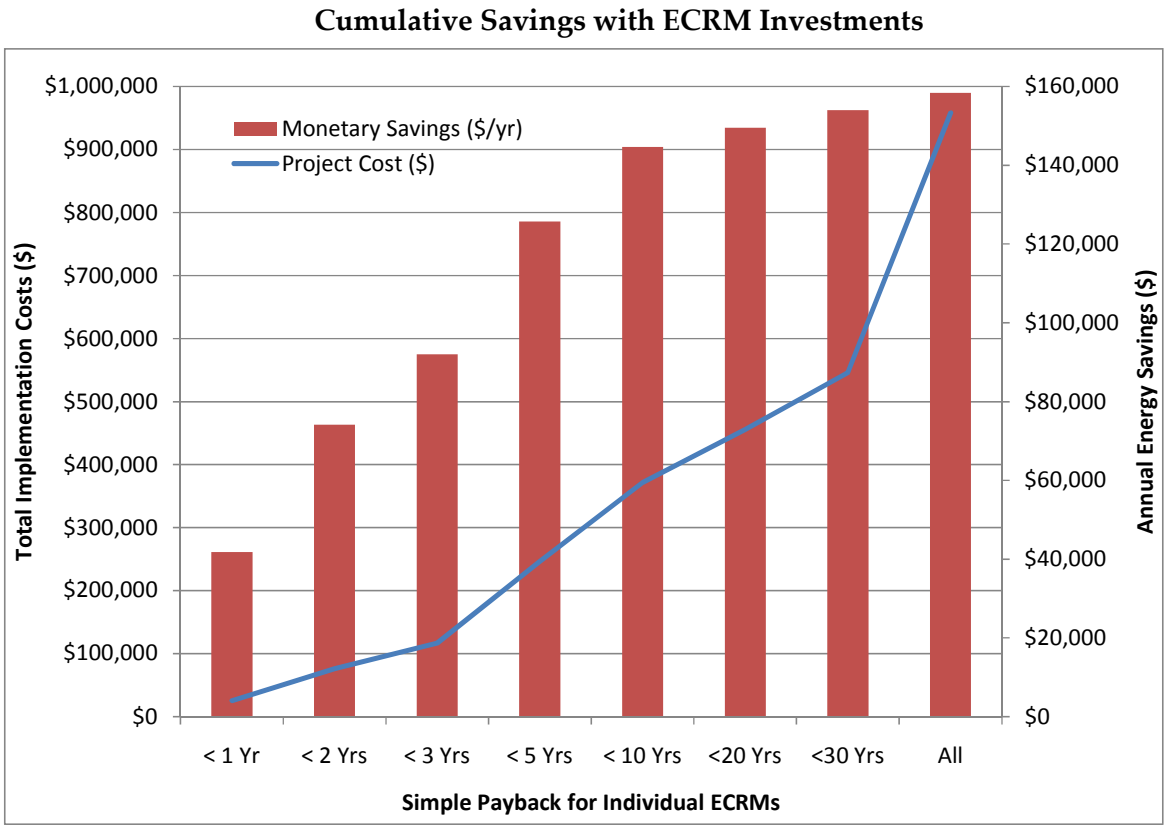


Each bar of the graph represents the total annual energy comsumption , both gas and electric, of the building before and after the implementation of the recommended energy conservation measures divided by the floor area of the building.

Facility Energy Star Performance Rating



The Federal Energy Star programs rates building on a scale of 1-100 where 50 represents the average energy consumption of building of the same type. This chart compares the energy performance of Kane County facilities with the Energy star database.



Each bar in this graph represents the energy savings that would result from investing in the recommended energy conservation retrofit measures with simple paybacks less than the indicated time period. The line represents the total cost of those same ECRMs.

BUILDING A

Facility Information. Building A is a four story building built in 1941 that was originally used as a religious residential facility. It contains 43,486 square feet of conditioned space.

Energy Consumption. The following Table gives an estimate of the energy usage of Building A.

Space Summary	
Space Type:	Office
Square Footage:	43,486
Weekly Operating Hours:	45

Energy Summary	
Total kWh:	742,387
Total Electric Cost:	$58,702
Total therms:	27,686
Total Yearly Btu's:	5,301,666,712
Yearly Btu/sq. ft.	121,917
Yearly $/sq. ft.	$1.91

Building Envelope. The exterior walls of Building A are masonry. Given the fact that the building was built in the 1940's, it is assumed that a common method of construction would have yielded an exterior wall built of withes of brick tied together with metal ties. This type of construction yielded a void or dead air space which could have been filled with some type of insulation. Since energy costs did not justify thermal insulation in the 1940's, it is assumed that Building A has little or no insulation in the exterior walls.

Existing windows appear to be aluminum framed, thermally broken, with insulated glass. Installation of the windows appears to have been done such that excessive air infiltration is not an issue.

Exterior doors in Building A vary from newer aluminum doors with panic hardware to the original wood doors at major building entrances.

The existing roof and attic spaces appear to be in good condition with an adequate amount of insulation in the attic.

There is a system of crawl spaces and tunnels under Building A.

Occupancy Patterns. This building is occupied from 8am to 5 pm, 5 days a week with occasional weekend and evening hours for Board and Committee meetings.

Energy Consuming Systems.

Primary Heating. Building A is heated by two Scotch Marine 60 horsepower low pressure steam boilers. The low pressure steam is supplied to two independent distribution systems:

1) Original 2 pipe steam perimeter radiation system; and
2) Hot water re-heat system with steam to hot water converter and circulation pumps in the boiler room and reheat coils in ductwork.

The hot water reheat system was initially installed in the 1990's. The entire fourth floor is heated with hot water reheat coils only. Most of the other areas of the building have hot water re-heat coils with perimeter steam radiators. The perimeter 2 pipe steam system is controlled by a thermostat near room 206.

Primary Cooling. There are 17 split condensing units scattered around the perimeter of the building and on two roofs of the building that provide air conditioning. There is one 8 ton rooftop unit located on the ground at the north end that is ducted into the building. This rooftop unit handles the auditor's office in Room 100 and other adjacent spaces. The air conditioning units were installed at different times. The size of the individual units varies from 3 to 8 tons with the efficiency of the condensing units varying widely from 8.5 to 12 SEER.

Domestic Hot Water. Domestic hot water is supplied by a natural gas fired unit.

Lighting System. The lighting is primarily fluorescent and through an incentive grant most of the fixtures are to be converted to T8. All incandescent lamps are to be converted to CFLs.

Other Equipment and Systems. There is a Johnson Metasys Building Automation System (BAS) with a PC located in the engineer's office. This system controls all the air handlers and fan coil units that serve the 4th floor, the Boardroom and 1st floor systems. The 2nd and 3rd floors are not on the BAS system.

Ventilation. There are operable windows throughout that provide natural ventilation. The air handlers have automated mixing dampers that maintain a minimum outside air position at 10%.

Recommended ECRMs. The following section of the report describes the most feasible ECRMs for Kane County's Building A and presents a summary listing of the key economic factors for consideration. For each ECRM, certain basic data was utilized and assumptions made to arrive at the projected savings. The basis for the information and cost and savings numbers are the SEDAC report.

The following ECRMs were analyzed and are recommended for this building:

1. L-3 LED Exit Lights
2. L-4 Occupancy Sensors
3. K-4 Energy Management System
4. C-1 Upgrade Cooling Equipment

Project Cost Estimates for ECRMs. The economics of each ECRMs were calculated as simple payback, the period of time (in years) that allows the annual savings to equal the estimated capital cost.

Basis for Costs. The cost estimates for ECRM K-4 and C-1 were taken from the SEDAC audit and checked by Patrick for viability. ECRM L-3 and L-4 cost estimates are based on Means 2009 and input from Kane County staff.

ECRM L-3-A: LED Exit Lights.

Economics.
Annual Cost Savings = $146
Estimated Installation Costs = $450
Simple Payback = 3.1 years

Summary. Patrick recommends that Kane County standardize all exit lights to LEDs with 1 watt of power draw. The results from the comparison of the proposed system with the existing system are based on the lighting savings kWh in the Judicial Center calculations. It is assumed the existing exit lights are 8 watt fluorescent. The additional winter heating required to compensate for the loss of radiant heat from the higher wattage fixtures and the cooling savings from reducing lighting energy consumption is taken into account in the calculation process.

Grant opportunities currently available can improve the payback.

ECRM L-4: Occupancy Sensors.

Economics.
Annual Cost Savings = $248
Estimated Installation Costs = $2,174
Simple Payback = 8.8 years

Summary. Patrick recommends that Kane County replace the wall switches in all 1 or 2 person offices with occupancy sensors to turn off lights while spaces are unoccupied.

A review of the floor plans and the lighting spreadsheet from the SEDAC audit indicate that 42 offices with 2 to 4 light fixtures may be appropriate for this measure. EPRI recommends a 25% use reduction factor for offices using this type of sensor.

The savings numbers reflect this reduction based on an average of 3 fixtures per office. Heating and cooling interactions are reflected in the savings numbers.

Grant opportunities currently available can further improve payback.

ECRM K-4: Energy Management System.

Economics.
Annual Cost Savings from EMS Changes = $14,179
Estimated Costs = $22,000
Simple Payback per unit = 1.6 years

Summary. It is recommended that the existing Energy Management System be reprogrammed and expanded and all functions utilized including night setback, free cooling, damper control and fan control. Expand these functions to all air handlers and install a control valve to shut off steam distribution during unoccupied hours if the outside air temperature is adequate.

ECRM C-1: Upgrade Cooling Equipment.

Economics.
Annual Cost Savings = $5,246
Estimated Installation Costs = $20,400
Simple Payback = 3.9 years

Summary. Replacing the cooling units with more efficient units is recommended as the units fail and replacements are required as described in the SEDAC audit report for Building A.

BUILDING B & I

Facility Information. Building B & I consists of a one story addition to a gym facility that has been converted to three levels of offices. It has 30,804 square feet of space. The original building was built in 1955 and the addition was added in 2001.

Building Envelope. The building is masonry with built up roofs. The windows are thermo-pane. Some are operable.

Occupancy Patterns. The building is occupied approximately 8 hours per day, Monday through Friday. Twice a year for several weeks during election periods the hours could be as long as 12 hours/day. Approximately 35 staff occupy the building.

Energy Consuming Systems.

Primary Heating. There is a hot water boiler that provides perimeter radiant heat to the east wall of the lower level of the original building and to the second and third levels. Two rooftop units provide heating and ventilation for the addition. Another rooftop unit provides heat and ventilation for the 3rd level. Two fan coil units provide heat and ventilation for the 2nd level. A packaged unit setting on the ground north of the original building provides ventilation to the first level.

Primary Cooling. The three rooftop and packaged units provide cooling. Two split DX units provide the cooling for the 2nd level. Two supplemental Liebert units provide supplemental cooling for the IT area and Records storage.

Domestic Hot Water. Domestic hot water is provided by a Richmond electric unit with a 2000 watt heating element.

Lighting System. The primary lighting is a mixture of T-12 with magnetic ballasts and T-8 with electronic ballasts. Some areas have CFLs.

Exit signs are LED.

Exterior lighting is metal halide.

Other Equipment and Systems. Plug loads include 81 PCs, several printers and scanners, 4 copiers, 3 refrigerators, 6 fans, 2 microwaves and 5 space heaters.

Feasible ECRMs. This section of the report describes identified ECRMs and presents a summary listing of the key economic factors for consideration. For each ECRM, certain basic data was utilized and assumptions made to arrive at the projected savings.

The following ECRMs were analyzed for this building:

1. L-1 Linear Fluorescent Lighting Retrofit
2. L-2 Incandescent Lamp Replacement
3. L-3 Exit Sign Retrofit/Replacement
4. L-4 Occupancy Sensors
5. L-5 Exterior Lighting Retrofit
6. L-6 Install Photocell on Exterior Lighting
7. K-4 Energy Management System
8. OM-1 Plug Loads

All of the ECRMs are recommended with the exception of L-3.

Basis for Energy Cost Savings Calculations. The utility costs used in this report to calculate cost savings were provided by taking an average of the per kWh or per therm cost over the last year as listed on the utility bills provided.

Project Cost Estimates for ECRMs. The economics of each ECRM were calculated as simple payback, the period of time (in years) that allows the annual savings to equal the estimated capital cost.

ECRM L-1-Bldg B & I: Linear Fluorescent Lighting Retrofit.

Economics.
Annual Cost Savings = $1,355
Installed Costs = $6,169
Simple Payback = 4.6 years
Annual Energy Reduction = 25,039 kWh, -708 therms
Monthly kW Demand Reduction = 6 kW

Summary. Replace the 78 fixtures that use T12 fluorescent lamps and magnetic ballasts with T8 HL 28 watt lamps and electronic ballasts, and upgrade the existing 166 T8 fixtures with T8 HL (28W) lamps and electronic ballasts.

Background. Building B & I has 78 fixtures containing T12 lamps and magnetic ballasts and 166 with T8 lamps and electronic ballasts. Converting these to T8 HL will save lighting energy and dollars.

Implementation. All T12 lamps and associated ballasts should be changed to T8 HL lamps with the proper electronic ballast. Convert the other fixtures to 28 watt T9 HL to standardize lamps. Install T-8 HL lamps with either 4100K or 5000K rating for better employee comfort.

The complete list of current and proposed fixtures and their locations can be seen in Exhibit 1. The estimated capital cost covers the cost of the lamps and ballasts and assumes installation by an electrician.

Savings. Savings result from reductions in kilowatt hours. The reduction in kilowatt hours was calculated by taking the difference in wattages between the existing and the proposed lamps and ballast wattages and the estimated hours of operation. Where the space is interior, the lighting retrofit savings are adjusted for heating and cooling interaction.

ECRM L-2-Bldg B & I: Incandescent Lamp Replacement

Economics.
Annual Cost Savings = $31
Installed Costs = $66
Simple Payback = 2.1 years
Annual Energy Reduction = 572 kWh, -16 therms
Monthly kW Demand Reduction = 0 kW

Summary. Replace all incandescent bulbs with CFLs.

Background. Building B & I had six incandescent bulbs. Incandescent bulbs last between 750 to 1000 hours and use 4 times the energy of the CFL replacement. CFLs have an estimated life of 10,000 hours.

Implementation. Install a 9 watt CFL for the 25 watt standard incandescent bulbs and a 23 watt CFL for the 100 watt incandescent bulbs.

Savings. Savings come from reductions in kWh. Cooling and heating interactions are taken into account in the calculations.

ECRM L-3-Bldg B & I: Exit Sign Retrofit/Replacement.

Economics.
Annual Cost Savings = $16
Installed Costs = $780
Simple Payback = 49.6 years
Annual Energy Reduction = 291 kWh, -8 therms
Monthly kW Demand Reduction = 0 kW

Summary. Replace the LED exit lights with photoluminescent fixtures.

Background. There are 6 exit lights in the building that could be converted.

Implementation. Photoluminescent fixtures that draw 0 watts per fixture. Savings are based on reductions in kWh. Costs are based on vendor quotes for other similar projects and assume contractor installation. The reduction in kilowatt hours was calculated based on the usage by the existing fixtures.

The space is interior; therefore, the lighting retrofit savings are adjusted for heating and cooling interaction.

ECRM L-4-Bldg B & I: Occupancy Sensors.

Economics.
Annual Cost Savings = $1,861
Installed Costs = $2,700
Simple Payback = 1.5 years
Annual Energy Reduction = 34,383 kWh, -972 therms
Monthly kW Demand Reduction = 0 kW

Summary. Replace on-off wall switches in the offices and other selected spaces with infrared and/or ultrasonic motion sensors wall switches to reduce electric energy consumption. This ECRM should be limited to offices, maintenance areas, locker rooms, restrooms and storage areas.

Background. There are two types of occupancy sensors that are generally used, ultrasonic and passive infrared. Ultrasonic sensors fill the room with high-frequency sound; movement causes the reflected sound to have a frequency shift, which in turn sets off the sensor. Because it does not rely on "line-of-sight" this type of sensor is well suited to areas with tall obstacles. (Ultrasonic sensors are not to be confused with acoustic sensors that require a person to make noise in order to be detected.) Passive infrared sensors rely on moving body heat. To be seen, the person must move between the "vanes" created by the sensor's lens.

The estimated capital cost is based on 26 sensors and includes contractor installation of a single sensor installed as a wall switch replacement in the smaller rooms. Wall switch replacements could be readily accomplished by in-house staff. Manufacturers' technical sales representatives are good resources to assess the applicability of various sensor models in different area types and for the desired area of coverage.

Implementation. Throughout this facility on-off wall switches are used to control lights in the offices, maintenance areas, locker rooms and restrooms. Therefore a 25% to 40% reduction in operating hours was used in the savings calculation based on the Occupancy Sensors fact sheet

included in Exhibit 4. The savings in this ECRM assume the T-12s have been converted to T-8s and the incandescent lighting replaced by CFLs or T-8s.

Savings. Savings come from reductions in kilowatt hours. Heating and cooling interaction is taken into account in the savings estimates.

ECRM L-5-Bldg B & I: Exterior Lighting Retrofit.

Economics
Annual Cost Savings = $93
Installed Costs = $720
Simple Payback = 7.7 years
Annual Energy Reduction = 1,177 kWh
Monthly kW Reduction = 0 kW

Summary. Replace existing wall packs and wall mounted lamps with pulse start fixtures.

Background. There are three 250 watt mercury vapor lamps and four 150 watt metal halide lights mounted on the building. These should be replaced with 150 watt and 100 watt, respectively. Pulse Start MH fixtures have a high lumen maintenance level. Although typically used as replacements, the County is encouraged to verify the light output suitability of the replacements.

Implementation. Replace the fixtures on a one-for-one basis. It is expected that the new units should fit in the existing hardware.

The estimated capital cost covers lamps and ballast for the proposed retrofit. The cost also includes labor and contractor installation. If all proposed lamps are replaced, the project is expected to have a 7.7 yrs. payback.

Savings. Savings come from reductions in kilowatt hours. The space is exterior; therefore the lighting retrofit savings need no modification. The lamp life is approximately the same as the existing lamps so there are no additional operations and maintenance savings.

ECRM L-6-Bldg B & I: Photocell Control on Exterior Lighting.

Economics.
Annual Cost Savings = $15
Installed Costs = $340
Simple Payback = 23.0
Annual Energy Reduction = 277 kWh
Monthly kW Reduction = 0 kW

Summary. Install master photocell control to turn the exterior wall and parking lots light fixtures on and off as required by ambient light. These lights are currently controlled by a timer.

Background. The exterior lights illuminating the building and the parking lots are controlled through a time clock that must be adjusted to keep the on/off sequence close to sunrise and sunset. The installation of a master photocell control at the facility to control the exterior lights will negate the need for programming changes and allow control to be based on ambient light levels.

Implementation. A master photocell to measure ambient light should be installed and the reading fed into the present relay to turn on the exterior lights as needed. One unit should be all that is needed to control the lights. The master unit should be mounted to the roof at an open, un-shaded location. The estimated capital cost covers the cost of the photocell, installation and an estimate of programming costs.

Savings. Savings come from reductions in kilowatt hours. Sunrise and sunset varies from 5:30 am and 8:30 pm in June to 7:30 am to 4:30 pm in December. Savings are based on a reduction of one hour a day. Savings are calculated assuming the exterior lights have been retrofitted to pulse start metal halides. The space is exterior; therefore the lighting retrofit savings need no modification.

ECRM K-4-Bldg B & I: Energy Management System.

Economics.
Annual Cost Savings = $4,451
Installed Costs = $90,000
Simple Payback = 20.2 years
Annual Energy Reduction = 16,021 kWh, 3,620 therms
Monthly kW Demand Reduction = 0 kW
Summary. Building B & I is primarily heated and cooled by rooftop units controlled by setback thermostats. There is a hot water boiler used to provide hot water for perimeter radiant heat These units have outside air and exhaust dampers.

Background. Kane County has received bids for an EMS system in Building C. The system is to optimize start/stop, night setback, holiday scheduling, free cooling and cfm tracking along with other functions. The system would be user friendly, have graphical displays with readings and allow operators to modify settings that more accurately reflect the operation of the building regarding occupied hours and temperature settings.

Implementation. Install the proposed system and incorporate programming features to include outside air control.

Savings. Savings come from reductions in kilowatt hours to cool the building and natural gas needed to heat it.

Basis for Cost. The cost estimate is based on bid response on similar building with adjustment for building square footage.

ECRM OM-1-Bldg B & I: Plug Load Minimization.

Economics.
Annual Cost Savings = $479
Installed Costs = $0
Simple Payback = 0 years
Annual Energy Reduction = 8,852 kWh, -250 therms
Monthly kW Demand Reduction = 0 kW

Summary. Building B&I has over 80 PCs that do not have the stand-by and/or sleep modes activated. Patrick recommends that the IT department investigates the possibility of activating the stand-by and sleep modes on all PCs, which would save about 100 kWh per year per PC. The sleep function is standard on Energy Star equipment and should not interfere with remote access since the units are not being shut off.

Replacing all appliances and equipment with Energy Star rated equipment as replacements are needed will also reduce energy consumption. Energy Star units typically use at least 10% less energy than the average unit.

Policies regarding use of personal space heaters, dorm refrigerators and radios would impact energy consumption but needs to be balanced against employee morale benefits.

Background. Plug loads in typical office facilities consume 10 to 35% of the total electric consumption. The largest user of this electricity is personal computers and their associated peripherals. This can range from 1,100 kWh per year for a conventional PC and monitor that are never shut off to 180 kWh per year if sleep mode is activated or 270 kWh per year if sleep mode is not activated but units are turned off at night and weekends. Monitoring of plug loads at the

Kane County facilities indicate that the unit monitored was shut off at night but sleep mode of the computer was not utilized.

Implementation. IT should be able to program all network enabled PCs to use sleep mode.

Savings. Savings result from reductions in both kilowatt hours of about 100 kWh per year per PC.

BUILDING C

Facility Information**.** Building C consists is a 3 story structure built in 1989. It has 22,015 square feet of conditioned space.

Building Envelope. The building is of masonry construction. The windows are thermo-pane with fixed sash. It has a flat roof with gravel ballast.

Occupancy Patterns. The building is occupied approximately 9 hours per day, Monday through Friday, and minimal hours on Saturday. There are approximately 90 staff in this building.

Energy Consuming Systems.

Primary Heating. Heating is provided by 3 gas fired rooftop units manufactured by Carrier. Firing rates of 360,000 and 275,000 BTUh were noted on each. These are self contained units, 2 with 10 hp air supply fans and 1 with a 7.5 hp fan. The fans were noted as having variable speed drives.

Primary Cooling. Cooling is provided by the 3 rooftop units plus 2 dedicated Liebert units.

Domestic Hot Water. Hot water is provided by an A O Smith unit with 50 gallons of storage and a rated input of 18,000 watts.

Lighting System. The interior lighting is a mix of T12 and T8 fluorescent.

Exit signs are lit by 8 watt fluorescent lamps.

Exterior lighting is metal halide lamps in the wall pacs and high pressure sodium lamps in the parking lot.

Other Equipment and Systems. The County GIS department is housed in this building with their numerous PCs. One of the Liebert Units is used to maintain space conditions in this area.

Feasible ECRMs. The following section of the report describes certain identified ECRMs and presents a summary listing of the key economic factors for consideration. For each ECRM, certain basic data was utilized and assumptions made to arrive at the projected savings.

The following ECRMs were analyzed for this building:

1. L-1 Linear Fluorescent Lighting Retrofit
2. L-2 Incandescent Lamp Replacement
3. L-3 Exit Sign Retrofit/Replacement
4. L-4 Occupancy Sensors
5. L-5 Exterior Lighting Retrofit
6. L-6 Install Photocell on Exterior Lighting
7. L-9 Bi-Level Stairwell Lighting
8. K-4 Energy Management System
9. K-5 Vending Machine Control
10. OM-1 Plug Loads

All are recommended.

Basis for Energy Cost Savings Calculations. The utility costs used in this report to calculate cost savings were provided by taking an average of the per kWh or per therm cost over the last year as listed on the utility bills provided.

Project Cost Estimates for ECRMs. The economics of each ECRM were calculated as simple payback, the period of time (in years) that allows the annual savings to equal the estimated capital cost.

ECRM L-1-Bldg C: Linear Fluorescent Lighting Retrofit.

Economics.
Annual Cost Savings = $2,100
Installed Costs = $11,029
Simple Payback = 5.3 years
Annual Energy Reduction = 38,812 kWh, -1,098 therms
Monthly kW Demand Reduction = 12 kW

Summary. Replace all T12 fluorescent lamp and magnetic ballasts with T8 RW (28W) lamps and electronic ballasts.

Background. Building C has 322 fixtures containing T12 lamps and magnetic ballasts. Converting these to T8 will save lighting energy and dollars.

Implementation. All T12 lamps and associated ballasts should be changed to T8 RW lamps with the proper electronic ballast. Install T-8 RW lamps with either 4100K or 5000K rating for better employee comfort.

The complete list of current and proposed fixtures and their locations can be seen in Exhibit 1. The estimated capital cost covers the cost of the lamps and ballasts and assumes installation by an electrician.

Savings. Savings result from reductions in kilowatt hours. The reduction in kilowatt hours was calculated by taking the difference in wattages between the existing and the proposed lamps and ballast wattages. Where the space is interior, the lighting retrofit savings are adjusted for heating and cooling interaction.

ECRM L-2-Bldg C: Incandescent Lamp Replacement.

Economics.
Annual Cost Savings = $22
Installed Costs = $9
Simple Payback = 0.4 year
Annual Energy Reduction = 403 kWh, -11 therms
Monthly kW Demand Reduction = 0 kW

Summary. Replace all incandescent lamps throughout the conditioned areas with CFLs.

Background. Building C had one incandescent bulb noted in an entry way. Incandescent bulbs last between 750 to 1000 hours and use four times the energy of the CFL replacement. CFLs have an estimated life of 10,000 hours.

Implementation. Install a 9 watt CFL for the 25 watt standard incandescent bulb.

Savings. Savings come from reductions in kWh. Cooling and heating interactions are taken into account in the calculations.

ECRM L-3-Bldg C: Exit Sign Retrofit/Replacement.

Economics.
Annual Cost Savings = $142
Installed Costs = $540
Simple Payback = 3.8
Annual Energy Reduction = 2,617 kWh, -74 therms
Monthly kW Demand Reduction = 0.3 kW

Summary. Complete the replacement of exit signs with LED exit signs.

Background. There are 18 exit signs in the building that still need to be converted to LED.

Implementation. Replace the 18 exit fixtures with new LED fixtures that draw less than 1 watt per fixture. Savings are based on reductions in wattages and are based on kWh and kW charges. Costs are based on vendor quotes and ComEd incentives costs and assume contractor installation. The reduction in kilowatt hours was calculated between the fluorescent fixtures and LED fixtures. The space is interior; therefore the lighting retrofit savings are adjusted for heating and cooling interaction.

Savings. Savings come from reductions in kWh. Cooling and heating interactions are taken into account in the calculations.

ECRM L-4-Bldg C: Occupancy Sensors.

Economics.
Annual Cost Savings = $3,174
Installed Costs = $3,700
Simple Payback = 1.2 years
Annual Energy Reduction = 58,658 kWh, -1,659 therms
Monthly kW Demand Reduction = 0 kW

Summary. Replace on-off wall switches in the offices and other selected spaces with infrared and/or ultrasonic motion sensors wall switches to reduce electric energy consumption. This ECRM should be limited to offices, maintenance areas, locker rooms, restrooms and storage areas.

Background. There are two types of occupancy sensors that are generally used, ultrasonic and passive infrared. Ultrasonic sensors fill the room with high-frequency sound; movement causes the reflected sound to have a frequency shift, which in turn sets off the sensor. Because it does not rely on "line-of-sight" this type of sensor is well suited to areas with tall obstacles. (Ultrasonic sensors are not to be confused with acoustic sensors that require a person to make noise in order to be detected.) Passive infrared sensors rely on moving body heat. To be seen, the person must move between the "vanes" created by the sensor's lens.

The estimated capital cost is based on 49 sensors and includes contractor installation of a single sensor installed as a wall switch replacement in the smaller rooms. Wall switch replacements could be readily accomplished by in-house staff.

Implementation. Throughout this facility on-off wall switches are used to control lights in the offices, maintenance areas, locker rooms and restrooms. Therefore a 25% to 40% reduction in operating hours was used in the savings calculation based on the Occupancy Sensors fact sheet

included in Exhibit 4. The savings in this ECRM assume the T-12s have been converted to T-8s and the incandescent lighting replaced by CFLs or T-8s.

Savings. Savings come from reductions in kilowatt hours. Heating and cooling interaction is taken into account in the savings estimates.

ECRM L-5-Bldg C: Exterior Lighting Retrofit.

Economics.
Annual Cost Savings = $635
Installed Costs = $3,420
Simple Payback = 5.4 yrs
Annual Energy Reduction = 8,038 kWh
Monthly kW Reduction = 2 kW

Summary. Replace existing wall packs, front pole lights, door entry light and the parking lot lamps with pulse start fixtures.

Background. There are twelve 250 watt HPS lamps in the parking lot, five 150 watt metal halide wall packs, two 150 watt pole lights and one 70 watt metal halide light by the door in this facility. These should be replaced with 150 watt, 100 watt or 70 watt Pulse Start MH fixtures which have comparable light levels and also maintain higher light levels over the bulb life.

Implementation. Replace the fixtures on a one-for-one basis. The new units should fit in the existing housing. The estimated capital cost covers lamps and ballast for the proposed retrofit. The cost also includes labor and contractor installation. If all proposed lamps are replaced, the project is expected to have a 5.4 yrs. payback.

Savings. Savings come from reductions in kilowatt hours. Reductions are again based on the difference between the current and the proposed fixtures.

The space is exterior; therefore the lighting retrofit savings need no modification. The lamp life is approximately the same as the existing lamps so there are no additional operations and maintenance savings.

ECRM L-6-Bldg C: Photocell Control on Exterior Lighting.

Economics.
Annual Cost Savings = $143
Installed Costs = $1,360
Simple Payback = 9.5 years
Annual Energy Reduction = 1,812 kWh
Monthly kW Reduction = 0 kW

Summary. Install master photocell control to turn the exterior wall and parking lots light fixtures on and off as required by ambient light. These lights are currently controlled by a timer.

Background. The exterior lights illuminating the building and the parking lots are controlled through a time clock that must be adjusted to keep the on/off sequence close to sunrise and sunset. The installation of a master photocell control at the facility to control the exterior lights will negate the need for programming changes and allow control to be based on ambient light levels.

Implementation. A master photocell to measure ambient light should be installed and the reading fed into the present relay to turn on the exterior lights as needed. One unit should be all that is needed to control the lights. The master unit should be mounted to the roof at an open, un-shaded location. The estimated capital cost covers the cost of the photocell, installation and an estimate of programming costs.

Savings. Savings come from reductions in kilowatt hours. Sunrise and sunset varies from 5:30am and 8:30pm in June to 7:30am to 4:30pm in December. Savings are based on a reduction of one hour a day. Savings are calculated assuming the exterior lights have been retrofitted to pulse start metal halides.

The space is exterior; therefore, the lighting retrofit savings need no modification.

ECRM L-9-Bldg C: Bi-Level Stairwell Lighting Retrofit.

Economics.
Annual Cost Savings = $270
Installed Costs = $1,520
Simple Payback = 5.6 years
Annual Energy Reduction = 3,422 kWh, -97 therms
Monthly kW Demand Reduction = 0 kW

Summary. Replace the stairwell lighting fixtures with T8 fixtures that incorporate dimming ballast and occupancy sensors. By dimming the fixtures during unoccupied times, a large portion of energy is saved. A full-output equipment failure mode is standard. The dimmed light level is estimated to be 10% of full output.

Background. This facility has eight fluorescent light fixtures in stairwells that run continuously due to code requirements. Replace the entire fixtures with new T8 bi-level fixtures that incorporate a dimming ballast and occupancy sensors. These fixtures are available prepackaged and in studies at universities have shown a reduction in kWh exceeding 90% versus standard fixtures left on 24/7.

Implementation. All stairwell fixtures should be replaced. The fixtures will be mounted the same location as the current fixtures. The estimated capital cost includes the fixtures and lamps for the proposed retrofits. Installation by a contractor is assumed.

Savings. Savings come from reductions in kilowatt hours due to the occupancy and dimming control. Where the space is interior, the lighting retrofit savings are adjusted for heating and cooling interaction.

Basis for Cost Estimates. The cost is based on vendor's price sheets for units with varying turndown rates.

Requirements. The code used is International Building Code 2003 which requires continuous operation of lighting in exit routes and a minimum level of 1 foot candle (fc). The bi-level fixtures can be used if a minimum light level exceeding 1 fc is demonstrated.

<u>ECRM K-4-Bldg C: Energy Management System</u>.

Economics.
Annual Cost Savings = $4,679
Installed Costs = $81,230
Simple Payback = 17.4 years
Annual Energy Reduction = 17,653 kWh, 3,733 therms
Monthly kW Demand Reduction = 0 kW

Summary. Building C is heated and cooled by 3 rooftop units controlled by setbacks thermostats. These units have variable speed fans and an internal outside air and exhaust dampers.

Background. Kane County has received bids for an EMS system in Building C. The proposed EMS system should be designed to optimize start/stop, night setback, holiday scheduling, free cooling and cfm tracking along with other functions.

The system would be user friendly, have graphical displays with readings and allow operators to modify settings that more accurately reflect the operation of the building regarding occupied hours and temperature settings.

Implementation. Install the proposed system and incorporate programming features to include outside air control.

Savings. Savings come from reductions in kilowatt hours to cool the building and natural gas needed to heat it.

Basis for Cost. The cost estimate is based on bid response.

ECRM K-5-Bldg C: Vending Machine Control.

Economics.
Annual Cost Savings = $86
Installed Costs = $260
Simple Payback = 3.0 years
Annual Energy Reduction = 1,440 kWh, -40 therms
Monthly kW Demand Reduction = 0 kW

Summary. Install vendor mizer (occupancy controls) to reduce electric energy consumption while spaces are unoccupied.

Background. The facility has at least three vending machines in the break areas. There are refrigerated cold drink units and snack units. The snack unit draws about 70 watts and the cold drink unit averages about 400 watts. Control units that the machines can be plugged into are available that will cycle the lights/machine off during low traffic periods while maintaining adequate temperatures to keep the beverages cold. This will save energy by reducing lighting usage, lower heat gain from lighting in the refrigerated units and control cycling of the compressor. The hot beverage unit was not included because adequate information on the water heating system was not available.

Implementation. There are several commercially available control units for refrigerated and non-refrigerated vending machines. Some are simply control units while others will monitor and provide electrical savings. Units are also available for inside and outside locations.

If the vending machines are owned by the county, Patrick recommends that vendor mizer units be installed. If the machines are part of an annual agreement this may need to be a condition of renewal or the machine owner may wish to supply ENERGY STAR rated units.

There is incentive money available through DCEO that would decrease the payback of this measure to 1.5 years.

Savings. Savings come from reductions in kilowatt hours. Case studies have shown up to a 75% reduction in energy use due to control units. Savings in this ECRM will be based on a 35% reduction.

A packaged system with the control unit that measures savings can be purchased. Since these are essentially plug and play systems, one unit with the measurement capability can be purchased and moved to various units to verify savings. Savings estimates for the refrigerated units are 1,225 kWh and for the snack units is 215 kWh.

ECRM OM-1-Bldg C: Plug Load Minimization.

Economics.
Annual Cost Savings = $479
Installed Costs = $0
Simple Payback = 0 year
Annual Energy Reduction = 8,852 kWh, -250 therms
Monthly kW Demand Reduction = 0 kW

Summary. Building C has over 80 PCs that do not have the stand-by and/or sleep modes activated. Patrick recommends that the IT department investigates the possibility of activating the stand-by and sleep modes on all PCs, which would save about 100 kWh per year per PC. The sleep function is standard on Energy Star equipment and should not interfere with remote access since the units are not being shut off.

Replacing all appliances and equipment with Energy Star rated equipment as replacements are needed will also reduce energy consumption. Energy Star units typically use at least 10% less energy than the average unit.

Policies regarding use of personal space heaters, dorm refrigerators and radios would impact energy consumption but needs to be balanced against employee morale benefits.

Background. Plug loads in typical office facilities consume 10 to 35% of the total electric consumption. The largest user of this electricity is personal computers and their associated peripherals. This can range from 1,100 kWh per year for a conventional PC and monitor that are never shut off to 180 kWh per year if sleep mode is activated or 270 kWh per year if sleep mode is not activated but units are turned off at night and weekends. Monitoring of plug loads at the Kane County facilities indicate that the unit monitored was shut off at night but sleep mode of the computer was not utilized.

Implementation. IT should be able to program all network enabled PCs to use sleep mode.

Savings. Savings result from reductions in kilowatt hours of about 100 kWh per year per PC.

3RD STREET COURTHOUSE

Facility Information. The 3rd Street Courthouse was constructed in 1891. It functions as a location for family and civil court cases. It has five levels and a basement and has 70,799 square feet of space.

Building Envelope. The building is masonry and has a plaster interior wall covering and plaster ceilings. The windows have been replaced with thermo-pane units.

Occupancy Patterns. The building is occupied approximately 9 hours per day, Monday through Friday. There are 30 staff located in this building.

Energy Consuming Systems.

Primary Heating. Heating is provided by perimeter radiant heat from steam radiators controlled by Danfoss valves and steam coils in the air handling units. Steam is produced by two 3,674 MBTUh natural gas fired boilers in the boiler house. These boilers were new in 2007. Steam pressure is normally 4.5 psig. Boilers are shut off when outside air temperature exceeds 45°F.

Primary Cooling. Cooling is provided by numerous direct expansion (DX) split units. Most are 5 tons and normal design is 2 per air handler which serves a designated area such as 1 courtroom and jury room. The units range from 10 to 13 SEER with most being 13 SEER Goodwin units. The air handlers are shut off at night and on weekends with the Metasys system.

Domestic Hot Water. Hot water for domestic use is produced a 65 gallon Rheem unit with 2-4,500 watt heating elements.

Lighting System. The lighting is a mixture of T8 and T12 with both electronic and magnetic ballasts. There are some areas such as restrooms that still use incandescent bulbs. Most incandescents have been converted to CFLs.

Exit signs are LED. Exterior lighting is mercury vapor in historic sidewalk light-poles.

Other Equipment and Systems. The building has typical office equipment. There are refrigerators to store drinks for jurors. The boiler has a 2 hp air compressor and a vacuum condensate return system.

Feasible ECRMs. The following section of the report describes the certain identified ECRMs and presents a summary listing of the key economic factors for consideration. For each ECRM, certain basic data was utilized and assumptions made to arrive at the projected savings.

The following ECRMs were analyzed for this building:

1. L-1 Linear Fluorescent Lighting Retrofit
2. L-2 Incandescent Lamp Replacement
3. L-3 Exit Sign Retrofit/Replacement
4. L-4 Occupancy Sensors
5. L-5 Exterior Lighting Retrofit
6. L-6 Install Photocell on Exterior Lighting
7. K-3 Outside Air Control
8. K-6 Rotunda Exhaust Fan Control
9. I-1 Attic Insulation
10. OM-1 Plug Loads

All but L-3 are recommended.

Basis for Energy Cost Savings Calculations. The utility costs used in this report to calculate cost savings were provided by taking an average of the per kWh or per therm cost over the last year as listed on the utility bills provided.

Project Cost Estimates for ECRMs. The economics of each ECRM were calculated as simple payback, the period of time (in years) that allows the annual savings to equal the estimated capital cost.

ECRM L-1-3rd Street Linear Fluorescent Lighting Retrofit.

Economics.
Annual Cost Savings = $4,183
Installed Costs = $26,309
Simple Payback = 6.3 years
Annual Energy Reduction = 61,872 kWh, -1,721 therms
Monthly kW Demand Reduction = 23 kW

Summary. Modify all the existing T12 fixtures and replace all T8 32 watt fluorescent lamps with T8 High Lumen (HL) (28 watt) lamps and electronic ballasts.

Background. 3rd Street Courthouse has 625 fixtures that can be converted to T8 HL. This will save lighting energy and dollars.

Implementation. All lamps should be changed to T8 HL lamps. Install T-8 HL lamps with either 4100K or 5000K rating for better employee comfort.

The complete list of current and proposed fixtures and their locations can be seen in Exhibit 1. The estimated capital cost covers the cost of the lamps and assumes installation by an electrician.

Savings. Savings result from reductions in kilowatt hours. The reduction in kilowatt hours was calculated by taking the difference in wattages between the existing and the proposed lamps. Where the space is interior, the lighting retrofit savings are adjusted for heating and cooling interaction.

ECRM L-2-3rd Street Incandescent Lamp Replacement.

Economics.
Annual Cost Savings = $907
Installed Costs = $355
Simple Payback = 0.4 year
Annual Energy Reduction = 13,410 kWh, -373 therms
Monthly kW Demand Reduction = 6 kW

Summary. Replace all incandescent lamps throughout the conditioned areas with CFLs.

Background. 3rd Street Courthouse has at least 53 incandescent lamps not on dimmers that can be changed. Incandescent lamps last between 750 to 1000 hours and use 4 times the energy of the CFL replacement. Commercial grade CFLs have an estimated life of 10,000 hours.

Implementation. Install 15 watt CFL for the 60 watt standard incandescent lamp; 20 watt CFLs for the 75 watt, 26 watt CFL for the 100 watt lamps and 40 watt CFL for the 150 watt incandescent.

Savings. Savings come from reductions in kWh. Cooling and heating interactions are taken into account in the calculations.

ECRM L-3-3rd Street: Exit Sign Retrofit/Replacement.

Economics.
Annual Cost Savings = $22
Installed Costs = $910
Simple Payback = 40.6 years
Annual Energy Reduction = 332 kWh, -9 therms
Monthly kW Demand Reduction = 0 kW

Summary. Replacement the LED exit signs with photoluminescent exit signs.

Background. There are 7 exit signs in the building that could be converted to photoluminescent exit lights.

Implementation. Replace the 7 exit fixtures with new photoluminescent exit lights that use no energy per fixture. Savings are based on reductions in wattages and are based on kWh charges. Costs are based on vendor quotes and assume contractor installation. The reduction in kilowatt hours was calculated between the LED fixtures and the photoluminescent fixtures. The space is interior; therefore the lighting retrofit savings are adjusted for heating and cooling interaction.

ECRM L-4-3rd Street: Occupancy Sensors.

Economics.
Annual Cost Savings = $2,375
Installed Costs = $4,940
Simple Payback = 2.1
Annual Energy Reduction = 35,132 kWh, -977 therms
Monthly kW Demand Reduction = 0 kW

Summary. Replace on-off wall switches in the offices and other selected spaces with infrared and/or ultrasonic motion sensors wall switches/relays to reduce electric energy consumption. This ECRM should be limited to offices, maintenance areas, locker rooms, restrooms and storage areas.

Background. There are two types of occupancy sensors that are generally used, ultrasonic and passive infrared. Ultrasonic sensors fill the room with high-frequency sound; movement causes the reflected sound to have a frequency shift, which in turn sets off the sensor. Because it does not rely on "line-of-sight" this type of sensor is well suited to areas with tall obstacles. (Ultrasonic sensors are not to be confused with acoustic sensors that require a person to make noise in order to be detected.) Passive infrared sensors rely on moving body heat. To be seen, the person must move between the "vanes" created by the sensor's lens.

The estimated capital cost is based on 70 sensors and includes contractor installation of a single sensor installed as a wall switch replacement in the smaller rooms. Wall switch replacements could be readily accomplished by in-house staff.

Implementation. Throughout this facility on-off wall switches are used to control lights in the offices, maintenance areas, locker rooms and restrooms. Therefore a 25% to 40% reduction in operating hours was used in the savings calculation based on the Occupancy Sensors fact sheet included in Exhibit 4. The savings in this ECRM assume the T8s have been converted to HLs and the incandescents replaced by CFLs or T-8s.

Savings. Savings come from reductions in kilowatt hours. Heating and cooling interaction is taken into account in the savings estimates.

ECRM L-5-3rd Street: Exterior Lighting Retrofit.

Economics.
Annual Cost Savings = $1,350
Installed Costs = $7,050
Simple Payback = 5.2 years
Annual Energy Reduction = 14,207 kWh

Summary. Replace existing wall illumination and the parking lot lamps with pulse start fixtures.

Background. There are about twenty-four 200 watt mercury vapor lamps, twelve 100 watt mercury vapor lamps and nine 60 watt mercury vapor lamps in the parking lot and walkways. These should be replaced with 100 watt, 70 watt and 50 watt Pulse Start MH fixtures respectively which have better lumen maintenance values.

Implementation. Replace the fixtures on a one-for-one basis. The new units should fit in the existing hardware. The estimated capital cost covers lamps and ballast for the proposed retrofit and installation by a contractor. If all proposed lamps are replaced, the project is expected to have a 5.2 year payback.

Savings. Savings come from reductions in kilowatt hours. The space is exterior; therefore the lighting retrofit savings need no modification.

ECRM L-6-3rd Street: Photocell Control on Exterior Lighting.

Economics.
Annual Cost Savings = $151
Installed Costs = $1,020
Simple Payback = 6.8 years
Annual Energy Reduction = 1,774 kWh
Monthly kW Reduction = 0 kW

Summary. Install master photocell control to turn the exterior wall and parking lots light fixtures on and off as required by ambient light. These lights are currently controlled by a timer.

Background. The exterior lights illuminating the building and the parking lots are controlled through a time clock that must be adjusted to keep the on/off sequence close to sunrise and sunset. The installation of a master photocell control at the facility to control the exterior lights

will negate the need for programming changes and allow control to be based on ambient light levels.

Implementation. A master photocell to measure ambient light should be installed and the reading fed into the present relay to turn on the exterior lights as needed. One unit should be all that is needed to control the lights. The master unit should be mounted to the roof at an open, un-shaded location.

The estimated capital cost covers the cost of the photocell, installation and an estimate of programming costs.

Savings. Savings come from reductions in kilowatt hours. Sunrise and sunset varies from 5:30 am and 8:30 pm in June to 7:30 am to 4:30 pm in December. Savings are based on a reduction of one hour a day. Savings are calculated assuming the exterior lights have been retrofitted to pulse start metal halides. The space is exterior; therefore the lighting retrofit savings need no modification.

ECRM K-3-3rd Street: Outside Air Control by Demand Response.

Economics.
Annual Cost Savings = $2,206
Installed Costs = $20,400
Simple Payback = 9.2 years
Annual Energy Reduction = 4,984 kWh, 1,761 therms

Summary. Install CO2 sensors in the return air duct and program the EMS to reduce outside air intake to the minimum needed to meet codes thereby reducing energy consumption.

Background. 3rd Street Courthouse has 16 air handlers dedicated to ventilate the courtrooms and associated areas. The fans on these areas presently operated from 6am to 6pm Monday through Friday. The cost of conditioning each 1,000 cfm of outside air based on these operating parameters is $668 per year. Controlling the amount of outside air by demand ventilation control based on CO_2 monitoring can reduce this volume significantly.

The current International Mechanical Code bases outside air ventilation on number of people and square footage. The required airflow is the number of occupants times 5 cfm per person plus the area square footage times 0.06 cfm/ft^2. This indicates with a properly designed damper system and controls one should be able to reduce the outside air.

Implementation. Each fan system should either have a CO_2 monitor installed in the return duct per fan system to control the outside air to the minimum needed. Alternatively the EMS could be programmed based on maximum estimates of people in the building.

Savings. Savings come from reductions in kilowatt hours to cool the air stream and natural gas needed to heat it. Savings are based on reduced outside air an average of 3 hours per day.

Basis for Cost Estimates. The cost is based on 1 point per unit at $1,200 per point installed and programming costs of $1,200 for the building. The building has most of the courtroom units already wired to the Metasys unit, therefore one sensor per courtroom and programming at the main control unit in the boiler house should allow this control method to occur. These costs are based on conversations with 2 HVAC installation and control engineers.

Code Requirements. International Mechanical Code allows demand response ventilation.

ECRM K-6-3rd Street: Rotunda Exhaust Fan Control.

Economics.
Annual Cost Savings = $110
Installed Costs = $70
Simple Payback = 0.6 year
Annual Energy Reduction = 1,150 kWh

Summary. The existing 3rd Street Courthouse Rotunda exhaust fan is exhausting the 5th level area on a 24 hour, seven day a week basis, 365 days per year. The fan is currently used to help cool the 5th floor and controlled by manually plugging in the fan or stopping it by unplugging the fan.

Background. The exhaust fan when operating continuously can use an estimated 2,300 kWh per year. By providing the existing fan with a thermostat to operate the fan when the dome area temperature exceeds a predetermined set-point, 85°F for example, the estimated power use can be in the range of 1,150 kWh per year.

Implementation. Provide the existing exhaust fan with a thermostat. Plug the thermostat into the existing electrical outlet and then plug the existing fan into the thermostat. No thermostat wiring is required since the thermostat is provided with electrical cord and plug.

Savings. Savings result from reductions in both kilowatt hours and demand kilowatts of about 1,150 kWh per year.

ECRM I-1-3rd Street: Attic Insulation.

Economics.
Annual Cost Savings = $7,332
Installed Costs = $32,929
Simple Payback = 4.5 years
Annual Energy Reduction = 1,975 kWh, 7,250 Therms

Summary. The installation of 12 inches of R 30 fiberglass insulation over the 4th floor ceiling of this building would result in a decrease of heat flow through the roof of about 7,250 therms per year and reduce air conditioning consumption by 1,975kWh each year.

The existing plaster ceiling should be inspected before adding insulation to determine if there is a possibility of moisture damage occurring with the installation of the new 12 inch layer of R30 insulation.

Background. Insufficient insulation is a common occurrence in older buildings. While it is not normally practical to insulate behind plaster walls due to the age of the wall, the wall thicknesses and possible building piping interferences, the attic is accessible and can be insulated at a lower cost than the walls.

Implementation. Install batts of R30 insulation above the plaster ceiling in areas accessible through the 5th level doors. The proposed reproofing project with the "cool roof" and 2 inches of insulation would reduce the savings from this concept. The "cool roof" proposal would add cooling savings.

Savings. Savings result from reductions in both kilowatt hours for cooling and therms for heating.

ECRM OM-1-3rd Street: Plug Load Minimization.

Economics.
Annual Cost Savings = $260
Installed Costs = $0
Simple Payback = 0 year
Annual Energy Reduction = 3,000 kWh
Monthly kW Demand Reduction = 0 kW

Summary. The 3rd Street Courthouse has over 30 PCs that do not have the stand-by and/or sleep modes activated. Patrick recommends that the IT department investigates the possibility of activating the stand-by and sleep modes on all PCs, which would save about 100 kWh per year per PC. The sleep function is standard on Energy Star equipment and should not interfere with remote access since the units are not being shut off.

Replacing all appliances and equipment with Energy Star rated equipment as replacements are needed will also reduce energy consumption.

Policies regarding use of personal space heaters, dorm refrigerators and radios would impact energy consumption but needs to be balanced against employee morale benefits.

Background. Plug loads in typical office facilities consume 10 to 35% of the total electric consumption. The largest user of this electricity is personal computers and their associated peripherals. This can range from 1,100 kWh per year for a conventional PC and monitor that are never shut off to 180 kWh per year if sleep mode is activated or 270 kWh per year if sleep mode is not activated but units are turned off at night and weekends. Monitoring of plug loads at the Kane County facilities indicate that the unit monitored was shut off at night but sleep mode of the computer was not utilized.

Implementation. IT should be able to program all network enabled PCs to use sleep mode.

Savings. Savings result from reductions in both kilowatt hours and demand kilowatts of about 100 kWh per year per PC.

JUVENILE JUSTICE CENTER

Facility Information. The Juvenile Justice Center consists of 67,000 square feet of detention facilities for juveniles, a kitchen and dining area, educational facilities, a Juvenile Court complex and offices for staff, prosecutors and advocates.

Building Envelope. The building is masonry with built up roof. The windows are thermo-pane.

Occupancy Patterns The building is occupied approximately 24 hours per day in the pod areas and typically 8 am to 5 pm in the remaining areas. The location has a staff of 13.

Energy Consuming Systems.

Primary Heating. There are 10 rooftop units to provide ventilation, heating and cooling. The units are natural gas fired. There is a hot water boiler that supplies heat to the radiant units along the west lobby wall and several unit heaters.

Primary Cooling. There are 10 rooftop units to provide ventilation, heating and cooling. These range in size from 7.5 tons to 60 tons. The estimated SEER is between 9.5 to 10.

Domestic Hot Water. Two natural gas fired units provide hot water.

Lighting System. The interior lighting is primarily T12 fluorescent with magnetic ballasts. The gym has metal halide fixtures.

Exit signs are LED fixtures.

Exterior lighting is metal halide on the walls and in the parking lots.

Other Equipment and Systems. The facility has a kitchen, a laundry and the gym.

Feasible ECRMs. The following section of the report describes certain ECRMs and presents a summary listing of the key economic factors for consideration. For each ECRM, certain basic data was utilized and assumptions made to arrive at the projected savings.

The following ECRMs were analyzed for this building:

1. L-1 Linear Fluorescent Lighting Retrofit
2. L-2 Incandescent Lamp Replacement
3. L-3 Exit Sign Retrofit/Replacement
4. L-4 Occupancy Sensors
5. L-5 Exterior Lighting Retrofit
6. L-8 High Bay Lighting Replacement

7. L-9 Bi-Level Stairwell Lighting
8. K-1 Night Shut-Down
9. K-3 Outside Air Control
10. K-5 Vending Machine Control
11. OM-1 Plug Loads

All but L-3 are recommended.

Basis for Energy Cost Savings Calculations. The utility costs used in this report to calculate cost savings were provided by taking an average of the per kWh or per therm cost over the last year as listed on the utility bills provided.

Project Cost Estimates for ECRMs. The economics of each ECRM were calculated as simple payback, the period of time (in years) that allows the annual savings to equal the estimated capital cost.

ECRM L-1-JJC: Linear Fluorescent Lighting Retrofit.

Economics.
Annual Cost Savings = $9,721
Installed Costs = $35,241
Simple Payback = 3.6 years
Annual Energy Reduction = 164,585 kWh, -4,632 therms

Summary. Replace all T12 fluorescent lamp and magnetic ballasts with T8 RW (28W) lamps and electronic ballasts.

Background. JJC has 566 fixtures containing T12 lamps and magnetic ballasts. Converting these to T8 will save lighting energy and dollars.

Implementation. All T12 lamps and associated ballasts should be changed to T8 RW lamps with the proper electronic ballast. Install T-8 RW lamps with either 4100K or 5000K rating for better employee comfort.

The complete list of current and proposed fixtures and their locations can be seen in Exhibit 1.
The estimated capital cost covers the cost of the lamps and ballasts and assumes installation by an electrician.

Savings. Savings result from reductions in kilowatt hours. The reduction in kilowatt hours was calculated by taking the difference in wattages between the existing and the proposed lamps and ballast wattages.
Where the space is interior, the lighting retrofit savings are adjusted for heating and cooling interaction.

ECRM L-2-JJC: Incandescent Lamp Replacement.

Economics.
Annual Cost Savings = $194
Installed Costs = $310
Simple Payback = 1.6 years
Annual Energy Reduction = 3,287 kWh, -93 therms

Summary. Replace all incandescent lamps throughout the conditioned areas kept above 45 degrees with CFLs.

Background. JJC has at least 16 incandescent lamps in these parts of the facility. Incandescent bulbs last between 750 to 1000 hours and use four times the energy of the CFL replacement. CFLs have an estimated life of 10,000 hours.

Implementation. Install 15 watt CFL for the 60 watt standard incandescent lamps; 20 watt CFLs for the 75 watt, 26 watt CFL for the 100 watt lamps and 40 watt CFL for the 150 watt incandescent.

Savings. Savings come from reductions in kWh. Cooling and heating interactions are taken into account in the calculations.

ECRM L-3-JJC: Exit Sign Retrofit/Replacement.

Economics.
Annual Cost Savings = $69
Installed Costs = $3,120
Simple Payback = 45.2 years
Annual Energy Reduction = 1,169 kWh, -33 therms
Monthly kW Demand Reduction = 0 kW

Summary. Replace the 24 existing LED exit signs with Photoluminescent exit signs.

Background. The exit signs noted during the visit were LED.

Implementation. Replace the LED exit fixtures with new Photoluminescent fixtures that use no energy.

Savings. The reduction in kilowatt hours was calculated between the LED fixtures and Photoluminescent fixtures. The space is interior; therefore the lighting retrofit savings are adjusted for heating and cooling interaction.

ECRM L-4-JJC: Occupancy Sensors.

Economics.
Annual Cost Savings = $3,846
Installed Costs = $9,365
Simple Payback = 2.4 years
Annual Energy Reduction = 65,112 kWh, -1,832 therms

Summary. Replace on-off wall switches in the offices and other selected spaces with infrared and/or ultrasonic motion sensors wall switches to reduce electric energy consumption. This ECRM should be limited to offices, maintenance areas, locker rooms, restrooms and storage areas.

Background. There are two types of occupancy sensors that are generally used, ultrasonic and passive infrared. Ultrasonic sensors fill the room with high-frequency sound; movement causes the reflected sound to have a frequency shift, which in turn sets off the sensor. Because it does not rely on "line-of-sight" this type of sensor is well suited to areas with tall obstacles. (Ultrasonic sensors are not to be confused with acoustic sensors that require a person to make noise in order to be detected.) Passive infrared sensors rely on moving body heat. To be seen, the person must move between the "vanes" created by the sensor's lens.

The estimated capital cost is based on 94 sensors and includes contractor installation of a single sensor installed as a wall switch replacement in the smaller rooms. Wall switch replacements could be readily accomplished by in-house staff.

Implementation. Throughout this facility on-off wall switches are used to control lights in the offices, maintenance areas, locker rooms and restrooms. Therefore a 25% to 40% reduction in operating hours was used in the savings calculation based on the Occupancy Sensors fact sheet included in Exhibit 4. The savings in this ECRM assume the T-12s have been converted to T-8s and the incandescent lighting replaced by CFLs or T-8s.

Savings. Savings come from reductions in kilowatt hours. Heating and cooling interaction is taken into account in the savings estimates.

ECRM L-5-JJC: Exterior Lighting Retrofit.

Economics.
Annual Cost Savings = $2,383
Installed Costs = $12,960
Simple Payback = 5.4 years
Annual Energy Reduction = 27,711 kWh

Summary. Replace existing wall packs and the parking lot lamps with pulse start fixtures.

Background. There are about thirty-two 250 watt metal halide lamps in the parking lot and forty 150 watt Metal Halide wall packs outside this facility. These should be replaced with 150 watt and 100 watt Pulse Start MH fixtures that have a better lumen maintenance level.

Implementation. Replace the fixtures on a one-for-one basis. The new units should fit in the existing fixture housing. The estimated capital cost covers lamps and ballast for the proposed retrofit. The cost also includes labor and contractor installation. If all proposed lamps are replaced, the project is expected to have a 5.4 yrs. payback.

Savings. Savings come from reductions in kilowatt hours. The space is exterior; therefore the lighting retrofit savings need no modification.

ECRM L-8-JJC: High Bay Lighting Retrofit.

Economics.
Annual Cost Savings = $316
Installed Costs = $2,700
Simple Payback = 8.5 years
Annual Energy Reduction = 5,358 kWh, -151 therms

Summary. Replace existing metal halide fixtures in the gym with T8 high bay fixtures.

Background. There are nine 400 watt metal halide lamps in the gym. These should be replaced with 4 foot 6 lamp T8 fixtures which have comparable light levels and also maintain higher levels over the bulb life. The fluorescent fixtures also have instant on/off capability allowing the lamps to be shut off when the gym is unoccupied.

Implementation. Replace the fixtures on a one-for-one basis. The estimated capital cost covers the fixtures and lamps for the proposed retrofit. The cost also includes labor and contractor installation. If all proposed lamps are replaced, the project is expected to have a 8.5 yrs payback.

Savings. Savings come from reductions in kilowatt hours. The reduction in kilowatt hours was calculated by taking the difference in wattages between the existing and the proposed lamps and ballast wattages. The lighting retrofit savings are adjusted for heating and cooling interaction.

ECRM L-9-JJC: Bi-Level Stairwell Lighting Retrofit.

Economics.
Annual Cost Savings = $238
Installed Costs = $2,850
Simple Payback = 12.0 years
Annual Energy Reduction = 4,021 kWh, -113 therms

Summary. Replace the stairwell lighting fixtures with T-8 fixtures that incorporate dimming ballast and occupancy sensors. By dimming the fixtures during unoccupied times, a large portion of energy is saved. A full-output equipment failure mode is standard. The dimmed light level is estimated to be 10% of full output.

Background. This facility has 15 fluorescent light fixtures in stairwells that run continuously due to code requirements. Replace the entire fixtures with new T8 bi-level fixtures that incorporate a dimming ballast and occupancy sensors. These fixtures are available prepackaged and in studies at universities have shown a reduction in kWh exceeding 90% versus standard fixtures left on 24/7.

Implementation. All stairwell fixtures should be replaced. The fixtures will be mounted the same location as the current fixtures. The estimated capital cost includes the fixtures and lamps for the proposed retrofits. Installation by a contractor is assumed.

Savings. Savings come from reductions in kilowatt hours due to the occupancy and dimming control. The lighting retrofit savings are adjusted for heating and cooling interaction.

Basis for Cost Estimates. The cost is based on vendor's price sheets for units with varying turndown rates.

Code Requirements. The Code used is International Building Code 2003 which requires continuous operation of lighting in exit routes and a minimum level of 1 foot candle (fc). The bi-level fixtures can be used if a minimum light level exceeding 1 fc is demonstrated. Verification with the local code authority is recommended prior to implementation.

ECRM K-1-JJC: Night Shutdown of HVAC.

Economics.
Annual Cost Savings = $13,300
Installed Costs = $21,600
Simple Payback = 1.6 years
Annual Energy Reduction = 37,750 kWh, 10,500 therms

Summary. Program the EMS to shut down units during unoccupied hours in unoccupied areas to reduce heating and cooling costs, fan motor costs and reduce ventilation loads.

Background. The facility has 10 air handlers with constant speed supply fans to ventilate the cell pods, the office areas, education area, kitchen, dining areas, restrooms and the gym. These fans are presently operated 24 hours per day, seven days per week. The cost of conditioning each 1,000 cfm of outside air based on these operating parameters is $1,970 per year. Controlling the rooftop units by turning them off and maintaining a minimum/maximum temperature will reduce energy consumption. The remaining cost of conditioning each 1000 cfm of outside air will be lowered to $700 per year using a 12-hour per day shut down Monday through Friday and 24 hours a day on Saturdays and Sundays.

Implementation. Program the EMS to shut off the rooftop units for all unoccupied areas from 6:00pm to 6:00am. The four units servicing the cell pods should not be included in this operational change. Critical areas that have the lowest temperature should be monitored during the heating season to insure freeze protection. Final operation should ensure equipment freeze protection and damper control.

Savings. Savings come from reductions in kilowatt hours to cool the air stream and natural gas needed to heat it. The savings are based on a total outside air amount of 10,500 cfm based on installed equipment size and damper settings for the-six units.

Basis for Cost Estimates. The cost is based on two points per unit at $1,200 per point installed and programming costs of $1,200 per unit. These costs are based on conversations with two HVAC installation and control engineers.

Code Requirements. The basis for continuous operation at present is operations personnel interpretation of the code requirements. This facility would be covered by the "Illinois County Juvenile Detention Standards" issued by the Illinois Department of Corrections. This code in Section 702.80 subpart 8 states the facility shall be comfortably heated and cooled with temperatures within the normal comfort zone and have a system to eliminate disagreeable odors. It does not state that systems must operate in unoccupied areas.

ECRM K-3-JJC: Outside Air Control by Demand Response.

Economics.
Annual Cost Savings = $10,690
Installed Costs = $24,000
Simple Payback = 2.2 years
Annual Energy Reduction = 46,800 kWh, 10,100 therms

Summary. Program the EMS to reduce outside air intake to the minimum needed to meet codes thereby reducing energy consumption.

Background. The facility has 10 air handlers with constant speed supply fans to ventilate the offices, the office areas, education area, kitchen, dining room, restrooms and the gym. The four fans on the cells pods are presently operated 24 hours per day, seven days per week. The cost of conditioning each 1,000 cfm of outside air based on these operating parameters is $1,970 per year. The other six the rooftop units, assuming ECRM K-1 (night shutdown of HVAC) is implemented, has a cost of conditioning each 1000 cfm of outside air of $700 per year using the 12 hour per day shut down Monday through Friday and 24 hours a day on Saturdays and Sundays.

Controlling the amount of outside air by demand ventilation control based on CO_2 monitoring can reduce this volume significantly.

The current International Mechanical Code bases outside air ventilation, if not controlled by a demand response set-up, on number of people, number of restroom facilities and office and gym square footage. The number of occupants in the building is about 168 and at 5 cfm per person equals 840 cfm. The building square footage times 0.06 cfm/ft^2 is 4,020 cfm. This places the outside air requirement at about 4,860 cfm maximum. This indicates with a properly designed damper system and controls one should be able to reduce the outside air.

The current outside air is estimated at 10,500 cfm for the six systems currently proposed for shut down and 6,125 cfm for the four units servicing the cell pods. This indicates with a properly designed damper system and controls one should be able to reduce the outside air by about 11,700 cfm and possibly more when building is at lower occupancy rates. That 11,700 cfm equates to a reduction of over $10,690 in utility bills.

Implementation. Each fan system could either have a CO_2 monitor installed in a strategic location for each fan system that would control the outside air to the minimum needed. Alternatively the EMS could be programmed based on maximum estimates of people in the building.

Savings. Savings come from reductions in kilowatt hours to cool the air stream and natural gas needed to heat it.

Basis for Cost Estimates. The cost is based on one point per unit at $1,200 per point installed and programming costs of $1,200 per unit. These costs are based on conversations with two HVAC installation and control engineers.

Code Requirements. The basis for continuous operation at present is operations personnel interpretation of the code requirements. This facility would be covered by the "Illinois County Juvenile Detention Standards" issued by the Illinois Department of Corrections. This code in Section 702.80 subpart 8 states the facility shall be comfortably heated and cooled with temperatures within the normal comfort zone and have a system to eliminate disagreeable odors. It does not state that systems must operate in unoccupied areas. Ventilation rates are covered under the International Mechanical Code which specifies rates based on activity, number of occupants and square footage. This code allows shut down in unoccupied areas and demand response rates when occupied.

ECRM K-5-JJC: Vending Machine Control.

Economics.
Annual Cost Savings = $246
Installed Costs = $620
Simple Payback = 2.5 years
Annual Energy Reduction = 4,111 kWh, -107 therms
Monthly kW Demand Reduction = 0 kW

Summary. Install vendor mizer (occupancy controls) to reduce electric energy consumption while spaces are unoccupied.

Background. The facility has at least four vending machines in the break areas. There are refrigerated cold drink units and snack units. The snack unit draws about 70 Watts and the cold drink unit averages about 400 watts. Control units that the machines can be plugged into are available that will cycle the lights/machine off during low traffic periods while maintaining adequate temperatures to keep the beverages cold. This will save energy by reducing lighting usage, lower heat gain from lighting in the refrigerated units and control cycling of the compressor. The hot beverage unit was not included because adequate information on the water heating system was not available.

Implementation. There are several commercially available control units for refrigerated and non-refrigerated vending machines. Some are simply control units while others will monitor and provide electrical savings. Units are also available for inside and outside locations.

If the vending machines are owned by the county, Patrick recommends that vendor mizer units be installed. If the machines are part of an annual agreement this may need to be a condition of renewal or the machine owner may wish to supply ENERGY STAR rated units.

There is incentive money available through the DCEO that would decrease the payback of this measure to 1.2 years.

Savings. Savings come from reductions in kilowatt hours. Case studies have shown up to a 75% reduction in energy use due to control units. Savings in this ECRM will be based on a 35% reduction.

A packaged system with the control unit that measures savings can be purchased. Since these are essentially plug and play systems, one unit with the measurement capability can be purchased and moved to various units to verify savings. Savings estimates for the refrigerated units are 1,225 kWh and for the snack units is 215 kWh each.

ECRM OM-1-JJC: Plug Load Minimization.

Economics.
Annual Cost Savings = $260
Installed Costs = $0
Simple Payback = 0 years
Annual Energy Reduction = -94 therms, 4,100 kWh

Summary. Juvenile Justice Center has over 30 PCs that do not have the stand-by and/or sleep modes activated. Patrick recommends that the IT department investigates the possibility of activating the stand-by and sleep modes on all PCs, which would save about 100 kWh per year per PC. The sleep function is standard on Energy Star equipment and should not interfere with remote access since the units are not being shut off.

Replacing all appliances and equipment with Energy Star rated equipment as replacements are needed will also reduce energy consumption. Energy Star units typically use at least 10% less energy than the average unit.

Policies regarding use of personal space heaters, dorm refrigerators and radios would impact energy consumption but needs to be balanced against employee morale benefits.

Background. Plug loads in typical office facilities consume 10 to 35% of the total electric consumption. The largest user of this electricity is personal computers and their associated peripherals. This can range from 1,100 kWh per year for a conventional PC and monitor that are never shut off to 180 kWh per year if sleep mode is activated or 270 kWh per year if sleep mode is not activated but units are turned off at night and weekends. Monitoring of plug loads at the Kane County facilities indicate that the unit monitored was shut off at night but sleep mode of the computer was not utilized.

Implementation. IT should be able to program all network enabled PCs to use sleep mode.

Savings. Savings result from reductions in kilowatt hours of about 100 kWh per year per PC plus interactions with heating and cooling.

JUDICIAL CENTER

Facility Information. The Judicial Center is the primary court facility for Kane County. It is a four-story structure with multiple courtrooms on each floor, the associated judges' chambers and jury rooms, public defenders offices, states attorneys offices and the Circuit Clerk's offices. It has 186,000 square feet of conditioned space. It was opened in 1992.

Building Envelope. The building is masonry walls with multiple insulation layers and steel studs with insulation and wallboard interior. The windows are thermo-pane with low emmissivity coatings. The windows are in good condition.

Occupancy Patterns. The building is occupied approximately 10 hours per day, Monday through Saturday, and 4 to 8 hours on Sunday. A staff of 240 occupy the building on a typical workday.

Energy Consuming Systems.

Primary Heating. Heating is provided by 5 supply air fans conditioning vertical quadrants of the building. The fan motors are variable speed drive with reheat coils in each final VAV box zone. The heating hot water is supplied by a modular system of boilers.

There is some radiant heat along the corridors acting as lobby areas for the courtrooms. A smaller system conditions the dining area and the child care area.

Primary Cooling. Cooling is provided by two 300 ton York centrifugal units with variable speed drives. These units are water cooled. The Integrated Part Load Value (IPLV) is estimated at 0.64 kW per ton.

Domestic Hot Water. Domestic hot water is provided by 2 heaters with circulating pumps.

Lighting System. The lighting is primarily T8 fluorescent.

Exit signs are a mixture of 8 watt fluorescent or LED fixtures.

Exterior lighting is metal halide to illuminate the walls and to light the parking areas.

Other Equipment and Systems. The facility has a kitchen and dining area to serve meals. This area has several vending machines.

A list of plug load equipment is included in Exhibit 3.

Feasible ECRMs. The following section of the report describes ECRMs and presents a summary listing of the key economic factors for consideration. For each ECRM, certain basic data was utilized and assumptions made to arrive at the projected savings.

The following ECRMs were analyzed for this building:

1. L-1 Linear Fluorescent Lighting Retrofit
2. L-2 Incandescent Lamp Replacement
3. L-3 Exit Sign Retrofit/Replacement
4. L-4 Occupancy Sensors
5. L-5 Exterior Lighting Retrofit
6. L-6 Install Photocell on Exterior Lighting
7. L-7 Daylight Harvesting
8. L-9 Bi-Level Stairwell Lighting
9. K-3 Outside Air Control
10. K-4 Replace Energy Management System
11. K-5 Vending Machine Control
12. OM-1 Plug Loads

All are recommended.

Basis for Energy Cost Savings Calculations. The utility costs used in this report to calculate cost savings were provided by taking an average of the per kWh or per therm cost over the last year as listed on the utility bills provided.

Project Cost Estimates for ECRMs. The economics of each ECRM were calculated as simple payback, the period of time (in years) that allows the annual savings to equal the estimated capital cost.

ECRM L-1-JC: Linear Fluorescent Lighting Retrofit.

Economics.
Annual Cost Savings = $3,325
Installed Costs = $21,003
Simple Payback = 6.3 years
Annual Energy Reduction = 55,522 kWh, -1,451 therms
Monthly kW Demand Reduction = 17 kW

Summary. Replace all the existing T8 fluorescent lamps with T8 High Lumen (RW) (28 watt) lamps and electronic ballasts.

Background. JJC has 1,517 fixtures. Converting these to T8 RW will save lighting energy and dollars.

Implementation. Because the linear fluorescent in the Judicial Center is already in the form of T8 lamps, the payback is not as desirable as for the other buildings with older lighting equipment. However, the lamps being used are standard 32 watt T8s with an approximate mean lumen output of 2,660 lumens. By relamping the fixtures with 28 watt T8 lamps, the lumen output would be comparable, but the energy required to power the fixtures would decrease.

If a total relamp of the Judicial Center were pursued and incentives of $1.00 per lamp replaced are available through DCEO, payback will decrease to 5.3 years.

As an alternative to a total relamp, the County could choose to phase out the standard 32 watt lamps and replace them with the high lumen 28 watt lamps as the old ones burn out. This would ultimately result in the same energy savings without the upfront capital investment.

The complete list of current and proposed fixtures and their locations can be seen in Exhibit 1. The estimated capital cost covers the cost of the lamps and assumes installation by an electrician.

Savings. Savings result from reductions in kilowatt hours. The reduction in kilowatt hours was calculated by taking the difference in wattages between the existing and the proposed lamps. Where the space is interior, the lighting retrofit savings are adjusted for heating and cooling interaction.

ECRM L-2-JC: Incandescent Lamp Replacement.

Economics.
Annual Cost Savings = $464
Installed Costs = $585
Simple Payback = 1.3 years
Annual Energy Reduction = 7,744 kWh, -202 therms
Monthly kW Demand Reduction = 3 kW

Summary. Replace all incandescent lamps throughout the conditioned areas with CFLs.

Background. JC has at least 39 incandescent PAR lamps in recessed or "can" fixtures that are not on dimmers. Incandescent lamps last between 750 to 1000 hours and use four times the energy of the CFL replacement. Commercial grade CFLs have an estimated life of 10,000 hours.

Implementation. Install 15 watt CFL for the 60 watt standard incandescent lamps; 20 watt CFLs for the 75 watt, 26 watt CFL for the 100 watt lamps and 40 watt CFL for the 150 watt incandescent.

Savings. Savings come from reductions in kWh. Cooling and heating interactions are taken into account in the calculations.

ECRM L-3-JC: Exit Sign Retrofit/Replacement.

Economics.
Annual Cost Savings = $155
Installed Costs = $600
Simple Payback = 3.9
Annual Energy Reduction = 2,592 kWh, -68 therms
Monthly kW Demand Reduction = 0.3 kW

Summary. Complete the replacement of exit signs with LED exit signs.

Background. There are over 20 exit signs in the building that still need to be converted to LED.

Implementation. Replace the 20 exit fixtures with new LED fixtures that draw less than 1 watt per fixture. Savings are based on reductions in wattages and are based on kWh charges. Costs are based on vendor quotes and assume contractor installation.

The reduction in kilowatt hours was calculated between the fluorescent fixtures and LED fixtures.

The space is interior; therefore the lighting retrofit savings are adjusted for heating and cooling interaction.

ECRM L-4-JC: Occupancy Sensors.

Economics.
Annual Cost Savings = $2,316.61
Installed Costs = $19,430
Simple Payback = 8.4 years
Annual Energy Reduction = 108,793 kWh, -1,011 therms
Monthly kW Demand Reduction = 0 kW

Summary. Replace on-off wall switches in the offices and other selected spaces with infrared and/or ultrasonic motion sensors wall switches to reduce electric energy consumption. This ECRM should be limited to offices, maintenance areas, locker rooms, restrooms and storage areas.

Background. There are two types of occupancy sensors that are generally used, ultrasonic and passive infrared. Ultrasonic sensors fill the room with high-frequency sound; movement causes the reflected sound to have a frequency shift, which in turn sets off the sensor. Because it does not rely on "line-of-sight" this type of sensor is well suited to areas with tall obstacles.

(Ultrasonic sensors are not to be confused with acoustic sensors that require a person to make noise in order to be detected.) Passive infrared sensors rely on moving body heat. To be seen, the person must move between the "vanes" created by the sensor's lens.

The estimated capital cost is based on 241 sensors and includes contractor installation of a single sensor installed as a wall switch replacement in the smaller rooms. Wall switch replacements could be readily accomplished by in-house staff.

Implementation. Throughout this facility on-off wall switches are used to control lights in the offices, maintenance areas, locker rooms and restrooms. Therefore a 25% to 40% reduction in operating hours was used in the savings calculation based on the Occupancy Sensors fact sheet included in Exhibit 4. The savings in this ECRM assume the T8s have been converted to RWs and the incandescents replaced by CFLs or T-8s.

Savings. Savings come from reductions in kilowatt hours. Heating and cooling interaction is taken into account in the savings estimates.

ECRM L-5-JC: Exterior Lighting Retrofit.

Economics.
Annual Cost Savings = $2,499
Installed Costs = $10,620
Simple Payback = 4.3 years
Annual Energy Reduction = 29,395 kWh

Summary. Replace existing wall illumination and the parking lot lamps with pulse start fixtures.

Background. There are about thirty-three 250 watt metal halide lamps in the parking lot and twenty-six 250 watt metal halide units used to illuminate the exterior of this facility. These should be replaced with 150 watt Pulse Start MH fixtures which have higher light lumen maintenance levels over the bulb life.

Implementation. Replace the fixtures on a one-for-one basis. The new units should fit in the existing hardware. The estimated capital cost covers lamps and ballast for the proposed retrofit. The cost also includes labor and contractor installation. If all proposed lamps are replaced, the project is expected to have a 4.3 years. payback.

Savings. Savings come from reductions in kilowatt hours. Monthly demand reductions are again based on the difference between the current and the proposed fixtures.

The space is exterior; therefore the lighting retrofit savings need no modification.

ECRM L-6-JC: Photocell Control on Exterior Lighting.

Economics.
Annual Cost Savings = $348
Installed Costs = $680
Simple Payback = 2.0 years
Annual Energy Reduction = 4,092 kWh
Monthly kW Reduction = 0 kW

Summary. Install master photocell control to turn the exterior wall and parking lots light fixtures on and off as required by ambient light. These lights are currently controlled by a timer.

Background. The exterior lights illuminating the building and the parking lots are controlled through a time clock that must be adjusted to keep the on/off sequence close to sunrise and sunset. The installation of a master photocell control at the facility to control the exterior lights will negate the need for programming changes and allow control to be based on ambient light levels.

Implementation. A master photocell to measure ambient light should be installed and the reading fed into the present relay to turn on the exterior lights as needed. One unit should be all that is needed to control the lights. The master unit should be mounted to the roof at an open, un-shaded location.

The estimated capital cost covers the cost of the photocell, installation and an estimate of programming costs.

Savings. Savings come from reductions in kilowatt hours. Sunrise and sunset varies from 5:30am and 8:30pm in June to 7:30am to 4:30pm in December. Savings are based on a reduction of one hour a day.

Savings are calculated assuming the exterior lights have been retrofitted to pulse start metal halides.

The space is exterior; therefore the lighting retrofit savings need no modification.

ECRM L-7-JC: Daylight Harvesting.

Economics.
Annual Cost Savings = $1,487
Installed Costs = $13,320
Simple Payback = 9.0 years
Annual Energy Reduction = 24,823 kWh, -648 therms
Monthly kW Demand Reduction = 0 kW

Summary. The corridors outside the courtrooms face the southwest and are therefore an excellent candidate for daylight harvesting. Automatic controls should be installed to dim the lights or turn them on or off based on ambient light levels.

Background. There are three corridor areas outside the courtroom entrance on each floor that are separately switched. Each corridor should have a photo sensor installed along with dimming ballasts in the fluorescent fixtures. Each sensor would control 14 fixtures. The Chicago area has sunshine 57% of the time therefore one can estimate a 57% reduction in operating hours of these lights during daylight hours.

Implementation. Install dimming ballasts in the fluorescent fixtures to enable varying light output based on feedback from photo sensors that measure the ambient light. These photo sensors can be used to control select types of fixtures or all of the fixtures. Savings are based on a 57% reduction in operating time for all the courtroom hallway fixtures and an average daylight time of 12 hours per day. Costs are based on vendor quotes and assume contractor installation.

Savings. Savings come from reductions in kilowatt hours. The space is interior; therefore the lighting retrofit savings are adjusted for heating and cooling interaction.

Basis for Cost Estimate. The costs are based on 3 courtroom lobby areas per floor, 4 levels, thereby 12 control units are needed. There are 14 fixtures per controlled area requiring a dimming ballast for a total of 168 dimming ballasts. Prices were based on a verbal quote from a lighting vendor.

ECRM L-9-JC: Bi-Level Stairwell Lighting.

Economics.
Annual Cost Savings = $728
Installed Costs = $3,040
Simple Payback = 4.2 years
Annual Energy Reduction = 11,707 kWh, -728 therms
Monthly kW Demand Reduction = 0 kW

Summary. Replace the stairwell lighting fixtures with T-8 fixtures that incorporate dimming ballast and occupancy sensors. By dimming the fixtures during unoccupied times, a large portion of energy is saved. A full-output equipment failure mode is standard. The dimmed light level is estimated to be 10% of full output.

Background. This facility has 16 fluorescent light fixtures in stairwells that run continuously due to code requirements. Replace the entire fixtures with new T-8 fixtures that incorporate a dimming ballast and occupancy sensors. These fixtures are available prepackaged and in

studies at Universities have shown a reduction in kWh exceeding 90% versus standard fixtures left on 24/7.

Implementation. All stairwell fixtures should be replaced. The fixtures will be mounted the same location as the current fixtures.

The estimated capital cost includes the fixtures and lamps for the proposed retrofits. Installation by a contractor is assumed.

Savings. Savings come from reductions in kilowatt hours due to the occupancy and dimming control.

Where the space is interior, the lighting retrofit savings are adjusted for heating and cooling interaction.

Basis for Cost Estimates. The cost is based on vendor's price sheets for units with varying turndown rates.

Requirements. The Code used is International Building Code 2003 which requires continuous operation of lighting in exit routes and a minimum level of 1 foot candle (fc). The bi-level fixtures can be used if a minimum light level exceeding 1 fc is demonstrated. Verification with the local code authority is recommended prior to implementation.

ECRM K-3-JC: Outside Air Control.

Economic.
Annual Cost Savings = $38,000
Installed Costs = $25,000
Simple Payback = 0.7 year
Annual Energy Reduction = 95,000 kWh, 31,700 therms
Monthly kW Demand Reduction = 0 kW

Summary. Install sensors and/or program the EMS to reduce outside air intake to the minimum needed to meet codes thereby reducing energy consumption.

Background. The facility has at four large air handlers with variable speed supply and return fans and a smaller system with variable speed supply and return fans to ventilate the dining room and kitchen. The fans, their respective maximum cfm and minimum outside air intake are listed in the table below.

Fan Airflow					
Air Handling Unit	Supply Air Cfm Max	Return Air Cfm Max	Outside Air Cfm min	Supply Fan hp	Return Fan hp
1	31,624	31,624	14,066	50	40
2	34,303	31,624	17,669	50	40
3	36,626	31,624	11,250	50	50
4	29,273	29,273	11,250	50	40
5	14,250	10,700	4,300	15	7.5
TOTALS			58,535		

These fans are presently operated from 6:00am to 9:30pm, seven days per week. The cost of conditioning each 1,000 cfm of outside air based on these operating parameters is $964 per year. Controlling the amount of outside air either by a programmed number of people in the building or by demand ventilation control based on CO_2 monitoring can reduce this volume significantly.

The current International Mechanical Code bases outside air ventilation, if not controlled by a demand response set-up, on number of people, number of restroom facilities and building square footage. The current number of employees in the building is about 240 at 5 cfm is 1,200 cfm. The building square footage times 0.06 cfm/ft² is 11,160 cfm. If one assumes a busy court day of 100 per court room adds about 1,200 people or another 6,000 cfm places the outside air requirement at about 18,360 cfm maximum. This indicates that, with a properly designed damper system and controls, one should be able to reduce the outside air by about 40,000 cfm and more when the building is at lower occupancy rates. That 40,000 cfm equates to a reduction of over $38,000 in utility bills.

Implementation. Each fan system could either have a CO_2 monitor installed in a strategic location or multiple sensors per fan system to control the outside air to the minimum needed. Alternatively the EMS could be programmed based on maximum estimates of people in the building.

Savings. Savings come from reductions in kilowatt hours to cool the air stream and natural gas needed to heat it.

ECRM K-4-JC: Replacement EMS System.

Economics.
Annual Cost Savings = $4,142
Installed Costs = $400,000
Simple Payback = 96.6 year
Annual Energy Reduction = 13,236 kWh, 3,143 therms
Monthly kW Demand Reduction = 0 kW

Summary. The existing STEAFA EMS system is original to the building and replacement components and manufacturer support are increasingly difficult to obtain. A replacement on a point by point basis is being investigated by staff. A new system would enable communication with the central EMS system and allow for expansion of system capabilities and control options.

Background. The facility has a STAEFA EMS system now that is antiquated. The system is being used at present to operate the building's 5 air handlers from 6am to 9:30pm with low temperature sensors to provide freeze protection. The systems currently operate based a design minimum outside air component and sensors which modulate total supply air flow based on a positive indoor building differential pressure. The 4 large air handlers have variable speed supply and return fans. A smaller system ventilates the dining room and kitchen.

A replacement system would be user friendly, have graphical displays with readings and allow operators to modify settings that more accurately reflect the operation of the building regarding occupied hours and temperature settings.

Implementation. Replace the current system on a point by point basis as proposed. Incorporate programming features to allow optimum start/stop, include outside air control from K-3, and fine tuning of temperature settings in the building.

Savings. Savings come from reductions in kilowatt hours to cool the building and natural gas needed to heat it. The savings from K-3 on outside air control could be programmed into this system versus sensors in high occupancy areas.

Basis for Cost. The cost estimate is based on conversations with building control vendors.

ECRM K-5-JC: Vending Machine Control.

Economics.
Annual Cost Savings = $471
Installed Costs = $960
Simple Payback = 2.0 years
Annual Energy Reduction = 5,545 kWh
Monthly kW Demand Reduction = 0 kW

Summary. Install vendor mizer (occupancy controls) to reduce electric energy consumption while spaces are unoccupied.

Background. The facility has at least seven vending machines in the break areas. There are refrigerated cold drink units, snack units and hot beverage units. The snack unit draws about 70 watts and the cold drink unit averages about 400 watts. Control units that the machines can be plugged into are available that will cycle the lights/machine off during low traffic periods while maintaining adequate temperatures to keep the beverages cold. This will save energy by

reducing lighting usage, lower heat gain from lighting in the refrigerated units and control cycling of the compressor. The hot beverage unit was not included because adequate information on the water heating system was not available.

Implementation. There are several commercially available control units for refrigerated and non-refrigerated vending machines. Some are simply control units while others will monitor and provide electrical savings. Units are also available for inside and outside locations.

If the vending machines are owned by the county, Patrick recommends that vendor mizer units be installed. If the machines are part of an annual agreement this may need to be a condition of renewal or the machine owner may wish to supply ENERGY STAR rated units.

There is incentive money available through the DCEO that would decrease the payback of this measure to 1.3 years.

Savings. Savings come from reductions in kilowatt hours. Case studies have shown up to a 75% reduction in energy use due to control units. Savings in this ECRM will be based on a 35% reduction.

A packaged system with the control unit that measures savings can be purchased. Since these are essentially plug and play systems, one unit with the measurement capability can be purchased and moved to various units to verify savings.

Savings estimates for the refrigerated units are 1,225 kWh each and estimates for the snack units are 215 kWh each.

ECRM OM-1-JC: Plug Load Minimization.

Economics.
Annual Cost Savings = $1,583
Installed Costs = $0
Simple Payback = 0 years
Annual Energy Reduction = 26,421 kWh, -690 therms
Monthly kW Demand Reduction = 0 kW

Summary. The IT department should investigate the possibility of activating the stand-by sleep modes on all PCs. This should not interfere with remote access since the units are not being shut off. This would save about 100 kWh per year per PC. This facility has over 250 PCs. The sleep function is standard on Energy Star equipment.

Replacing all appliances and equipment with Energy Star rated equipment as replacements are needed will also reduce energy consumption. Energy Star units typically use at least 10% less energy than the average unit.

Policies regarding use of personal space heaters, dorm refrigerators and radios would impact energy consumption but needs to be balanced against employee morale benefits.

Background. Plug loads in typical office facilities can consume 10 to 35% of the electric consumption. The largest user of this electricity is personal computers and their associated peripherals. This can range from 1,100 kWh per year for a conventional PC and monitor never being shut off to 180 kWh per year if sleep mode is activated to 270 kWh per if sleep mode is not activated but units are turned off at night and weekends. Monitoring of plug loads indicate the unit monitored was shut off at night but sleep mode of the computer was not utilized.

The other large user was a personal space heater which had a usage of over 2 kWh per day. Each personal space heater is using about 250 kWh each year.

Implementation. IT should be able to program all network enabled PCs to use sleep mode.

Savings. Savings result from reductions in kilowatt hours of about 100 kWh per year per PC and include interactions with the heating and cooling systems.

PUBLIC HEALTH - 1240 HIGHLAND

Facility Information. Health Department-Aurora South at 1240 Highland is a two-story office building with a basement. It consists of 18,500 square feet of conditioned space.

Building Envelope. This site was not visited by Patrick but the review of the utility bills indicated that the master metering concept needed to be investigated.

Occupancy Patterns. The office portion of the building is occupied approximately 10 hours per day, Monday through Friday, and seven hours on Saturday. There are 87 employees at this site.

Feasible ECRMs. The following section of the report describes identified ECRMs and presents a summary listing of the key economic factors for consideration. For each ECRM, certain basic data was utilized and assumptions made to arrive at the projected savings.

Basis for Energy Cost Savings Calculations. The utility costs used in this report to calculate cost savings were provided by taking an average of the per kWh or per therm cost over the last year as listed on the utility bills provided.

Project Cost Estimates for ECRMs. The economics of each ECRM were calculated as simple payback, the period of time (in years) that allows the annual savings to equal the estimated capital cost.

ECRM O-1: Master Meter.

Economics.
Annual Cost Savings = $3,648
Estimated Installation Costs = $15,000
Simple Payback = 4.1 years

*Summary***.** Patrick recommends that KANE COUNTY consider installing a master meter to eliminate 16 facility charges each month that are included in the bill. There are currently 17 meters read and summarized together.

The ComEd External Affairs representative for Kane County was contacted to determine if this concept is feasible.

This facility was initially a medical office building with 17 suites for doctors. Each suite had its own electric meter.

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EXHIBIT 1

LIGHTING INFORMATION

Juvenile Justice Center - Lighting Input

Wattages				
Fixture Type	**# of Lamps**	**Lamp Wattage**	**Ballast Factor**	**Fixture Wattage**
4-foot 1-lamp 32W Std T8	1	32	1.00	32
4-foot 2-lamp 32W Std T8	2	32	1.00	64
4-foot 3-lamp 32W Std T8	3	32	1.00	96
4-foot 4-lamp 32W Std T8	4	32	1.00	128
4-foot 1-lamp 32W HP T8	1	32	0.88	28
4-foot 2-lamp 32W HP T8	2	32	0.88	56
4-foot 3-lamp 32W HP T8	3	32	0.88	84
4-foot 4-lamp 32W HP T8	4	32	0.88	113
4-foot 1-lamp 28W HL T8	1	28	1.00	28
4-foot 2-lamp 28W HL T8	2	28	1.00	56
4-foot 3-lamp 28W HL T8	3	28	1.00	84
4-foot 4-lamp 28W HL T8	4	28	1.00	112
4-foot 1-lamp 34W Std T12	1	34	1.10	37.4
4-foot 2-lamp 34W Std T12	2	34	1.10	74.8
4-foot 3-lamp 34W Std T12	3	34	1.10	112.2
4-foot 4-lamp 34W Std T12	4	34	1.10	149.6
4-foot 2-lamp 31W U-bend T8	2	31	1.00	62
4-foot 3-lamp 31W U-bend T8	3	31	1.00	93
2-foot 2-lamp 17W T8	2	17	1.00	34

Hours of Operation				
Room Type	**Hrs/ Day**	**Days/Wk**	**Wks/ Yr**	**Annual Hours**
L = Living Sace	15.0	7.0	52	5460
G = Gym	8.0	5.5	52	2288
0 = Offices, Classroom	9.0	5.0	52	2340
CF = Conference Rooms, Storage	4.0	5.0	52	1040
C = Common Areas (break, copy, etc.)	14.0	5.0	52	3640
H = Halls & Lobbys	14.0	5.5	52	4004
RR = Restrooms	9.0	5.5	52	2574
M = Mechanical/ Electrical Rooms	14.0	5.0	52	3640

* Pricing includes cost to recycle old lamps or ballasts

L1: Linear Fluorescent Lighting Retrofit (Juvenile Justice Center)							
		Present Lighting			Proposed Lighting		
Room	Space Type	Qty	Fixture	Watts	Qty	Fixture	Watts
Stairwell	H	5	4-foot 1-lamp Std 34W T12	37.4	5	4-foot 1-lamp RW T8	28
Stairwell	H	5	4-foot 1-lamp Std 34W T12	37.4	5	4-foot 1-lamp RW T8	28
Stairwell	H	5	4-foot 1-lamp Std 34W T12	37.4	5	4-foot 1-lamp RW T8	28
M100	M	2	4-foot 1-lamp Std 34W T12	37.4	2	4-foot 1-lamp RW T8	28
		2					
BOILER RM	M	4	4-foot 2-lamp 34W T12	74.8	4	4-foot 2-lamp RW T8	56
ELECT CLOSET	M	1	4-foot 2-lamp 34W T12	74.8	1	4-foot 2-lamp RW T8	56
HOUSE STORAGE	CF	2	4-foot 2-lamp 34W T12	74.8	2	4-foot 2-lamp RW T8	56
JANITOR	CF	1	4-foot 2-lamp 34W T12	74.8	1	4-foot 2-lamp RW T8	56
JANITOR	CF	2	4-foot 2-lamp 34W T12	74.8	2	4-foot 2-lamp RW T8	56
LOADING	CF	3	4-foot 2-lamp 34W T12	74.8	3	4-foot 2-lamp RW T8	56
M1	O	1	4-foot 2-lamp 34W T12	74.8	1	4-foot 2-lamp RW T8	56
M101	O	3	4-foot 2-lamp 34W T12	74.8	3	4-foot 2-lamp RW T8	56
M102	O	2	4-foot 2-lamp 34W T12	74.8	2	4-foot 2-lamp RW T8	56
M106	O	2	4-foot 2-lamp 34W T12	74.8	2	4-foot 2-lamp RW T8	56
M108	O	1	4-foot 2-lamp 34W T12	74.8	1	4-foot 2-lamp RW T8	56
M111	O	2	4-foot 2-lamp 34W T12	74.8	2	4-foot 2-lamp RW T8	56
M112	O	1	4-foot 2-lamp 34W T12	74.8	1	4-foot 2-lamp RW T8	56
M113	O	1	4-foot 2-lamp 34W T12	74.8	1	4-foot 2-lamp RW T8	56
M114	O	1	4-foot 2-lamp 34W T12	74.8	1	4-foot 2-lamp RW T8	56
MANTRAP	CF	1	4-foot 2-lamp 34W T12	74.8	1	4-foot 2-lamp RW T8	56
MEN	RR	1	4-foot 2-lamp 34W T12	74.8	1	4-foot 2-lamp RW T8	56
MEN	RR	2	4-foot 2-lamp 34W T12	74.8	2	4-foot 2-lamp RW T8	56
REFFER HALL	C	3	4-foot 2-lamp 34W T12	74.8	3	4-foot 2-lamp RW T8	56
RESTROOM	RR	1	4-foot 2-lamp 34W T12	74.8	1	4-foot 2-lamp RW T8	56
RESTROOM	RR	1	4-foot 2-lamp 34W T12	74.8	1	4-foot 2-lamp RW T8	56
RESTROOM	RR	1	4-foot 2-lamp 34W T12	74.8	1	4-foot 2-lamp RW T8	56
RESTROOM	RR	3	4-foot 2-lamp 34W T12	74.8	3	4-foot 2-lamp RW T8	56
SALLYPORT	C	9	4-foot 2-lamp 34W T12	74.8	9	4-foot 2-lamp RW T8	56
SHOWER	RR	3	4-foot 2-lamp 34W T12	74.8	3	4-foot 2-lamp RW T8	56
SLOP	CF	1	4-foot 2-lamp 34W T12	74.8	1	4-foot 2-lamp RW T8	56
STAFF	C	3	4-foot 2-lamp 34W T12	74.8	3	4-foot 2-lamp RW T8	56
TELEPHONE	C	1	4-foot 2-lamp 34W T12	74.8	1	4-foot 2-lamp RW T8	56
VEST C HALL	H	4	4-foot 2-lamp 34W T12	74.8	4	4-foot 2-lamp RW T8	56
VISITORS HALL	H	7	4-foot 2-lamp 34W T12	74.8	7	4-foot 2-lamp RW T8	56
WOMEN	RR	1	4-foot 2-lamp 34W T12	74.8	1	4-foot 2-lamp RW T8	56
WOMEN	RR	2	4-foot 2-lamp 34W T12	74.8	2	4-foot 2-lamp RW T8	56
		71					
1.1	L	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56
1.2	L	7	4-foot 3-lamp 34W T12	112.2	7	4-foot 2-lamp RW T8 w/ Refl	56
12B	C	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56
AD101	O	4	4-foot 3-lamp 34W T12	112.2	4	4-foot 2-lamp RW T8 w/ Refl	56
AD102	O	2	4-foot 3-lamp 34W T12	112.2	2	4-foot 2-lamp RW T8 w/ Refl	56
AD103	O	2	4-foot 3-lamp 34W T12	112.2	2	4-foot 2-lamp RW T8 w/ Refl	56
AD104	O	2	4-foot 3-lamp 34W T12	112.2	2	4-foot 2-lamp RW T8 w/ Refl	56
AD105	O	3	4-foot 3-lamp 34W T12	112.2	3	4-foot 2-lamp RW T8 w/ Refl	56
AD106	O	2	4-foot 3-lamp 34W T12	112.2	2	4-foot 2-lamp RW T8 w/ Refl	56
ADMIN	O	3	4-foot 3-lamp 34W T12	112.2	3	4-foot 2-lamp RW T8 w/ Refl	56
BREAK RM	C	6	4-foot 3-lamp 34W T12	112.2	6	4-foot 2-lamp RW T8 w/ Refl	56
COURT SECURITY	C	2	4-foot 3-lamp 34W T12	112.2	2	4-foot 2-lamp RW T8 w/ Refl	56
CR201	O	2	4-foot 3-lamp 34W T12	112.2	2	4-foot 2-lamp RW T8 w/ Refl	56
CR202	O	2	4-foot 3-lamp 34W T12	112.2	2	4-foot 2-lamp RW T8 w/ Refl	56
CR203	O	4	4-foot 3-lamp 34W T12	112.2	4	4-foot 2-lamp RW T8 w/ Refl	56
CR204	O	6	4-foot 3-lamp 34W T12	112.2	6	4-foot 2-lamp RW T8 w/ Refl	56
CR205	O	2	4-foot 3-lamp 34W T12	112.2	2	4-foot 2-lamp RW T8 w/ Refl	56
FILE	C	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56
FILE 2	C	3	4-foot 3-lamp 34W T12	112.2	3	4-foot 2-lamp RW T8 w/ Refl	56
FS102	C	2	4-foot 3-lamp 34W T12	112.2	2	4-foot 2-lamp RW T8 w/ Refl	56
FS103	C	3	4-foot 3-lamp 34W T12	112.2	3	4-foot 2-lamp RW T8 w/ Refl	56
GYM	G	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56
HALL	H	64	4-foot 3-lamp 34W T12	112.2	64	4-foot 2-lamp RW T8 w/ Refl	56
HALL	H	4	4-foot 3-lamp 34W T12	112.2	4	4-foot 2-lamp RW T8 w/ Refl	56
HALL	H	13	4-foot 3-lamp 34W T12	112.2	13	4-foot 2-lamp RW T8 w/ Refl	56
HALL	H	4	4-foot 3-lamp 34W T12	112.2	4	4-foot 2-lamp RW T8 w/ Refl	56
HB101	O	2	4-foot 3-lamp 34W T12	112.2	2	4-foot 2-lamp RW T8 w/ Refl	56
HOME BOUND	C	6	4-foot 3-lamp 34W T12	112.2	6	4-foot 2-lamp RW T8 w/ Refl	56
LA101	C	5	4-foot 3-lamp 34W T12	112.2	5	4-foot 2-lamp RW T8 w/ Refl	56
LA102	O	2	4-foot 3-lamp 34W T12	112.2	2	4-foot 2-lamp RW T8 w/ Refl	56
LADIES LOCKER	RR	9	4-foot 3-lamp 34W T12	112.2	9	4-foot 2-lamp RW T8 w/ Refl	56

MANTRAP	C	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56
MEN	RR	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56
MENS LOCKER	RR	5	4-foot 3-lamp 34W T12	112.2	5	4-foot 2-lamp RW T8 w/ Refl	56
OBSERVATION	C	3	4-foot 3-lamp 34W T12	112.2	3	4-foot 2-lamp RW T8 w/ Refl	56
PD OFFICER	O	2	4-foot 3-lamp 34W T12	112.2	2	4-foot 2-lamp RW T8 w/ Refl	56
PD201	O	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56
PD202	O	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56
PD203	O	2	4-foot 3-lamp 34W T12	112.2	2	4-foot 2-lamp RW T8 w/ Refl	56
PD204	O	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56
PD205	O	4	4-foot 3-lamp 34W T12	112.2	4	4-foot 2-lamp RW T8 w/ Refl	56
POD3	O	7	4-foot 3-lamp 34W T12	112.2	7	4-foot 2-lamp RW T8 w/ Refl	56
PUBLIC DEFENDER	O	2	4-foot 3-lamp 34W T12	112.2	2	4-foot 2-lamp RW T8 w/ Refl	56
RECEPTION	O	6	4-foot 3-lamp 34W T12	112.2	6	4-foot 2-lamp RW T8 w/ Refl	56
RECEPTION	O	4	4-foot 3-lamp 34W T12	112.2	4	4-foot 2-lamp RW T8 w/ Refl	56
RESTROOM	RR	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56
RESTROOM	RR	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56
RESTROOM	RR	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56
RESTROOM	RR	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56
RESTROOM	RR	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56
RESTROOM	RR	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56
SA BREAK	C	2	4-foot 3-lamp 34W T12	112.2	2	4-foot 2-lamp RW T8 w/ Refl	56
SA202	O	2	4-foot 3-lamp 34W T12	112.2	2	4-foot 2-lamp RW T8 w/ Refl	56
SA203	O	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56
SA204	O	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56
SA205	O	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56
SA206	O	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56
SA210	O	4	4-foot 3-lamp 34W T12	112.2	4	4-foot 2-lamp RW T8 w/ Refl	56
STORAGE	CF	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56
STORAGE	CF	5	4-foot 3-lamp 34W T12	112.2	5	4-foot 2-lamp RW T8 w/ Refl	56
STORAGE	CF	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56
VISITOR 1B	C	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56
VISITORS WAIT	C	4	4-foot 3-lamp 34W T12	112.2	4	4-foot 2-lamp RW T8 w/ Refl	56
WOMEN	RR	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56
		241					
1A	L	6	4-foot 4-lamp 34W T12	149.6	6	4-foot 2-lamp RW T8 w/ Refl	56
1A1	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
1A2	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
1A3	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
1A4	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
1A5	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
1A6	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
1A7	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
1A8	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
1B	L	6	4-foot 4-lamp 34W T12	149.6	6	4-foot 2-lamp RW T8 w/ Refl	56
1B1	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
1B2	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
1B3	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
1B4	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
1B5	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
1B6	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
1B7	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
1B8	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
3A	L	6	4-foot 4-lamp 34W T12	149.6	6	4-foot 2-lamp RW T8 w/ Refl	56
3A1	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
3A2	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
3A3	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
3A4	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
3A5	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
3A6	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
3A7	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
3A8	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
3B	L	6	4-foot 4-lamp 34W T12	149.6	6	4-foot 2-lamp RW T8 w/ Refl	56
3B1	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
3B2	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
3B3	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
3B4	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
3B5	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
3B6	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
3B7	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
3B8	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
3C	L	6	4-foot 4-lamp 34W T12	149.6	6	4-foot 2-lamp RW T8 w/ Refl	56
3C1	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
3C2	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56

3C3	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
3C4	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
3C5	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
3C6	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
3C7	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
3C8	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
4A	L	6	4-foot 4-lamp 34W T12	149.6	6	4-foot 2-lamp RW T8 w/ Refl	56
4A1	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
4A2	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
4A3	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
4A4	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
4A5	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
4A6	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
4A7	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
4A8	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
4B	L	6	4-foot 4-lamp 34W T12	149.6	6	4-foot 2-lamp RW T8 w/ Refl	56
4B1	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
4B2	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
4B3	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
4B4	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
4B5	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
4B6	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
4B7	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
4B8	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
4C	L	6	4-foot 4-lamp 34W T12	149.6	6	4-foot 2-lamp RW T8 w/ Refl	56
4C1	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
4C2	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
4C3	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
4C4	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
4C5	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
4C6	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
4C7	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
4C8	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
ADMISSIONS	O	10	4-foot 4-lamp 34W T12	149.6	10	4-foot 2-lamp RW T8 w/ Refl	56
ADMISSIONS INTERV	O	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
CLASS 1	O	6	4-foot 4-lamp 34W T12	149.6	6	4-foot 2-lamp RW T8 w/ Refl	56
CLASS 2	O	6	4-foot 4-lamp 34W T12	149.6	6	4-foot 2-lamp RW T8 w/ Refl	56
CLASS 4	O	6	4-foot 4-lamp 34W T12	149.6	6	4-foot 2-lamp RW T8 w/ Refl	56
COMPUTER LAB	O	6	4-foot 4-lamp 34W T12	149.6	6	4-foot 2-lamp RW T8 w/ Refl	56
DINING 1	C	4	4-foot 4-lamp 34W T12	149.6	4	4-foot 2-lamp RW T8 w/ Refl	56
DINING 2	C	8	4-foot 4-lamp 34W T12	149.6	8	4-foot 2-lamp RW T8 w/ Refl	56
DRYER	C	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
EXAM	O	4	4-foot 4-lamp 34W T12	149.6	4	4-foot 2-lamp RW T8 w/ Refl	56
FS101	C	13	4-foot 4-lamp 34W T12	149.6	13	4-foot 2-lamp RW T8 w/ Refl	56
FS103	C	3	4-foot 4-lamp 34W T12	149.6	3	4-foot 2-lamp RW T8 w/ Refl	56
GH1	O	2	4-foot 4-lamp 34W T12	149.6	2	4-foot 2-lamp RW T8 w/ Refl	56
GH2	O	2	4-foot 4-lamp 34W T12	149.6	2	4-foot 2-lamp RW T8 w/ Refl	56
H1	H	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
H2	H	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
HALL	H	22	4-foot 4-lamp 34W T12	149.6	22	4-foot 2-lamp RW T8 w/ Refl	56
HALL	H	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
I101	O	2	4-foot 4-lamp 34W T12	149.6	2	4-foot 2-lamp RW T8 w/ Refl	56
LIBRARY	C	6	4-foot 4-lamp 34W T12	149.6	6	4-foot 2-lamp RW T8 w/ Refl	56
M1	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
M2	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
M3	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
MANTRAP	C	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
MED STORAGE	CF	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
MEDICAL	O	5	4-foot 4-lamp 34W T12	149.6	5	4-foot 2-lamp RW T8 w/ Refl	56
MULTI RM	L	6	4-foot 4-lamp 34W T12	149.6	6	4-foot 2-lamp RW T8 w/ Refl	56
OBS1	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
OBS2	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
OBS3	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
OBS4	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
OBS5	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
OFFICE	O	2	4-foot 4-lamp 34W T12	149.6	2	4-foot 2-lamp RW T8 w/ Refl	56
SALLYPORT SEARCH	O	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56
SHIFT SUPER	O	6	4-foot 4-lamp 34W T12	149.6	6	4-foot 2-lamp RW T8 w/ Refl	56
TEACHER	O	2	4-foot 4-lamp 34W T12	149.6	2	4-foot 2-lamp RW T8 w/ Refl	56
VESTIBULE A	C	3	4-foot 4-lamp 34W T12	149.6	3	4-foot 2-lamp RW T8 w/ Refl	56

L2: Incandescent & CFL Lamp Replacement (Juvenile Justice Center)							
		Present Lighting			Proposed Lighting		
Room	Space Type	Qty	Fixture	Watts	Qty	Fixture	Watts
SHOWER	C	4	100W Incandescent	100	4	26W CFL	26
CONTROL RM	C	12	50W Incandescent	50	12	13W CFL	13
OBS1		1	7W CFL Night Light	7	1	1W LED Night Light	1
OBS2		1	7W CFL Night Light	7	1	1W LED Night Light	1
OBS3		1	7W CFL Night Light	7	1	1W LED Night Light	1
OBS4		1	7W CFL Night Light	7	1	1W LED Night Light	1
OBS5		1	7W CFL Night Light	7	1	1W LED Night Light	1
Cells	L	80	7W CFL Night Light	7	80	1W LED Night Light	1

L4: Occupancy Sensors (Juvenile Justice Center)		
Room Type	**Number of Sensors**	**Sensor Type**
Existing Restrooms	20	Ceiling IR
Existing Offices	52	Wall Switch IR
Existing Mechanical Rooms	3	Wall Switch IR
Existing Visitor's Areas	3	Combination
Existing Break Rooms	5	Wall Switch IR
Existing File Rooms	2	Wall Switch IR
Existing Misc Common Rooms	9	Wall Switch IR

Proposed Restrooms	20	Ceiling IR
Proposed Offices	52	Wall Switch IR
Proposed Mechanical Rooms	3	Wall Switch IR
Proposed Visitor's Areas	3	Combination
Proposed Break Rooms	5	Wall Switch IR
Proposed File Rooms	2	Wall Switch IR
Proposed Misc Common Rooms	9	Wall Switch IR

L5: Exterior Lighting Retrofit (Juvenile Justice Center)							
		Present Lighting			Proposed Lighting		
Option	Location	Qty	Fixture	Watts	Qty	Fixture	Watts
1	Exterior Parking Lot	32	250W MH	295	32	150W Pulse Start MH Retrofit	190
1	Exterior Wall Packs	40	150W MH	190	40	100W Pulse Start MH Retrofit	128

L8: High Bay Lighting Replacement (Juvenile Justice Center)							
		Present Lighting			Proposed Lighting		
Option	Location	Qty	Fixture	Watts	Qty	Fixture	Watts
3	Gym	9	400W Metal Halide	458	9	4-foot 4-lamp T5 HO Fixtures	216

Judicial Center - Lighting Input

Wattages				
Fixture Type	**# of Lamps**	**Lamp Wattage**	**Ballast Factor**	**Fixture Wattage**
4-foot 1-lamp 32W Std T8	1	32	1.00	32
4-foot 2-lamp 32W Std T8	2	32	1.00	64
4-foot 3-lamp 32W Std T8	3	32	1.00	96
4-foot 4-lamp 32W Std T8	4	32	1.00	128
4-foot 1-lamp 32W HP T8	1	32	0.88	28.16
4-foot 2-lamp 32W HP T8	2	32	0.88	56.32
4-foot 3-lamp 32W HP T8	3	32	0.88	84.48
4-foot 4-lamp 32W HP T8	4	32	0.88	112.64
4-foot 1-lamp 28W HL T8	1	28	1.00	28
4-foot 2-lamp 28W HL T8	2	28	1.00	56
4-foot 3-lamp 28W HL T8	3	28	1.00	84
4-foot 4-lamp 28W HL T8	4	28	1.00	112
4-foot 1-lamp 34W Std T12	1	34	1.10	37.4
4-foot 2-lamp 34W Std T12	2	34	1.10	74.8
4-foot 3-lamp 34W Std T12	3	34	1.10	112.2
4-foot 4-lamp 34W Std T12	4	34	1.10	149.6
4-foot 2-lamp 31W U-bend T8	2	31	1.00	62
4-foot 3-lamp 31W U-bend T8	3	31	1.00	93
2-foot 2-lamp 17W T8	2	17	1.00	34

Hours of Operation				
Room Type	**Hrs/ Day**	**Days/Wk**	**Wks/ Yr**	**Annual Hours**
CR = Courtrooms	8.0	5.5	52	2288
0 = Offices	9.0	5.0	52	2340
CF = Conference Rooms, Storage	4.0	5.0	52	1040
C = Common Areas (break, copy, etc.	14.0	5.0	52	3640
H = Halls & Lobbys	14.0	5.5	52	4004
RR = Restrooms	9.0	5.5	52	2574
M = Mechanical/ Electrical Rooms	14.0	5.0	52	3640

L1: Linear Fluorescent Lighting Retrofit (Judicial Center)								
			Present Lighting			Proposed Lighting		
Line	Room	Space Type	Qty	Fixture	Watts	Qty	Fixture	Watts
1	CR201	CR	10	4-foot 1-lamp Std 32W T8	32	10	Relamp w/ RW 28W T8	28
2	CR203	CR	6	4-foot 1-lamp Std 32W T8	32	6	Relamp w/ RW 28W T8	28
3	CR209	CR	6	4-foot 1-lamp Std 32W T8	32	6	Relamp w/ RW 28W T8	28
4	CR217	CR	6	4-foot 1-lamp Std 32W T8	32	6	Relamp w/ RW 28W T8	28
5	CR305	CR	6	4-foot 1-lamp Std 32W T8	32	6	Relamp w/ RW 28W T8	28
6	CR311	CR	6	4-foot 1-lamp Std 32W T8	32	6	Relamp w/ RW 28W T8	28
7	CR313	CR	6	4-foot 1-lamp Std 32W T8	32	6	Relamp w/ RW 28W T8	28
8	CR319	CR	6	4-foot 1-lamp Std 32W T8	32	6	Relamp w/ RW 28W T8	28
9	REST ROOM	RR	1	4-foot 1-lamp Std 32W T8	32	1	Relamp w/ RW 28W T8	28
10	REST ROOM	RR	1	4-foot 1-lamp Std 32W T8	32	1	Relamp w/ RW 28W T8	28
11	REST ROOM	RR	1	4-foot 1-lamp Std 32W T8	32	1	Relamp w/ RW 28W T8	28
12	REST ROOM	RR	1	4-foot 1-lamp Std 32W T8	32	1	Relamp w/ RW 28W T8	28
13	REST ROOM	RR	2	4-foot 1-lamp Std 32W T8	32	2	Relamp w/ RW 28W T8	28
14	REST ROOM	RR	2	4-foot 1-lamp Std 32W T8	32	2	Relamp w/ RW 28W T8	28
15	REST ROOM	RR	2	4-foot 1-lamp Std 32W T8	32	2	Relamp w/ RW 28W T8	28
16	REST ROOM	RR	2	4-foot 1-lamp Std 32W T8	32	2	Relamp w/ RW 28W T8	28
17	RESTROOM	RR	2	4-foot 1-lamp Std 32W T8	32	2	Relamp w/ RW 28W T8	28
18	RESTROOM	RR	2	4-foot 1-lamp Std 32W T8	32	2	Relamp w/ RW 28W T8	28
19	MEN	RR	1	4-foot 1-lamp Std 32W T8	32	1	Relamp w/ RW 28W T8	28
20	WOMEN	RR	1	4-foot 1-lamp Std 32W T8	32	1	Relamp w/ RW 28W T8	28
21	MEN	RR	1	4-foot 1-lamp Std 32W T8	32	1	Relamp w/ RW 28W T8	28
22	WOMEN	RR	1	4-foot 1-lamp Std 32W T8	32	1	Relamp w/ RW 28W T8	28
23	HALL 2ND	H	70	4-foot 1-lamp Std 32W T8	32	70	Relamp w/ RW 28W T8	28
			142					
24	CR303	C	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ RW 28W T8	56
25	REST ROOM	RR	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56
26	REST ROOM	RR	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56
27	B307	CF	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56
28	COPY ROOM	C	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ RW 28W T8	56
29	MAIN AREA	C	68	4-foot 2-lamp Std 32W T8	64	68	Relamp w/ RW 28W T8	56
30	CHAPA	O	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56
31	LL200	C	184	4-foot 2-lamp Std 32W T8	64	184	Relamp w/ RW 28W T8	56
32	PENTHOUSE	M	32	4-foot 2-lamp Std 32W T8	64	32	Relamp w/ RW 28W T8	56
33	RR	RR	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ RW 28W T8	56
34	RR	RR	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ RW 28W T8	56
35	SW Facing Corridor	H	56	4-foot 2-lamp Std 32W T8	64	56	Relamp w/ RW 28W T8	56
36	CS 101	CF	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56
37	CS 104	CF	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56
38	CS 122 & CS 124	O	12	4-foot 2-lamp Std 32W T8	64	12	Relamp w/ RW 28W T8	56
39	Restroom	RR	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56
40	CR 101	CR	6	4-foot 2-lamp Std 32W T8	64	6	Relamp w/ RW 28W T8	56
41	CR 111	CR	6	4-foot 2-lamp Std 32W T8	64	6	Relamp w/ RW 28W T8	56
42	CR 113	CR	6	4-foot 2-lamp Std 32W T8	64	6	Relamp w/ RW 28W T8	56
43	CR 123	CR	6	4-foot 2-lamp Std 32W T8	64	6	Relamp w/ RW 28W T8	56
44	100	C	52	4-foot 2-lamp Std 32W T8	64	52	Relamp w/ RW 28W T8	56
45	101	C	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ RW 28W T8	56
46	103	C	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56
47	104	C	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56
48	Men's RR	RR	3	4-foot 2-lamp Std 32W T8	64	3	Relamp w/ RW 28W T8	56
49	Women's RR	RR	3	4-foot 2-lamp Std 32W T8	64	3	Relamp w/ RW 28W T8	56
50	Men's RR	RR	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ RW 28W T8	56
51	Women's RR	RR	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ RW 28W T8	56
52	B109	O	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56
53	CR 134	CF	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56
54	Main Entry Screening	H	6	4-foot 2-lamp Std 32W T8	64	6	Relamp w/ RW 28W T8	56
55	Main Entry Valence	H	16	4-foot 2-lamp Std 32W T8	64	16	Relamp w/ RW 28W T8	56
56	Kitchen Hood	C	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56
57	Restroom	RR	7	4-foot 2-lamp Std 32W T8	64	7	Relamp w/ RW 28W T8	56
58	Restroom	RR	7	4-foot 2-lamp Std 32W T8	64	7	Relamp w/ RW 28W T8	56
59	Kitchen Offices	O	10	4-foot 2-lamp Std 32W T8	64	10	Relamp w/ RW 28W T8	56
60	CR 001	CR	20	4-foot 2-lamp Std 32W T8	64	20	Relamp w/ RW 28W T8	56
61	Lobby	H	7	4-foot 2-lamp Std 32W T8	64	7	Relamp w/ RW 28W T8	56
62	Hall	H	8	4-foot 2-lamp Std 32W T8	64	8	Relamp w/ RW 28W T8	56
63	Stairwell 1	H	3	4-foot 2-lamp Std 32W T8	64	3	Relamp w/ RW 28W T8	56
64	Women's Restroom	RR	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ RW 28W T8	56

65	Men's Restroom	RR	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ RW 28W T8	56
66	Hall to Maintenance a	H	3	4-foot 2-lamp Std 32W T8	64	3	Relamp w/ RW 28W T8	56
67	Receiving	C	11	4-foot 2-lamp Std 32W T8	64	11	Relamp w/ RW 28W T8	56
68	B 009	C	5	4-foot 2-lamp Std 32W T8	64	5	Relamp w/ RW 28W T8	56
69	CR 011	CR	3	4-foot 2-lamp Std 32W T8	64	3	Relamp w/ RW 28W T8	56
70	CR 009	CR	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56
71	Elevator Machine Roo	M	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56
72	Elevator	H	3	4-foot 2-lamp Std 32W T8	64	3	Relamp w/ RW 28W T8	56
73	B 019	O	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56
74	C 001	CF	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56
75	R 0003	O	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56
76	B 018	O	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56
77	Women's Restroom	RR	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ RW 28W T8	56
78	Men's Restroom	RR	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ RW 28W T8	56
79	Janitor	CF	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56
80	Stairwell	H	3	4-foot 2-lamp Std 32W T8	64	3	Relamp w/ RW 28W T8	56
81	Chiller Room	M	12	4-foot 2-lamp Std 32W T8	64	12	Relamp w/ RW 28W T8	56
82	Boiler Room	M	11	4-foot 2-lamp Std 32W T8	64	11	Relamp w/ RW 28W T8	56
83	Penthouse	M	10	4-foot 2-lamp Std 32W T8	64	10	Relamp w/ RW 28W T8	56
			620					
84	CR201A	CF	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84
85	CR201B	CF	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84
86	CR207	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84
87	CR209	CR	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84
88	CR213	CF	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84
89	CR215	CF	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84
90	CR307	CF	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84
91	CR309	CF	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84
92	CR313HC	CR	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
93	CR315HC	CR	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
94	CR317HC	CR	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
95	CRIMINAL RECEPTION	C	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84
96	GRAND JURY CONF	CF	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84
97	GRAND JURY OFFICE	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84
98	SUPEONA	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84
99	COURT ADMIN	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84
100	CR339	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84
101	ADMIN	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
102	CR335	CF	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84
103	CR333	CF	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84
104	CR331	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84
105	CR329	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84
106	CR327	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84
107	CR325	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84
108	CR323	CF	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84
109	ST ATTORN WAIT	C	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84
110	ST ATTORN RECPT	C	3	4-foot 3-lamp Std 32W T8	96	3	Relamp w/ RW 28W T8	84
111	SA301	C	9	4-foot 3-lamp Std 32W T8	96	9	Relamp w/ RW 28W T8	84
112	SA345	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
113	SA347	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
114	SA349	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
115	SA351	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
116	SA363	O	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84
117	SA361	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
118	SA359	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
119	SA357	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
120	SA364	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
121	SA362	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
122	SA360	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
123	SA358	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
124	SA355	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84
125	SA354	O	3	4-foot 3-lamp Std 32W T8	96	3	Relamp w/ RW 28W T8	84
126	SA352	CF	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
127	SA344	O	3	4-foot 3-lamp Std 32W T8	96	3	Relamp w/ RW 28W T8	84
128	SA342	O	3	4-foot 3-lamp Std 32W T8	96	3	Relamp w/ RW 28W T8	84
129	SA340	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
130	SA338	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
131	COPY RM	C	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
132	SA341A	O	10	4-foot 3-lamp Std 32W T8	96	10	Relamp w/ RW 28W T8	84
133	SA336A	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84

134	CHILD SUPPORT	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
135	GREG SIMS	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
136	DEBURGT	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
137	SA334	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
138	SA328	O	3	4-foot 3-lamp Std 32W T8	96	3	Relamp w/ RW 28W T8	84
139	SA326	O	3	4-foot 3-lamp Std 32W T8	96	3	Relamp w/ RW 28W T8	84
140	SA314	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
141	SA315	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
142	SA313	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
143	SA311	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
144	SA312	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
145	SA308	O	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84
146	SA RECEPTIONIST	C	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84
147	SA	C	3	4-foot 3-lamp Std 32W T8	96	3	Relamp w/ RW 28W T8	84
148	SA322	C	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84
149	SA323	O	3	4-foot 3-lamp Std 32W T8	96	3	Relamp w/ RW 28W T8	84
150	SA321	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
151	SA320	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
152	SA318	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
153	SA319	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
154	SA307	CF	3	4-foot 3-lamp Std 32W T8	96	3	Relamp w/ RW 28W T8	84
155	SA305	O	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84
156	SA304	O	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84
157	PD200	C	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84
158	PD RECEPTIONIST	C	8	4-foot 3-lamp Std 32W T8	96	8	Relamp w/ RW 28W T8	84
159	LIBRARY	O	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84
160	FILE RM	C	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84
161	CUBES	C	6	4-foot 3-lamp Std 32W T8	96	6	Relamp w/ RW 28W T8	84
162	AMATO	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
163	OFFICE 1	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
164	OFFICE	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
165	KERMIE	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
166	HANGER	O	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84
167	PD207	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
168	PD208	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
169	PD209	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84
170	PD210	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
171	PD211	CF	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84
172	PD212	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
173	PD213	C	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
174	PD214	O	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84
175	PD124	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
176	PD220	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84
177	PD221	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
178	PD223	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
179	PD225	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
180	PD224	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
181	PD226	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
182	PD227	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
183	PD228	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
184	PD229	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
185	YOON	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
186	KATHY	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
187	LOREK	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
188	CORNER	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
189	FILE RM 2	C	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84
190	FILE RM 3	C	8	4-foot 3-lamp Std 32W T8	96	8	Relamp w/ RW 28W T8	84
191	STICKER	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
192	JULIA	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
193	PD236	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
194	PD238	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
195	PD240	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
196	HOOK	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
197	PD242	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
198	LAWYERS	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
199	HANGER 2	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
200	PD244	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
201	HALL	H	10	4-foot 3-lamp Std 32W T8	96	10	Relamp w/ RW 28W T8	84
202	COMMON	C	18	4-foot 3-lamp Std 32W T8	96	18	Relamp w/ RW 28W T8	84
203	LL204	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84

204	LL202	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
205	CR235	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84
206	CR233	CF	10	4-foot 3-lamp Std 32W T8	96	10	Relamp w/ RW 28W T8	84
207	CR231	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84
208	CR229	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84
209	CR227	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84
210	CR225	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84
211	CR224	CF	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84
212	CR223	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84
213	STORAGE	CF	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
214	CS 123	O	6	4-foot 3-lamp Std 32W T8	96	6	Relamp w/ RW 28W T8	84
215	CS 125	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
216	CS127	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84
217	CS129	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
218	CS128	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84
219	Conference	CF	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84
220	CS131	O	3	4-foot 3-lamp Std 32W T8	96	3	Relamp w/ RW 28W T8	84
221	Open Area	H	12	4-foot 3-lamp Std 32W T8	96	12	Relamp w/ RW 28W T8	84
222	CS134	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84
223	CS 132	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
224	CS 140	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84
225	CS 142	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84
226	CS 145	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84
227	CS 143	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
228	CS 161	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
229	CS 144	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
230	CS 146	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
231	CS 148	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
232	Open Area	H	9	4-foot 3-lamp Std 32W T8	96	9	Relamp w/ RW 28W T8	84
233	153 Storage	CF	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84
234	CS 151	O	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84
235	CS 149	O	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84
236	CS 115	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84
237	CS 117	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84
238	CS 119	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84
239	CS 121	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84
240	Court Services	C	9	4-foot 3-lamp Std 32W T8	96	9	Relamp w/ RW 28W T8	84
241	Circuit Clerk	O	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84
242	Hall	H	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84
243	CS 105	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
244	CS 106	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
245	CS 107	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
246	CS 108	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
247	CS 109	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
248	CS 111	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
249	CS 113	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
250	CS 115	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
251	CS 117	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
252	CS 118	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
253	CS 120	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
254	111 A	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84
255	111 B	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84
256	123A	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84
257	B107	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84
258	File Room	C	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
259	CR 133	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84
260	CR 135	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84
261	CR 137	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84
262	CR 139	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84
263	CR 141	C	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84
264	CR 143	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84
265	CR 145	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
266	CR 147	O	6	4-foot 3-lamp Std 32W T8	96	6	Relamp w/ RW 28W T8	84
267	Dining Area Entry	C	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84
268	Janitor Closet	CF	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84
269	Security Roll Call	C	6	4-foot 3-lamp Std 32W T8	96	6	Relamp w/ RW 28W T8	84
270	CR 007	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84
271	R 0003	C	12	4-foot 3-lamp Std 32W T8	96	12	Relamp w/ RW 28W T8	84
272	Vault	C	6	4-foot 3-lamp Std 32W T8	96	6	Relamp w/ RW 28W T8	84
273	BR 155	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84

274	BR 157	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84
275	BR 159	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84
276	BR 160	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84
277	BR 174	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84
			601					
278	SA316	C	2	4-foot 4-lamp Std 32W T8	128	2	Relamp w/ RW 28W T8	112
279	Entrance	H	4	4-foot 4-lamp Std 32W T8	128	4	Relamp w/ RW 28W T8	112
280	Kitchen	C	13	4-foot 4-lamp Std 32W T8	128	13	Relamp w/ RW 28W T8	112
			19					

L1: Linear Fluorescent Lighting Retrofit (Judicial Center)

		Present Lighting			Proposed Lighting		
Room	**Space Type**	**Qty**	**Fixture**	**Watts**	**Qty**	**Fixture**	**Watts**
CS 101	CF	2	4-foot 2-lamp Std 32W T8	128	2	Relamp w/ LED linear	60

L2: Incandescent Lamp Replacement (Judicial Center)							
	Space	Present Lighting			Proposed Lighting		
Room	Type	Qty	Fixture	Watts	Qty	Fixture	Watts
CR339	O	10	100W INCANDESCENT	100	10	23W PAR CFL	23
CR336	O	8	100W INCANDESCENT	100	8	23W PAR CFL	23
SA	C	6	100W INCANDESCENT	100	6	23W PAR CFL	23
PD205	O	2	100W INCANDESCENT	100	2	23W PAR CFL	23
CR143	C	5	100W INCANDESCENT	100	5	23W PAR CFL	23
1st Floor Conference	CF	8	100W INCANDESCENT	100	8	23W PAR CFL	23
					39		
CR201		50	150W INCANDESCENT	150	50	No change - on dimmers	150
CR203		31	150W INCANDESCENT	150	31	No change - on dimmers	150
CR209		31	150W INCANDESCENT	150	31	No change - on dimmers	150
CR211		31	150W INCANDESCENT	150	31	No change - on dimmers	150
CR217		31	150W INCANDESCENT	150	31	No change - on dimmers	150
CR305		31	150W INCANDESCENT	150	31	No change - on dimmers	150
CR311		31	150W INCANDESCENT	150	31	No change - on dimmers	150
CR313		31	150W INCANDESCENT	150	31	No change - on dimmers	150
CR319		31	150W INCANDESCENT	150	31	No change - on dimmers	150
SA373		21	150W INCANDESCENT	150	21	No change - on dimmers	150
PD205		2	150W INCANDESCENT	150	2	No change - on dimmers	150
CR 101		21	150W INCANDESCENT	150	21	No change - on dimmers	150
CR 111		18	150W INCANDESCENT	150	18	No change - on dimmers	150
CR 113		18	150W INCANDESCENT	150	18	No change - on dimmers	150
CR 123		18	150W INCANDESCENT	150	18	No change - on dimmers	150

L3: Exit Sign Retrofit/ Replacement (Judicial Center)

Option	Area	Number of Fixtures	Present Fixture Type	Present Fixture Wattage	New Fixture Type	New Fixture Wattage (W)	Demand Reduction per unit (kW)	Energy Use Reduction per unit (kWh/yr)
1	Judicial Center Building	20	8W CFL Exit	16	LED Exit Retrofit	2	0.01	123

L4: Occupancy Sensors (Judicial Center)						
Room Type	**Number of Sensors**	**Load (W)**	**Predicted Savings (%)**	**Time On (hr/year)**	**Electricity Savings (kWh/yr)**	**Sensor Type**
Existing Restrooms	29	3136	40%	2574	3,229	Ceiling IR
Existing Offices	153	38010	25%	2340	22,236	Wall Switch IR
Existing Mechanical Rooms	12	4160	35%	3640	5,300	Combination
Existing Conference Rooms	24	5421	35%	1040	1,973	Wall Switch IR
Existing Break & Misc Common Rms	16	5448	35%	3640	6,941	Wall Switch IR
Existing Copy Rooms	3	1728	35%	3640	2,201	Wall Switch IR
Existing File Rooms	4	382	35%	3640	487	Wall Switch IR
Proposed Restrooms	29	2,744	40%	2574	2,825	Ceiling IR
Proposed Offices	153	33,198	25%	2340	19,421	Wall Switch IR
Proposed Mechanical Rooms	12	3,640	35%	3640	4,637	Combination
Proposed Conference Rooms	24	4,466	35%	1040	1,626	Wall Switch IR
Proposed Break & Misc Common Rms	16	4,524	35%	3640	5,764	Wall Switch IR
Proposed Copy Rooms	3	314	35%	3640	400	Wall Switch IR
Proposed File Rooms	4	1,512	35%	3640	1,926	Wall Switch IR
		50,398				

L5: Exterior Lighting Retrofit (Judicial Center)							
		Present Lighting			Proposed Lighting		
Option	Location	Qty	Fixture	Watts	Qty	Fixture	Watts
1	Exterior Parking Lot	79	250W Metal Halide	295	79	150W Pulse Start MH Retrofit	190
1	Exterior Wall Packs	26	250W Metal Halide	295	26	150W Pulse Start MH Retrofit	190
		105					
2	Exterior Parking Lot	4	250W Metal Halide	295	4	Demonstration 96W LED Shoebox Fixture	96

L6: Photocells on Exterior Fixtures (Judicial Center)				
Option	**Location**	**Nominal Fixture Wattage**	**Load (W)**	**Number of Sensors**
2	Pulse Start MH Exterior Parking Lot	150	15,010	1
2	Pulse Start MH Exterior Wall Packs	150	4,940	1
			19,950	
3	LED Exterior Parking Lot	96	384	NOTE

NOTE: Part of Exterior Parking Lot Circuit above.

Building C - Lighting Input

Wattages				
Fixture Type	# of Lamps	Lamp Wattage	Ballast Factor	Fixture Wattage
4-foot 1-lamp 32W Std T8	1	32	1.00	32
4-foot 2-lamp 32W Std T8	2	32	1.00	64
4-foot 3-lamp 32W Std T8	3	32	1.00	96
4-foot 4-lamp 32W Std T8	4	32	1.00	128
4-foot 1-lamp 32W HP T8	1	32	0.88	28
4-foot 2-lamp 32W HP T8	2	32	0.88	56
4-foot 3-lamp 32W HP T8	3	32	0.88	84
4-foot 4-lamp 32W HP T8	4	32	0.88	113
4-foot 1-lamp 28W HL T8	1	28	1.00	28
4-foot 2-lamp 28W HL T8	2	28	1.00	56
4-foot 3-lamp 28W HL T8	3	28	1.00	84
4-foot 4-lamp 28W HL T8	4	28	1.00	112
4-foot 2-lamp 32W T8-M	2	32	1.10	70
4-foot 4-lamp 32W T8-M	4	32	1.10	141
4-foot 1-lamp 34W Std T12	1	34	1.10	37
4-foot 2-lamp 34W Std T12	2	34	1.10	75
4-foot 3-lamp 34W Std T12	3	34	1.10	112
4-foot 4-lamp 34W Std T12	4	34	1.10	150
8-foot 2-lamp 60W T12	2	60	1.10	132
4-foot 2-lamp 31W U-bend T8	2	31	1.00	62
4-foot 3-lamp 31W U-bend T8	3	31	1.00	93
4-foot 1-lamp 34W U-bend T12	1	34	1.10	37
3-foot 2-lamp 25W Std T12	2	25	1.10	55
3-foot 2-lamp 25W HP T8	2	25	0.88	44
2-foot 2-lamp 17W T8	2	17	1.00	34

Hours of Operation				
Room Type	Hrs/ Day	Days/Wk	Wks/ Yr	Annual Hours
CR = Courtrooms	8.0	5.5	52	2288
O = Offices	9.0	5.0	52	2340
CF = Conference Rooms, Storage	4.0	5.0	52	1040
C = Common Areas (break, copy, etc.	14.0	5.0	52	3640
H = Halls & Lobbys	14.0	5.5	52	4004
RR = Restrooms	9.0	5.5	52	2574
M = Mechanical/ Electrical Rooms	14.0	5.0	52	3640

L1: Linear Fluorescent Lighting Retrofit (Building C)

Line	Room	Present Lighting				Proposed Lighting		
		Space Type	Qty	Fixture	Watts	Qty	Fixture	Watts
1	Elevator Entry	H	1	3-foot 2-lamp 25W T12	55	1	3-foot 2-lamp HP T8	44
2	Mechchanical 1st	M	7	4-foot 1-lamp 34W T12	37	7	4-foot 1-lamp HP T8	28
3	Records	C	30	4-foot 1-lamp 34W T12	37	30	4-foot 1-lamp HP T8	28
4	Elevator	H	1	4-foot 2-lamp 34W T12	75	1	4-foot 2-lamp HP T8	56
5	Lunch	C	1	4-foot 2-lamp 34W T12	75	1	4-foot 2-lamp HP T8	56
6	Stairwell	H	2	4-foot 2-lamp 34W T12	75	2	4-foot 2-lamp HP T8	56
7	Stairwell	H	2	4-foot 2-lamp 34W T12	75	2	4-foot 2-lamp HP T8	56
8	Storage 2nd	CF	5	4-foot 2-lamp 34W T12	75	5	4-foot 2-lamp HP T8	56
9	Assesment	O	33	4-foot 4-lamp 34W T12	150	33	4-foot 2-lamp HP T8 w/ Refl	56
10	Copy	C	5	4-foot 4-lamp 34W T12	150	5	4-foot 2-lamp HP T8 w/ Refl	56
11	IT	O	2	4-foot 4-lamp 34W T12	150	2	4-foot 2-lamp HP T8 w/ Refl	56
12	Lunch	C	6	4-foot 4-lamp 34W T12	150	6	4-foot 2-lamp HP T8 w/ Refl	56
13	Mark	O	5	4-foot 4-lamp 34W T12	150	5	4-foot 2-lamp HP T8 w/ Refl	56
14	Men's Restroom	RR	2	4-foot 4-lamp 34W T12	150	2	4-foot 2-lamp HP T8 w/ Refl	56
15	Men's Restroom	RR	2	4-foot 4-lamp 34W T12	150	2	4-foot 2-lamp HP T8 w/ Refl	56
16	Records	C	33	4-foot 4-lamp 34W T12	150	33	4-foot 2-lamp HP T8 w/ Refl	56
17	Women's Restroom	RR	4	4-foot 4-lamp 34W T12	150	4	4-foot 2-lamp HP T8 w/ Refl	56
18	Women's Restroom	RR	4	4-foot 4-lamp 34W T12	150	4	4-foot 2-lamp HP T8 w/ Refl	56
19	209	O	4	4-foot 2-lamp Std 32W T8	64	4	Relamp w/ high lumen 28W T8	56
20	211	O	21	4-foot 2-lamp Std 32W T8	64	21	Relamp w/ high lumen 28W T8	56
21	212	O	5	4-foot 2-lamp Std 32W T8	64	5	Relamp w/ high lumen 28W T8	56
22	213	O	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ high lumen 28W T8	56
23	214	O	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ high lumen 28W T8	56
24	216	O	6	4-foot 2-lamp Std 32W T8	64	6	Relamp w/ high lumen 28W T8	56
25	217	O	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ high lumen 28W T8	56
26	218	O	5	4-foot 2-lamp Std 32W T8	64	5	Relamp w/ high lumen 28W T8	56
27	219	O	3	4-foot 2-lamp Std 32W T8	64	3	Relamp w/ high lumen 28W T8	56
28	20 Years	O	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ high lumen 28W T8	56
29	211 Hall	H	3	4-foot 2-lamp Std 32W T8	64	3	Relamp w/ high lumen 28W T8	56
30	Break	C	4	4-foot 2-lamp Std 32W T8	64	4	Relamp w/ high lumen 28W T8	56
31	Break Room	C	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ high lumen 28W T8	56

32	Computer Room	O	10	4-foot 2-lamp Std 32W T8	64	10	Relamp w/ high lumen 28W T8	56
33	Conference B	CF	4	4-foot 2-lamp Std 32W T8	64	4	Relamp w/ high lumen 28W T8	56
34	File Room	C	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ high lumen 28W T8	56
35	GIS	O	8	4-foot 2-lamp Std 32W T8	64	8	Relamp w/ high lumen 28W T8	56
36	GIS 2	O	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ high lumen 28W T8	56
37	GIS 3	O	5	4-foot 2-lamp Std 32W T8	64	5	Relamp w/ high lumen 28W T8	56
38	GIS 4	O	3	4-foot 2-lamp Std 32W T8	64	3	Relamp w/ high lumen 28W T8	56
39	Sector 7G	O	3	4-foot 2-lamp Std 32W T8	64	3	Relamp w/ high lumen 28W T8	56
40	Stairway	H	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ high lumen 28W T8	56
41	Stairway	H	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ high lumen 28W T8	56
42	Storage 2nd	CF	7	4-foot 2-lamp Std 32W T8	64	7	Relamp w/ high lumen 28W T8	56
43	Tom	O	5	4-foot 2-lamp Std 32W T8	64	5	Relamp w/ high lumen 28W T8	56
44	Tract Department	O	19	4-foot 3-lamp Std 32W T8	96	19	Relamp w/ high lumen 28W T8	84
45	Board of Review	O	6	4-foot 4-lamp Std 32W T8	128	6	Relamp w/ high lumen 28W T8	112
46	Tract Copy	C	9	4-foot 4-lamp Std 32W T8	128	9	Relamp w/ high lumen 28W T8	112
47	Break Room	C	6	4-foot 2-lamp 31W U-bend T8	62	6	2-foot 2-lamp 17W T8	34
48	Break Room	C	6	4-foot 2-lamp 31W U-bend T8	62	6	2-foot 2-lamp 17W T8	34
49	Common Hall	H	3	4-foot 2-lamp 31W U-bend T8	62	3	2-foot 2-lamp 17W T8	34
50	Hall	H	5	4-foot 2-lamp 31W U-bend T8	62	5	2-foot 2-lamp 17W T8	34
51	Hall	H	10	4-foot 2-lamp 31W U-bend T8	62	10	2-foot 2-lamp 17W T8	34

L2: Incandescent Lamp Replacement (Building C)

Room	Space Type	Present Lighting			Proposed Lighting		
		Qty	Fixture	Watts	Qty	Fixture	Watts
Entry	H	1	25W INCANDESCENT	100	1	9W CFL	9

L3: Exit Sign Retrofit/ Replacement (Building C)

Area	Number of Fixtures	Present Fixture Type	Present Fixture Wattage (W)	New Fixture Type	New Fixture Wattage (W)
Building C	18	8W FL Exit	16	LED	1

L4: Occupancy Sensors (Building C)

Room Type	Number of Sensors	Load (W)	Predicted Savings (%)	Sensor Type
Existing Restrooms	4	1795	0.4	Ceiling IR
Existing Offices	26	14208	0.25	Wall Switch IR
Existing Mechanical Rooms	1	262	0.35	Combination
Existing Conference Rooms	3	1078	0.35	Wall Switch IR
Existing Large Common Rooms	7	7211	0.35	Combination
Existing Break & Misc Common Rms	8	2912	0.35	Wall Switch IR
Proposed Restrooms	4	676	0.4	Ceiling IR
Proposed Offices	26	9449	0.25	Wall Switch IR
Proposed Mechanical Rooms	1	197	0.35	Combination
Proposed Conference Rooms	3	896	0.35	Wall Switch IR
Proposed Large Common Rooms	7	3711	0.35	Combination
Proposed Break & Misc Common Rms	8	1476	0.35	Wall Switch IR

L5: Exterior Lighting Retrofit (Building C)

Option	Location	Present Lighting			Proposed Lighting		
		Qty	Fixture	Watts	Qty	Fixture	Watts
1	East Parking Lot	12	250W Metal Halide	295	12	150W Pulse Start MH Retrofit	190
1	West Decorative Pole	2	150W HPS	190	2	100W Pulse Start MH Retrofit	128
1	Exterior Wall Packs	5	150W Metal Halide	190	5	100W Pulse Start MH Retrofit	128
1	Exterior Door Lights	1	70W Metal Halide	95	1	70W Pulse Start MH Retrofit	95

L6: Photocells on Exterior Fixtures (Building C)

Option	Location	Nominal Fixture Wattage	Load (W)
2	Pulse Start East Parking Lot	150	2280
2	Pulse Start West Decorative Pole	100	256
2	Pulse Start Exterior Wall Packs	100	640
2	Pulse Start Exterior Door Lights	70	95

Building B&I - Lighting Input

Wattages

Fixture Type	# of Lamps	Lamp Wattage	Ballast Factor	Fixture Wattage
4-foot 1-lamp 32W Std T8	1	32	1	32
4-foot 2-lamp 32W Std T8	2	32	1	64
4-foot 3-lamp 32W Std T8	3	32	1	96
4-foot 4-lamp 32W Std T8	4	32	1	128
4-foot 1-lamp 32W HP T8	1	32	0.88	28
4-foot 2-lamp 32W HP T8	2	32	0.88	56
4-foot 3-lamp 32W HP T8	3	32	0.88	84
4-foot 4-lamp 32W HP T8	4	32	0.88	113
4-foot 1-lamp 28W HL T8	1	28	1	28
4-foot 2-lamp 28W HL T8	2	28	1	56
4-foot 3-lamp 28W HL T8	3	28	1	84
4-foot 4-lamp 28W HL T8	4	28	1	112
4-foot 2-lamp 32W T8-M	2	32	1.1	70
4-foot 4-lamp 32W T8-M	4	32	1.1	141
4-foot 1-lamp 34W Std T12	1	34	1.1	37
4-foot 2-lamp 34W Std T12	2	34	1.1	75
4-foot 3-lamp 34W Std T12	3	34	1.1	112
4-foot 4-lamp 34W Std T12	4	34	1.1	150
8-foot 2-lamp 60W T12	2	60	1.1	132
4-foot 2-lamp 31W U-bend T8	2	31	1	62
4-foot 3-lamp 31W U-bend T8	3	31	1	93
4-foot 1-lamp 34W U-bend T12	1	34	1.1	37
2-foot 2-lamp 17W T8	1	17	1	17
2-foot 2-lamp 17W T8	2	17	1	34

Hours of Operation

Room Type	Hrs/ Day	Days/Wk	Wks/ Yr	Annual Hours
CR = Courtrooms	8	5.5	52	2288
0 = Offices	9	5	52	2340
CF = Conference Rooms, Storage	4	5	52	1040
C = Common Areas (break, copy, etc.)	14	5	52	3640
H = Halls & Lobbys	14	5.5	52	4004
RR = Restrooms	9	5.5	52	2574
M = Mechanical/ Electrical Rooms	14	5	52	3640

L1: Linear Fluorescent Lighting Retrofit (Building B&I)

Room	Space Type	Present Lighting			Proposed Lighting		
		Qty	Fixture	Watts	Qty	Fixture	Watts
Back Entrance	H	3	4-foot 2-lamp Std 32W T8	64	3	Relamp w/ high lumen 28W T8	56
Electric Room	M	3	4-foot 2-lamp Std 32W T8	64	3	Relamp w/ high lumen 28W T8	56
Entrance Way	H	10	4-foot 2-lamp Std 32W T8	64	10	Relamp w/ high lumen 28W T8	56
Envelope Supply	C	3	4-foot 2-lamp Std 32W T8	64	3	Relamp w/ high lumen 28W T8	56
Hallway	H	12	4-foot 2-lamp Std 32W T8	64	12	Relamp w/ high lumen 28W T8	56
Printer Room	C	3	4-foot 2-lamp Std 32W T8	64	3	Relamp w/ high lumen 28W T8	56
Records Area	C	82	4-foot 2-lamp Std 32W T8	64	82	Relamp w/ high lumen 28W T8	56
Records Room	C	12	4-foot 2-lamp Std 32W T8	64	12	Relamp w/ high lumen 28W T8	56
Rest Rooms	RR	5	4-foot 2-lamp Std 32W T8	64	5	Relamp w/ high lumen 28W T8	56
Break Room	C	9	4-foot 4-lamp Std 32W T8	128	9	Relamp w/ high lumen 28W T8	112
Conference Room	CF	4	4-foot 4-lamp Std 32W T8	128	4	Relamp w/ high lumen 28W T8	112
Copy Room	C	3	4-foot 4-lamp Std 32W T8	128	3	Relamp w/ high lumen 28W T8	112
Elections Office	O	2	4-foot 4-lamp Std 32W T8	128	2	Relamp w/ high lumen 28W T8	112
Office	O	2	4-foot 4-lamp Std 32W T8	128	2	Relamp w/ high lumen 28W T8	112
Private Office	O	4	4-foot 4-lamp Std 32W T8	128	4	Relamp w/ high lumen 28W T8	112
Private Office	O	4	4-foot 4-lamp Std 32W T8	128	4	Relamp w/ high lumen 28W T8	112
Tax Extension Office	O	2	4-foot 4-lamp Std 32W T8	128	2	Relamp w/ high lumen 28W T8	112
Voting Office	O	3	4-foot 4-lamp Std 32W T8	128	3	Relamp w/ high lumen 28W T8	112
Boiler Room	M	1	4-foot 2-lamp 34W T12	75	1	4-foot 2-lamp HP T8	56
Multi-purpose Room	C	30	4-foot 2-lamp 34W T12	75	30	4-foot 2-lamp HP T8	56
Boiler Alcove	M	1	4-foot 4-lamp 34W T12	150	1	4-foot 2-lamp HP T8 w/ Refl	56
Mens Restroom	RR	2	4-foot 4-lamp 34W T12	150	2	4-foot 2-lamp HP T8 w/ Refl	56
Multi-purpose Room	C	30	4-foot 4-lamp 34W T12	150	30	4-foot 2-lamp HP T8 w/ Refl	56
Records Room	C	12	4-foot 4-lamp 34W T12	150	12	4-foot 2-lamp HP T8 w/ Refl	56
Back Entrance	H	1	4-foot 1-lamp 34W U-bend T12	37	1	2-foot 1-lamp 17W T8	17
Records Room	C	1	4-foot 1-lamp 34W U-bend T12	37	1	2-foot 1-lamp 17W T8	17

L2: Incandescent Lamp Replacement (Building B&I)

Room	Space Type	Present Lighting			Proposed Lighting		
		Qty	Fixture	Watts	Qty	Fixture	Watts
Janitor's Closet	CF	1	100W Incandescent	100	1	23W PAR CFL	23
Head Banger	O	1	100W Incandescent	100	1	23W PAR CFL	23
Stairwell	H	4	25 W Incandescent	25	4	9W CFL	9

L4: Occupancy Sensors (Building B&I)

Room Type	Number of Sensors	Load (W)	Predicted Savings (%)	Time On (hr/year)	Electricity Savings (kWh/yr)	Sensor Type	Capital Cost per Sensor ($)	Labor Cost Per Sensor ($)	Electricity Savings ($)	Total Cost ($)	Payback (Yrs)
Existing Restrooms	2	619	40%	2574	638	Ceiling IR	$80.00	$150.00	$54.19	$460.00	8.5
Existing Offices	6	2176	25%	2340	1,273	Wall Switch IR	$30.00	$20.00	$108.20	$300.00	2.8
Existing Mechanical Rooms	3	416	35%	3640	530	Combination	$80.00	$150.00	$45.09	$690.00	15.3
Existing Conference Rooms	1	512	35%	1040	186	Wall Switch IR	$30.00	$20.00	$15.84	$50.00	3.2
Existing Break & Misc Common Rooms	4	1920	35%	3640	2,446	Wall Switch IR	$30.00	$20.00	$207.92	$200.00	1.0
Existing Large Common Rooms	10	14581	35%	3640	18,576	Combination	$80.00	$20.00	$1,578.93	$1,000.00	0.6
Proposed Restrooms	2	393	40%	2574	404	Ceiling IR	$80.00	$150.00	$34.36	$460.00	13.4
Proposed Offices	6	1,904	25%	2340	1,114	Wall Switch IR	$30.00	$20.00	$94.68	$300.00	3.2
Proposed Mechanical Rooms	3	281	35%	3640	358	Combination	$80.00	$150.00	$30.39	$690.00	22.7
Proposed Conference Rooms	1	448	35%	1040	163	Wall Switch IR	$30.00	$20.00	$13.86	$50.00	3.6
Proposed Break & Misc Common Rooms	4	1,680	35%	3640	2,140	Wall Switch IR	$30.00	$20.00	$181.93	$200.00	1.1
Proposed Large Common Rooms	10	9,375	35%	3640	11,944	Combination	$80.00	$20.00	$1,015.22	$1,000.00	1.0

Option 1: Sensors on Existing Fixtures

Direct Savings Summary		
Electricity Savings	23,649	(kWh/yr)
Total Direct Savings	$1,868.28	($/yr)

HVAC Interaction Summary		
Cooling Load Reduction	2,521	(kWh/yr)
Heating Load Reduction	-740	(therm/yr)
Electricity Savings	$199.15	($/yr)
Natural Gas Savings	-$651.26	($/yr)
Net HVAC Savings	-$452.10	($/yr)

Economic Analysis		
Total Electricity Savings	26,170	(kWh/yr)
Total Natural Gas Savings	-740	(therm/yr)
Net Savings	$1,416.18	($/yr)
Total Cost	$2,700.00	($)
Combined Simple Payback	1.9	(yrs)

Option 2: Sensors on Proposed Fixtures

Direct Savings Summary		
Electricity Savings	16,123	(kWh/yr)
Total Direct Savings	$1,273.70	($/yr)

HVAC Interaction Summary		
Cooling Load Reduction	1,719	(kWh/yr)
Heating Load Reduction	-505	(therm/yr)
Electricity Savings	$135.77	($/yr)
Natural Gas Savings	-$444.00	($/yr)
Net HVAC Savings	-$308.22	($/yr)

Economic Analysis		
Total Electricity Savings	17,841	(kWh/yr)
Total Natural Gas Savings	-505	(therm/yr)
Net Savings	$965.48	($/yr)
Total Cost	$2,700.00	($)
Combined Simple Payback	2.8	(yrs)

Note: The following are energy savings predictions published by EPRI. The predictions fall in the range published by the U.S. EPA.

Private Offices: 25%
Conference Rooms: 35%
Restrooms: 40%

L5: Exterior Lighting Retrofit (Building B&I)

Option	Location	Present Lighting			Proposed Lighting		
		Qty	Fixture	Watts	Qty	Fixture	Watts
1	Gym Exterior Pole Fixture	3	250W Mercury Vapor	295	3	150W Pulse Start MH Retrofit	190
1	Exterior Wall Packs	4	150W MH	190	4	100W Pulse Start MH Retrofit	128

L6: Photocells on Exterior Fixtures (Building B&I)

Option	Location	Nominal Fixture Wattage	Load (W)
2	Pulse Start MH Exterior Wall Packs	100	512

3rd Street Courthouse - Lighting Input

Wattages				
Fixture Type	**# of Lamps**	**Lamp Wattage**	**Ballast Factor**	**Fixture Wattage**
4-foot 1-lamp 32W Std T8	1	32	1.00	32
4-foot 2-lamp 32W Std T8	2	32	1.00	64
4-foot 3-lamp 32W Std T8	3	32	1.00	96
4-foot 4-lamp 32W Std T8	4	32	1.00	128
4-foot 1-lamp 32W HP T8	1	32	0.88	28
4-foot 2-lamp 32W HP T8	2	32	0.88	56
4-foot 3-lamp 32W HP T8	3	32	0.88	84
4-foot 4-lamp 32W HP T8	4	32	0.88	113
4-foot 1-lamp 28W HL T8	1	28	1.00	28
4-foot 2-lamp 28W HL T8	2	28	1.00	56
4-foot 3-lamp 28W HL T8	3	28	1.00	84
4-foot 4-lamp 28W HL T8	4	28	1.00	112
4-foot 2-lamp 32W T8-M	2	32	1.10	70
4-foot 4-lamp 32W T8-M	4	32	1.10	141
4-foot 1-lamp 34W Std T12	1	34	1.10	37
4-foot 2-lamp 34W Std T12	2	34	1.10	75
4-foot 3-lamp 34W Std T12	3	34	1.10	112
4-foot 4-lamp 34W Std T12	4	34	1.10	150
8-foot 2-lamp 60W T12	2	60	1.10	132
4-foot 2-lamp 32W U-bend T8	2	32	1.00	64
4-foot 3-lamp 31W U-bend T8	3	31	1.00	93
4-foot 1-lamp 34W U-bend T12	1	34	1.10	37
2-foot 2-lamp 17W T8	2	17	1.00	34

Hours of Operation				
Room Type	**Hrs/ Day**	**Days/Wk**	**Wks/ Yr**	**Annual Hours**
CR = Courtrooms	8.0	5.5	52	2288
0 = Offices	9.0	5.0	52	2340
CF = Conference Rooms, Storage	4.0	5.0	52	1040
C = Common Areas (break, copy, etc.	14.0	5.0	52	3640
H = Halls & Lobbys	14.0	5.5	52	4004
RR = Restrooms	9.0	5.5	52	2574
M = Mechanical/ Electrical Rooms	14.0	5.0	52	3640

L1: Linear Fluorescent Lighting Retrofit (3rd Street Courthouse)

Line	Room	Space Type	Present Lighting			Proposed Lighting		
			Qty	Fixture	Watts	Qty	Fixture	Watts
1	060	O	6	4-foot 2-lamp Std 32W T8	64	6	Relamp w/ high lumen 28W T8	56
2	461	O	4	4-foot 2-lamp Std 32W T8	64	4	Relamp w/ high lumen 28W T8	56
3	464	O	6	4-foot 2-lamp Std 32W T8	64	6	Relamp w/ high lumen 28W T8	56
4	Boiler House	M	13	4-foot 2-lamp Std 32W T8	64	13	Relamp w/ high lumen 28W T8	56
5	Break Room	C	3	4-foot 2-lamp Std 32W T8	64	3	Relamp w/ high lumen 28W T8	56
6	Hallway	H	14	4-foot 2-lamp Std 32W T8	64	14	Relamp w/ high lumen 28W T8	56
7	315	O	2	4-foot 2-lamp 32W T8-M	70	2	4-foot 2-lamp HP T8	56
8	330	CR	10	4-foot 2-lamp 32W T8-M	70	10	4-foot 2-lamp HP T8	56
9	330 A	O	2	4-foot 2-lamp 32W T8-M	70	2	4-foot 2-lamp HP T8	56
10	330 B	O	2	4-foot 2-lamp 32W T8-M	70	2	4-foot 2-lamp HP T8	56
11	351	O	4	4-foot 2-lamp 32W T8-M	70	4	4-foot 2-lamp HP T8	56
12	Restroom 3rd	RR	1	4-foot 2-lamp 32W T8-M	70	1	4-foot 2-lamp HP T8	56
13	Restroom 4th	RR	2	4-foot 2-lamp 32W T8-M	70	2	4-foot 2-lamp HP T8	56
14	111	O	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ high lumen 28W T8	84
15	121	O	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ high lumen 28W T8	84
16	154	O	6	4-foot 3-lamp Std 32W T8	96	6	Relamp w/ high lumen 28W T8	84
17	311	O	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ high lumen 28W T8	84
18	320	CR	15	4-foot 3-lamp Std 32W T8	96	15	Relamp w/ high lumen 28W T8	84
19	321	O	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ high lumen 28W T8	84
20	410	CR	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ high lumen 28W T8	84
21	432	O	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ high lumen 28W T8	84
22	461	O	10	4-foot 3-lamp Std 32W T8	96	10	Relamp w/ high lumen 28W T8	84
23	462	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ high lumen 28W T8	84
24	Circuit Court	CR	17	4-foot 3-lamp Std 32W T8	96	17	Relamp w/ high lumen 28W T8	84
25	tes Attornet(420-423?)	O	13	4-foot 3-lamp Std 32W T8	96	13	Relamp w/ high lumen 28W T8	84
26	312	O	3	4-foot 4-lamp 32W T8-M	141	3	4-foot 2-lamp HP T8 w/ Refl	56
27	325	O	5	4-foot 4-lamp 32W T8-M	141	5	4-foot 2-lamp HP T8 w/ Refl	56
28	361	O	4	4-foot 4-lamp 32W T8-M	141	4	4-foot 2-lamp HP T8 w/ Refl	56
29	Maint. Shop	C	1	4-foot 1-lamp Std 34W T12	37	1	4-foot 1-lamp HP T8	28
30	Old Chiller Room	M	1	4-foot 1-lamp Std 34W T12	37	1	4-foot 1-lamp HP T8	28
31	112	O	6	4-foot 2-lamp 34W T12	75	6	4-foot 2-lamp HP T8	56
32	160	CR	10	4-foot 2-lamp 34W T12	75	10	4-foot 2-lamp HP T8	56
33	211	O	8	4-foot 2-lamp 34W T12	75	8	4-foot 2-lamp HP T8	56
34	212	O	5	4-foot 2-lamp 34W T12	75	5	4-foot 2-lamp HP T8	56
35	213	O	8	4-foot 2-lamp 34W T12	75	8	4-foot 2-lamp HP T8	56
36	230	CR	15	4-foot 2-lamp 34W T12	75	15	4-foot 2-lamp HP T8	56
37	260	CR	1	4-foot 2-lamp 34W T12	75	1	4-foot 2-lamp HP T8	56
38	263	O	1	4-foot 2-lamp 34W T12	75	1	4-foot 2-lamp HP T8	56
39	353	O	2	4-foot 2-lamp 34W T12	75	2	4-foot 2-lamp HP T8	56
40	354	O	2	4-foot 2-lamp 34W T12	75	2	4-foot 2-lamp HP T8	56
41	363	O	1	4-foot 2-lamp 34W T12	75	1	4-foot 2-lamp HP T8	56
42	440	CR	6	4-foot 2-lamp 34W T12	75	6	4-foot 2-lamp HP T8	56
43	448	O	6	4-foot 2-lamp 34W T12	75	6	4-foot 2-lamp HP T8	56
44	453	O	14	4-foot 2-lamp 34W T12	75	14	4-foot 2-lamp HP T8	56
45	Cave	O	1	4-foot 2-lamp 34W T12	75	1	4-foot 2-lamp HP T8	56
46	Chem Store	CF	2	4-foot 2-lamp 34W T12	75	2	4-foot 2-lamp HP T8	56

47	Hall	H	3	4-foot 2-lamp 34W T12	75	3	4-foot 2-lamp HP T8	56
48	Hallway (454?)	H	8	4-foot 2-lamp 34W T12	75	8	4-foot 2-lamp HP T8	56
49	Ladies Restroom	RR	2	4-foot 2-lamp 34W T12	75	2	4-foot 2-lamp HP T8	56
50	Lock-up	C	7	4-foot 2-lamp 34W T12	75	7	4-foot 2-lamp HP T8	56
51	Maint. Shop	C	4	4-foot 2-lamp 34W T12	75	4	4-foot 2-lamp HP T8	56
52	Restrooms 4th	RR	2	4-foot 2-lamp 34W T12	75	2	4-foot 2-lamp HP T8	56
53	Storage	CF	1	4-foot 2-lamp 34W T12	75	1	4-foot 2-lamp HP T8	56
54	122	O	6	4-foot 4-lamp 34W T12	150	6	4-foot 2-lamp HP T8 w/ Refl	56
55	141	O	8	4-foot 4-lamp 34W T12	150	8	4-foot 2-lamp HP T8 w/ Refl	56
56	142	O	4	4-foot 4-lamp 34W T12	150	4	4-foot 2-lamp HP T8 w/ Refl	56
57	153	O	6	4-foot 4-lamp 34W T12	150	6	4-foot 2-lamp HP T8 w/ Refl	56
58	160	CR	5	4-foot 4-lamp 34W T12	150	5	4-foot 2-lamp HP T8 w/ Refl	56
59	221	O	4	4-foot 4-lamp 34W T12	150	4	4-foot 2-lamp HP T8 w/ Refl	56
60	241	C	18	4-foot 4-lamp 34W T12	150	18	4-foot 2-lamp HP T8 w/ Refl	56
61	242	O	4	4-foot 4-lamp 34W T12	150	4	4-foot 2-lamp HP T8 w/ Refl	56
62	254	O	8	4-foot 4-lamp 34W T12	150	8	4-foot 2-lamp HP T8 w/ Refl	56
63	260	CR	3	4-foot 4-lamp 34W T12	150	3	4-foot 2-lamp HP T8 w/ Refl	56
64	261	O	2	4-foot 4-lamp 34W T12	150	2	4-foot 2-lamp HP T8 w/ Refl	56
65	262	O	1	4-foot 4-lamp 34W T12	150	1	4-foot 2-lamp HP T8 w/ Refl	56
66	430	CR	12	4-foot 4-lamp 34W T12	150	12	4-foot 2-lamp HP T8 w/ Refl	56
67	431	O	5	4-foot 4-lamp 34W T12	150	5	4-foot 2-lamp HP T8 w/ Refl	56
68	440	CR	21	4-foot 4-lamp 34W T12	150	21	4-foot 2-lamp HP T8 w/ Refl	56
69	453	O	5	4-foot 4-lamp 34W T12	150	5	4-foot 2-lamp HP T8 w/ Refl	56
70	462	O	2	4-foot 4-lamp 34W T12	150	2	4-foot 2-lamp HP T8 w/ Refl	56
71	Old Chiller Room	M	1	4-foot 4-lamp 34W T12	150	1	4-foot 2-lamp HP T8 w/ Refl	56
72	Storage	CF	4	4-foot 4-lamp 34W T12	150	4	4-foot 2-lamp HP T8 w/ Refl	56
73	253	O	2	4-foot 4-lamp 40W T12	192	2	4-foot 2-lamp HP T8 w/ Refl	56
74	Record Storage	C	18	4-foot 1-lamp 40W T12	48	18	4-foot 1-lamp HP T8	28
75	Tunnel	H	3	8-foot 2-lamp 60W T12	132	3	4-foot 2-lamp HP T8 w/ Refl	56
76	Storage	CF	4	8-foot 2-lamp 60W T12	132	4	4-foot 2-lamp HP T8 w/ Refl	56
77	111	O	1	4-foot 2-lamp 32W U-bend T8	64	1	2-foot 2-lamp 17W T8	34
78	110	CR	12	4-foot 2-lamp 32W U-bend T8	64	12	2-foot 2-lamp 17W T8	34
79	120	CR	15	4-foot 2-lamp 32W U-bend T8	64	15	2-foot 2-lamp 17W T8	34
80	121	O	1	4-foot 2-lamp 32W U-bend T8	64	1	2-foot 2-lamp 17W T8	34
81	140	CR	18	4-foot 2-lamp 32W U-bend T8	64	18	2-foot 2-lamp 17W T8	34
82	142	O	2	4-foot 2-lamp 32W U-bend T8	64	2	2-foot 2-lamp 17W T8	34
83	153	O	2	4-foot 2-lamp 32W U-bend T8	64	2	2-foot 2-lamp 17W T8	34
84	210	CR	16	4-foot 2-lamp 32W U-bend T8	64	16	2-foot 2-lamp 17W T8	34
85	220	CR	16	4-foot 2-lamp 32W U-bend T8	64	16	2-foot 2-lamp 17W T8	34
86	240	CR	18	4-foot 2-lamp 32W U-bend T8	64	18	2-foot 2-lamp 17W T8	34
87	242	O	2	4-foot 2-lamp 32W U-bend T8	64	2	2-foot 2-lamp 17W T8	34
88	250	CR	17	4-foot 2-lamp 32W U-bend T8	64	17	2-foot 2-lamp 17W T8	34
89	251	O	6	4-foot 2-lamp 32W U-bend T8	64	6	2-foot 2-lamp 17W T8	34
90	360	CR	4	4-foot 2-lamp 32W U-bend T8	64	4	2-foot 2-lamp 17W T8	34
91	360 A	O	4	4-foot 2-lamp 32W U-bend T8	64	4	2-foot 2-lamp 17W T8	34
92	360 Copy	C	4	4-foot 2-lamp 32W U-bend T8	64	4	2-foot 2-lamp 17W T8	34
93	341	O	4	4-foot 2-lamp 32W U-bend T8	64	4	2-foot 2-lamp 17W T8	34
94	340	CR	30	4-foot 2-lamp 32W U-bend T8	64	30	2-foot 2-lamp 17W T8	34
95	342	O	4	4-foot 2-lamp 32W U-bend T8	64	4	2-foot 2-lamp 17W T8	34
96	410	CR	2	4-foot 2-lamp 32W U-bend T8	64	2	2-foot 2-lamp 17W T8	34

97	Jury Lounge	C	8	4-foot 2-lamp 32W U-bend T8	64	8	2-foot 2-lamp 17W T8	34
98	Lock-up	C	5	4-foot 2-lamp 32W U-bend T8	64	5	2-foot 2-lamp 17W T8	34
99	212	O	1	4-foot 2-lamp 34W U-bend T12	82	1	2-foot 2-lamp 17W T8	34
100	221	O	2	4-foot 2-lamp 34W U-bend T12	82	2	2-foot 2-lamp 17W T8	34
101	Restrooms	RR	2	2-foot 2-lamp T8		2	No change	

L2: Incandescent Lamp Replacement (3rd Street Courthouse)

Room	Space Type	Present Lighting			Proposed Lighting		
		Qty	Fixture	Watts	Qty	Fixture	Watts
321	O	1	35 W Incandescent	35	1	9W	9
Hallway	H	6	60 W Incandescent	60	6	13W	13
Restroom 1st	RR	1	67 W Incandescent	67	1	13W	13
263	O	1	67 W Incandescent	67	1	13W	13
440	O	4	R75 W Incandescent	75	4	23W	23
Restroom 3rd	RR	2	100 W Incandescent	100	2	23W PAR CFL	23
Restroom 3rd	RR	2	100 W Incandescent	100	2	23W PAR CFL	23
Restroom 3rd	RR	1	100 W Incandescent	100	1	23W PAR CFL	23
Restroom 3rd	RR	2	100 W Incandescent	100	2	23W PAR CFL	23
Restroom 3rd	RR	2	100 W Incandescent	100	2	23W PAR CFL	23
Storage (030?)	CF	11	200 W Incandescent	200	11	52W	52
Phone Room	C	3	200 W Incandescent	200	3	52W	52
Storage (030?)	CF	1	200 W Incandescent	200	1	52W	52
350	O	16	200 W Incandescent	200	16	52W	52

L4: Occupancy Sensors (3rd St Courthouse)

Room Type	Number of Sensors	Load (W)	Predicted Savings (%)	Sensor Type
Existing Restrooms	4	510.4	0.4	Ceiling IR
Existing Offices	54	22873.6	0.25	Wall Switch IR
Existing Mechanical Rooms	2	1019	0.35	Combination
Existing Storage Areas	4	1350.8	0.35	Wall Switch IR
Existing Large Common Areas	2	3556.8	0.35	Combination
Existing Common Rms	4	1296.6	0.35	Wall Switch IR
Proposed Restrooms	4	394.24	0.4	Ceiling IR
Proposed Offices	54	13656.56	0.25	Wall Switch IR
Proposed Mechanical Rooms	2	812.48	0.35	Combination
Proposed Storage Areas	4	619.52	0.35	Wall Switch IR
Proposed Large Common Area	2	1520.64	0.35	Combination
Proposed Misc Common Rms	4	829.44	0.35	Wall Switch IR

L5: Exterior Lighting Retrofit (3rd St Courthouse)

Option	Location	Present Lighting			Proposed Lighting		
		Qty	Fixture	Watts	Qty	Fixture	Watts
1	Front of Building	24	200W MV	234	24	100 W Pulse Start MH Retrofit	128
1	West Parking Lot	12	100W MV	125	12	70 W Pulse Start MH Retrofit	95
1	West Parking Lot	9	60W MV	82	9	50 W Pulse Start MH Retrofit	72

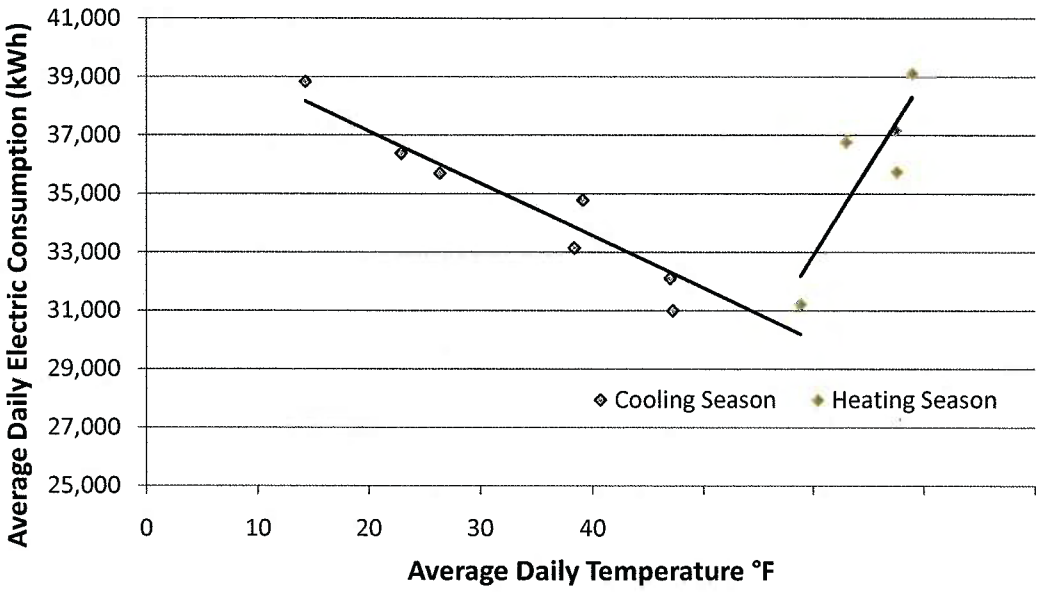
L6: Photocells on Exterior Fixtures (3rd St. Courthouse)

Option	Location	Nominal Fixture Wattage	Load (W)
2	Pulse Start MH Exterior Parking Lot	190	3072
2	Pulse Start MH Exterior Wall Packs	95	1140
2	Pulse Start MH Exterior Wall Packs		648

EXHIBIT 2

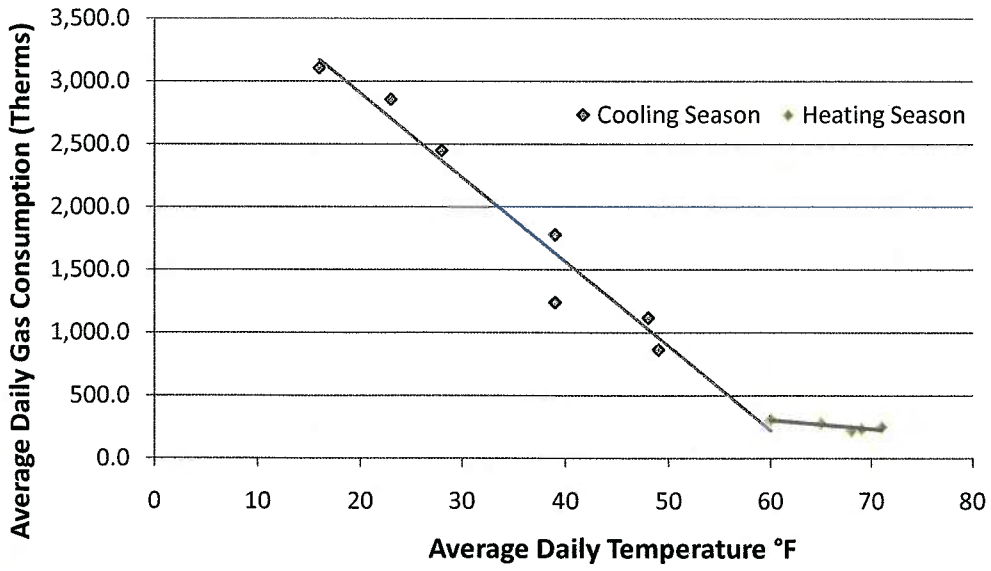
ENERGY CONSUMPTION

Kane County Facilities* Electricity Usage



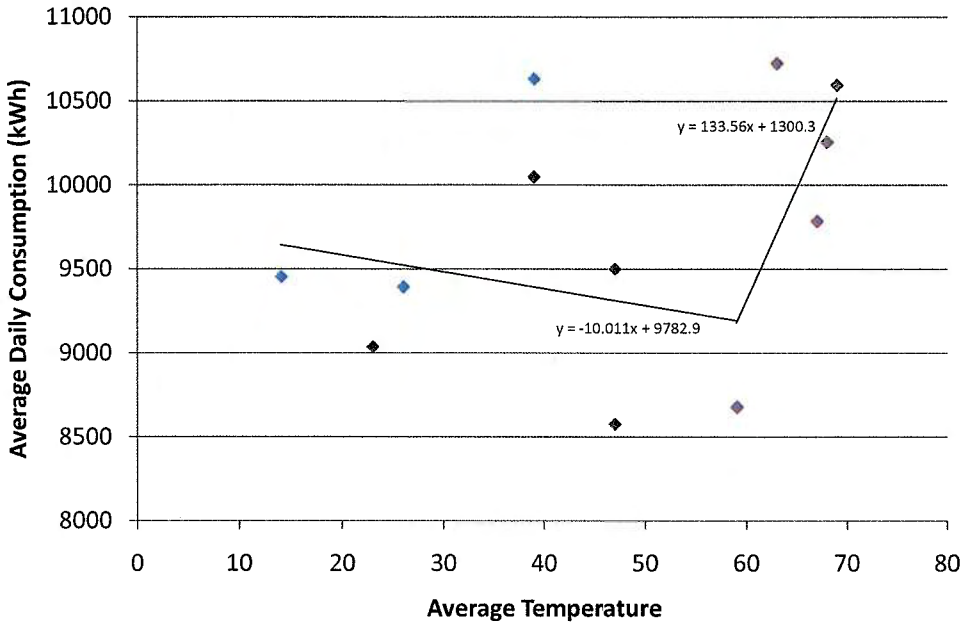
* Includes: 3rd St. Courthouse , 703 E. Fabyan, Circuit Clerk , Government Center, Health Dept 1330, Sheriff's Office/ Jail , Juvenile Justice Center, Judicial Center, New Child Advocacy Center, Old Child Advocacy Center, and Old Corrections

Kane County Facilities* Gas Usage

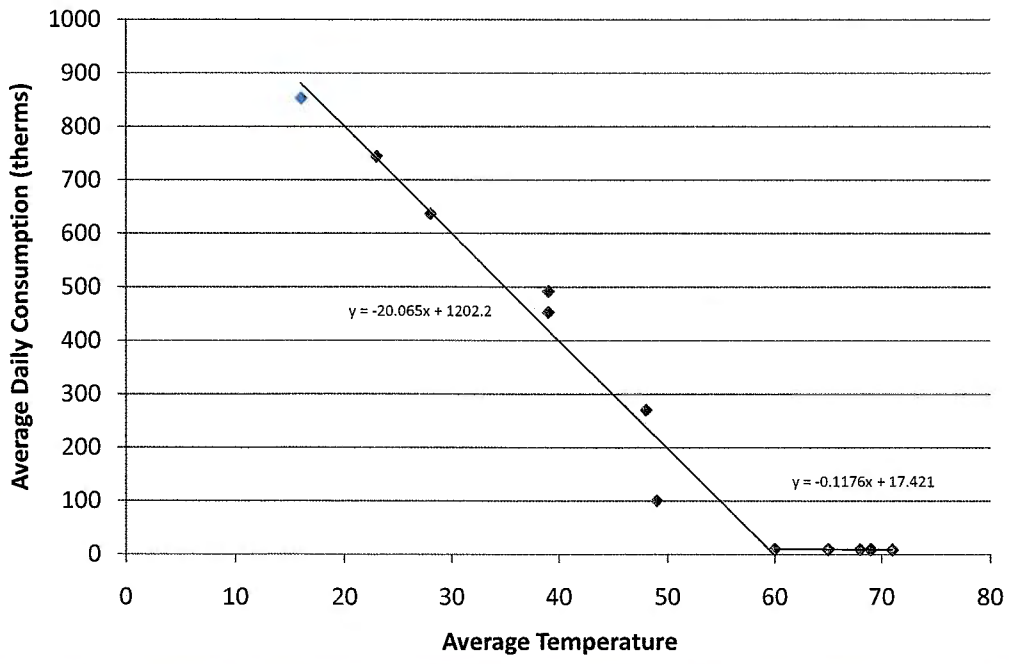


*Includes: 3rd St. Courthouse , Circuit Clerk , Government Center, Sheriff's Office/ Jail , Juvenile Justice Center, Judicial Center

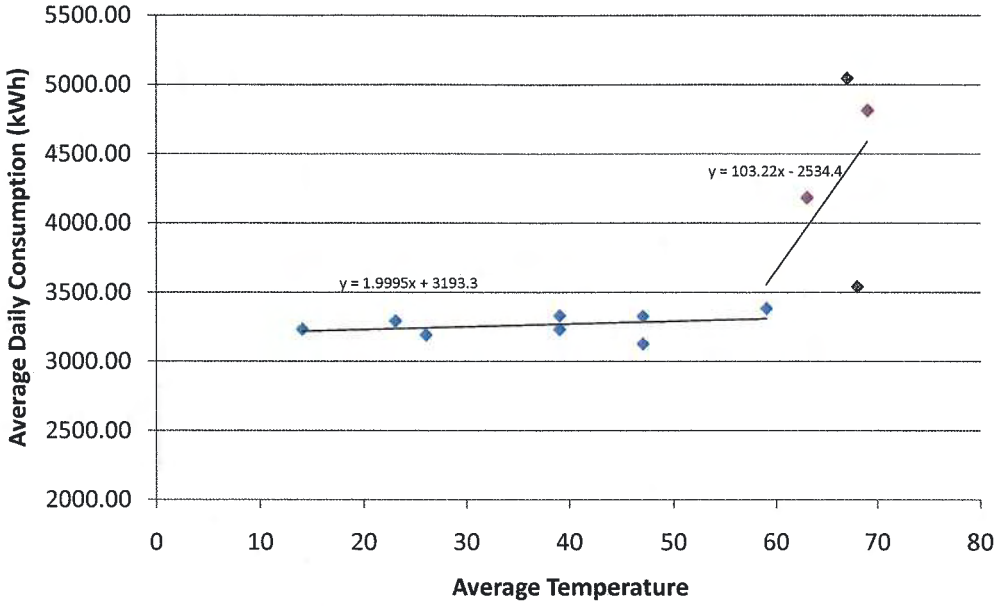
JUDICIAL CENTER (electric)



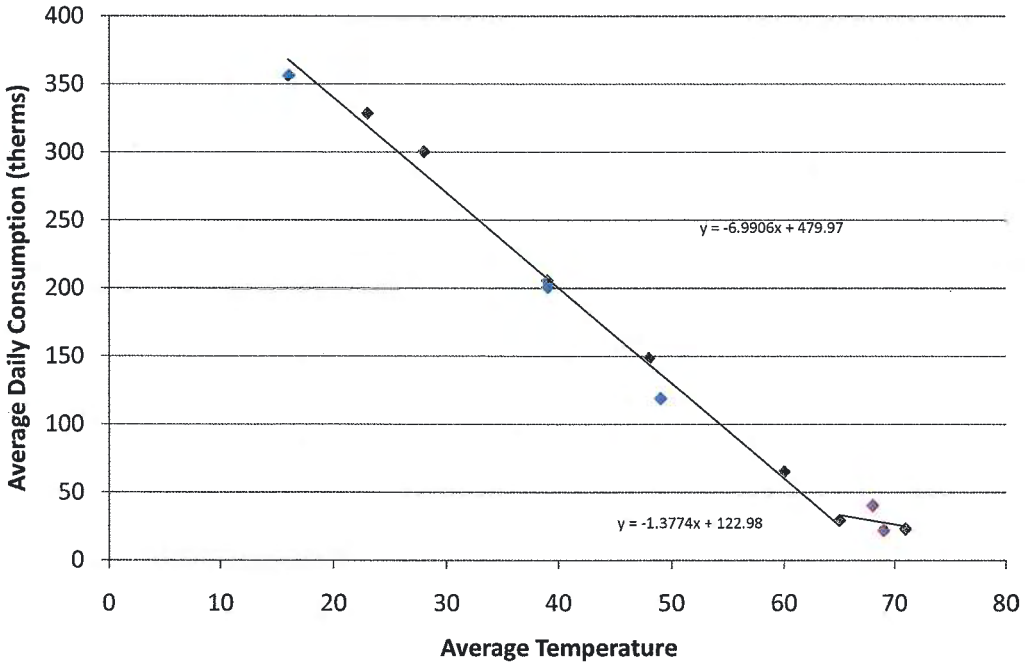
JUDICIAL CENTER (gas)



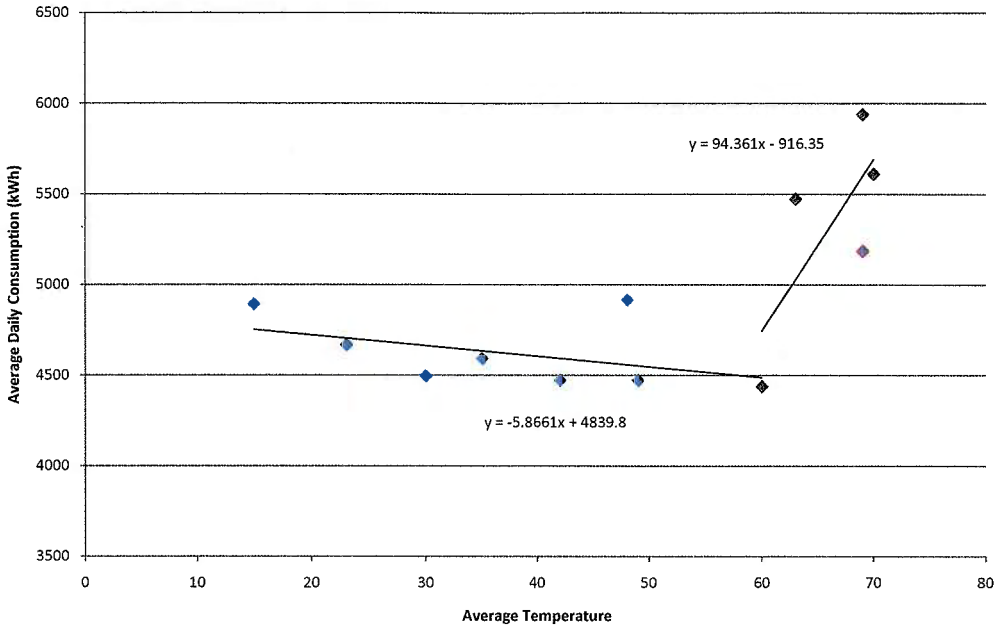
JUVENILE JUSTICE CENTER (electric)



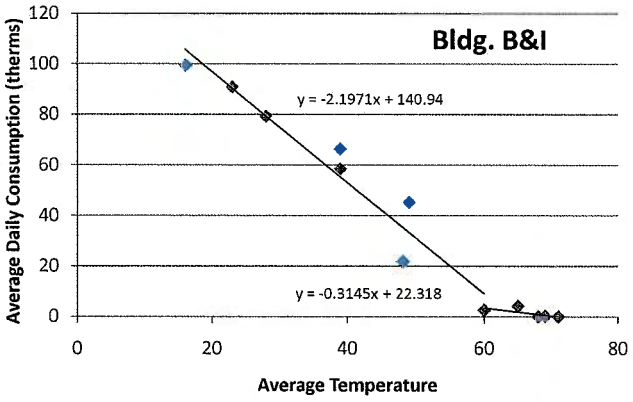
JUVENILE JUSTICE CENTER (gas)

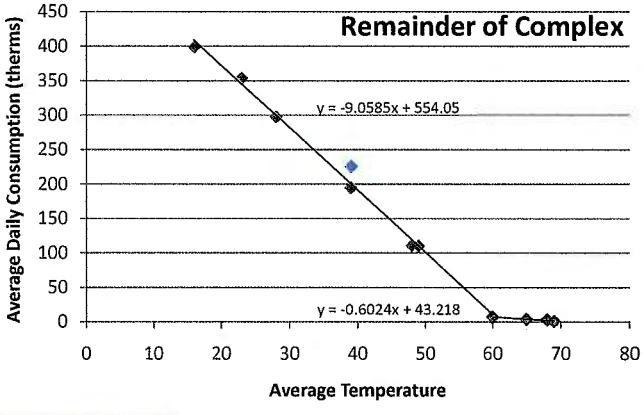


Government Center (electric)

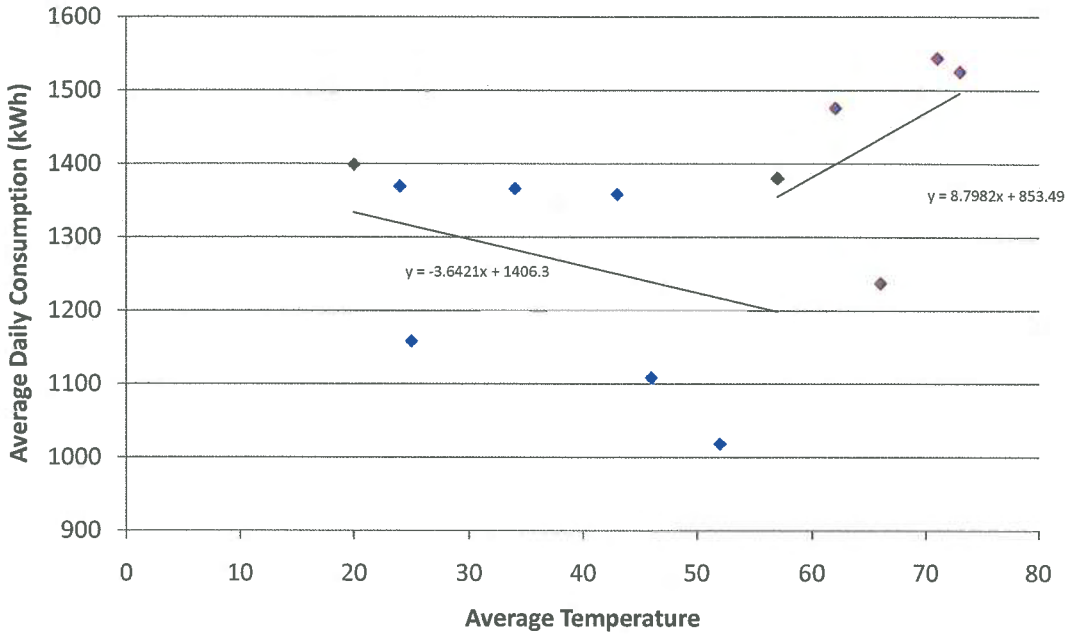


GOVERNMENT CENTER (gas)

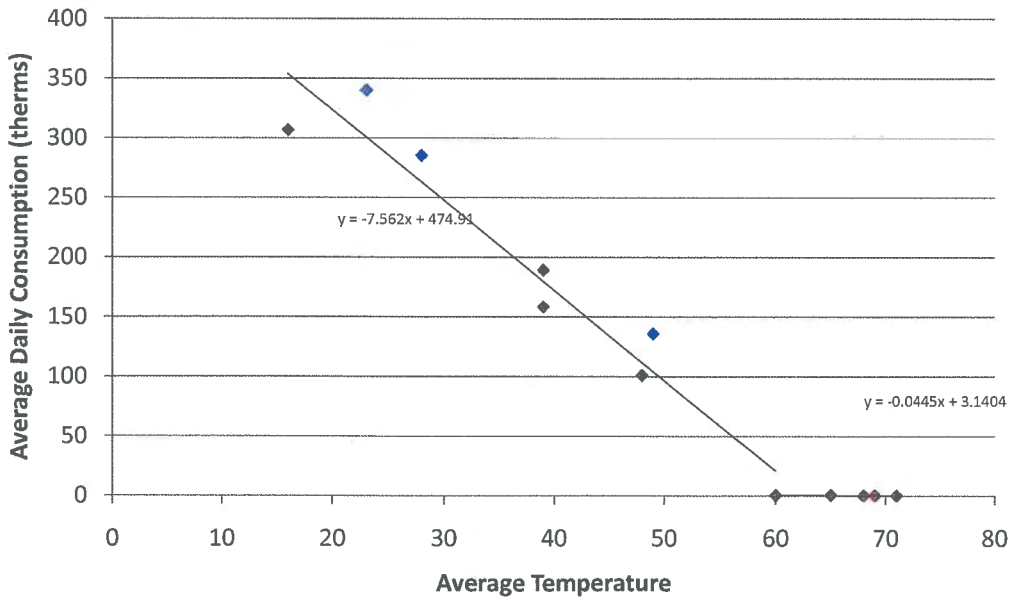


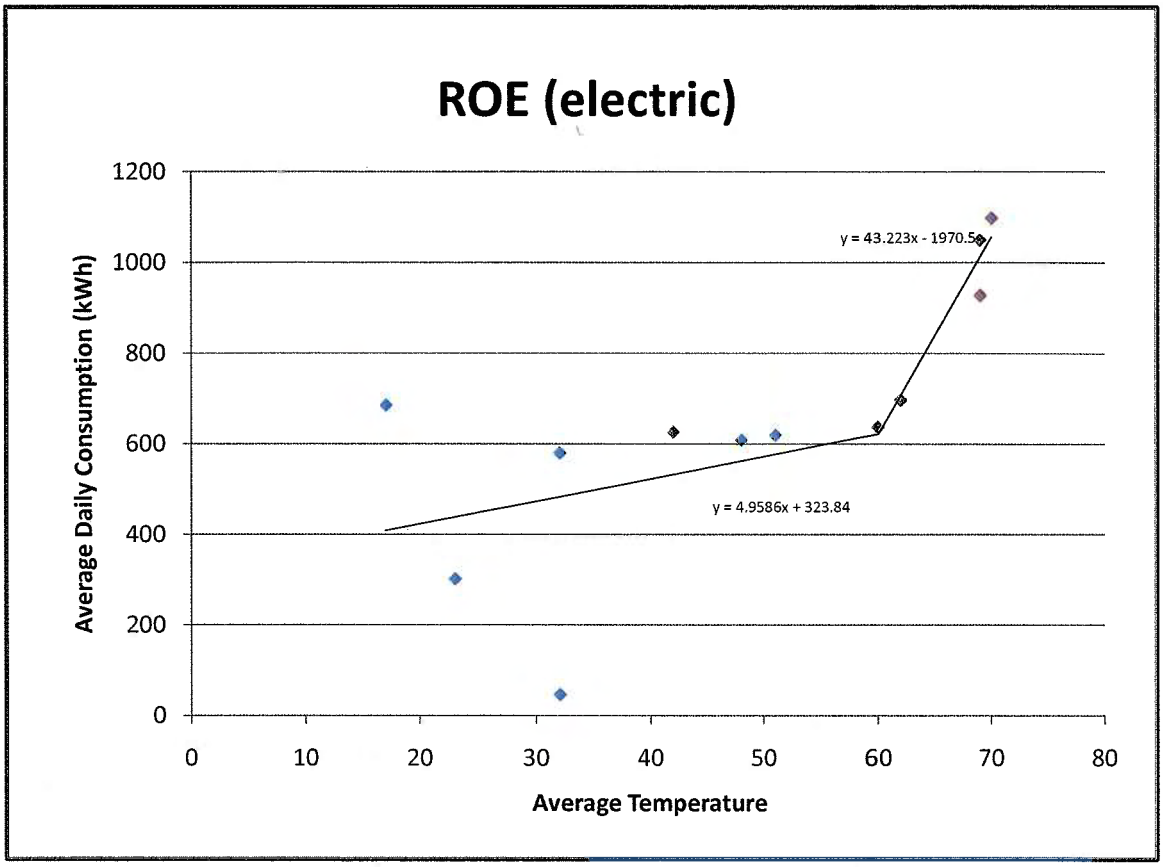


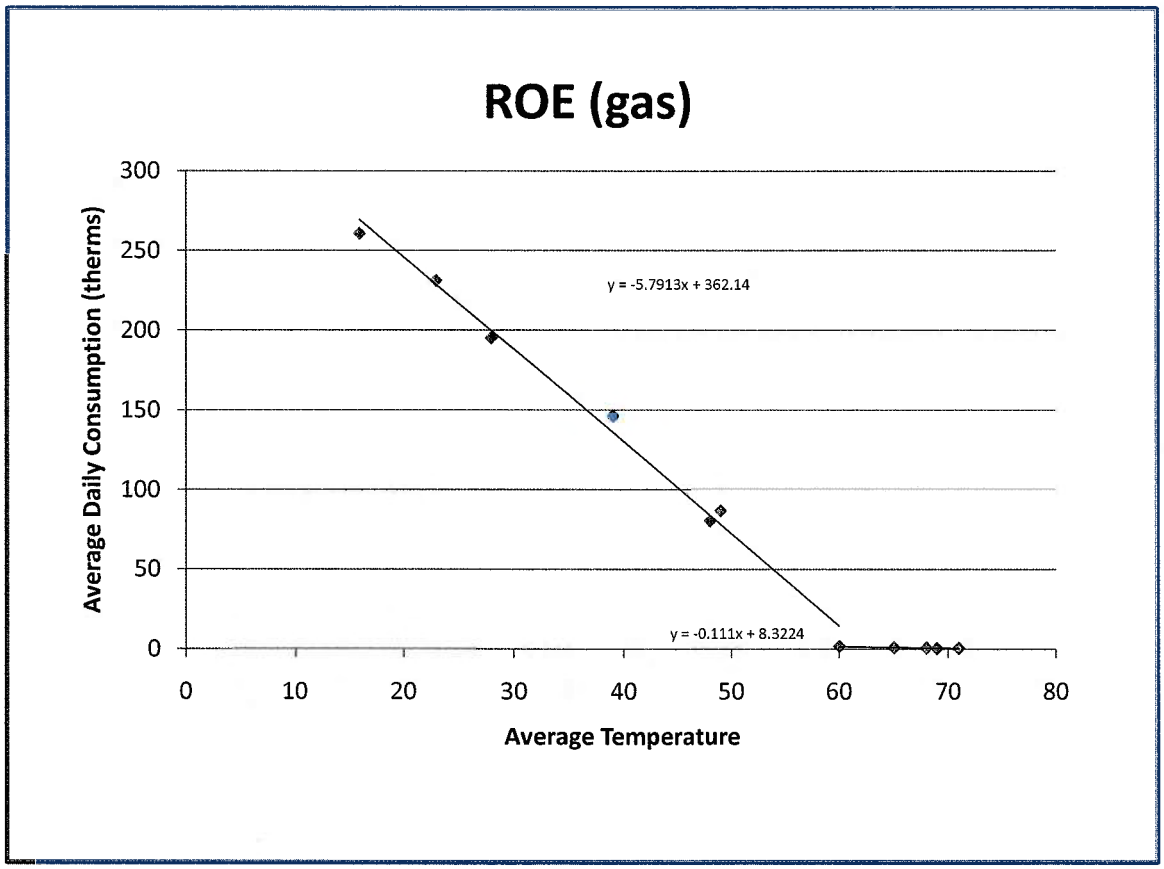
3RD ST. COURTHOUSE (electric)

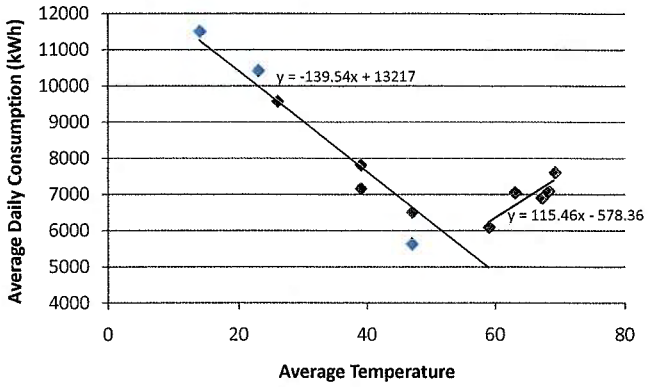


3rd St. COURTHOUSE (gas)

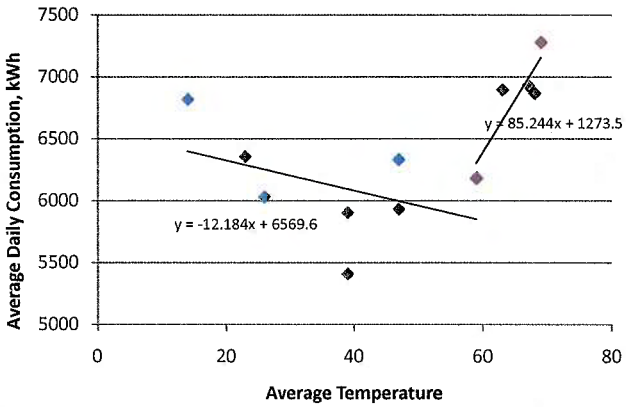



ROE (electric)
Average Daily Consumption (kWh)
1200
1000
800
600
400
200
0
y = 43.223x - 1970.5
y = 4.9586x + 323.84
0
10
20
30
40
50
60
70
80
Average Temperature

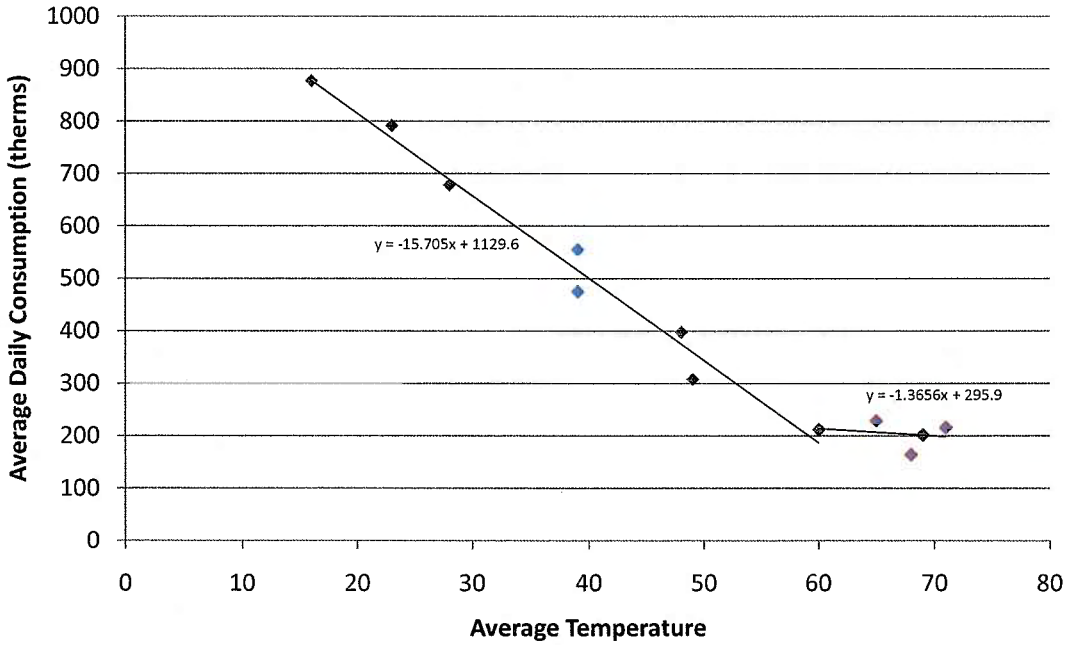

ROE (gas)
Average Daily Consumption (therms)
300
250
200
150
100
50
0
y = -5.7913x + 362.14
y = -0.111x + 8.3224
0
10
20
30
40
50
60
70
80
Average Temperature



SHERIFF'S OFFICE / JAIL (electric)



SHERIFF'S OFFICE / JAIL (gas)



Judicial Center

Space Summary	
Space Type:	Courthouse
Square Footage:	186,000
Weekly Operating Hours:	168
Worker on Main Shift:	241
Number of PCs:	

Energy Summary	
Total kWh:	3,533,992
Total Electric Cost:	$301,196
Total therms:	108,286
Total Natural Gas Cost	$104,068
Total Cost (NG + Elect):	$405,264
Total Yearly Btu's:	22,886,572,749
Yearly Btu/sq. ft.	123,046
Yearly $/sq. ft.	$2.18

Meter: 090116390

Period	Reading Date	Days	Total kWh	Total Charge ($)	Average Temperature	Average Daily kWh
1	11/25/2008	29	291,372	$22,178.43	39	10,047.31
2	12/31/2008	36	325,315	$23,707.42	23	9,036.53
3	2/2/2009	33	311,986	$22,859.50	14	9,454.12
4	3/2/2009	28	263,037	$22,855.54	26	9,394.18
5	3/29/2009	27	287,061	$25,609.12	39	10,631.89
6	4/29/2009	31	294,483	$25,677.33	47	9,499.45
7	5/29/2009	30	260,388	$22,945.47	59	8,679.60
8	6/28/2009	30	307,704	$27,986.13	68	10,256.80
9	7/28/2009	30	293,591	$26,442.43	67	9,786.37
10	8/27/2009	30	317,864	$28,331.28	69	10,595.47
11	9/27/2009	31	332,469	$29,774.83	63	10,724.81
12	10/26/2009	29	248,722	$22,828.18	47	8,576.62

Note: Temperature data complete from utility bills

Vanguard

Period	Reading Date	Days	Total therms	Total Charge ($)	Average Temperature	Notes	Average Daily
1	11/30/2008	29	14,255.18	$12,407.76	39		491.56
2	12/31/2008	31	23,059.36	$22,265.98	23		743.85
3	1/31/2009	31	26,426.93	$23,661.51	16		852.48
4	2/28/2009	28	17,822.94	$15,952.69	28		636.53
5	3/31/2009	31	14,028.05	$12,094.83	39	1	452.52
6	4/30/2009	30	8,106.09	$6,403.05	48		270.20
7	5/31/2009	31	319.27	-$227.31	60		10.30
8	6/30/2009	30	288.93	$225.18	68		9.63
9	7/31/2009	31	289.99	$222.78	69		9.35
10	8/31/2009	31	275.45	$216.61	71		8.89
11	9/30/2009	30	293.66	$224.04	65		9.79
12	10/31/2009	31	3,120.07	$2,426.86	49		100.65

Nicor

Period	End Billing Period	Days	Total therms	Total Charge ($)
1	12/1/2008	30	13,937.29	901.35
2	1/1/2009	31	22,545.14	1,214.05
3	2/1/2009	31	25,837.61	1,384.66
4	3/1/2009	28	17,425.48	1,058.23
5	4/1/2009	31	13,715.22	919.29
6	5/1/2009	30	7,928.41	653.57
7	6/1/2009	31	312.15	315.33
8	7/1/2009	30	282.48	322.08
9	8/1/2009	31	283.52	322.16
10	9/1/2009	31	269.30	322.01
11	10/1/2009	30	287.26	323.16
12	11/1/2009	31	3,052.05	458.08

Note: Temperature data for ORD from weatherunderground.com

1 Therms calculated from meter reading info on before and after bills and $ from before and after averag

Juvenile Justice Center

Space Summary	
Space Type:	Jail
Square Footage:	67,000
Weekly Operating Hours:	168
Worker on Main Shift:	13
Number of PCs:	

Energy Summary	
Total kWh:	1,325,815
Total Electric Cost:	$113,543
Total therms:	55,592
Total Natural Gas Cost	$53,228
Total Cost (NG + Elect):	$166,772
Total Yearly Btu's:	10,082,838,799
Yearly Btu/sq. ft.	150,490
Yearly $/sq. ft.	$2.49

Total kWh	Total Charge ($)	Average Temperature	Average Daily kWh
96,640	$7,355.97	39	3332.41
118,634	$8,645.49	23	3295.39
106,738	$7,820.81	14	3234.48
89,431	$7,770.74	26	3193.96
87,328	$7,879.73	39	3234.37
97,002	$8,458.05	47	3129.10
101,574	$8,950.73	59	3385.80
106,222	$9,661.05	68	3540.73
151,402	$13,636.10	67	5046.73
144,518	$12,880.92	69	4817.27
129,783	$11,622.94	63	4186.55
96,543	$8,860.90	47	3329.07

Note: Temperature data complete from utility bills

Vanguard

Period	Reading Date	Days	Total therms	Total Charge ($)	Average Temperature	Notes	Average Daily therms
1	11/30/2008	29	5827.5	5071.92	39		200.95
2	12/31/2008	31	10181.36	9822.14	23		328.43
3	1/31/2009	31	11050.47	9888.54	16		356.47
4	2/28/2009	28	8407.88	7525.86	28		300.28
5	4/1/2009	32	6578.38	5654.17	39	1	205.57
6	4/30/2009	29	4303.97	3400.07	48		148.41
7	5/31/2009	31	2022.27	1441.41	60		65.23
8	6/30/2009	30	1223.51	954.56	68		40.78
9	7/31/2009	31	695.09	534.01	69		22.42
10	8/31/2009	31	716.81	564.20	71		23.12
11	9/30/2009	30	886.48	676.61	65		29.55
12	10/31/2009	31	3697.86	2876.45	49		119.29

Nicor

Period	End Billing Period	Days	Total therms	Total Charge ($)
1	12/1/2008	30	5,697.54	494.82
2	1/1/2009	31	9,954.32	649.32
3	2/1/2009	31	10,804.04	701.62
4	3/1/2009	28	8,220.38	600.45
5	4/1/2009	31	6,431.68	533.46
6	5/1/2009	30	4207.99	371.55
7	6/1/2009	31	1977.18	265.15
8	7/1/2009	30	1196.23	230.61
9	8/1/2009	31	679.72	207.17
10	9/1/2009	31	700.82	208.96
11	10/1/2009	30	867.28	216.34
12	11/1/2009	31	3,617.25	339.06

Note: Temperature data for ORD from weatherunderground.com

1 Therms calculated from meter reading info on before and after bills and $ from before and after average cc

Government Center

Space Summary	
Space Type:	Office
Square Footage:	108,783
Weekly Operating Hours:	45
Worker on Main Shift:	124
Number of PCs:	

Energy Summary	
Total kWh:	1,801,440
Total Electric Cost:	$142,442
Total therms:	65,438
Total Natural Gas Cost	$57,598
Total Cost (NG + Elect):	$200,040
Total Yearly Btu's:	12,690,352,280
Yearly Btu/sq. ft.	116,657
Yearly $/sq. ft.	$1.84

Meter: 28899888 (Grounds)

Period	Reading Date	Days	Total kWh	Demand (kW)	Total Charge ($)	Average Temperature	Notes	Average Daily kWh
1	12/4/2008	29	133,200	316.44	$8,899.79	35		4,593.10
2	1/6/2009	33	154,080	312.12	$10,533.69	23		4,669.09
3	2/5/2009	30	146,700	314.28	$9,748.53	15		4,890.00
4	3/5/2009	29	130,320	293.22	$9,268.56	30		4,493.79
5	4/3/2009	31	138,677		$11,412.20	42	1	4,473.45
6	5/5/2009	30	134,203		$11,044.02	49	1	4,473.43
7	6/4/2009	30	133,200	360	$12,417.39	60		4,440.00
8	7/7/2009	33	171,180	455.76	$15,087.50	69		5,187.27
9	8/5/2009	29	162,720	423.72	$16,646.64	70		5,611.03
10	9/8/2009	34	201,960	432.36	$18,232.39	69		5,940.00
11	10/5/2009	27	147,780	413.28	$9,655.51	63		5,473.33
12	11/4/2009	30	147,420	299.34	$9,495.89	48		4,914.00

1 kWh calculated from meter reading info on before and after bills and $ from before and after average costs.

Vanguard: 7248001000 (719 S. Batavia)

Period	Reading Date	Days	Total therms	Total Charge ($)	Average Temperature	Notes	Average Daily therms
1	11/30/2008	29	1694.53	1476.88	39		58.43
2	12/31/2008	31	2816.68	2714.01	23		90.86
3	1/31/2009	31	3081.15	2754.60	16		99.39
4	2/28/2009	28	2220.38	1987.46	28		79.30
5	4/1/2009	31	2059.28	1794.77	39	1	66.43
6	4/30/2009	29	629.5	496.36	48		21.71
7	5/31/2009	31	78.65	-56.31	60		2.54
8	6/30/2009	30	0	0.00	68		0.00
9	7/31/2009	31	5.17	3.92	69		0.17
10	8/31/2009	31	0	0.00	71		0.00
11	9/30/2009	30	125.13	95.38	65		4.17
12	10/31/2009	31	1406.43	1091.86	49		45.37

Vanguard: 9641221000 (719 S. Batavia Ave.)

Period	Reading Date	Days	Total therms	Total Charge ($)	Average Temperature	Notes	Average Daily therms
1	11/30/2008	29	6527.59	5684.05	39		225.09
2	12/31/2008	31	10955.06	10569.88	23		353.39
3	1/31/2009	31	12357.26	11055.74	16		398.62
4	2/28/2009	28	8326.98	7452.98	28		297.39
5	4/1/2009	31	6027.07	5218.53	39	1	194.42
6	4/30/2009	29	3213.95	2539.71	48		110.83
7	5/31/2009	31	218.73	-155.88	60		7.06
8	6/30/2009	30	98.26	76.61	68		3.28
9	7/31/2009	31	26.86	20.71	69		0.87
10	8/31/2009	31	46.56	36.72	71		1.50
11	9/30/2009	30	115.75	88.34	65		3.86
12	10/31/2009	31	3407.42	2651.65	49		109.92

Nicor: 7248001000

Period	End Billing Period	Days	Total therms	Total Charge ($)
1	12/1/2008	30	1656.74	216.99
2	1/1/2009	31	2753.87	292.64
3	2/1/2009	31	3012.44	316.76
4	3/1/2009	28	2170.87	256.37
5	4/1/2009	31	2059.28	256.43
6	5/1/2009	30	42.58	159.53
7	6/1/2009	31	76.9	125.47
8	7/1/2009	30	0	120.13
9	8/1/2009	31	5.05	120.82
10	9/1/2009	31	0	120.97
11	10/1/2009	30	122.4	137.78
12	11/1/2009	31	1372.84	202.45

Nicor: 9641221000

Period	End Billing Period	Days	Total therms	Total Charge ($)
1	12/1/2008	30	6382.03	596.62
2	1/1/2009	31	10710.76	761.51
3	2/1/2009	31	12081.69	838.79
4	3/1/2009	28	8141.29	678.41
5	4/1/2009	31	6027.07	595.15
6	5/1/2009	30	399.51	403.83
7	6/1/2009	31	213.85	253.35
8	7/1/2009	30	96.07	250.27
9	8/1/2009	31	26.26	240.68
10	9/1/2009	31	45.52	244.15
11	10/1/2009	30	113.22	253.44
12	11/1/2009	31	3333.13	417.53

1 Billing dollars calculated from meter reading info on before and after bills and from before and after

3rd. Street Courthouse

Space Summary	
Space Type:	Museum
Square Footage:	71,199
Weekly Operating Hours:	45
Worker on Main Shift:	30
Number of PCs:	

Energy Summary	
Total kWh:	485,680
Total Electric Cost:	$46,251
Total therms:	45,813
Total Natural Gas Cost	$45,147
Total Cost (NG + Elect):	$91,399
Total Yearly Btu's:	6,238,429,125
Yearly Btu/sq. ft.	87,620
Yearly $/sq. ft.	$1.28

Meter: 49200017

Period	Reading Date	Days	Total kWh	Demand (kW)	Total Charge ($)	Average Temperature	Average Daily kWh
1	11/18/2008	27	29920	142.4	3122.06	46	1108.15
2	12/22/2008	34	39360	108	2829.92	25	1157.65
3	1/22/2009	31	43360	112	3265.23	20	1398.71
4	2/19/2009	28	38320	124	3068.12	24	1368.57
5	3/19/2009	29	39600	134.4	3372.35	34	1365.52
6	4/21/2009	33	44800		3817.05	43	1357.58
7	5/19/2009	28	38640	144	3293.86	57	1380.00
8	6/17/2009	29	42800		4305.66	62	1475.86
9	7/21/2009	34	52480	212	5872.76	71	1543.53
10	8/21/2009	31	47280	184	5896.18	73	1525.16
11	9/22/2009	32	39600	160	4872.58	66	1237.50
12	10/21/2009	29	29520	129.6	2535.67	52	1017.93

Note: Temperature data for ORD from weatherunderground.com

Vanguard

Period	Reading Date	Days	Total therms	Total Charge ($)	Average Temperature	Notes	Average Daily therms
1	11/30/2008	29	4593.3	3998.27	39		158.39
2	12/31/2008	31	10535.03	10163.70	23		339.84
3	1/31/2009	31	9509.25	8506.57	16		306.75
4	2/28/2009	28	7971.24	7134.99	28		284.69
5	4/1/2009	32	6054.43	5100.69	39		189.20
6	4/30/2009	29	2925.65	2310.83	48		100.88
7	5/31/2009	31	11.41	8.24	60		0.37
8	6/30/2009	30	0	0.00	68		0.00
9	7/31/2009	31	0	0.00	69		0.00
10	8/31/2009	31	0	0.00	71		0.00
11	9/30/2009	30	15.52	11.52	65		0.52
12	10/31/2009	31	4197.06	3266.40	49		135.39

Nicor

Period	End Billing Period	Days	Total therms	Total Charge ($)
1	12/1/2008	30	9,632.87	663.66
2	1/1/2009	31	10,300.09	690.02
3	2/1/2009	31	9,297.20	671.46
4	3/1/2009	28	7,793.49	608.70
5	4/1/2009	31	5919.42	516.38
6	5/1/2009	30	2,860.41	320.7
7	6/1/2009	31	11.15	161.99
8	7/1/2009	30	0	159.74
9	8/1/2009	31	0	159.74
10	9/1/2009	31	0	159.74
11	10/1/2009	30	15.18	162.65
12	11/1/2009	31	4105.62	371.3

Note: Temperature data for ORD from weatherunderground.com

1 Billing dollars calculated from meter reading info on before and after bills and from before and after average costs.

Regional Office of Education

Space Summary	
Space Type:	Office
Square Footage:	24,860
Weekly Operating Hours:	
Worker on Main Shift:	
Number of PCs:	

Energy Summary	
Total kWh:	240,768
Total Electric Cost:	$24,125
Total therms:	34,788
Total Natural Gas Cost	$34,564
Total Cost (NG + Elect):	$58,689
Total Yearly Btu's:	4,300,310,789
Yearly Btu/sq. ft.	172,981
Yearly $/sq. ft.	$2.36

Meter: 12360940

Period	Reading Date	Days	Total kWh	Demand (kW)	Total Charge ($)	Average Temperature	Notes	Average Daily kWh
1	12/8/2008	32	1488	46.08	664.82	32	1	47
2	1/8/2009	31	9360	46.32	1005.89	23		302
3	2/9/2009	32	21920	45.36	1481.18	17		685
4	3/9/2009	29	16800	39.84	1261.46	32		579
5	4/6/2009	28	17520	39.84	1309.82	42		626
6	5/7/2009	31	19200		2071.05	51	2	619
7	6/5/2009	29	18480	624.8	2573.40	60	3	637
8	7/8/2009	33	34640	115.92	3496.98	69		1050
9	8/7/2009	30	32960	99.84	3654.91	70		1099
10	9/9/2009	33	30640	102.32	3426.43	69		928
11	10/7/2009	28	19520	100.96	1875.15	62		697
12	11/6/2009	30	18240	44.08	1303.76	48		608

Note: Temperature data for ORD from weatherunderground.com

1 kWh estimated from previous reading 6 months before and prorated over period. Dollars estimate from averag
2 kWh calculated from meter readings on before and after bills. Dollar estimated from average costs from before
3 Dollars corrected from demand charge of 624.8 and adjusted from the original billed amount of over $11,000.

Vanguard

Period	Reading Date	Days	Total therms	Total Charge ($)	Average Temperature	Notes	Average Daily
1	11/30/2008	29	4,230.31	$3,682.49	39		145.87
2	12/31/2008	31	7,166.43	$6,914.27	23		231.18
3	1/31/2009	31	8,081.18	$7,236.65	16		260.68
4	2/28/2009	28	5,461.37	$4,889.16	28		195.05
5	4/1/2009	32	4,685.74	$4,047.47	39	1	146.43
6	4/30/2009	29	2,331.34	$1,842.05	48		80.39
7	5/31/2009	31	54.84	-$39.14	60		1.77
8	6/30/2009	30	23.76	$18.64	68		0.79
9	7/31/2009	31	15.49	$11.75	69		0.50
10	8/31/2009	31	19.63	$15.30	71		0.63
11	9/30/2009	30	28.91	$21.76	65		0.96
12	10/31/2009	31	2,689.10	$2,091.96	49		86.75

Nicor

Period	End Billing Period	Days	Total therms	Total Charge ($)
1	12/1/2008	30	4,135.98	$413.82
2	1/1/2009	31	7,006.62	$549.82
3	2/1/2009	31	7,900.97	$600.27
4	3/1/2009	28	5,339.58	$496.00
5	4/1/2009	31	4581.25	$462.64
6	5/1/2009	30	2,279.35	$273.40
7	6/1/2009	31	53.61	$150.69
8	7/1/2009	30	23.23	$149.12
9	8/1/2009	31	15.15	$148.00
10	9/1/2009	31	19.19	$149.42
11	10/1/2009	30	28.28	$150.66
12	11/1/2009	31	2,630.47	$288.13

Note: Temperature data for ORD from weatherunderground.com

1 therms calculated from meter readings on before and after bills. Dollar estimated from average cost

Jail-Sheriff's Office

Space Summary	
Space Type:	Jail/Office
Square Footage:	236,582
Weekly Operating Hours:	
Worker on Main Shift:	
Number of PCs:	

Energy Summary	
Total kWh:	5,194,650
Total Electric Cost:	$438,189
Total therms:	154,441
Total Natural Gas Cost	$135,300
Total Cost (NG + Elect):	$573,489
Total Yearly Btu's:	33,168,223,879
Yearly Btu/sq. ft.	140,198
Yearly $/sq. ft.	$2.42

Vanguard

Period	Reading Date	Days	Total therms	Total Charge ($)	Average Temperature	Notes	Average Daily therms
1	11/30/2008	29	16103.35	14015.80	39		555.29
2	12/31/2008	31	24532.09	23678.38	23		791.36
3	1/31/2009	31	27172.65	24315.15	16		876.54
4	2/28/2009	28	18980.38	16986.18	28		677.87
5	4/1/2009	32	15213.49	13012.18	39	1	475.42
6	4/30/2009	29	11531.7	9110.97	48		397.64
7	5/31/2009	31	6579.41	-4690.25	60		212.24
8	6/30/2009	30	4948.33	3859.64	68		164.94
9	7/31/2009	31	6252.77	4802.13	69		201.70
10	8/31/2009	31	6712.77	5281.54	71		216.54
11	9/30/2009	30	6880.71	5250.30	65		229.36
12	10/31/2009	31	9533.13	7415.92	49		307.52

Nicor

Period	End Billing Period	Days	Total therms	Total Charge ($)		
1	12/1/2008	30	15,744.24	1211.25		
2	1/1/2009	31	23,985.02	1,694.37		
3	2/1/2009	31	26,566.70	1,895.77		
4	3/1/2009	28	18,557.12	1,406.91		
5	4/1/2009	31	14,874.23	1187.3		26097.15
6	5/1/2009	30	10388.31	991.28		
7	6/1/2009	31	6432.69	610.84		
8	7/1/2009	30	4837.98	538.39		
9	8/1/2009	31	6113.33	617.24		
10	9/1/2009	31	6563.076	649.765	1	1271.6
11	10/1/2009	30	6730.71	654.36		
12	11/1/2009	31	9325.31	804.15		

1 Billing dollars calculated from meter reading info on before and after bills and from before and after avera

Meter: 116732096

Period	Reading Date	Days	Total kWh	Total Charge ($)	Average Temperature	Average Daily
1	11/25/2008	29	207,673	$15,807.49	39	7161.14
2	12/31/2008	36	375,236	$27,345.43	23	10423.22
3	2/2/2009	33	379,973	$27,841.04	14	11514.33
4	3/2/2009	28	267,988	$23,285.73	26	9571.00
5	3/29/2009	27	210,887	$18,342.42	39	7810.63
6	4/29/2009	31	201,524	$17,571.80	47	6500.77
7	5/29/2009	30	182,719	$16,101.25	59	6090.63
8	6/28/2009	30	212,912	$19,364.66	68	7097.07
9	7/28/2009	30	207,200	$18,661.58	67	6906.67
10	8/27/2009	30	228,209	$20,340.31	69	7606.97
11	9/27/2009	31	218,473	$19,565.73	63	7047.52
12	10/26/2009	29	163,473	$15,003.86	47	5637.00

Meter: 116734694

Period	Reading Date	Days	Total kWh	Total Charge ($)	Average Temperature	Average Daily
1	11/25/2008	29	156,855	$11,939.37	39	5408.79
2	12/31/2008	36	228,887	$16,680.20	23	6357.97
3	2/2/2009	33	225,147	$16,496.77	14	6822.64
4	3/2/2009	28	168,915	$14,677.19	26	6032.68
5	3/29/2009	27	159,406	$13,851.13	39	5903.93
6	4/29/2009	31	183,850	$16,030.73	47	5930.65
7	5/29/2009	30	185,501	$16,346.40	59	6183.37
8	6/28/2009	30	206,022	$18,738.00	68	6867.40
9	7/28/2009	30	207,866	$18,721.56	67	6928.87
10	8/27/2009	30	218,458	$19,471.20	69	7281.93
11	9/27/2009	31	213,764	$19,144.00	63	6895.61
12	10/26/2009	29	183,712	$16,861.43	47	6334.90

Note: Temperature data complete from utility bills

Diagnostic Center

Space Summary	
Space Type:	Jail
Square Footage:	4,261
Weekly Operating Hours:	
Worker on Main Shift:	
Number of PCs:	

Energy Summary	
Total kWh:	66,280
Total Electric Cost:	$6,325
Total therms:	3,232
Total Natural Gas Cost	$2,665
Total Cost (NG + Elect):	$8,990
Total Yearly Btu's:	549,328,360
Yearly Btu/sq. ft.	128,920
Yearly $/sq. ft.	$2.11

Meter: 28373866

Period	Reading Date	Days	Total kWh	Demand (kW)	Total Charge ($)	Average Temperature	Average Daily kWh
1	11/5/2008	28	4680		379.74	53	167.14
2	12/4/2008	29	5640		412.62	35	194.48
3	1/6/2009	33	6560		511.63	23	198.79
4	2/5/2009	30	6360		476.63	15	212.00
5	3/5/2009	29	5240		413.29	30	180.69
6	4/3/2009	29	5120		409.33	42	176.55
7	5/5/2009	32	4920		418.12	49	153.75
8	6/4/2009	30	4320		440.54	60	144.00
9	7/7/2009	33	5960	32.68	853.68	69	180.61
10	8/5/2009	29	5560	25.68	804.00	70	191.72
11	9/8/2009	34	7000	26.44	871.53	69	205.88
12	10/5/2009	27	4920		334.20	63	182.22
		363					

Note: Temperature data for ORD from weatherunderground.com

Demand charges only appear for three months on the bills

Meter: 3677438

Period	Reading Date	Days	Total therms	Total Charge ($)	Average Temperature	Average Daily Therms
1	12/11/2008	31	492.8	459.45	31	15.90
2	1/12/2009	32	726.02	599.78	22	22.69
3	2/10/2009	29	803.08	639.51	18	27.69
4	3/12/2009	30	605.35	422.08	32	20.18
5	4/13/2009	32	184.54	134.21	42	5.77
6						
7	6/15/2009	63	127.76	134.22	58	2.03
8						
9	8/13/2009	59	3.03	29.95	72	0.05
10	9/14/2009	32	12.15	34.19	68	0.38
11	10/14/2009	30	79.94	69.58	57	2.66
12	11/11/2009	28	197.14	141.74	49	7.04
		366				

Note: Temperature data for ORD from weatherunderground.com

Circuit Clerk

Space Summary	
Space Type:	Office
Square Footage:	54,000
Weekly Operating Hours:	45
Worker on Main Shift:	121
Number of PCs:	

Energy Summary	
Total kWh:	237,450
Total Electric Cost:	$20,209
Total therms:	27,366
Total Natural Gas Cost	$27,229
Total Cost (NG + Elect):	$47,438
Total Yearly Btu's:	3.55E+09
Yearly Btu/sq. ft.	65,680
Yearly $/sq. ft.	$0.88

540 S Randall

Period	Reading Date	Days	Total kWh	Total Charge ($)	Average Temperature	Average Daily kWh
1	12/4/2008	30	31	20.73	36	1.03
2	1/5/2009	32	33	20.78	23	1.03
3	2/3/2009	29	31	20.73	15	1.07
4	2/27/2009	24	27	20.41	29	1.13
5	3/30/2009	31	34	20.97	39	1.10
6	4/29/2009	30	31	20.73	47	1.03
7	6/1/2009	33	33	20.78	60	1.00
8	7/2/2009	31	30	22.95	68	0.97
9	8/3/2009	32	33	23.31	70	1.03
10	9/2/2009	30	30	22.95	70	1.00
11	9/29/2009	27	28	22.71	66	1.04
12	10/28/2009	29	29	22.71	49	1.00

530 S Randall

Period	Reading Date	Days	Total kWh	Demand (kW)	Total Charge ($)	Average Temperature	Average Daily kWh
1	12/4/2008	30	20680	61.6	1503.82	36	689.33
2	1/5/2009	32	20960		1531.15	23	655.00
3	2/3/2009	29	20920	63.6	1535.1	15	721.38
4	2/27/2009	24	20960	68.4	1589.71	29	873.33
5	3/30/2009	31	26240	71.2	1822.38	39	846.45
6	4/29/2009	30	21800	63.2	1564.29	47	726.67
7	6/1/2009	33	16360	55.6	1272.43	60	495.76
8	7/2/2009	31	15520	72.8	1839.21	68	500.65
9	8/3/2009	32	20960	70.8	2025.46	70	655.00
10	9/2/2009	30	21000	80.8	2189.27	70	700.00
11	9/29/2009	27	17040	67.6	1815.97	66	631.11
12	10/28/2009	29	14640	54.4	1260.59	49	504.83

Note: Temperature data complete from utility bills

Vanguard

Period	Reading Date	Days	Total therms	Total Charge ($)	Average Temperature	Average Daily therms
1	11/30/2008	29	2577.12	2244.47	39	88.87
2	12/31/2008	31	6412.43	6185.00	23	206.85
3	1/31/2009	31	6652.01	5957.40	16	214.58
4	2/28/2009	28	4829.77	4319.42	28	172.49
5	4/1/2009	32	3140.23	2717.33	39	98.13
6	4/30/2009	29	1863.6	1472.54	48	64.26
7	5/31/2009	31	348.38	-248.59	60	11.24
8	6/30/2009	30	53.82	41.93	68	1.79
9	7/31/2009	31	3.09	2.24	69	0.10
10	8/31/2009	31	6.2	4.90	71	0.20
11	9/30/2009	30	43.41	33.29	65	1.45
12	10/31/2009	31	1435.47	1117.09	49	46.31

Nicor

Period	End Billing Period	Days	Total therms	Total Charge ($)
1	12/1/2008	30	2519.65	300.36
2	1/1/2009	31	6269.43	509.19
3	2/1/2009	31	6503.67	530.66
4	3/1/2009	28	4722.07	453.01
5	4/1/2009	31	3140.23	346.95
6	5/1/2009	30	154.12	251.36
7	6/1/2009	31	340.61	182.24
8	7/1/2009	30	52.62	149.10
9	8/1/2009	31	3.03	142.56
10	9/1/2009	31	6.06	143.76
11	10/1/2009	30	42.46	148.55
12	11/1/2009	31	1404.18	224.03

Note: Temperature data for ORD from weatherunderground.com

Old Corrections

Space Summary	
Space Type:	Jail
Square Footage:	87,054
Weekly Operating Hours:	
Worker on Main Shift:	
Number of PCs:	

Energy Summary	
Total kWh:	912,116
Total Electric Cost:	$62,774
Total therms:	98
Total Natural Gas Cost	$910
Total Cost (NG + Elect):	$63,684
Total Yearly Btu's:	3,121,961,792
Yearly Btu/sq. ft.	35,862
Yearly $/sq. ft.	$0.73

Meter: 28467699

Period	Reading Date	Days	Total kWh	Demand (kW)	Total Charge ($)	Average Temperature	Average Daily kWh
1	12/5/2008	29	84000	163.6	5198.98	34	2896.55
2	1/5/2009	31	106800	162.8	6666.43	23	3445.16
3	2/6/2009	32	89600	153.6	5510.25	15	2800.00
4	3/6/2009	29	85200	156.8	5664.23	32	2937.93
5	4/15/2009	40	88800	151.2	5846.85	42	2220.00
6	5/14/2009	29				55	0.00
7	6/1/2009	18	63200	132.4	5284.49	62	3511.11
8	7/1/2009	30	78800	127.6	5633.07	68	2626.67
9	8/3/2009	33	72800	104	6079.71	70	2206.06
10	9/1/2009	29	42400	100.4	4041.49	70	1462.07
11	10/1/2009	30	70800	112	3651.29	65	2360.00
12	11/2/2009	32	67200	108.4	3882.99	49	2100.00

Meter: 60814547

Period	Reading Date	Days	Total kWh	Total Charge ($)	Average Temperature	Average Daily kWh
1	12/4/2008	29	288	35.88	35	9.93
2	1/6/2009	33	382	45.34	23	11.58
3	2/5/2009	30	245	33.01	15	8.17
4	3/5/2009	29	229	32.44	30	7.90
5	4/3/2009	29	384	45.92	42	13.24
6	5/5/2009	32	468	63.57	49	14.63
7	6/4/2009	30	264	42.10	60	8.80
8	7/7/2009	33	351	50.26	69	10.64
9	8/5/2009	29	310	50.51	70	10.69
10	9/8/2009	34	318	30.13	69	9.35
11	10/5/2009	27	261	32.24	63	9.67
12	11/4/2009	30	296	36.97	48	9.87

Meter: 28638124

Period	Reading Date	Days	Total kWh	Total Charge ($)	Average Temperature	Average Daily kWh
1	12/5/2008	29	3920	273.50	34	135.17
2	1/5/2009	31	3600	272.06	23	116.13
3	2/6/2009	32	3360	244.76	15	105.00
4	3/6/2009	29	3520	266.64	32	121.38
5	4/15/2009	40	3920	298.58	42	98.00
6	5/14/2009	29	3200	276.09	55	110.34
7	6/1/2009	18	3200	315.73	62	177.78
8	7/1/2009	30	9200	829.55	68	306.67
9	8/3/2009	33	6320	670.34	70	191.52
10	9/1/2009	29	4000	415.48	70	137.93
11	10/1/2009	30	6240	387.63	65	208.00
12	11/2/2009	32	8240	565.50	49	257.50

Note: Temperature data for ORD from weatherunderground.com

Period	Reading Date	Days	Total therms	Total Charge ($)	Average Temperature
1	12/1/2009	30	16.16	82.97	39
2					
3					
4	2/10/2009	71	13.18	161.01	21
5	3/12/2009	30	9.12	69.86	32
6					
7	5/13/2009	62	18.27	159.01	48
8					
9					
10					
11					
12	10/14/2009	154	41.49	437.04	66
		347			

Health Dept. 1240

Space Summary	
Space Type:	Office
Square Footage:	18,500
Weekly Operating Hours:	50
Worker on Main Shift:	87
Number of PCs:	

Energy Summary	
Total kWh:	138,094
Total Electric Cost:	$17,664
Total therms:	6,223
Total Natural Gas Cost	$5,003
Total Cost (NG + Elect):	$22,666
Total Yearly Btu's:	1,093,464,728
Yearly Btu/sq. ft.	59,106
Yearly $/sq. ft.	$1.23

Meter: 092632047

Period	Reading Date	Days	Total kWh	Total Charge ($)	Average Temperature	Notes	Average Daily kWh
1	12/10/2008				31	1	#DIV/0!
2	1/13/2009				22	1	#DIV/0!
3	2/13/2009	31	380	57.41	19		12.25806
4	3/13/2009	28	343	53.95	31		12.25
5	4/13/2009	31	397	58.98	43		12.80645
6	5/12/2009	29	360	55.55	54		12.41379
7	6/11/2009	30	379	30.68	61		12.63333
8	7/13/2009	32	406	40.05	71		12.6875
9	8/11/2009	29	362	54.23	72		12.48276
10	9/10/2009	30	388	56.67	68		12.93333
11	10/9/2009	29	358	53.87	61		12.34483
12	11/9/2009	31	336	51.73	48		10.83871

Meter: 082758893

Period	Reading Date	Days	Total kWh	Total Charge ($)	Average Temperature		Average Daily kWh
1	12/10/2008				31	1	#DIV/0!
2	1/13/2009				22	1	#DIV/0!
3	2/13/2009	31	6000	649.76	19		193.5484
4	3/13/2009	28	4680	548.90	31		167.1429
5	4/13/2009	31	4560	534.23	43		147.0968
6	5/12/2009	29	4680	573.17	54		161.3793
7	6/11/2009	30	5760	713.08	61		192
8	7/13/2009	32	10440	1129.65	71		326.25
9	8/11/2009	29	9480	1018.75	72		326.8966
10	9/10/2009	30	9120	998.84	68		304
11	10/9/2009	29	6840	834.23	61		235.8621
12	11/9/2009	31	4440	544.83	48		143.2258

1 Estimated

Note: Temperature data for ORD from weatherunderground.com

Period	Reading Date	Days	Total therms	Total Charge ($)	Average Temperature	Notes	Average Daily
1	12/11/2008	32	557.75	$454.25	31	1	17.43
2	1/12/2009	32	1173.19	$955.49	22		36.66
3	2/10/2009	29	1664.98	$1,286.24	18		57.41
4	3/12/2009	30	1012.98	$701.91	32		33.77
5	4/14/2009	33	554.65	$369.19	42		16.81
6	5/13/2009	29	112.25		56		3.87
7	6/15/2009	33	91.56	$278.77	58		2.77
8	7/14/2009	29	167.14	$177.03	72		5.76
9	8/12/2009	29	103.32	$137.74	72		3.56
10	9/14/2009	33	198.54	$178.65	69		6.02
11	10/13/2009	29	153.82	$155.12	57		5.30
12	11/11/2009	29	432.70	$308.47	49		14.92

1 estimated

New Child Advocacy Center 427 W. Campbell

Space Summary	
Space Type:	Office
Square Footage:	3,000
Weekly Operating Hours:	
Worker on Main Shift:	
Number of PCs:	

Energy Summary	
Total kWh:	54,480
Total Electric Cost:	$4,662
Total therms:	1,441
Total Natural Gas Cost	$1,389
Total Cost (NG + Elect):	$6,050
Total Yearly Btu's:	329,948,760
Yearly Btu/sq. ft.	109,983
Yearly $/sq. ft.	$2.02

Meter: 28601885

Period	Reading Date	Days	Total kWh	Total Charge ($)	Average Temperature	Average Daily kWh
1	11/18/2008	27	4000	328.90	46	148.15
2	12/22/2008	34	4720	348.92	25	138.82
3	1/22/2009	31	4480	356.25	20	144.52
4	2/19/2009	28	4240	325.21	24	151.43
5	3/19/2009	29	3840	308.77	34	132.41
6	4/21/2009	33	4320	316.80	43	130.91
7	5/19/2009	28	3840	293.83	57	137.14
8	6/17/2009	29	4640	387.39	62	160.00
9	7/21/2009	34	5680	549.44	71	167.06
10	8/21/2009	31	5520	616.43	73	178.06
11	9/22/2009	32	5040	543.52	66	157.50
12	10/21/2009	29	4160	286.26	52	143.45
		365				

Note: Temperature data for ORD from weatherunderground.com

Meter: 4153357

Period	Reading Date	Days	Total therms	Total Charge ($)	Average Temperature	Average Daily therms
1	11/21/2008	30	83.14	104.17	44	2.77
2	12/22/2008	31	244.37	233.05	24	7.88
3	1/20/2009	29	354.9	309.69	19	12.24
4	2/20/2009	31	273.78	232.17	23	8.83
5	3/24/2009	32	189.61	144.38	37	5.93
6						#DIV/0!
7	5/26/2009	63	149.05	145.05	53	2.37
8						#DIV/0!
9	7/27/2009	62	21.27	68.56	68	0.34
10	8/25/2009	29	27.35	43.4	72	0.94
11	9/25/2009	31	14.18	34.9	66	0.46
12	10/23/2009	28	82.98	73.2	51	2.96
		366				

Note: Temperature data for ORD from weatherunderground.com

Health Dept. 1330

Space Summary	
Space Type:	Office
Square Footage:	6,503
Weekly Operating Hours:	
Worker on Main Shift:	
Number of PCs:	

Energy Summary	
Total kWh:	70,680
Total Electric Cost:	$7,758
Total therms:	1,115
Total Natural Gas Cost	$755
Total Cost (NG + Elect):	$8,513
Total Yearly Btu's:	352,687,160
Yearly Btu/sq. ft.	54,235
Yearly $/sq. ft.	$1.31

Meter: 086273041

Period	Reading Date	Days	Total kWh	Total Charge ($)	Average Temperature	Average Daily kWh
1	12/10/2008	33	7260	633.50	31	220.00
2	1/13/2009	34	9660	817.33	22	284.12
3	2/13/2009	31	9240	907.43	19	298.06
4	3/13/2009	28	7020	744.98	31	250.71
5	4/13/2009	31	5340	600.08	43	172.26
6	5/12/2009	29	4080	552.06	54	140.69
7	6/11/2009	30	4080	523.49	61	136.00
8	7/13/2009	32	5820	691.49	71	181.88
9	8/11/2009	29	5040	642.04	72	173.79
10	9/10/2009	30	5160	623.46	68	172.00
11	10/9/2009	29	3960	518.66	61	136.55
12	11/9/2009	31	4020	503.82	48	129.68

Note: Temperature data for ORD from weatherunderground.com

Period	Reading Date	Days	Total therms	Total Charge ($)	Average Temperature	Average Daily
1	12/11/2008	32			31	0
2	1/12/2009	32			22	0
3	2/10/2009	29			18	0
4	3/12/2009	30			32	0
5	4/14/2009	33	437.03	$263.57	42	13.24333
6	5/13/2009					#DIV/0!
7	6/15/2009	62	171.37	$112.75	58	2.764032
8	7/14/2009	29	32.41	$45.28	72	1.117586
9	8/12/2009	29	16.21	$20.03	72	0.558966
10	9/14/2009	33	44.57	$49.84	69	1.350606
11	10/13/2009	29	94.21	$64.42	57	3.248621
12	11/11/2009	29	319.47	$199.07	49	11.01621

401 Campbell Street

Space Summary	
Space Type:	Office
Square Footage:	1,781
Weekly Operating Hours:	
Worker on Main Shift:	
Number of PCs:	

Energy Summary	
Total kWh:	10,972
Total Electric Cost:	$1,163
Total therms:	1,562
Total Natural Gas Cost	$1,480
Total Cost (NG + Elect):	$2,643
Total Yearly Btu's:	193,667,464
Yearly Btu/sq. ft.	108,741
Yearly $/sq. ft.	$1.48

Meter: 40083579

Period	Reading Date	Days	Total kWh	Total Charge ($)	Average Temperature	Average Daily kWh
1	11/18/2008	27	534	61.88	46	19.78
2	12/22/2008	34	903	83.65	25	26.56
3	1/22/2009	31	844	84.03	20	27.23
4	2/19/2009	28	877	83.75	24	31.32
5	3/19/2009	29	1074	101.40	34	37.03
6	4/21/2009	33	784	81.10	43	23.76
7	5/19/2009	28	882	91.23	57	31.50
8	6/17/2009	29	993	102.72	62	34.24
9	7/21/2009	34	1228	136.72	71	36.12
10	8/21/2009	31	1179	149.68	73	38.03
11	9/22/2009	32	929	118.69	66	29.03
12	10/21/2009	29	745	68.20	52	25.69

Note: Temperature data for ORD from weatherunderground.com

Meter: 2521549

Period	Reading Date	Days	Total therms	Total Charge ($)	Average Temperature	Average Daily Therms
1	11/21/2008	30	149.05	169.41	44	4.97
2	12/22/2008	31	236.26	226.36	24	7.62
3	1/20/2009	29	358.95	312.85	19	12.38
4	2/20/2009	31	263.64	224.77	23	8.50
5	3/24/2009	32	193.67	146.81	37	6.05
6	4/24/2009	31	152.1	117.21	45	4.91
7	5/26/2009	32	33.46	46.85	59	1.05
8	6/24/2009	29	31.43	46.27	65	1.08
9	7/27/2009	33	14.18	35.73	71	0.43
10	8/25/2009	29	21.27	39.86	72	0.73
11	9/25/2009	31	17.22	36.47	66	0.56
12	10/23/2009	28	91.08	77.62	51	3.25

Note: Temperature data for ORD from weatherunderground.com

EXHIBIT 3

PLUG LOAD INFORMATION

Building B & I

Summary Table

Desktop Computer w/ flat screen	81
Copier	4
TV/DVD/VCR	6
Fan	6
Heater	5
Refrigerator	3
Microwave	2
Coffee Makers	3
Shredders	2
Scanner/Printer	4

JC

Summary Table

Desktop Computer w/ flat screen	188
Secondary flat screen monitor	2
Laptop	0
Phone	169
Undercabinet 2-foot T8	139
Undercabinet 3-foot T8	141
Undercabinet 4-foot T8	3
Small Desktop Printer	30
Medium Energy Star Printer	9
Medium Printer	18
Large Commercial Printer	11
All-in-one (fax, scanner, printer)	7
Fax Machine	4
Word Processor	6
Large Shredder	3
Desktop Shredder	2
Microwave	20
Stereo/ Radio	21
TV small	5
TV med	4
TV large	16
2'x2' Refrigerator	10
2'x3' Refrigerator	8
Full Sized Refrigerator	4
Toaster/ Toaster Oven	2
Residential Coffeemaker	19
Commercial Coffeemaker	3
Personal humidifier	1
Space heater	7
Desktop fan	9
Box Fan	1
Floor Fan	2
Table Lamp	9
Floor Lamp	3
Beverage Vending	2
Snack Vending	1
Steno-grapher	5
Water Heater/ Cooler	2

JJC

Summary Table

Desktop Computer w/ flat screen	30
Secondary flat screen monitor	15
Laptop	6
Phone	42
Undercabinet 2-foot T8	0
Undercabinet 3-foot T8	4
Undercabinet 4-foot T8	3
Small Desktop Printer	1
Medium Energy Star Printer	3
Medium Printer	16
Large Commercial Printer	6
All-in-one (fax, scanner, printer)	1
Fax Machine	5
Word Processor	1
Large Shredder	3
Desktop Shredder	1
Microwave	8
Stereo/ Radio	11
TV small	9
TV med	23
TV large	6
DVD/ VCR	6
Video Game Sys.	4
2'x2' Refrigerator	5
2'x3' Refrigerator	8
Full Sized Refrigerator	0
Toaster/ Toaster Oven	3
Residential Coffeemaker	1
Commercial Coffeemaker	2
#REF!	#REF!
Space heater	2
Desktop fan	4
Box Fan	3
Floor Fan	0
Table Lamp	5
Floor Lamp	1
Beverage Vending	3
Snack Vending	1
Steno-grapher	1
Water Heater/ Cooler	1
Pencil Sharpener	0
Large Laminator	0
Radio Chargers (bank of 6)	0
Radio Charger (single)	0
Exam Table w/ power strip	0

Building C

Summary Table

Desktop Computer w/ flat screen	112
Secondary flat screen monitor	29
Laptop	0
Phone	74
Undercabinet 2-foot T8	0
Undercabinet 3-foot T8	0
Undercabinet 4-foot T8	0
Small Desktop Printer	5
Medium Energy Star Printer	4
Medium Printer	30
Large Commercial Printer	14
All-in-one (fax, scanner, printer)	0
Fax Machine	3
Word Processor	1
Large Shredder	1
Desktop Shredder	4
Microwave	6
Stereo/ Radio	4
TV small	1
TV med	2
TV large	7
DVD/ VCR	3
Video Game Sys.	0
2'x2' Refrigerator	0
2'x3' Refrigerator	3
Full Sized Refrigerator	3
Toaster/ Toaster Oven	3
Residential Coffeemaker	6
Commercial Coffeemaker	0
Space heater	3
Desktop fan	8
Box Fan	1
Floor Fan	4
Table Lamp	1
Hot Beverage Vending	1
Beverage Vending	1
Snack Vending	1
Steno-grapher	0
Water Heater/ Cooler	3
Electric Stapler	1
Large Laminator	1
Radio Chargers (bank of 6)	0
Radio Charger (single)	1

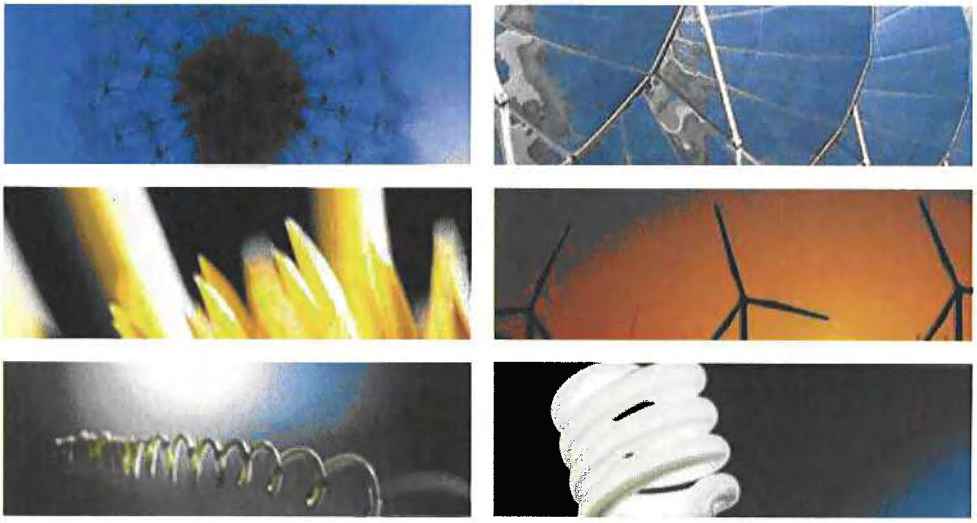
3rd Street Courthouse

Summary Table

Desktop Computer w/ flat screen	30
Fan	1
Heater	0
Refrigerator	5
Microwave	7
Coffee Makers	3

Area	Equipment	kWh	Hrs	Hz	PF	W	VA	Amp	Volt
State's Attorney Open Office	Dell Energy Star Printer	6.73	287	59.9	0.59	15	25	0.21	120.9
State's Attorney Open Office	HP Printer	5.13	286	59.9	0.57	14	24	0.2	120.5
SA334B (window office)	PC, monitor, phone, space heater	29.3	286	59.9	0.82	99	120	0.99	120.2
Cube in State's Attorney	PC, monitor, phone	6.5	286	59.9	0.4	3	8	0.06	120.5
PD 228 (window office)	Personal refrigerator - small	7.07	286	59.9	1	0	0	0	121.2
PD 228 (window office)	Microwave	1.16	286	59.9	0.54	0	6	0.05	120.9

Making a World of Difference



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Office Plug Load Field Monitoring Report

Prepared by:

Laura Moorefield, Brooke Frazer and Paul Bendt, Ph.D.

Ecos
1199 Main Avenue, Suite 242
Durango, CO 81301
970 259-6801

December 2008

- Twelve of the businesses surveyed stated that they have sustainable energy procurement guidelines in place.
- Five of these businesses specified that their sustainable energy procurement practices include the purchase of ENERGY STAR® computers and monitors.
- Seventy-five percent of the businesses surveyed said that they participated in some environmental stewardship activities with 97 percent of these describing environmental stewardship as only recycling.
- One business mentioned using San Diego Gas &Electric's energy conservation program.
- Another business produced its own green power with photovoltaic panels.

While the majority of businesses in our study stated that they strive for environmental stewardship, to almost all of them, this consisted mainly of recycling. In addition, only five businesses mentioned procurement of ENERGY STAR computers and monitors. These findings indicate that there is still a need for consumer education on the energy impacts of office plug loads. In addition, because power management on IT equipment typically was not tightly regulated, another energy reduction approach in offices would simply be to activate automatic power management settings.

Analysis of Plug Load Product Categories

To assess the overall impacts of the varieties of plug loads found in offices, researchers multiplied the average annual energy consumption of each device type metered (e.g., inkjet printers, LCD monitors, etc.) with the total number of each device type inventoried in all offices in this study. This enabled researchers to expand upon the metered data findings to estimate the annual energy consumption of all plug loads encountered in the study. Researchers then categorized all of plug loads in this study into one of three groups: Computers and Monitors, Office Electronics, and Miscellaneous Plug Loads. Figure 10 illustrates the distribution of cumulative annual energy use per product category at the 47 sites visited.

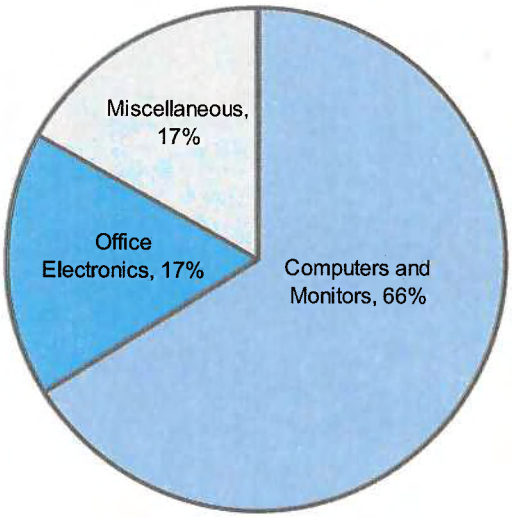


Figure 10. Office Plug Load Categories with Percentages of Total Energy Use

As expected, the Computers and Monitors category was by far the largest category, accounting for 66 percent of all plug load energy use at the offices in the study. This category includes desktop, laptop, and

thin client computers as well as CRT and LCD monitors. This suggests that programs and policies targeting these two most basic of office electronics stand to have the greatest energy reduction.

The other two categories, Office Electronics and Miscellaneous, each account for 17 percent of plug load energy use. Office Electronics includes imaging equipment (e.g., printers, copiers, and multifunction devices) as well as computer peripherals such as computer speakers, external drives, and hubs and switches. Devices such as paper shredders, adding machines, and portable desk lamps fall into the Miscellaneous category. Miscellaneous also includes telephony equipment and small kitchen appliances like coffee makers and toaster ovens. (White goods such as dishwashers and refrigerators are outside the scope of this study and therefore not included in the above categories.)

Product Level Results

This section discusses the study's findings in detail by presenting results on average power demand by mode, duty cycle, and estimated annual energy use on a product by product basis.

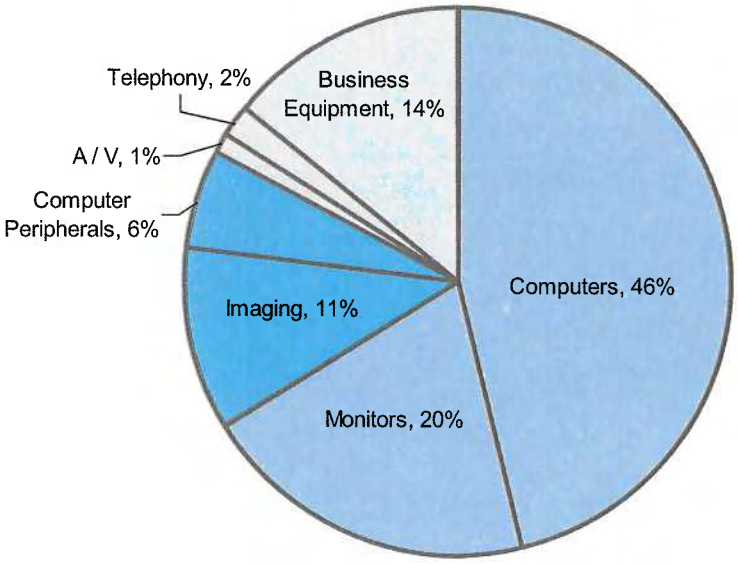


Figure 11. Percentage of Office Energy Consumed by Product Types

Computers and Monitors

Computers were the single largest office plug load end use. Their energy consumption alone accounted for 46 percent of total office plug load energy use in the study. Researchers collected meter data on 61 desktop computers, 20 notebooks, and six thin client computers.

Power Demand by Mode

The low power modes (sleep and standby) of desktop and notebook computers in the study were similar, typically less than 3 watts. All of the computers metered demonstrated low standby power values (0.9 to 2.6 watts), indicating that efficiency standards targeting standby mode have effectively lowered standby power in computers.

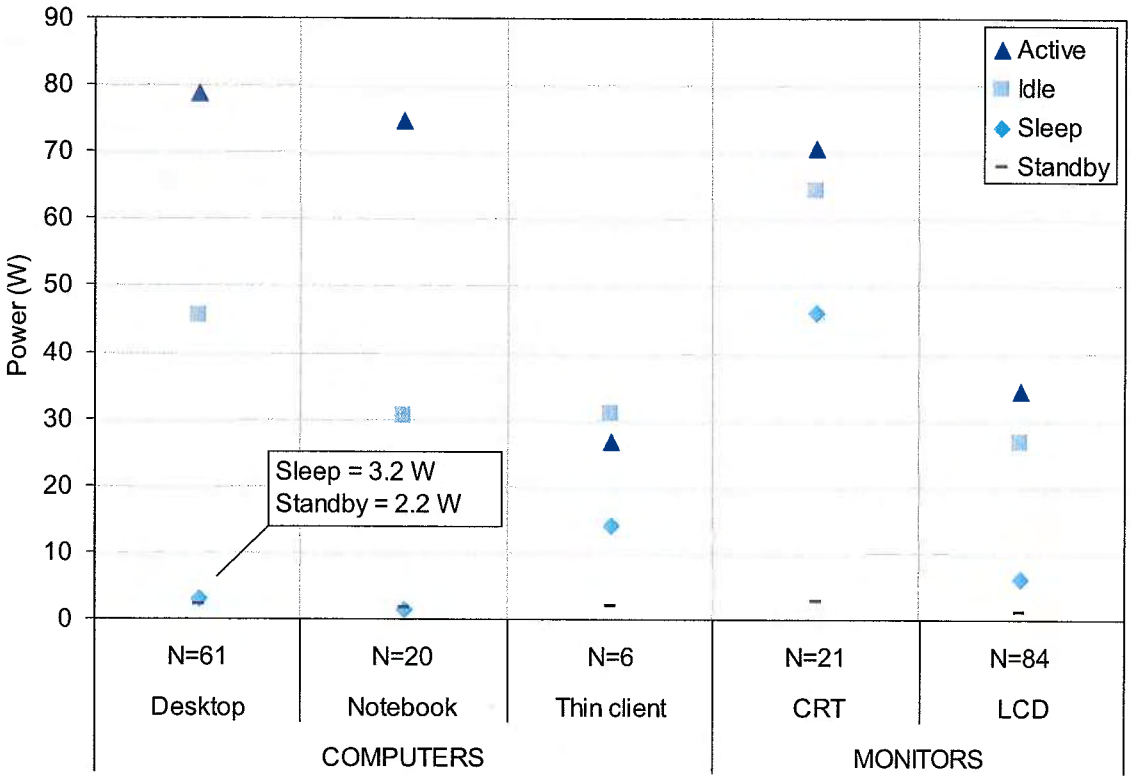


Figure 12. Computer and Monitor Power Demand by Mode

The power data for monitors was derived from meter files from 21 CRT monitors and 84 LCD monitors. This is representative of the distribution of all monitors inventoried. As expected, LCD monitors drew less power than CRT monitors in every mode, with significant differences in every mode except standby.

Within the monitor category, CRTs used 14 to 49 percent more power than LCDs in each mode. CRTs used an average of 71 watts in active, while LCDs used an average of only 34 watts in active. The average power for CRTs in sleep mode was 46 watts while the average power for LCDs in sleep mode was just over 6 watts. Of the 955 monitors inventoried in the 47 offices in this study, 79 percent were LCDs, indicating that consumers are already making the shift to the more-efficient technology.

Duty Cycles

Standby mode was the predominant mode for all computers occupying between 39 percent (for thin client computers) up to 56 percent (for notebook computers) of the two-week metering period. On average, desktop computers spent one-third of the two-week metering period in active mode. Thin client computers had a similar amount of time devoted to active mode. In contrast, notebook computers spent only 10 percent of time in active mode. Idle mode was utilized the most by thin client computers. Desktops and notebooks used idle mode less frequently at 13 percent and 6 percent of time, respectively. Sleep mode was not utilized often in any of the computers metered. Time spent in disconnect ranged widely—from 1 percent for thin clients to 26 percent for notebooks. Disconnect mode could indicate that the computer was unplugged. More likely is that the computer was powered down with a hard off switch or turned off via a plug strip. Because thin client computers are often used as small servers, their low percentage of time in disconnect makes sense.

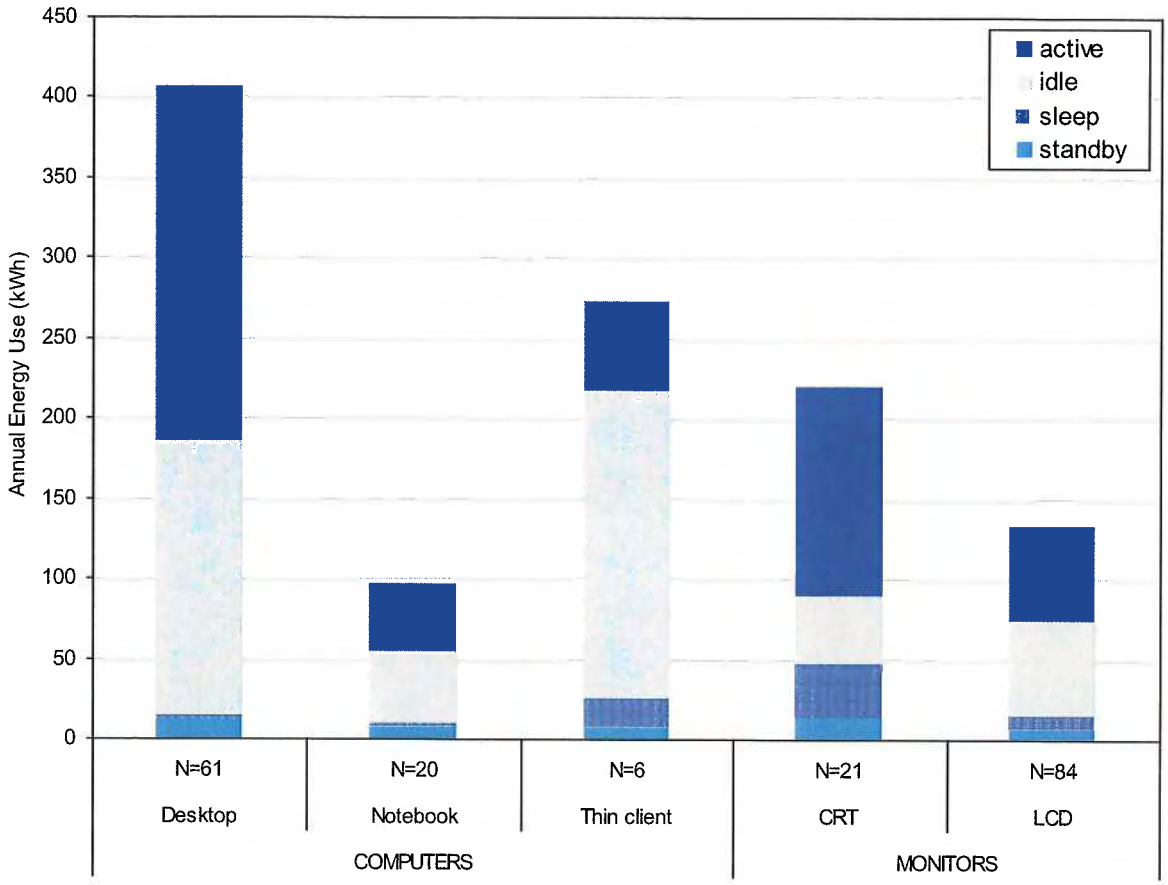


Figure 13. Computer and Monitor Energy Annual Energy Use per Device

Time of Use

Because computers made up such a significant share of office plug load energy use, researchers conducted an additional time of use analysis on desktop and notebook computers to better understand how and when computers operate. Figure 14 and Figure 15 illustrate the average hourly energy use per mode of notebook and desktop computers, respectively. The energy levels represented in these graphs is the weekday hourly average of the 20 notebook and 61 desktop computers metered. Note how active mode is concentrated during working hours for notebooks but continues throughout the evening for desktops. Active energy use by computers during nonworking hours is often indicative of screen savers. Sleep mode accounts for very little energy and is rarely used.

Office Electronics

In this study, the office electronics category consisted of imaging equipment and computer peripherals. Printers, fax machines, scanners, and multifunction devices were all considered imaging equipment and made up 11 percent of plug load energy use in the offices that participated in the study. In total, researchers metered 77 imaging devices and inventoried 232. Laser printers accounted for more than half of all the imaging equipment in the study.

Computer peripherals metered in this study consisted mostly of computer speakers, but also included external drives, and Ethernet and USB hubs and switches. These devices accounted for 6 percent of office plug load energy use.

Power Demand by Mode

Most of the imaging devices metered operated in standby, idle, and active modes throughout the two-week metering period; however, a sleep mode was also apparent in some samples (but not all) of two device types: inkjet printers and laser multifunction devices. As expected, active mode power was higher in laser devices than in inkjet devices. An exception was the wide format printers, which are typically inkjet. The laser printer had the highest active power demand at 130 watts, followed by the wide format printer active power of 87 watts and the laser multifunction devices' average active power of 76 watts. The process of fusing ink onto paper utilized in laser printers is energy intensive because it requires a great deal of heat. Therefore, a laser printer has higher active power than a laser multifunction device because the fuser is needed for every print job but is not needed for faxing and scanning.

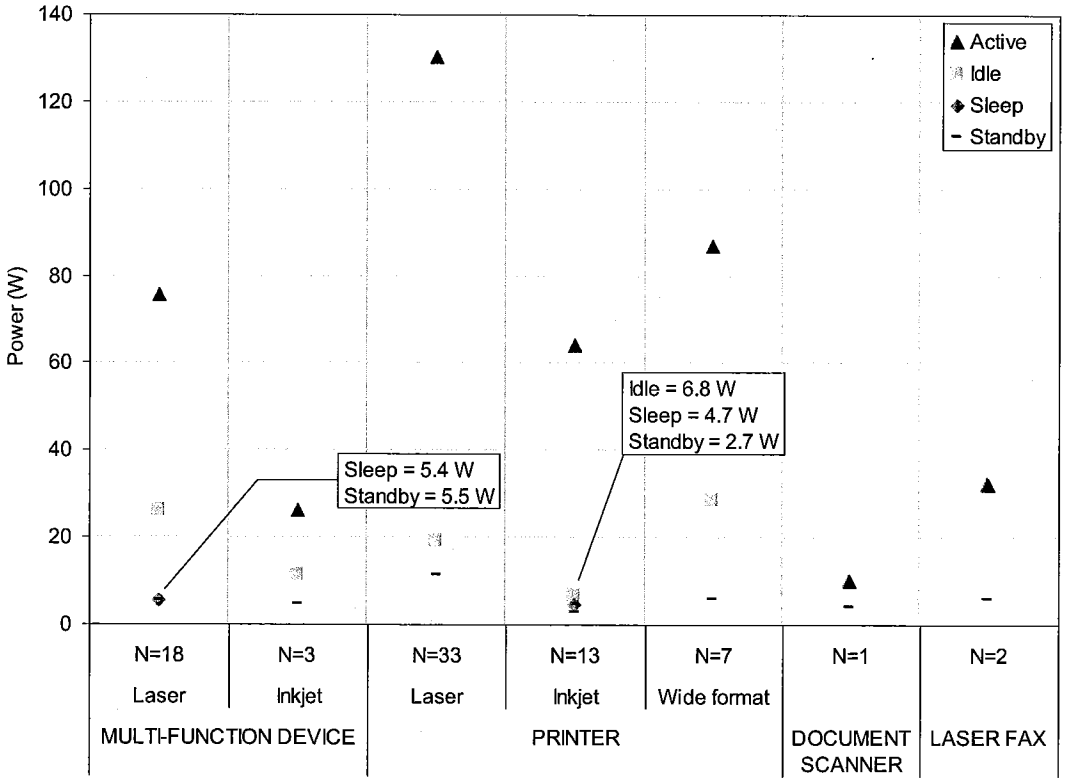


Figure 16. Imaging Equipment Power Demand by Mode

Across the range of imaging equipment, idle mode power was well below active, but on average more than three times higher than standby. This indicates potential for power reduction and ultimately energy savings by enabling device power management features to automatically move the device into a low power mode instead of remaining in idle mode indefinitely.

Note that only one scanner and two fax machines were metered. While these files reveal useful data about the metered devices, they can in no way be considered to be representative samples for these technologies.

All of the computer peripheral devices metered had active power demands of less than 30 watts with the exception of two samples of computer speakers. Eighteen of the 20 computer speakers metered had active power in the range of 7 to 8 watts. This finding was consistent with the computer speaker data recorded in the 2006 residential plug load field research (Porter et al. 2006). The two outlier computer speakers had active power values of 78 watts each. These high active measurements were surprising but probably recorded from computer speaker systems that often include multiple speakers and a subwoofer all linked together in one system. While such high-power computer speakers are not likely to be found in many office settings, they are evidently present in some. Researchers chose to separate out the higher power readings along with those of traditional computer speakers for clarity. Standby mode was 3 watts or less for every device in this category.

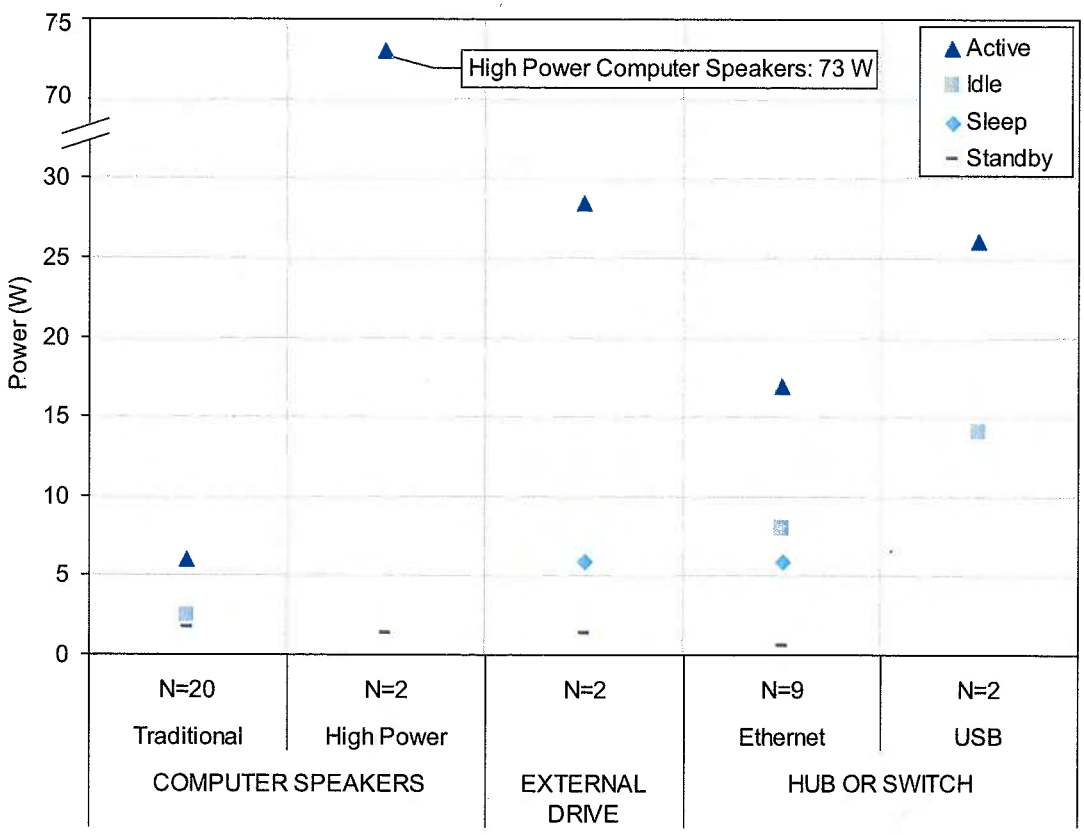


Figure 17. Computer Peripheral Power Demand by Mode

Duty Cycles

Standby mode dominated all of the imaging equipment devices metered. However, laser multifunction devices, laser printers, inkjet printers, and wide format printers all showed time in disconnect mode.

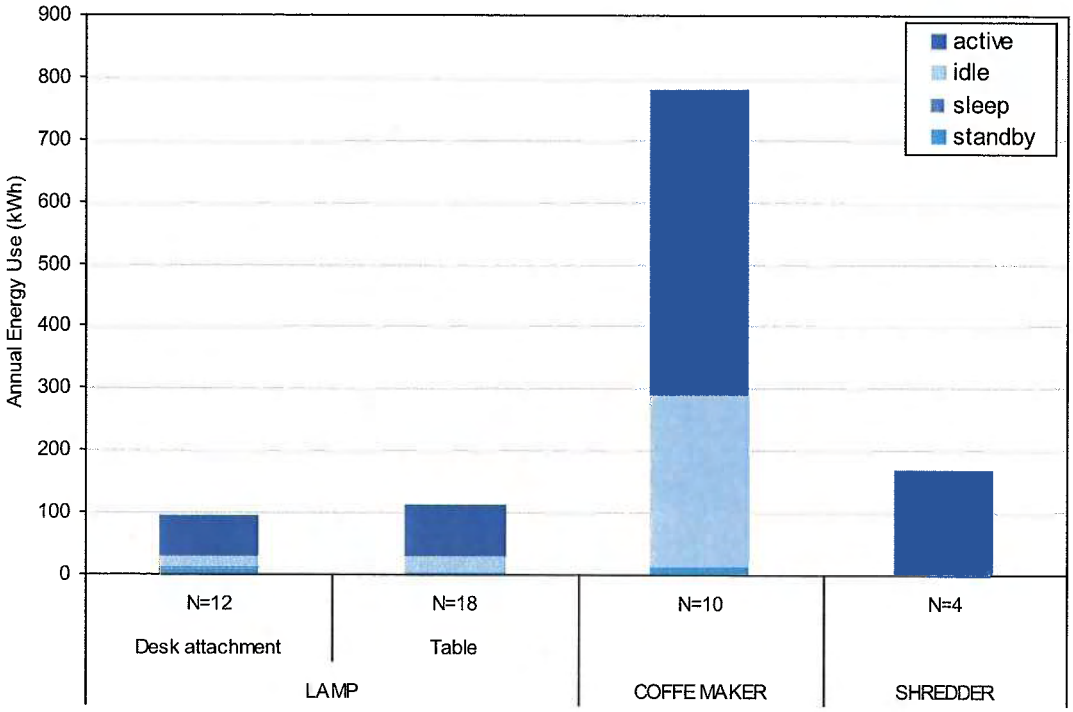


Figure 22. Miscellaneous Office Equipment Annual Energy Use by Mode

Comparing Results with Other Studies

As noted above, the study's high-level findings are in alignment with the 2006 CEUS report (Itron 2006) for share of total office energy consumed by plug loads, office plug load energy density, and total California energy consumed by office plug loads. Because the study was not large enough to be statistically significant, some variances from previous research in this area were expected.

The 2007 LBNL study, *Space Heaters, Computers, Cell Phone Chargers: How Plugged In Are Commercial Buildings?* (Sanchez et al. 2007) reported slightly lower results than the Ecos study did. In this report, researchers found that the plug loads accounted for 11 percent to 19 percent of total electricity consumption in the buildings they audited. One explanation for this difference in findings is that the LBNL sites were in San Francisco, Atlanta, and Pittsburg, whereas all of the Ecos study sites were in California. Because California has a mild climate and many building efficiency standards, it is reasonable that the share of office plug load energy use is higher in this state than in states with fewer regulations and greater heating and cooling loads. In the Annual Energy Outlook (2006), the EIA found that 14 percent of commercial electricity was attributable to PC and non-PC office equipment. This lower percentage is expected because the Ecos study focused specifically on offices, not the entire commercial sector, where office electronics and other plug loads are likely to be more prevalent. Similarly, the 2006 PG&E report *Consumer Electronics: Market Trends, Energy Consumption, and Program Recommendation* (Chase et al 2006) reported that in 2005, electronics represented 18 percent of small business and residential electricity consumption in PG&E's territory. Regarding the number of devices per square foot, LBNL reported 23 plug load devices per 1,000 square feet for all the commercial buildings it surveyed, whereas Ecos

recorded 30 devices per 1,000 square feet. However, the average number of devices for small, medium, and large offices in the LBNL study is 31.5 devices per 1,000 square feet (Sanchez et al. 2007).

Perhaps the most significant departure from previous research is the Ecos study's findings on computer energy use. Previous research may have underestimated the magnitude of computer energy use. Annual per-product energy use was not measured in previous research, but rather was calculated based on instantaneous power measurements and estimates of annual hours spent in each mode. Average measured commercial desktop and notebook computer annual energy per device is 1.3 to 3.9 times higher than these previously calculated values (see Table 6). Another explanation for the discrepancy in computer energy use is very likely the fact that both desktops and laptops in use today are faster, more powerful, and have more capabilities than the computers that were evaluated in previous studies.

Table 6. Comparison of Selected Findings with Previous Research

	Study Annual kWh/product	LBNL Annual kWh/product (Kawamoto et al 2001)	LBNL Annual kWh/product (McWhinney et al 2004)	LBNL Annual kWh/product (Sanchez et al 2007)	US DOE Annual kWh/product (Roth 2002)
Desktop Computer	407	213	n/a	n/a	297
Laptop/Notebook Computer	96	24.6	n/a	n/a	32
Inkjet Printer	84	74	52	n/a	92
Laser Printer	280	283	620[7]	n/a	735
LCD Monitor	132	n/a	n/a	n/a	23
CRT Monitor	220	205	n/a	n/a	306
Inkjet MFD	47	n/a	73	n/a	n/a
Laser MFD	197	n/a	n/a	n/a	n/a
Computer speakers	45	n/a	n/a	74	n/a

Conclusions and Next Steps

The purpose of this study was to gain detailed insights into the plug loads currently in use in California's offices and to inform future energy efficiency policies, programs, and research. Researchers inventoried how many and what kinds of plug loads are in use in 47 California offices, and recorded detailed meter files to determine which modes products operate in, what the average power demand is for each identified mode, and how products operate and are operated by consumers in their everyday office settings.

7. Includes data from black-and-white and color laser printers

Miscellaneous Category Duty Cycle Data

Table 13. Miscellaneous Category Duty Cycle Data

Product	Number Metered	Average Time in Active	Average Time in Idle	Average Time in Sleep	Average Time in Standby	Average Time in Disconnect
Television, LCD	2	16%	0%	0%	34%	50%
DVD player	1	0%	0%	0%	100%	0%
Video Projector	4	6%	0%	5%	64%	25%
CD player	3	5%	0%	0%	95%	0%
Portable CD Player	7	5%	9%	0%	75%	11%
Speakers	6	7%	37%	2%	40%	14%
Portable Stereo	1	3%	11%	0%	86%	0%
Subwoofer	1	0%	100%	0%	0%	0%
Table Radio	2	16%	0%	0%	84%	0%
Mobile Phone Charger	3	2%	.25%	0%	33.75%	64%
Corded Phone	11	0%	92%	0%	0%	8%
Answering Machine	2	0%	100%	0%	0%	0%
Adding Machine	12	5%	54%	0%	25%	16%
Battery Charger	2	1%	0%	0%	49%	50%
Clock	1	0%	100%	0%	0%	0%
Clock Radio	4	6%	72%	0%	22%	0%
Coffee Maker	10	25.5%	16%	0%	46%	12.5%
Coffee Grinder	2	0%	45%	0%	25%	30%
Espresso Maker	1	5%	0%	0%	95%	0%
Lamp, Desk Attachment	9	20%	1%	0%	9%	70%
Lamp, Table	16	14.5%	1.5%	0%	4%	80%
Shredder	4	25%	0%	0%	43%	32%
Space heater, portable	4	1%	0%	0%	99%	0%
Stapler	2	0%	48%	0%	50%	2%
Toaster Oven	1	1%	0%	0%	33%	66%
Typewriter, Electric	1	0%	0%	0%	100%	0%
PDA Charger	2	1%	44%	0%	50%	5%

EXHIBIT 4

REFERENCE MATERIALS

Occupancy Sensors

UTILITY SAVINGS INITIATIVE (USI) – FACT SHEET

Opportunities for Occupancy Sensors in Lighting Systems

Occupancy sensors automatically turn off lighting in unoccupied spaces such as classrooms, conference rooms, public spaces, dormitories, and large offices.

The typical office spends 29% of its electrical energy costs for lighting.[1] Occupancy sensors can reduce these charges by 50% or more, at an energy savings of 5¢ - 20¢ per square foot.[2] These sensors, which are usually infrared and/or ultrasonic, are most effective in those areas which are often unoccupied, such as corridors and conference rooms.[3]

Technologies: Infrared and Ultrasonic

Two technologies dominate the occupancy sensor market: infrared and ultrasonic. Passive infrared sensors detect temperature changes in a room, and work well where the entire room is within the sensor's field of view. Ultrasonic sensors use high frequency sound, much like bats do, to detect motion (even around corners). Dual-technology sensors use both methods, increasing accuracy and flexibility, but at a higher price.

Choosing the Best Applications

Facility staff can determine the best areas to install occupancy sensors by using lighting loggers or random surveys about room/area occupancy. Lighting loggers can count lighting hours and can correlate lighting duration with detected occupancy. Recording ammeters document lighting energy use. See chart for potential energy savings for various types of building spaces.

Installation & Cost Information

Proper placement and orientation of occupancy sensors is essential. Placement of controls should take into account furniture placement as much as possible. Occupancy sensors must be able to sense all occupants to avoid turning off lights while the space is occupied. At the same time, the sensitivity of the sensors must be set to avoid "false-on" incidents triggered by passerbys in adjoining hallways. Occupancy sensors with their sensitivity set too high can fail to save energy, and occupancy sensors with too low a sensitivity or too short a delay time can be annoying to occupants. Commissioning and calibration of lighting controls are essential if energy savings are to be achieved and maintained.

Occupancy sensor costs range from approximately $30 to $130, depending on the type. Payback period of occupancy sensors retrofits range from 0.5 to 5 years, depending upon the level of occupancy and energy savings potential of the area controlled.

Successes with Occupancy Sensors

NCSU Facilities Staff is testing the use of occupancy sensors as a retrofit application in various classrooms in Dabney and Broughton Hall on the North Carolina State University campus. The sensors were installed by NCSU Facility Management staff and classroom energy consumption and occupancy has been monitored by the NCSU Industrial Assessment Center (IAC). Initial adjustments were made to sensor's sensitivity to reduce 'false triggers' by passerbys outside of the classrooms. IAC staff also recommend the use of dual sensing technologies for optimum performance. Sensors were installed in a drop acoustical tile ceiling.

IAC staff have measured an approximate reduction of 30% in lighting electrical load since the installation of the sensors. After the optimization of the sensors, students and instructors have been pleased with lighting control functions. For more information, contact Alan Daeke, Director of Utilities and Engineering Services, NCSU, (919) 513-5081 or e-mail: alan_daeke@ncsu.edu.

Estimating Potential Cost Savings from Occupancy Sensors

Square Footage Basis

_____sq.ft. area of application. x 3000 hrs of operation/year* x ____% time unoccupied** x 1.5 Watts/sq.ft. x $0.0639/kWh*** x 0.001 = $_____ savings/year

Lighting Fixture Basis

_____# of fluorescent fixtures controlled by sensors x 3000 hrs. of operation/year* x ____% time unoccupied** x ____ Watts/fixture**** x $0.0639/kWh*** x 0.001 = $ _____ savings/year

* typical annual hours for a one shift/office operation. Adjust for specific applications.
** Reference U.S. EPA Chart below
*** Assumes 1.5 watts per square foot of lighting energy density with an average commercial rate of 6.39¢ per kWh in NC.
**** Use 72 watts for a 4 foot, 2-lamp, T-12 system. Use 144 watts for 4-lamp, T-12 systems; 58 watts for 2-lamp T-8's; 94 watts for 3-lamp T-8's; and 112 watts for 4-lamp T-8 systems

Potential Energy Savings From Occupancy Sensors:[3]
(Estimated Time Unoccupied)

Type of Space	U.S. EPA Prediction	EPRI Prediction
Private Offices	13-50%	25%
Classrooms	40-46%	-
Conference Rooms	22-65%	35%
Restrooms	30-90%	40%
Corridors	30-80%	-
Storage Areas	45-80%	-
Hotel Meeting Rooms	-	65%

Alternatives to Occupancy Sensors

Occupancy sensors are used in place of establishing the occupants' behavior to shut off lights upon exiting a room. For applications where the installation of occupancy sensors is cost prohibited, note the following options:

- raise awareness for building occupants with light switch stickers and educational materials,
- require custodial and security personnel to turn lights out, and
- consider controlling lights with timers or through existing energy management systems.

References & Resources:

1.Lighting Control Types, Federal Energy Management Program.
hhttp://www.eere.energy.gov/femp/procurement/light_controls.html#occupancy

2. Novitas, Inc.
http://www.novitas.com/

3.Energy Advisor: Lighting: Occupancy Sensors, Florida Power and Light, 2003
http://www.fpl.com/savings/energy_advisor/PA_10.html

Occupancy Sensor Vendors include: Watt Stopper, Sensor Switch, Novitas and Leviton.

Sponsored by the State Energy Office, N.C. Department of Administration and the U.S. Department of Energy, with State Energy Program funds, in cooperation with the **Land-of-Sky Regional Council (Waste Reduction Partners)** and the **NCDPPEA**. However, any opinions, findings, conclusions, or recommendations expressed herein are those of the author(s) and do not necessarily reflect the views of either the N.C. Department of Administration or the U.S. Department of Energy. An online version of this fact sheet is available at: http://www.landofsky.org/wrp.



Bi-level Stairwell Lighting

"Bi-level lighting has a lot of energy savings potential. Over 60% energy savings and no complaints!"

–Paul Black, UC Berkeley Manager of Utilities Engineering

Energy Savings Opportunity

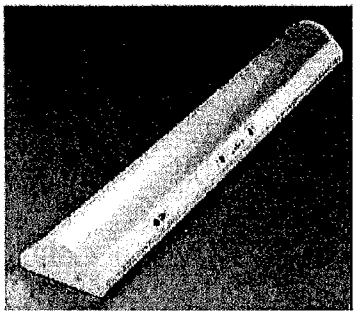
Stairwell lighting typically operates continuously at full output despite very low, intermittent use. A bi-level product line developed by LaMar Lighting uses an ultra-sonic motion sensor to detect motion in stairwells and corridors, and solid state controls are used to dim fixtures to lower light levels when a space is unoccupied. This product is ideal for areas where codes, user preferences, safety, or security requirements call for minimal light levels during unoccupied periods and full light output during occupied periods.

A preliminary study sponsored by the New York State Energy Research and Development Authority tested the technology and showed less than 4% occupancy of stairwells at two monitored sites with energy savings of 53% to 60% using bi-level fixtures that dim to 33% during unoccupied periods. Depending on the fixture configuration, the technology decreases light output from full output to 5%, 10% (120V only), or 33%. Thus, power in a typical two lamp 32 W T8 fixture is reduced from 64 W to 7–28 W.

Currently, most building codes require minimal lighting of 1 foot-candle (fc) for emergency egress in all staircases. However, a new ANSI standard has been proposed that would increase the required amount of light in stairwells during occupancy from the current standard of 1 fc to 10 fc on the stair tread or landing. To mitigate the increase in energy costs that would accompany such a requirement, these codes would also allow the use of bi-level lighting technology to reduce stairwell light levels back to 1 fc during unoccupied periods.

UC Berkeley Test Site

Researchers replaced 23 2-lamp 40 W T12 fixtures with 2-lamp 32 W T8 bi-level lighting fixtures in one stairwell at Evans Hall on the UC Berkeley campus, which is a 10-story math building with multiple stairwells. Lighting levels provided by the old fixtures ranged from 0.8 to 11 fc. Post-retrofit light levels ranged from 6 to 11 fc at 100% and around 1fc in standby mode.



Highlights

- 63% annual energy savings
- Three times the energy savings of a typical T8 retrofit
- 3.8 year payback
- Higher quality lighting

Product: Occu-smart® Series
Manufacturer: LaMar Lighting Inc.
Market: Stairwells, storerooms, restrooms, and laundry rooms
Site: Evans Hall, University of California Berkeley

Payback

The northeast stairwell of Evans Hall was retrofit with 23 2-lamp 32 W T8 Voyager bi-level fixtures for a total installed cost of $5,450. Extrapolating 4 months of monitored data for an entire year, the bi-level lighting retrofit results in annual savings of $1,430 per year compared to the old system, yielding a payback of less than 4 years (assuming $0.14/kWh).

In comparison, a standard lighting retrofit (i.e. typical 2-lamp 32 W T8 with no bi-level capabilities) would have a payback of 5.5 years, assuming $60 for a new fixture and $50 for installation.

Evans Hall Payback

	Energy Use (kWh/yr)	Energy Savings (kWh/yr)	Fixture Cost ($)	Installation Cost ($)	Total Cost ($)	Annual Cost ($)	Annual Savings ($)	Evans Hall Payback (yrs)
No retrofit	16,120	--	$0	$0	$0	$2,260	$0	-
Strandard retrofit	12,890	3,230	$1,380	$1,150	$2,530	$1,800	$460	5.5
Bi-level retrofit	5,910	10,210	$4,300	$1,150	$5,450	$830	$1,430	3.8

* Fixture costs were $187; installation time was approximately 30 minutes and estimated to cost $50.

For new construction, the predicted payback period is between 2 and 8 years depending on the fixture wattage of the alternative and the bi-level dimming capacity selected (5%, 10%, or 33%). Using a utility rate of $0.14/kWh, analysis shows:

New Construction Payback

Bi-Level Dimming Configuration	Standard Fixture Power (W)	Bi-level Fixture Power (W)	Bi-level Standby Power (W)	Estimated Time in Standby (%)	Average Bi-level Power (W)	Average Energy Saved (W)	Annual Energy Savings (kWh/yr)	Annual Cost Savings ($)	Added Cost Bi-level ($)	New Payback (yrs)
Dim to 5% at	62	62	13	95%	15.5	75	650	$91	$187	2.1
Standby	62	62	13	95%	15.5	47	410	$57	$187	3.3
(120V or 277V)	32	32	8	95%	9.2	23	200	$28	$187	6.7
Dim to 10% at	62	62	13	95%	15.5	75	650	$91	$172	1.9
Standby	62	62	13	95%	15.5	47	410	$57	$172	3.0
(120V only)	32	32	8	95%	9.2	23	200	$28	$172	6.2
Dim to 33% at	62	62	28	95%	29.7	60	530	$74	$163	2.2
Standby	62	62	28	95%	29.7	32	280	$39	$163	4.2
(120V or 277V)	32	32	14	95%	14.9	17	150	$21	$163	7.8

Study Results

Total energy savings for Evans Hall were calculated by recording the amount of time the fixtures were in standby mode (dimmed to 5%). Four months of data demonstrated that, on average, the fixtures were in the standby mode 68% of the time.

Figure 2 shows the average variation in bi-level lighting usage between floors. Usage patterns also differed from weekends to weekdays. Extrapolating four months of data to an entire year showed the bi-level fixture will save 10,210 kWh/yr, a 63% energy savings, or roughly **three times greater energy savings than a typical T8 lighting retrofit! (see Figure 3)**

In general, energy savings for bi-level fixtures depend on stairwell occupancy and the step-down settings. A comparison of energy savings at Evans Hall and three other California office buildings with similar bi-level retrofits show the greatest energy savings at Evans Hall (**see below table**).

The other three sites were in occupied mode less than 25% of the time but showed less than 50% energy savings. The sites used bi-level fixtures that dimmed to 33% compared to 5% at Evans Hall.

Bi-Level Fixture Energy Savings for Four Buildings

Building	Occupied (%)	Standby Mode (%)	Energy Savings (%)
Evans Hall	32%	68%	**63%**
Chiron Building M	25%	75%	**42%**
Alameda County Office	11%	89%	**46%**
SBC Office	18%	82%	**38%**

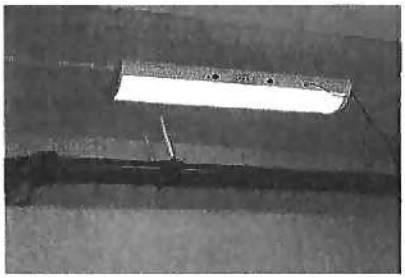


Figure 1- Example of the bi-level stairwell fixture.

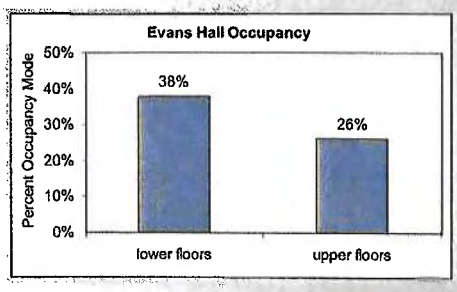
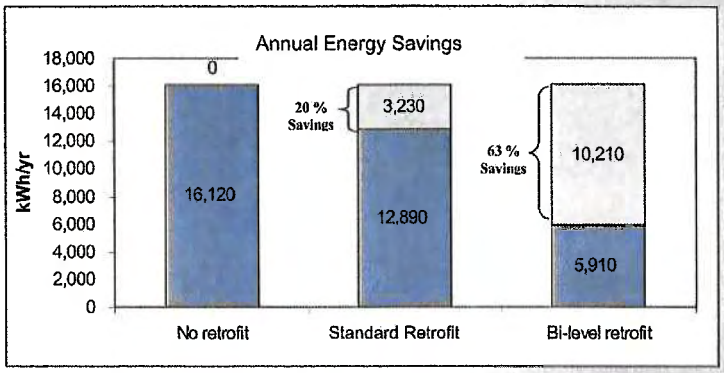


Figure 2-The percent time bi-level fixtures were in the occupied mode for upper and lower floors.



Energy Use Comparison Between Retrofits

	Percent Full	Percent Standby	Number of Fixtures	Watts Full (W)	Watts Standby (W)	Energy Use (kWh/yr)	Energy Savings (kWh/yr)	**Energy Savings (%)**
No Retrofit	100%	0%	23	80	n/a	16,120	--	**0%**
Standard Retrofit	100%	0%	23	64	n/a	12,890	3230	**20%**
Bi-level Retrofit	32%	68%	23	64	13	5,910	10210	**63%**

Figure 3- Shows the annual energy savings for the bi-level retrofit at Evans Hall compared to a standard T8 lighting retrofit. The table below the figure summarizes the data.

Conclusion

Using bi-level stairwell lighting clearly demonstrated a dramatic reduction in energy use at Evans Hall. Replacing old T12 fixtures with the bi-level fixtures resulted in 63% energy savings and a payback of less than 4 years. The fixtures were in the standby mode 68% of the time. The potential for energy savings is even higher in office buildings where stairwell usage is primarily limited to high traffic times. Bi-level stairwell fixture technology is designed to provide safe, reliable, and efficient lighting with high illumination during occupied periods and reduced illumination when stairwells are vacant.

Availability

The Occu-smart® Series bi-level light fixtures are currently being offered for sale through LaMar Lighting. To purchase or learn more about the system, visit the LaMar Lighting web site (www.lamarlighting.com).

About PIER

This project was conducted by the California Energy Commission's Public Interest Energy Research (PIER) program. PIER supports public-interest energy research and development that helps improve the quality of life in California by bringing environmentally safe, affordable, and reliable energy services and products to the marketplace.

For more information see www.energy.ca.gov/pier

093005
Pub # CEC-500-2005-141-A26

Arnold Schwarzenegger, *Governor*
California Energy Commission *Chairman* Joe Desmond *Commissioners* Arthur H. Rosenfeld, James D. Boyd, John L. Geesman, Jackalyne Pfannenstiel

Case Study ID

05-0042



ENERGY OFFICE

Case Study Series

Vending Machine Energy Savings

There are many no and low cost ways to cut the energy use in a facility. In this case study, the focus is on vending machine applications that can save, on average, 60% of typical vending machine electrical use. Vending machines are a gold mine for savings in buildings that are not occupied around the clock.

In this case study you will learn about vending machine control technology, see actual data from two Michigan school districts and get enough information to reduce your own vending machines energy consumption.

Background

Vending machines are found in all kinds of facilities today and the demand for them continues to rise. Very seldom does anyone evaluate the cost of operating a vending machine. A refrigerated vending machine operates 24 hours, seven days per week. In addition to consuming 2,500 to 4,400 kilowatt-hours (kWh) of energy per year, vending machines add to cooling loads to the spaces they occupy. With average electricity costs of about $0.08/kWh, that amounts to $200 to $350 per year in operating costs not including increased cooling loads. Energy consumption and cost will vary depending on type and size of each vending machine.

There are two primary ways to reduce operating cost while maintaining the operation of the machines. These methods are upgrading or eliminating display lighting, and occupancy sensing.

Upgrade lighting A typical vending machine with a lighted front display panel uses two or three 4-foot high-output T12 fluorescent lamps powered by conventional magnetic ballasts, drawing as much as 150 watts of power. This continuous load consumes 1,314 kWh per year for an annual cost of $105 (at 8¢ per kWh). The heat from the lights also increases the machine's refrigeration load. In one test, disconnecting a vending machine's lights cut energy use by 35 percent. However, users' attempts to get operators or vendors to disconnect the lights don't always meet with success. Retro-fitting the light fixtures with energy efficient T-8 lamps and electronic ballasts will reduce the energy consumption. Pair this retrofit with a simple timing mechanism to turn the lights off in unoccupied hours to achieve additional savings.

Occupancy sensing There is at least one product on the market that utilizes passive infrared technology to cut power to vending machines while an area is unoccupied. This stops the compressor from cycling and the fluorescent lights from burning. This device will also monitor room conditions and allow the machine to operate as required to keep the contents at a temperature not much different from that of regular operation.

In typical operation, power is cut to the vending machine after the area has been vacant for 15 minutes. The device is designed so that a machine in a room that's around 70 degrees Fahrenheit will be shut down for up to two hours if no one walks by. At that point, the machine is turned back on to run a compressor cycle, after which it turns back off if the occupancy sensor indicates that the area is still vacant. When someone approaches the machine, the sensor sends a signal to turn the lights and other electronic components back on, and the compressor runs a cooling cycle if needed.

The controller ensures that after the machine is re-powered, the compressor is allowed to run a complete cooling cycle before it is powered down again. A sensor also determines whether the compressor is running and prevents the machine from shutting down until the cycle has been completed. Both of these features ensure that

a high-pressure start, which would strain the compressor, does not occur. An indicator light goes on if the compressor has been running for more than 12 hours—a signal that maintenance may be required. Savings, as claimed by the manufacturer and users, for vending machines equipped with these devices range from 25 to 75 percent, depending on usage patterns, occupancy in the area, and ambient conditions.

Sample Outcomes in two school districts

Two Michigan school districts have experimented with these approaches to reducing vending machine energy consumption— Grandville Public Schools and Belding Area Schools. Both districts have achieved ENERGY STAR Building Labels, placing them in the top 25% in the nation for energy efficiency, and both have been recognized for their approach to efficient building operation.

Grandville Public Schools installed VendingMiser® equipment for all 42 of their refrigerated vending machines in the summer of 2003. They have estimated that these devices have already paid for themselves in energy cost savings. In addition to energy cost savings they have identified at least one vending machine that was malfunctioning causing the compressor to run continuously and costing the district a considerable amount of expense. This machine has been repaired and is now functioning properly.

Belding Area Schools has installed VendingMiser® equipment for all 22 of their refrigerated vending machines. Belding plans to disconnect the fluorescent lights in all of their machines. In addition to energy cost savings they too have identified at least two vending machines that were malfunctioning causing the compressors to run continuously. These machines have been repaired and are now functioning properly.

		Machine 1	Machine 2	Machine 3
Constant Values	Traffic Volume	Low	Low	High
	Cost of Electricity (per kWh)	$0.0826	$0.0826	$0.083
Before Installation	Status of Display Lights	In Use	In Use	Not In Use
	Consumption (kW per hour)	0.438	0.43	0.36
	Annual Consumption (KWH)	3,837	3,767	3,154
	Annual Cost	$316.93	$311.15	$261.75
After Installation	Status of Display Lights	In Use	In Use	Not In Use
	Consumption (kW per hour)	0.18	0.081	0.22
	Annual Consumption (KWH)	1,577	710	1,927
	Annual Cost	$130.26	$58.65	$159.96
Savings Information	Energy Saved	2,260	3,057	1,226
	Cost Savings	$186.67	$252.5	$101.8
	Overall Reduction	59%	80%	39%

Both districts report that the installation process is simple including plugging the vending machine into the VendingMiser® and then into the standard wall plug. The motion sensor for the unit also requires mounting. Approximate cost to implement was less than $200 per machine for both districts.

The information below was collected by the Belding and Grandville facility staff, thru the use of watt meters, general knowledge of the buildings and maintenance records.

Machine 1– Grandville Public Schools. This machine is located in West Elementary in a fairly low traffic area. Low traffic in the vicinity of this machine will increase the potential for energy cost savings.

Machine 2– Grandville Public Schools. This machine is located in the transportation building in a fairly low traffic area. Low traffic in the vicinity of this machine will increase the potential for energy cost savings.

Machine 3– Belding Area Schools. This machine is located in the Belding Middle School common area just outside

For more information regarding this particular Energy Project or other questions pertaining to it:

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Belding Area School
Director of Facilities
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Brandy Minikey
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Staff Engineer
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bjminik@michigan.gov

Carl Goeb
USA Technologies, Inc
Michigan Representative
(616) 296-0037
carlgoeb@sbcglobal.net

VendingMiser®

ENERGY MANAGEMENT SYSTEM
For Refrigerated Vending Machines

Improve the profitability of your existing cold drink machines. Vending Miser® puts you on a cost-effective refresher course for energy savings and conservation.

VendingMiser cuts energy costs down to size

VendingMiser incorporates its innovative energy-saving technology into a small, plug-and-play powerhouse that installs in minutes either on the wall or on the vending machine. It's that easy.

With VendingMiser there's no need to have new machines to achieve maximum energy savings resulting in a reduction in operating costs and greenhouse gas emissions. When equipped with the VendingMiser, refrigerated beverage vending machines use less energy and are comparable in daily energy performance to new ENERGY STAR® qualified machines.

Power play

Compatible with all types of cold drink vending machines, the VendingMiser uses a Passive Infrared Sensor (PIR) to power down the machine when the area surrounding it is vacant. Then it monitors the room's temperature and automatically re-powers the cooling system at one- to three-hour intervals, independent of sales, to ensure that the product stays cold.

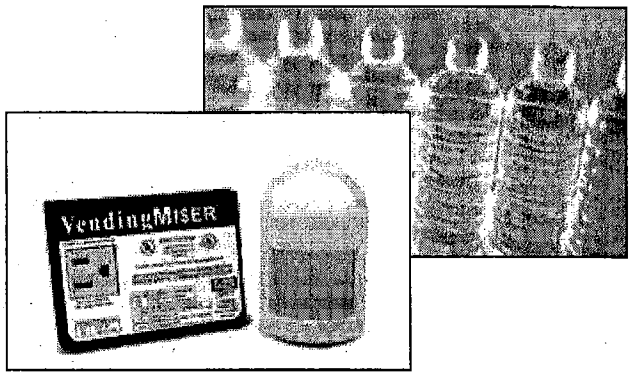
This Miser runs the bank

For a series of up to four machines, VendingMiser can use its embedded Sensor Repeater, which allows it to be controlled from the PIR sensor of any other Miser in the bank.

Refresher course

VendingMiser's microcontroller will never power down the machine while the compressor is running, eliminating compressor short-cycling. In addition, when the machine is powered up, the cooling cycle is allowed to finish before again powering down. This reduces the wear and tear on your machines, extending the lifespan and prolonging your profitability. Maintenance savings is generated through reduced running time of vendor components – estimated at $40 - $80 per year, per machine. The VendingMiser has been tested and accepted for use by major bottlers.

VendingMiser reduces energy consumption an average of 46%—typically $150 per machine.



Vending Miser offers...

- A quick, inexpensive solution to energy savings and conservation
- Longer machine lifespan
- Early return on investment
- Environmental benefits

VendingMiser can also control other cooled product vending machines, such as refrigerated candy machines.

VendingMiser Technical Specifications

Electrical Specifications
Input Voltage: 115 Volts
Input Frequency: 50/60 Hz
Maximum Load: 12 Amps (Steady-State)
Power Consumption: Less than 1 Watt (Standby)

Environmental Specifications
Operating Temp: -15°C to 75°C
Storage Temp: -40°C to 85°C
Relative Humidity: 95% Maximum (Non-Condensing)

Compatibility
Vending Machines: Any machine, except those containing perishable goods such as dairy products

Inactivity Timeouts
Occupancy Timeout: 15 minutes
Auto Re-power: One to three hours, dynamically adjusted, based on ambient temperature

Dimensions
Size: 4.5"W x 1.75"H x 3.25"D
Weight: 2.2 lbs. (includes power cable)

Regulatory Approvals
Safety: UL/C-UL Listed
Information Technology Equipment (ITE) 9T79

Other energy-saving products offered by USA Technologies include VM21Q™, CoolerMiser™, SnackMiser™ and PlugMiser™.

GSA Schedule
Contract GS-35F-0031R

ENERGY STAR PARTNER

USA TECHNOLOGIES

Optimum Energy Products Ltd. Toll Free 877-766-5412 Main 403-256-3636 Fax 403-256-3431

Frequently Asked Questions

Will VendingMiser® keep my drinks cold?
Absolutely - VendingMiser® has been tested and accepted for use by both major bottlers.

Is the VendingMiser® easy to install?
Yes! VendingMiser® is a simple external plug-and-play product. The VendingMiser® can be installed on the wall with simple hand tools or it can be attached to the vending machine without tools using the new Easy-Install system. The Easy-Install System allows quick installation in 5 minutes.

Is VendingMiser® safe for all machines?
Yes! VendingMiser® is compatible with all types of cold drink vending machines. In fact, by reducing run time of the machines, VendingMiser® reduces maintenance costs.

Has VendingMiser® been field tested?
Tens of thousands of VendingMisers® are operational in the field. Typical energy savings have been independently documented to be between 35% and 45%. Measurement and verification test results as well as testimonials are available on the website.

Are there any locations not appropriate for VendingMiser®?
VendingMiser's® savings are generated as a result of location vacancy. Therefore, a machine in a location that is occupied 24-hours, 7 days a week will likely generate little savings. Our VM2IQ is more appropriate for this type of location and will typically save up to 35% energy use.

Technical Specifications

ELECTRICAL SPECIFICATIONS

Input Voltage:	115 Volts (230 Volts available)
Input Frequency:	50/60 Hz
Maximum Load:	12 Amps (Steady-State)
Power Consumption:	Less than 1 Watt (Standby)

ENVIRONMENTAL SPECIFICATIONS

Operating Temp:	-15°C to 75°C
Storage Temp:	-40°C to 85°C
Relative Humidity:	95% Maximum (Non-Condensing)

COMPATIBILITY

Vending Machines:	Any machine, except those containing perishable goods such as dairy products.

INACTIVITY TIMEOUTS

Occupancy Timeout:	15 minutes
Auto Repower:	One to three hours, dynamically adjusted based on ambient temperature

DIMENSIONS

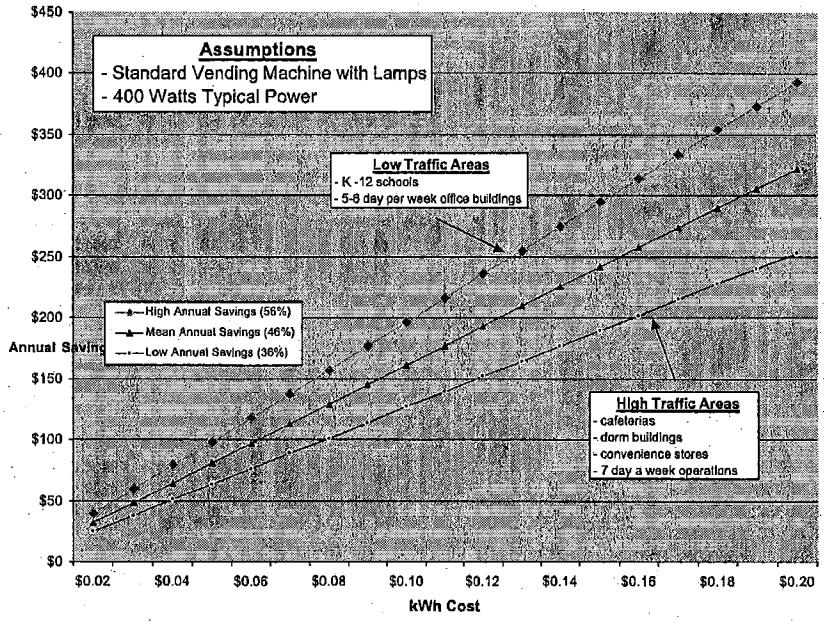
Size:	4.5"W x 1.75"H x 3.25"D
Weight:	2.2 lb. (incl. power cable)

REGULATORY APPROVALS

Safety:	UL/C-UL Listed Information Technology Equipment (ITE) 9179

UL LISTED c UL LISTED

Typical Saving Generated with VendingMiser®



VendingMiser® Products

VM150	VendingMiser® with PIR Sensor
VM151	VendingMiser® only
VM160	Weatherproof VendingMiser® with PIR Sensor
VM161	Weatherproof VendingMiser® only
VM170	Easy-Install VendingMiser® with PIR Sensor
VM171	Easy-Install VendingMiser® only
VM180	Weatherproof Easy-Install VendingMiser w/PIR sensor
VM181	Weatherproof Easy-Install VendingMiser only

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Main | Features | Specs | Documents | Accessories

SnackMiser will power down a snack machine when it determines that no one is in the area around the machine. Like other Miser family members, SnackMiser utilizes a Passive Infrared (PIR) Sensor to determine occupancy in the area around the vending machine. For a bank of machines, SnackMiser can utilize its unique embedded Sensor Repeater, which allows it to be controlled from the PIR sensor of any other Miser in the bank. This facilitates a quick and simple installation.

A snack machine's lights and electronics typically draw nearly 100 Watts. This means a powered on snack machine is equivalent to leaving a 100 Watt light bulb on 24 hours a day, every day of the year - holidays included. Powering this snack machine down when not needed can result in real savings.

Additionally, keeping a snack machine's electronics powered off, unless the machine is actually needed, lengthens the expected lifetime of the equipment and reduces its exposure to damaging power line spikes. Air conditioning load is also reduced, resulting in further savings. SnackMiser is proudly made in the USA.

More Information

See the USA Technologies SM150 Brochure

Optimize It!

Increase the value of your USA Technologies SM150 with these useful accessories.



10 pack of SM150, Save $80
Save $80 on the USAT SnackMiser Master Uni...
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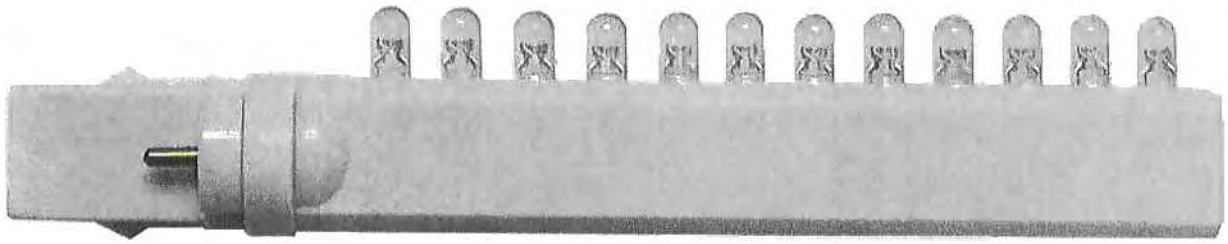
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To find the right product quickly and easily visit our specialty test & measurement websites at:
http://www.optimumenergy.com/websites.html

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WATT-MAN
L.E.D. LIGHTING
LED LAMP SPECIALISTS

Model: UBW12WK120P or UBW12WK277P



LED Security Fixture – 12 LED Bed Check Lamp

$13 to $15

PRODUCT FEATURES

- Retrofits PL5,7,9 (G23 based) fluorescent tubes used for security fixture bed check lights in detention cells
- Eliminates bulb replacement assuring increased safety with long-term operational service
- 12 high intensity white LEDs
- Solid-state electronic circuitry
- 120VAC or 277VAC voltages available
- PL5,7,9 (G23) base
- 5.75" M.O.L.
- 1-watt energy consumption
- 50,000 hour design life
- Lamp installation requires bypassing the ballast in the circuit



Tel: 1.800.296.3948 Fax: 888.249.8989 | www.wattmanledlamp.com

EXHIBIT 5

CALCULATIONS

Summary of Juvenile Justice Center Lighting ECRMs

ECM	Description	Natural Gas Savings (therm/yr)	Electrical Savings (kWh/yr)	Monetary Savings ($/yr)	Project Cost ($)	Simple Payback (yrs)
L1	Linear Fluorescent Lighting Retrofit	(4,632)	164,585	$9,721	$35,241	3.6
L2	Incandescent & CFL Lamp Replacement	(224)	7,963	$470	$2,710	5.8
L3	LED Exit Sign Replacement	(33)	1,169	$69	$3,120	45.2
L4	Occupancy Sensors	(384)	13,646	$806	$9,365	11.6
L5	Exterior Lighting Retrofit	0	27,711	$2,383	$12,960	5.4
L8	High Bay Lighting Replacement	(156)	5,541	$327	$2,925	8.9

Juvenile Justice Center - Input

Local Seasonal Weather Information		
Average Winter Temp.	39.1	(˚F)
Average Summer Temp.	71.5	(˚F)
Heating Season Length	251	(days/yr)
Cooling Season Length	114	(days/yr)
Heating Season Length	35.9	(wks/yr)
Cooling Season Length	16.3	(wks/yr)
Annual Daylight Hours (Chicago)	4380	(days/yr)

HVAC System Information		
Heating System Eff.	75%	(%)
Cooling System Eff.	1.26	(kW/ton)
Winter Temp. Setpoint	74	(˚F)
Summer Temp. Setpoint	68	(˚F)

Utility Cost Information		
Natural Gas Rate	$0.957	($/therm)
Electricity Usage Rate	$0.086	($/kWh)
Electricity Demand Rate	$0.00	($/kW-mo)

HVAC Energy Consumption		
Heating Energy Use	0	(kWh/yr)
Heating Energy Use	1,571	(therm/yr)
Cooling Energy Use	6,071	(kWh/yr)
Cooling Energy Use	0	(therm/yr)

Juvenile Justice Center - Lighting Input

Wattages				
Fixture Type	**# of Lamps**	**Lamp Wattage**	**Ballast Factor**	**Fixture Wattage**
4-foot 1-lamp 32W Std T8	1	32	1.00	32
4-foot 2-lamp 32W Std T8	2	32	1.00	64
4-foot 3-lamp 32W Std T8	3	32	1.00	96
4-foot 4-lamp 32W Std T8	4	32	1.00	128
4-foot 1-lamp 32W HP T8	1	32	0.88	28
4-foot 2-lamp 32W HP T8	2	32	0.88	56
4-foot 3-lamp 32W HP T8	3	32	0.88	84
4-foot 4-lamp 32W HP T8	4	32	0.88	113
4-foot 1-lamp 28W HL T8	1	28	1.00	28
4-foot 2-lamp 28W HL T8	2	28	1.00	56
4-foot 3-lamp 28W HL T8	3	28	1.00	84
4-foot 4-lamp 28W HL T8	4	28	1.00	112
4-foot 1-lamp 34W Std T12	1	34	1.10	37.4
4-foot 2-lamp 34W Std T12	2	34	1.10	74.8
4-foot 3-lamp 34W Std T12	3	34	1.10	112.2
4-foot 4-lamp 34W Std T12	4	34	1.10	149.6
4-foot 2-lamp 31W U-bend T8	2	31	1.00	62
4-foot 3-lamp 31W U-bend T8	3	31	1.00	93
2-foot 2-lamp 17W T8	2	17	1.00	34

Pricing	
Price	**Replacement Fixture**
$2.50	28W High Lumen T8 Lamp*
$2.50	32W High Lumen T8 Lamp*
$2.25	17W High Lumen T8 Lamp*
$10.00	23W PAR CFL
$13.00	1-Lamp NBF T8 Ballast*
$13.00	2-Lamp NBF T8 Ballast*
$14.00	3-Lamp NBF T8 Ballast*
$15.00	4-Lamp NBF T8 Ballast*
$13.00	2-Lamp LBF T8 Ballast*
$11.00	2-foot Retrofit kit (U-tube to F17)
$15.00	4-foot Retrofit kit
$45.00	Wall Switch IR Sensor
$50.00	Ceiling IR Sensor
$100.00	Ceiling IR/ Ultrasonic Sensor

Hours of Operation				
Room Type	**Hrs/ Day**	**Days/Wk**	**Wks/ Yr**	**Annual Hours**
L = Living Sace	15.0	7.0	52	5460
G = Gym	8.0	5.5	52	2288
0 = Offices, Classroom	9.0	5.0	52	2340
CF = Conference Rooms, Storage	4.0	5.0	52	1040
C = Common Areas (break, copy, etc.)	14.0	5.0	52	3640
H = Halls & Lobbys	14.0	5.5	52	4004
RR = Restrooms	9.0	5.5	52	2574
M = Mechanical/ Electrical Rooms	14.0	5.0	52	3640

* Pricing includes cost to recycle old lamps or ballasts

L1: Linear Fluorescent Lighting Retrofit (Juvenile Justice Center)

Line	Room	Space Type	Present Lighting			Proposed Lighting			Time On	Demand Reduction	Electricity Savings	Capital	Labor Cost	Total Cost
			Qty	Fixture	Watts	Qty	Fixture	Watts	(hrs/yr)	(kW)	(kWh/yr)	Cost ($)	($)	($)
1	Stairwell	H	5	4-foot 1-lamp Std 34W T12	37.4	5	4-foot 1-lamp RW T8	28	4004	0.05	185	$15.50	$30.00	$227.50
2	Stairwell	H	5	4-foot 1-lamp Std 34W T12	37.4	5	4-foot 1-lamp RW T8	28	4004	0.05	185	$15.50	$30.00	$227.50
3	Stairwell	H	5	4-foot 1-lamp Std 34W T12	37.4	5	4-foot 1-lamp RW T8	28	4004	0.05	185	$15.50	$30.00	$227.50
4	M100	M	2	4-foot 1-lamp Std 34W T12	37.4	2	4-foot 1-lamp RW T8	28	3640	0.02	67	$15.50	$30.00	$91.00
			2											
5	BOILER RM	M	4	4-foot 2-lamp 34W T12	74.8	4	4-foot 2-lamp RW T8	56	3640	0.07	269	$18.00	$30.00	$192.00
6	ELECT CLOSET	M	1	4-foot 2-lamp 34W T12	74.8	1	4-foot 2-lamp RW T8	56	3640	0.02	67	$18.00	$30.00	$48.00
7	HOUSE STORAGE	CF	2	4-foot 2-lamp 34W T12	74.8	2	4-foot 2-lamp RW T8	56	1040	0.04	38	$18.00	$30.00	$96.00
8	JANITOR	CF	1	4-foot 2-lamp 34W T12	74.8	1	4-foot 2-lamp RW T8	56	1040	0.02	19	$18.00	$30.00	$48.00
9	JANITOR	CF	2	4-foot 2-lamp 34W T12	74.8	2	4-foot 2-lamp RW T8	56	1040	0.04	38	$18.00	$30.00	$96.00
10	LOADING	CF	3	4-foot 2-lamp 34W T12	74.8	3	4-foot 2-lamp RW T8	56	1040	0.06	58	$18.00	$30.00	$144.00
11	M1	O	1	4-foot 2-lamp 34W T12	74.8	1	4-foot 2-lamp RW T8	56	2340	0.02	43	$18.00	$30.00	$48.00
12	M101	O	3	4-foot 2-lamp 34W T12	74.8	3	4-foot 2-lamp RW T8	56	2340	0.06	130	$18.00	$30.00	$144.00
13	M102	O	2	4-foot 2-lamp 34W T12	74.8	2	4-foot 2-lamp RW T8	56	2340	0.04	86	$18.00	$30.00	$96.00
14	M106	O	2	4-foot 2-lamp 34W T12	74.8	2	4-foot 2-lamp RW T8	56	2340	0.04	86	$18.00	$30.00	$96.00
15	M108	O	1	4-foot 2-lamp 34W T12	74.8	1	4-foot 2-lamp RW T8	56	2340	0.02	43	$18.00	$30.00	$48.00
16	M111	O	2	4-foot 2-lamp 34W T12	74.8	2	4-foot 2-lamp RW T8	56	2340	0.04	86	$18.00	$30.00	$96.00
17	M112	O	1	4-foot 2-lamp 34W T12	74.8	1	4-foot 2-lamp RW T8	56	2340	0.02	43	$18.00	$30.00	$48.00
18	M113	O	1	4-foot 2-lamp 34W T12	74.8	1	4-foot 2-lamp RW T8	56	2340	0.02	43	$18.00	$30.00	$48.00
19	M114	O	1	4-foot 2-lamp 34W T12	74.8	1	4-foot 2-lamp RW T8	56	2340	0.02	43	$18.00	$30.00	$48.00
20	MANTRAP	CF	1	4-foot 2-lamp 34W T12	74.8	1	4-foot 2-lamp RW T8	56	1040	0.02	19	$18.00	$30.00	$48.00
21	MEN	RR	1	4-foot 2-lamp 34W T12	74.8	1	4-foot 2-lamp RW T8	56	2574	0.02	48	$18.00	$30.00	$48.00
22	MEN	RR	2	4-foot 2-lamp 34W T12	74.8	2	4-foot 2-lamp RW T8	56	2574	0.04	95	$18.00	$30.00	$96.00
23	REFFER HALL	C	3	4-foot 2-lamp 34W T12	74.8	3	4-foot 2-lamp RW T8	56	3640	0.06	202	$18.00	$30.00	$144.00
24	RESTROOM	RR	1	4-foot 2-lamp 34W T12	74.8	1	4-foot 2-lamp RW T8	56	2574	0.02	48	$18.00	$30.00	$48.00
25	RESTROOM	RR	1	4-foot 2-lamp 34W T12	74.8	1	4-foot 2-lamp RW T8	56	2574	0.02	48	$18.00	$30.00	$48.00
26	RESTROOM	RR	1	4-foot 2-lamp 34W T12	74.8	1	4-foot 2-lamp RW T8	56	2574	0.02	48	$18.00	$30.00	$48.00
27	RESTROOM	RR	3	4-foot 2-lamp 34W T12	74.8	3	4-foot 2-lamp RW T8	56	2574	0.06	143	$18.00	$30.00	$144.00
28	SALLYPORT	C	9	4-foot 2-lamp 34W T12	74.8	9	4-foot 2-lamp RW T8	56	3640	0.17	605	$18.00	$30.00	$432.00
29	SHOWER	RR	3	4-foot 2-lamp 34W T12	74.8	3	4-foot 2-lamp RW T8	56	2574	0.06	143	$18.00	$30.00	$144.00
30	SLOP	CF	1	4-foot 2-lamp 34W T12	74.8	1	4-foot 2-lamp RW T8	56	1040	0.02	19	$18.00	$30.00	$48.00
31	STAFF	C	3	4-foot 2-lamp 34W T12	74.8	3	4-foot 2-lamp RW T8	56	3640	0.06	202	$18.00	$30.00	$144.00
32	TELEPHONE	C	1	4-foot 2-lamp 34W T12	74.8	1	4-foot 2-lamp RW T8	56	3640	0.02	67	$18.00	$30.00	$48.00
33	VEST C HALL	H	4	4-foot 2-lamp 34W T12	74.8	4	4-foot 2-lamp RW T8	56	4004	0.07	296	$18.00	$30.00	$192.00
34	VISITORS HALL	H	7	4-foot 2-lamp 34W T12	74.8	7	4-foot 2-lamp RW T8	56	4004	0.13	518	$18.00	$30.00	$336.00
35	WOMEN	RR	1	4-foot 2-lamp 34W T12	74.8	1	4-foot 2-lamp RW T8	56	2574	0.02	48	$18.00	$30.00	$48.00
36	WOMEN	RR	2	4-foot 2-lamp 34W T12	74.8	2	4-foot 2-lamp RW T8	56	2574	0.04	95	$18.00	$30.00	$96.00
			71											
37	1.1	L	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.06	305	$33.00	$30.00	$63.00
38	1.2	L	7	4-foot 3-lamp 34W T12	112.2	7	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.39	2,136	$33.00	$30.00	$441.00
39	12B	C	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56	3640	0.06	203	$33.00	$30.00	$63.00
40	AD101	O	4	4-foot 3-lamp 34W T12	112.2	4	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.22	523	$33.00	$30.00	$252.00
41	AD102	O	2	4-foot 3-lamp 34W T12	112.2	2	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.11	262	$33.00	$30.00	$126.00
42	AD103	O	2	4-foot 3-lamp 34W T12	112.2	2	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.11	262	$33.00	$30.00	$126.00
43	AD104	O	2	4-foot 3-lamp 34W T12	112.2	2	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.11	262	$33.00	$30.00	$126.00
44	AD105	O	3	4-foot 3-lamp 34W T12	112.2	3	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.17	392	$33.00	$30.00	$189.00
45	AD106	O	2	4-foot 3-lamp 34W T12	112.2	2	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.11	262	$33.00	$30.00	$126.00
46	ADMIN	O	3	4-foot 3-lamp 34W T12	112.2	3	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.17	392	$33.00	$30.00	$189.00
47	BREAK RM	C	6	4-foot 3-lamp 34W T12	112.2	6	4-foot 2-lamp RW T8 w/ Refl	56	3640	0.34	1,220	$33.00	$30.00	$378.00
48	COURT SECURIYT	C	2	4-foot 3-lamp 34W T12	112.2	2	4-foot 2-lamp RW T8 w/ Refl	56	3640	0.11	407	$33.00	$30.00	$126.00
49	CR201	O	2	4-foot 3-lamp 34W T12	112.2	2	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.11	262	$33.00	$30.00	$126.00
50	CR202	O	2	4-foot 3-lamp 34W T12	112.2	2	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.11	262	$33.00	$30.00	$126.00
51	CR203	O	4	4-foot 3-lamp 34W T12	112.2	4	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.22	523	$33.00	$30.00	$252.00
52	CR204	O	6	4-foot 3-lamp 34W T12	112.2	6	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.34	785	$33.00	$30.00	$378.00
53	CR205	O	2	4-foot 3-lamp 34W T12	112.2	2	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.11	262	$33.00	$30.00	$126.00
54	FILE	C	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56	3640	0.06	203	$33.00	$30.00	$63.00

55	FILE 2	C	3	4-foot 3-lamp 34W T12	112.2	3	4-foot 2-lamp RW T8 w/ Refl	56	3640	0.17	610	$33.00	$30.00	$189.00
56	FS102	C	2	4-foot 3-lamp 34W T12	112.2	2	4-foot 2-lamp RW T8 w/ Refl	56	3640	0.11	407	$33.00	$30.00	$126.00
57	FS103	C	3	4-foot 3-lamp 34W T12	112.2	3	4-foot 2-lamp RW T8 w/ Refl	56	3640	0.17	610	$33.00	$30.00	$189.00
58	GYM	G	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56	2288	0.06	128	$33.00	$30.00	$63.00
59	HALL	H	64	4-foot 3-lamp 34W T12	112.2	64	4-foot 2-lamp RW T8 w/ Refl	56	4004	3.58	14,320	$33.00	$30.00	$4,032.00
60	HALL	H	4	4-foot 3-lamp 34W T12	112.2	4	4-foot 2-lamp RW T8 w/ Refl	56	4004	0.22	895	$33.00	$30.00	$252.00
61	HALL	H	13	4-foot 3-lamp 34W T12	112.2	13	4-foot 2-lamp RW T8 w/ Refl	56	4004	0.73	2,909	$33.00	$30.00	$819.00
62	HALL	H	4	4-foot 3-lamp 34W T12	112.2	4	4-foot 2-lamp RW T8 w/ Refl	56	4004	0.22	895	$33.00	$30.00	$252.00
63	HB101	O	2	4-foot 3-lamp 34W T12	112.2	2	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.11	262	$33.00	$30.00	$126.00
64	HOME BOUND	C	6	4-foot 3-lamp 34W T12	112.2	6	4-foot 2-lamp RW T8 w/ Refl	56	3640	0.34	1,220	$33.00	$30.00	$378.00
65	LA101	C	5	4-foot 3-lamp 34W T12	112.2	5	4-foot 2-lamp RW T8 w/ Refl	56	3640	0.28	1,017	$33.00	$30.00	$315.00
66	LA102	O	2	4-foot 3-lamp 34W T12	112.2	2	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.11	262	$33.00	$30.00	$126.00
67	LADIES LOCKER	RR	9	4-foot 3-lamp 34W T12	112.2	9	4-foot 2-lamp RW T8 w/ Refl	56	2574	0.50	1,295	$33.00	$30.00	$567.00
68	MANTRAP	C	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56	3640	0.06	203	$33.00	$30.00	$63.00
69	MEN	RR	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56	2574	0.06	144	$33.00	$30.00	$63.00
70	MENS LOCKER	RR	5	4-foot 3-lamp 34W T12	112.2	5	4-foot 2-lamp RW T8 w/ Refl	56	2574	0.28	719	$33.00	$30.00	$315.00
71	OBSERVATION	C	3	4-foot 3-lamp 34W T12	112.2	3	4-foot 2-lamp RW T8 w/ Refl	56	3640	0.17	610	$33.00	$30.00	$189.00
72	PD OFFICER	O	2	4-foot 3-lamp 34W T12	112.2	2	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.11	262	$33.00	$30.00	$126.00
73	PD201	O	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.06	131	$33.00	$30.00	$63.00
74	PD202	O	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.06	131	$33.00	$30.00	$63.00
75	PD203	O	2	4-foot 3-lamp 34W T12	112.2	2	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.11	262	$33.00	$30.00	$126.00
76	PD204	O	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.06	131	$33.00	$30.00	$63.00
77	PD205	O	4	4-foot 3-lamp 34W T12	112.2	4	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.22	523	$33.00	$30.00	$252.00
78	POD3	O	7	4-foot 3-lamp 34W T12	112.2	7	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.39	915	$33.00	$30.00	$441.00
79	PUBLIC DEFENDER	O	2	4-foot 3-lamp 34W T12	112.2	2	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.11	262	$33.00	$30.00	$126.00
80	RECEPTION	O	6	4-foot 3-lamp 34W T12	112.2	6	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.34	785	$33.00	$30.00	$378.00
81	RECEPTION	O	4	4-foot 3-lamp 34W T12	112.2	4	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.22	523	$33.00	$30.00	$252.00
82	RESTROOM	RR	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56	2574	0.06	144	$33.00	$30.00	$63.00
83	RESTROOM	RR	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56	2574	0.06	144	$33.00	$30.00	$63.00
84	RESTROOM	RR	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56	2574	0.06	144	$33.00	$30.00	$63.00
85	RESTROOM	RR	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56	2574	0.06	144	$33.00	$30.00	$63.00
86	RESTROOM	RR	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56	2574	0.06	144	$33.00	$30.00	$63.00
87	RESTROOM	RR	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56	2574	0.06	144	$33.00	$30.00	$63.00
88	SA BREAK	C	2	4-foot 3-lamp 34W T12	112.2	2	4-foot 2-lamp RW T8 w/ Refl	56	3640	0.11	407	$33.00	$30.00	$126.00
89	SA202	O	2	4-foot 3-lamp 34W T12	112.2	2	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.11	262	$33.00	$30.00	$126.00
90	SA203	O	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.06	131	$33.00	$30.00	$63.00
91	SA204	O	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.06	131	$33.00	$30.00	$63.00
92	SA205	O	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.06	131	$33.00	$30.00	$63.00
93	SA206	O	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.06	131	$33.00	$30.00	$63.00
94	SA210	O	4	4-foot 3-lamp 34W T12	112.2	4	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.22	523	$33.00	$30.00	$252.00
95	STORAGE	CF	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56	1040	0.06	58	$33.00	$30.00	$63.00
96	STORAGE	CF	5	4-foot 3-lamp 34W T12	112.2	5	4-foot 2-lamp RW T8 w/ Refl	56	1040	0.28	291	$33.00	$30.00	$315.00
97	STORAGE	CF	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56	1040	0.06	58	$33.00	$30.00	$63.00
98	VISITOR 1B	C	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56	3640	0.06	203	$33.00	$30.00	$63.00
99	VISITORS WAIT	C	4	4-foot 3-lamp 34W T12	112.2	4	4-foot 2-lamp RW T8 w/ Refl	56	3640	0.22	814	$33.00	$30.00	$252.00
100	WOMEN	RR	1	4-foot 3-lamp 34W T12	112.2	1	4-foot 2-lamp RW T8 w/ Refl	56	2574	0.06	144	$33.00	$30.00	$63.00
			241											
101	1A	L	6	4-foot 4-lamp 34W T12	149.6	6	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.56	3,056	$33.00	$30.00	$378.00
102	1A1	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
103	1A2	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
104	1A3	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
105	1A4	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
106	1A5	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
107	1A6	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
108	1A7	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
109	1A8	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
110	1B	L	6	4-foot 4-lamp 34W T12	149.6	6	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.56	3,056	$33.00	$30.00	$378.00
111	1B1	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
112	1B2	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
113	1B3	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
114	1B4	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00

115	1B5	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
116	1B6	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
117	1B7	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
118	1B8	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
119	3A	L	6	4-foot 4-lamp 34W T12	149.6	6	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.56	3,056	$33.00	$30.00	$378.00
120	3A1	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
121	3A2	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
122	3A3	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
123	3A4	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
124	3A5	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
125	3A6	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
126	3A7	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
127	3A8	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
128	3B	L	6	4-foot 4-lamp 34W T12	149.6	6	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.56	3,056	$33.00	$30.00	$378.00
129	3B1	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
130	3B2	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
131	3B3	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
132	3B4	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
133	3B5	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
134	3B6	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
135	3B7	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
136	3B8	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
137	3C	L	6	4-foot 4-lamp 34W T12	149.6	6	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.56	3,056	$33.00	$30.00	$378.00
138	3C1	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
139	3C2	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
140	3C3	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
141	3C4	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
142	3C5	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
143	3C6	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
144	3C7	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
145	3C8	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
146	4A	L	6	4-foot 4-lamp 34W T12	149.6	6	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.56	3,056	$33.00	$30.00	$378.00
147	4A1	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
148	4A2	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
149	4A3	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
150	4A4	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
151	4A5	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
152	4A6	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
153	4A7	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
154	4A8	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
155	4B	L	6	4-foot 4-lamp 34W T12	149.6	6	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.56	3,056	$33.00	$30.00	$378.00
156	4B1	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
157	4B2	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
158	4B3	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
159	4B4	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
160	4B5	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
161	4B6	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
162	4B7	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
163	4B8	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
164	4C	L	6	4-foot 4-lamp 34W T12	149.6	6	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.56	3,056	$33.00	$30.00	$378.00
165	4C1	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
166	4C2	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
167	4C3	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
168	4C4	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
169	4C5	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
170	4C6	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
171	4C7	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
172	4C8	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
173	ADMISSIONS	O	10	4-foot 4-lamp 34W T12	149.6	10	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.93	2,183	$33.00	$30.00	$630.00
174	ADMISSIONS INTERVIEW	O	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.09	218	$33.00	$30.00	$63.00
175	CLASS 1	O	6	4-foot 4-lamp 34W T12	149.6	6	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.56	1,310	$33.00	$30.00	$378.00

176	CLASS 2	O	6	4-foot 4-lamp 34W T12	149.6	6	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.56	1,310	$33.00	$30.00	$378.00
177	CLASS 4	O	6	4-foot 4-lamp 34W T12	149.6	6	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.56	1,310	$33.00	$30.00	$378.00
178	COMPUTER LAB	O	6	4-foot 4-lamp 34W T12	149.6	6	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.56	1,310	$33.00	$30.00	$378.00
179	DINING 1	C	4	4-foot 4-lamp 34W T12	149.6	4	4-foot 2-lamp RW T8 w/ Refl	56	3640	0.37	1,358	$33.00	$30.00	$252.00
180	DINING 2	C	8	4-foot 4-lamp 34W T12	149.6	8	4-foot 2-lamp RW T8 w/ Refl	56	3640	0.75	2,716	$33.00	$30.00	$504.00
181	DRYER	C	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	3640	0.09	340	$33.00	$30.00	$63.00
182	EXAM	O	4	4-foot 4-lamp 34W T12	149.6	4	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.37	873	$33.00	$30.00	$252.00
183	FS101	C	13	4-foot 4-lamp 34W T12	149.6	13	4-foot 2-lamp RW T8 w/ Refl	56	3640	1.21	4,414	$33.00	$30.00	$819.00
184	FS103	C	3	4-foot 4-lamp 34W T12	149.6	3	4-foot 2-lamp RW T8 w/ Refl	56	3640	0.28	1,019	$33.00	$30.00	$189.00
185	GH1	O	2	4-foot 4-lamp 34W T12	149.6	2	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.19	437	$33.00	$30.00	$126.00
186	GH2	O	2	4-foot 4-lamp 34W T12	149.6	2	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.19	437	$33.00	$30.00	$126.00
187	H1	H	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	4004	0.09	373	$33.00	$30.00	$63.00
188	H2	H	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	4004	0.09	373	$33.00	$30.00	$63.00
189	HALL	H	22	4-foot 4-lamp 34W T12	149.6	22	4-foot 2-lamp RW T8 w/ Refl	56	4004	2.05	8,217	$33.00	$30.00	$1,386.00
190	HALL	H	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	4004	0.09	373	$33.00	$30.00	$63.00
191	I101	O	2	4-foot 4-lamp 34W T12	149.6	2	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.19	437	$33.00	$30.00	$126.00
192	LIBRARY	C	6	4-foot 4-lamp 34W T12	149.6	6	4-foot 2-lamp RW T8 w/ Refl	56	3640	0.56	2,037	$33.00	$30.00	$378.00
193	M1	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
194	M2	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
195	M3	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
196	MANTRAP	C	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	3640	0.09	340	$33.00	$30.00	$63.00
197	MED STORAGE	CF	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	1040	0.09	97	$33.00	$30.00	$63.00
198	MEDICAL	O	5	4-foot 4-lamp 34W T12	149.6	5	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.47	1,091	$33.00	$30.00	$315.00
199	MULTI RM	L	6	4-foot 4-lamp 34W T12	149.6	6	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.56	3,056	$33.00	$30.00	$378.00
200	OBS1	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
201	OBS2	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
202	OBS3	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
203	OBS4	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
204	OBS5	L	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	5460	0.09	509	$33.00	$30.00	$63.00
205	OFFICE	O	2	4-foot 4-lamp 34W T12	149.6	2	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.19	437	$33.00	$30.00	$126.00
206	SALLYPORT SEARCH	O	1	4-foot 4-lamp 34W T12	149.6	1	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.09	218	$33.00	$30.00	$63.00
207	SHIFT SUPER	O	6	4-foot 4-lamp 34W T12	149.6	6	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.56	1,310	$33.00	$30.00	$378.00
208	TEACHER	O	2	4-foot 4-lamp 34W T12	149.6	2	4-foot 2-lamp RW T8 w/ Refl	56	2340	0.19	437	$33.00	$30.00	$126.00
209	VESTIBULE A	C	3	4-foot 4-lamp 34W T12	149.6	3	4-foot 2-lamp RW T8 w/ Refl	56	3640	0.28	1,019	$33.00	$30.00	$189.00
			252											

Direct Savings Summary		
Electricity Savings	148,017	(kWh/yr)
Demand Reduction	38.44	(kW)
Direct Electricity Savings	$12,729.49	($/yr)
Demand Savings	$0.00	($/yr)
Total Direct Savings	$12,729.49	($/yr)

Economic Analysis		
Total Electricity Savings	164,585	(kWh/yr)
Total Natural Gas Savings	-4,632	(therm/yr)
Net Savings	$9,721.45	($/yr)
Total Cost	$35,240.50	($)
Simple Payback	3.6	(yrs)

HVAC Interaction Summary		
Cooling Load Reduction	16,567	(kWh/yr)
Heating Load Reduction	-4,632	(therm/yr)
Electricity Savings	$1,424.78	($/yr)
Natural Gas Savings	-$4,432.82	($/yr)
Net HVAC Savings	-$3,008.04	($/yr)

Lamp Removals

3 to 2: Row 37 - 100 = 241 fixtures X (3-2) = 241 lamps removed
4 to 2: Row 101 - 200 = 209 fixtures X (4-2) = 504 lamps removed
Total lamps removed = 241 + 504 = 745 lamps

Total lamps and ballast changed

71 - 2 lamp fixture, 241 changed from 3 to 2 and 252 from 4 to 2 for a total of 564 fixtures
Lamps and ballast replaced = 564 fixtures X 2 lamps/fixtures plus 2 - 1 lamp fixtures = 1,130 lamps & ballas

L2: Incandescent & CFL Lamp Replacement (Juvenile Justice Center)

Room	Space Type	Present Lighting Qty	Present Lighting Fixture	Present Lighting Watts	Proposed Lighting Qty	Proposed Lighting Fixture	Proposed Lighting Watts	Time On (hrs/yr)	Demand Reduction (kW)	Electricity Savings (kWh/yr)	Capital Cost ($)	Labor Cost ($)	Total Cost ($)
SHOWER	C	4	100W Incandescent	100	4	26W CFL	26	3640	0.30	1,077	$5.00	$5.00	$40.00
CONTROL RM	C	12	50W Incandescent	50	12	13W CFL	13	3640	0.44	1,616	$5.00	$5.00	$120.00
OBS1		1	7W CFL Night Light	7	1	1W LED Night Light	1	8760	0.01	53	$15.00	$15.00	$30.00
OBS2		1	7W CFL Night Light	7	1	1W LED Night Light	1	8760	0.01	53	$15.00	$15.00	$30.00
OBS3		1	7W CFL Night Light	7	1	1W LED Night Light	1	8760	0.01	53	$15.00	$15.00	$30.00
OBS4		1	7W CFL Night Light	7	1	1W LED Night Light	1	8760	0.01	53	$15.00	$15.00	$30.00
OBS5		1	7W CFL Night Light	7	1	1W LED Night Light	1	8760	0.01	53	$15.00	$15.00	$30.00
Cells	L	80	7W CFL Night Light	7	80	1W LED Night Light	1	8760	0.48	4,205	$15.00	$15.00	$2,400.00
										4,468			

Direct Savings Summary		
Electricity Savings	7,161	(kWh/yr)
Demand Reduction	1.25	(kW)
Direct Electricity Savings	$615.86	($/yr)
Demand Savings	$0.00	($/yr)
Total Direct Savings	$615.86	($/yr)

Economic Analysis		
Total Electricity Savings	7,963	(kWh/yr)
Total Natural Gas Savings	-224	(therm/yr)
Net Savings	$470.33	($/yr)
Total Cost	$2,710.00	($)
Simple Payback	5.8	(yrs)

HVAC Interaction Summary		
Cooling Load Reduction	802	(kWh/yr)
Heating Load Reduction	-224	(therm/yr)
Electricity Savings	$68.93	($/yr)
Natural Gas Savings	-$214.46	($/yr)
Net HVAC Savings	-$145.53	($/yr)

LED
500
-140

Pricing for LED fixtures from the LED Light Store catalogue

L3: Exit Sign Retrofit/ Replacement (Juvenile Justice Center)

Room	Number of Fixtures	Present Fixture Type	Present Fixture Wattage	New Fixture Type	New Fixture Wattage (W)	Demand Reduction per unit (kW)	Energy Use Reduction per unit (kWh/yr)	Capital Cost ($)	Installation Cost ($)	Total Cost ($)
Juvenille Justice Center	24	LED Exit	5	Photoluminescent	0	0.01	44	$120.00	$10.00	$3,120.00

Direct Savings	
Total Energy Use Reduction (kWh/yr)	1,051
Total Demand Reduction (kW)	0.12
Energy Savings ($/yr)	$90.40
Demand Savings ($/yr)	$0.00
Total Direct Savings ($/yr)	$90.40

HVAC Interaction	
Cooling Load Reduction (kWh/yr)	118
Heat Load Reduction (therm/yr)	-33
Cooling Energy Savings ($/yr)	$10.12
Natural Gas Cost Increase ($/yr)	($31.48)
Net HVAC Savings ($/yr)	-$21.36

Economic Analysis	
Total Electricity Use Reduction (kWh/yr)	1,169
Natural Gas Use Savings (therm/yr)	-33
Net Savings ($/yr)	$69.04
Total Cost ($)	$3,120.00
Simple Payback (yrs)	45.2

L4: Occupancy Sensors (Juvenile Justice Center)

Room Type	Number of Sensors	Load (W)	Predicted Savings (%)	Time On (hr/year)	Electricity Savings (kWh/yr)	Sensor Type	Capital Cost per Sensor ($)	Labor Cost Per Sensor ($)	Electricity Savings ($)	Total Cost ($)	Payback (Yrs)
Existing Restrooms	20	3590	40%	2574	3,697	Ceiling IR	$50.00	$150.00	$317.91	$4,000.00	12.6
Existing Offices	52	18214	25%	2340	10,655	Wall Switch IR	$45.00	$20.00	$916.34	$3,380.00	3.7
Existing Mechanical Rooms	3	449	35%	3640	572	Wall Switch IR	$45.00	$150.00	$49.17	$585.00	11.9
Existing Visitor's Areas	3	636	35%	1040	231	Combination	$100.00	$20.00	$19.90	$360.00	18.1
Existing Break Rooms	5	3067	35%	3640	3,907	Wall Switch IR	$45.00	$20.00	$336.01	$325.00	1.0
Existing File Rooms	2	449	35%	3640	572	Wall Switch IR	$45.00	$20.00	$49.17	$130.00	2.6
Existing Misc Common Rooms	9	4750	35%	3640	6,051	Wall Switch IR	$45.00	$20.00	$520.41	$585.00	1.1
Proposed Restrooms	20	2,084	40%	2574	2,146	Ceiling IR	$50.00	$150.00	$184.51	$4,000.00	21.7
Proposed Offices	52	8,392	25%	2340	4,909	Wall Switch IR	$45.00	$20.00	$422.19	$3,380.00	8.0
Proposed Mechanical Rooms	3	338	35%	3640	431	Wall Switch IR	$45.00	$150.00	$37.02	$585.00	15.8
Proposed Visitor's Areas	3	338	35%	1040	123	Combination	$100.00	$20.00	$10.58	$360.00	34.0
Proposed Break Rooms	5	1,352	35%	3640	1,722	Wall Switch IR	$45.00	$20.00	$148.10	$325.00	2.2
Proposed File Rooms	2	225	35%	3640	287	Wall Switch IR	$45.00	$20.00	$24.68	$130.00	5.3
Proposed Misc Common Rooms	9	2,084	35%	3640	2,655	Wall Switch IR	$45.00	$20.00	$228.31	$585.00	2.6
		14,812									

Option 1: Sensors on Existing Fixtures

Direct Savings Summary		
Electricity Savings	25,685	(kWh/yr)
Total Direct Savings	$2,208.92	($/yr)

HVAC Interaction Summary		
Cooling Load Reduction	2,875	(kWh/yr)
Heating Load Reduction	-804	(therm/yr)
Electricity Savings	$247.24	($/yr)
Natural Gas Savings	-$769.22	($/yr)
Net HVAC Savings	-$521.98	($/yr)

Economic Analysis		
Total Electricity Savings	28,560	(kWh/yr)
Total Natural Gas Savings	-804	(therm/yr)
Net Savings	$1,686.94	($/yr)
Total Cost	$9,365.00	($)
Combined Simple Payback	5.6	(yrs)

Option 2: Sensors on Proposed Fixtures

Direct Savings Summary		
Electricity Savings	12,272	(kWh/yr)
Total Direct Savings	$1,055.39	($/yr)

HVAC Interaction Summary		
Cooling Load Reduction	1,374	(kWh/yr)
Heating Load Reduction	-384	(therm/yr)
Electricity Savings	$118.13	($/yr)
Natural Gas Savings	-$367.52	($/yr)
Net HVAC Savings	-$249.39	($/yr)

Economic Analysis		
Total Electricity Savings	13,646	(kWh/yr)
Total Natural Gas Savings	-384	(therm/yr)
Net Savings	$806.00	($/yr)
Total Cost	$9,365.00	($)
Combined Simple Payback	11.6	(yrs)

Note: The following are energy savings predictions published by EPRI. The predictions fall in the range published by the U.S. EPA.

Private Offices: 25%
Conference Rooms: 35%
Restrooms: 40%

Line	Room	Space Type	Present Lighting			Total Existing Watts per Area	Proposed Lighting			Total New Watts per Area	Time On (hrs/yr)
			Qty	Fixture	Watts		Qty	Fixture	Watts		
48	COURT SECURIYT	C	2	4-foot 3-lamp 34W T12	112.2	224.4	2	4-foot 2-lamp HP T8 w/ Refl	56	113	3640
179	DINING 1	C	4	4-foot 4-lamp 34W T12	149.6	598.4	4	4-foot 2-lamp HP T8 w/ Refl	56	225	3640
180	DINING 2	C	8	4-foot 4-lamp 34W T12	149.6	1196.8	8	4-foot 2-lamp HP T8 w/ Refl	56	451	3640
181	DRYER	C	1	4-foot 4-lamp 34W T12	149.6	149.6	1	4-foot 2-lamp HP T8 w/ Refl	56	56	3640
64	HOME BOUND	C	6	4-foot 3-lamp 34W T12	112.2	673.2	6	4-foot 2-lamp HP T8 w/ Refl	56	338	3640
65	LA101	C	5	4-foot 3-lamp 34W T12	112.2	561	5	4-foot 2-lamp HP T8 w/ Refl	56	282	3640
66	LA102	C	2	4-foot 3-lamp 34W T12	112.2	224.4	2	4-foot 2-lamp HP T8 w/ Refl	56	113	3640
192	LIBRARY	C	6	4-foot 4-lamp 34W T12	149.6	897.6	6	4-foot 2-lamp HP T8 w/ Refl	56	338	3640
23	REFFER HALL	C	3	4-foot 2-lamp 34W T12	74.8	224.4	3	4-foot 2-lamp HP T8	56	169	3640
54	FILE	C	1	4-foot 3-lamp 34W T12	112.2	112.2	1	4-foot 2-lamp HP T8 w/ Refl	56	56	3640
55	FILE 2	C	3	4-foot 3-lamp 34W T12	112.2	336.6	3	4-foot 2-lamp HP T8 w/ Refl	56	169	3640
47	BREAK RM	C	6	4-foot 3-lamp 34W T12	112.2	673.2	6	4-foot 2-lamp HP T8 w/ Refl	56	338	3640
183	FS101	C	13	4-foot 4-lamp 34W T12	149.6	1944.8	13	4-foot 2-lamp HP T8 w/ Refl	56	732	3640
88	SA BREAK	C	2	4-foot 3-lamp 34W T12	112.2	224.4	2	4-foot 2-lamp HP T8 w/ Refl	56	113	3640
31	STAFF	C	3	4-foot 2-lamp 34W T12	74.8	224.4	3	4-foot 2-lamp HP T8	56	169	3640
32	TELEPHONE	C	1	4-foot 2-lamp 34W T12	74.8	74.8	1	4-foot 2-lamp HP T8	56	56	3640
98	VISITOR 1B	C	1	4-foot 3-lamp 34W T12	112.2	112.2	1	4-foot 2-lamp HP T8 w/ Refl	56	56	3640
99	VISITORS WAIT	C	4	4-foot 3-lamp 34W T12	112.2	448.8	4	4-foot 2-lamp HP T8 w/ Refl	56	225	3640
5	BOILER RM	M	4	4-foot 2-lamp 34W T12	74.8	299.2	4	4-foot 2-lamp HP T8	56	225	3640
6	ELECT CLOSET	M	1	4-foot 2-lamp 34W T12	74.8	74.8	1	4-foot 2-lamp HP T8	56	56	3640
4	M100	M	2	4-foot 1-lamp Std 34W T12	37.4	74.8	2	4-foot 1-lamp HP T8	28	56	3640
40	AD101	O	4	4-foot 3-lamp 34W T12	112.2	448.8	4	4-foot 2-lamp HP T8 w/ Refl	56	225	2340
41	AD102	O	2	4-foot 3-lamp 34W T12	112.2	224.4	2	4-foot 2-lamp HP T8 w/ Refl	56	113	2340
42	AD103	O	2	4-foot 3-lamp 34W T12	112.2	224.4	2	4-foot 2-lamp HP T8 w/ Refl	56	113	2340
43	AD104	O	2	4-foot 3-lamp 34W T12	112.2	224.4	2	4-foot 2-lamp HP T8 w/ Refl	56	113	2340
44	AD105	O	3	4-foot 3-lamp 34W T12	112.2	336.6	3	4-foot 2-lamp HP T8 w/ Refl	56	169	2340
45	AD106	O	2	4-foot 3-lamp 34W T12	112.2	224.4	2	4-foot 2-lamp HP T8 w/ Refl	56	113	2340
46	ADMIN	O	3	4-foot 3-lamp 34W T12	112.2	336.6	3	4-foot 2-lamp HP T8 w/ Refl	56	169	2340
174	ADMISSIONS INTERVIEW	O	1	4-foot 4-lamp 34W T12	149.6	149.6	1	4-foot 2-lamp HP T8 w/ Refl	56	56	2340
175	CLASS 1	O	6	4-foot 4-lamp 34W T12	149.6	897.6	6	4-foot 2-lamp HP T8 w/ Refl	56	338	2340
176	CLASS 2	O	6	4-foot 4-lamp 34W T12	149.6	897.6	6	4-foot 2-lamp HP T8 w/ Refl	56	338	2340
177	CLASS 4	O	6	4-foot 4-lamp 34W T12	149.6	897.6	6	4-foot 2-lamp HP T8 w/ Refl	56	338	2340
178	COMPUTER LAB	O	6	4-foot 4-lamp 34W T12	149.6	897.6	6	4-foot 2-lamp HP T8 w/ Refl	56	338	2340
49	CR201	O	2	4-foot 3-lamp 34W T12	112.2	224.4	2	4-foot 2-lamp HP T8 w/ Refl	56	113	2340
50	CR202	O	2	4-foot 3-lamp 34W T12	112.2	224.4	2	4-foot 2-lamp HP T8 w/ Refl	56	113	2340
51	CR203	O	4	4-foot 3-lamp 34W T12	112.2	448.8	4	4-foot 2-lamp HP T8 w/ Refl	56	225	2340
52	CR204	O	6	4-foot 3-lamp 34W T12	112.2	673.2	6	4-foot 2-lamp HP T8 w/ Refl	56	338	2340
53	CR205	O	2	4-foot 3-lamp 34W T12	112.2	224.4	2	4-foot 2-lamp HP T8 w/ Refl	56	113	2340
182	EXAM	O	4	4-foot 4-lamp 34W T12	149.6	598.4	4	4-foot 2-lamp HP T8 w/ Refl	56	225	2340
56	FS102	O	2	4-foot 3-lamp 34W T12	112.2	224.4	2	4-foot 2-lamp HP T8 w/ Refl	56	113	2340
57	FS103	O	3	4-foot 3-lamp 34W T12	112.2	336.6	3	4-foot 2-lamp HP T8 w/ Refl	56	169	2340
184	FS103	O	3	4-foot 4-lamp 34W T12	149.6	448.8	3	4-foot 2-lamp HP T8 w/ Refl	56	169	2340
185	GH1	O	2	4-foot 4-lamp 34W T12	149.6	299.2	2	4-foot 2-lamp HP T8 w/ Refl	56	113	2340
186	GH2	O	2	4-foot 4-lamp 34W T12	149.6	299.2	2	4-foot 2-lamp HP T8 w/ Refl	56	113	2340

63	HB101	O	2	4-foot 3-lamp 34W T12	112.2	224.4	2	4-foot 2-lamp HP T8 w/ Refl	56	113	2340
191	I101	O	2	4-foot 4-lamp 34W T12	149.6	299.2	2	4-foot 2-lamp HP T8 w/ Refl	56	113	2340
11	M1	O	1	4-foot 2-lamp 34W T12	74.8	74.8	1	4-foot 2-lamp HP T8	56	56	2340
12	M101	O	3	4-foot 2-lamp 34W T12	74.8	224.4	3	4-foot 2-lamp HP T8	56	169	2340
13	M102	O	2	4-foot 2-lamp 34W T12	74.8	149.6	2	4-foot 2-lamp HP T8	56	113	2340
14	M106	O	2	4-foot 2-lamp 34W T12	74.8	149.6	2	4-foot 2-lamp HP T8	56	113	2340
15	M108	O	1	4-foot 2-lamp 34W T12	74.8	74.8	1	4-foot 2-lamp HP T8	56	56	2340
16	M111	O	2	4-foot 2-lamp 34W T12	74.8	149.6	2	4-foot 2-lamp HP T8	56	113	2340
17	M112	O	1	4-foot 2-lamp 34W T12	74.8	74.8	1	4-foot 2-lamp HP T8	56	56	2340
18	M113	O	1	4-foot 2-lamp 34W T12	74.8	74.8	1	4-foot 2-lamp HP T8	56	56	2340
19	M114	O	1	4-foot 2-lamp 34W T12	74.8	74.8	1	4-foot 2-lamp HP T8	56	56	2340
198	MEDICAL	O	5	4-foot 4-lamp 34W T12	149.6	748	5	4-foot 2-lamp HP T8 w/ Refl	56	282	2340
205	OFFICE	O	2	4-foot 4-lamp 34W T12	149.6	299.2	2	4-foot 2-lamp HP T8 w/ Refl	56	113	2340
72	PD OFFICER	O	2	4-foot 3-lamp 34W T12	112.2	224.4	2	4-foot 2-lamp HP T8 w/ Refl	56	113	2340
73	PD201	O	1	4-foot 3-lamp 34W T12	112.2	112.2	1	4-foot 2-lamp HP T8 w/ Refl	56	56	2340
74	PD202	O	1	4-foot 3-lamp 34W T12	112.2	112.2	1	4-foot 2-lamp HP T8 w/ Refl	56	56	2340
75	PD203	O	2	4-foot 3-lamp 34W T12	112.2	224.4	2	4-foot 2-lamp HP T8 w/ Refl	56	113	2340
76	PD204	O	1	4-foot 3-lamp 34W T12	112.2	112.2	1	4-foot 2-lamp HP T8 w/ Refl	56	56	2340
77	PD205	O	4	4-foot 3-lamp 34W T12	112.2	448.8	4	4-foot 2-lamp HP T8 w/ Refl	56	225	2340
78	POD3	O	7	4-foot 3-lamp 34W T12	112.2	785.4	7	4-foot 2-lamp HP T8 w/ Refl	56	394	2340
79	PUBLIC DEFENDER	O	2	4-foot 3-lamp 34W T12	112.2	224.4	2	4-foot 2-lamp HP T8 w/ Refl	56	113	2340
80	RECEPTION	O	6	4-foot 3-lamp 34W T12	112.2	673.2	6	4-foot 2-lamp HP T8 w/ Refl	56	338	2340
81	RECEPTION	O	4	4-foot 3-lamp 34W T12	112.2	448.8	4	4-foot 2-lamp HP T8 w/ Refl	56	225	2340
89	SA202	O	2	4-foot 3-lamp 34W T12	112.2	224.4	2	4-foot 2-lamp HP T8 w/ Refl	56	113	2340
90	SA203	O	1	4-foot 3-lamp 34W T12	112.2	112.2	1	4-foot 2-lamp HP T8 w/ Refl	56	56	2340
91	SA204	O	1	4-foot 3-lamp 34W T12	112.2	112.2	1	4-foot 2-lamp HP T8 w/ Refl	56	56	2340
92	SA205	O	1	4-foot 3-lamp 34W T12	112.2	112.2	1	4-foot 2-lamp HP T8 w/ Refl	56	56	2340
93	SA206	O	1	4-foot 3-lamp 34W T12	112.2	112.2	1	4-foot 2-lamp HP T8 w/ Refl	56	56	2340
94	SA210	O	4	4-foot 3-lamp 34W T12	112.2	448.8	4	4-foot 2-lamp HP T8 w/ Refl	56	225	2340
206	SALLYPORT SEARCH	O	1	4-foot 4-lamp 34W T12	149.6	149.6	1	4-foot 2-lamp HP T8 w/ Refl	56	56	2340
207	SHIFT SUPER	O	6	4-foot 4-lamp 34W T12	149.6	897.6	6	4-foot 2-lamp HP T8 w/ Refl	56	338	2340
208	TEACHER	O	2	4-foot 4-lamp 34W T12	149.6	299.2	2	4-foot 2-lamp HP T8 w/ Refl	56	113	2340
67	LADIES LOCKER	RR	9	4-foot 3-lamp 34W T12	112.2	1009.8	9	4-foot 2-lamp HP T8 w/ Refl	56	507	2574
21	MEN	RR	1	4-foot 2-lamp 34W T12	74.8	74.8	1	4-foot 2-lamp HP T8	56	56	2574
22	MEN	RR	2	4-foot 2-lamp 34W T12	74.8	149.6	2	4-foot 2-lamp HP T8	56	113	2574
69	MEN	RR	1	4-foot 3-lamp 34W T12	112.2	112.2	1	4-foot 2-lamp HP T8 w/ Refl	56	56	2574
70	MENS LOCKER	RR	5	4-foot 3-lamp 34W T12	112.2	561	5	4-foot 2-lamp HP T8 w/ Refl	56	282	2574
24	RESTROOM	RR	1	4-foot 2-lamp 34W T12	74.8	74.8	1	4-foot 2-lamp HP T8	56	56	2574
25	RESTROOM	RR	1	4-foot 2-lamp 34W T12	74.8	74.8	1	4-foot 2-lamp HP T8	56	56	2574
26	RESTROOM	RR	1	4-foot 2-lamp 34W T12	74.8	74.8	1	4-foot 2-lamp HP T8	56	56	2574
27	RESTROOM	RR	3	4-foot 2-lamp 34W T12	74.8	224.4	3	4-foot 2-lamp HP T8	56	169	2574
82	RESTROOM	RR	1	4-foot 3-lamp 34W T12	112.2	112.2	1	4-foot 2-lamp HP T8 w/ Refl	56	56	2574
83	RESTROOM	RR	1	4-foot 3-lamp 34W T12	112.2	112.2	1	4-foot 2-lamp HP T8 w/ Refl	56	56	2574
84	RESTROOM	RR	1	4-foot 3-lamp 34W T12	112.2	112.2	1	4-foot 2-lamp HP T8 w/ Refl	56	56	2574
85	RESTROOM	RR	1	4-foot 3-lamp 34W T12	112.2	112.2	1	4-foot 2-lamp HP T8 w/ Refl	56	56	2574
86	RESTROOM	RR	1	4-foot 3-lamp 34W T12	112.2	112.2	1	4-foot 2-lamp HP T8 w/ Refl	56	56	2574
87	RESTROOM	RR	1	4-foot 3-lamp 34W T12	112.2	112.2	1	4-foot 2-lamp HP T8 w/ Refl	56	56	2574
29	SHOWER	RR	3	4-foot 2-lamp 34W T12	74.8	224.4	3	4-foot 2-lamp HP T8	56	169	2574
35	WOMEN	RR	1	4-foot 2-lamp 34W T12	74.8	74.8	1	4-foot 2-lamp HP T8	56	56	2574
36	WOMEN	RR	2	4-foot 2-lamp 34W T12	74.8	149.6	2	4-foot 2-lamp HP T8	56	113	2574
100	WOMEN	RR	1	4-foot 3-lamp 34W T12	112.2	112.2	1	4-foot 2-lamp HP T8 w/ Refl	56	56	2574

L5: Exterior Lighting Retrofit (Juvenile Justice Center)

Option	Location	Present Lighting			Proposed Lighting			Time On (hrs/yr)	Demand Reduction (kW)	Electricity Savings (kWh/yr)	Capital Cost ($)	Labor Cost ($)	Line Cost ($)
		Qty	Fixture	Watts	Qty	Fixture	Watts						
1	Exterior Parking Lot	32	250W MH	295	32	150W Pulse Start MH Retrofit	190	4745	3.36	15,943	$150.00	$30.00	$5,760.00
1	Exterior Wall Packs	40	150W MH	190	40	100W Pulse Start MH Retrofit	128	4745	2.48	11,768	$150.00	$30.00	$7,200.00
2	Exterior Parking Lot	32	250W MH	295	32	96W LED Shoebox Fixture	96	4745	6.37	30,216	$1,000.00	$150.00	$36,800.00
2	Exterior Wall Packs	40	150W MH	190	40	56W LED Wallpack	56	4745	5.36	25,433	$750.00	$150.00	$36,000.00
3	Exterior Parking Lot	32	250W MH	295	32	120W Induction Shoebox	120	4745	5.60	26,572	$550.00	$150.00	$22,400.00
3	Exterior Wall Packs	40	150W MH	190	40	80W Induction Wall Packs	80	4745	4.40	20,878	$350.00	$150.00	$20,000.00

Direct Savings Summary				
	Opt 1	Opt 2	Opt 3	
Electricity Savings	27,711	55,649	47,450	(kWh/yr)
Demand Reduction	5.84	11.73	10.00	(kW)
Direct Electricity Savings	$2,383.13	$4,785.84	$4,080.70	($/yr)
Demand Savings	$0.00	$0.00	$0.00	($/yr)
Total Direct Savings	$2,383.13	$4,785.84	$4,080.70	($/yr)

HVAC Interaction Summary				
	Opt 1	Opt 2	Opt 3	
Cooling Load Reduction	0	0	0	(kWh/yr)
Heating Load Reduction	0	0	0	(therm/yr)
Electricity Savings	$0.00	$0.00	$0.00	($/yr)
Natural Gas Savings	$0.00	$0.00	$0.00	($/yr)
Net HVAC Savings	$0.00	$0.00	$0.00	($/yr)

Economic Analysis				
	Opt 1	Opt 2	Opt 3	
Total Electricity Savings	27,711	55,649	47,450	(kWh/yr)
Total Natural Gas Savings	0	0	0	(therm/yr)
Net Savings	$2,383.13	$4,785.84	$4,080.70	($/yr)
Total Cost	$12,960.00	$72,800.00	$42,400.00	($)
Simple Payback	5.4	15.2	10.4	(yrs)

Pricing for LED fixtures from LEDtronics
Pricing for Induction Lighting from FSG

L8: High Bay Lighting Replacement (Juvenile Justice Center)

Option	Location	Present Lighting			Proposed Lighting			Time On (hrs/yr)	Demand Reduction (kW)	Electricity Savings (kWh/yr)	Capital Cost ($)	Labor Cost ($)	Line Cost ($)
		Qty	Fixture	Watts	Qty	Fixture	Watts						
1	Gym	9	400W Metal Halide	458	9	250W Pulse Start MH Retrofit	295	2288	1.47	3,356	$200.00	$150.00	$3,150.00
2	Gym	9	400W Metal Halide	458	9	4-foot 6-lamp T8 Fixtures	224	2288	2.11	4,819	$150.00	$150.00	$2,700.00
3	Gym	9	400W Metal Halide	458	9	4-foot 4-lamp T5 Fixtures	216	2288	2.18	4,983	$175.00	$150.00	$2,925.00

Direct Savings Summary				
	Opt 1	Opt 2	Opt 3	
Electricity Savings	3,356	4,819	4,983	(kWh/yr)
Demand Reduction	1.47	2.11	2.18	(kW)
Direct Electricity Savings	$288.66	$414.39	$428.56	($/yr)
Demand Savings	$0.00	$0.00	$0.00	($/yr)
Total Direct Savings	$288.66	$414.39	$428.56	($/yr)

HVAC Interaction Summary				
	Opt 1	Opt 2	Opt 3	
Cooling Load Reduction	376	539	558	(kWh/yr)
Heating Load Reduction	-105	-151	-156	(therm/yr)
Electricity Savings	$32.31	$46.38	$47.97	($/yr)
Natural Gas Savings	-$100.52	-$144.31	-$149.24	($/yr)
Net HVAC Savings	-$68.21	-$97.92	-$101.27	($/yr)

Economic Analysis				
	Opt 1	Opt 2	Opt 3	
Total Electricity Savings	3,732	5,358	5,541	(kWh/yr)
Total Natural Gas Savings	-105	-151	-156	(therm/yr)
Net Savings	$220.45	$316.47	$327.29	($/yr)
Total Cost	$3,150.00	$2,700.00	$2,925.00	($)
Simple Payback	14.3	8.5	8.9	(yrs)

PATRICK ENGINEERING INC.

Project No	20903.047			
Project	Kane County			
Calculated by	DEK	Date	2/28/10	
Checked by	CJB	Date	3/5/10	
Title	Stairwell Lights ECM L-9-JJC	Sheet	1	of 2

PROBLEM STATEMENT: Determine the savings for replacing the existing fluorescent light fixtures in the stairwells that are on continuously in the Juvenile Justice Center, with new T-8 fixtures that incorporate a dimming ballast and occupancy sensors

GIVEN:

1. The T-8 fixtures will consume 28 W/fixture when on, and only 10% of that when idle (See Exhibit 4)
2. Electricity for the Juvenile Justice Center costs about $0.086/kWh.
3. A.C. efficiency is 1.26 kWh/ton. (Rooftop Units, from Nameplate Info)
4. One therm of gas costs about $0.96.

ASSUMPTIONS:

1. The 3 interior enclosed stairwells are used 4 hr/day on average, 365 day/yr for a total of 1,460 hr/yr. (based on building occupancy)
2. The heating season length of St. Charles is comparable to the 251 day heating season of Chicago. (Technical Assistance Program Manual).
3. The boiler efficiency is about 0.75. (Rooftop Units, from Nameplate Info)

CALCULATION:

Present Lighting

Lamp	# of Fixtures	Wattage per fixture (W)	Usage (hr/yr)	Consumption (kWh/yr)
1 -28 W T-8	15	28	8,760	3,679
			Total:	3,679

Proposed Lighting

Full output = 28 W/fixture

Idle output = 10% of Full output = 3 W/fixture

Operating Mode	Wattage (W)	Usage (hr/yr)	Consumption per Fixture (kWh/yr)
Idle	3	7,300	22
On	28	1,460	41
		Total:	63

Total Consumption = (63 kWh/yr-fixture) (15 fixtures) = 945 kWh/yr

Energy Usage Reduction = 3,679 kWh/yr – 63 kWh/yr = 3,616 kWh/yr

HVAC Interaction

Heat Load Addition = (3,616 kWh/yr) (251/365) (3413Btu/kWh) / [(0.75) (100,000 Btu/therm)]

= 113 therms

Natural Gas Cost Increase = (113 therms) ($0.96/therm) = $108/yr

Cooling Load Reduction = (3,616 kWh/yr) (114/365) (3413Btu/kWh) (1.26 kWh/ton) / (12,000 Btu/ton)
= 405 kWh/yr

Economic Analysis

Total Energy Usage Reduction = 3,616 kWh/yr + 405 kWh/yr = 4,021 kWh/yr

Total Energy Savings = (4,021 kWh/yr) ($0.086/kWh) = $346/yr

Net Savings = Total Energy Savings – Natural Gas Cost Increase
= $346/yr - $108/yr = $238

Distributor cost per fixture for small orders: $165/ fixture.

Total fixture cost: ($165/fixture) (15 fixtures) = $2,475

Installation: ($25/fixture) (15 fixtures) = $375

Total Installed Cost = $2,475 + $375 = $2,850

Simple Payback = ($2,850) / ($238/yr) = 12.0 years

Modified JJC NIGHT SHUTDOWN

Period of Record = 1967 to 1996

Annual Totals

Breakpoint from graph 60 °F
Fan on from 6 to 18

HVAC System

Chiller	1.26	kW/ton	0.086 $/kWh
Heat	0.75	%	0.957 $/therm

BTU/1000 cfm
Assumes 55°F SAT

Temperature Range (oF)	Hour Group LST 01 to 08	09 to 16	17 to 00	Total Obs	MCWB (oF)	HOURS ON oF	01 to 08	09 to 16	17 to 00	SUM	Tons	Heat Required	Cooling kWh required	Therms Required
100/104	0	1	0	1	78.9	102	0.0	0.7	0.0	0.7	36257	3.02	3.807	
95/99	0	10	1	11	76.8	97	0.0	7.1	0.2	7.3	332100	28	35	
90/94	0	50	11	62	74.8	92	0.0	35.7	2.0	37.7	1505636	125	158	
85/89	2	121	40	163	72.3	87	0.4	86.4	7.1	93.9	3246171	271	341	
80/84	22	219	99	340	69.6	82	3.9	156.4	17.7	178.0	5191521	433	545	
75/79	90	269	181	540	67	77	16.1	192.1	32.3	240.5	5715129	476	600	
70/74	201	244	244	689	64.4	72	35.9	174.3	43.6	253.8	4658850	388	489	
65/69	254	199	244	696	60.5	67	45.4	142.1	43.6	231.1	2994686	250	314	
60/64	259	203	237	699	56.3	62	46.3	145.0	42.3	233.6	1765800	147	185	
55/59	234	181	210	626	51.7	57	41.8	129.3	37.5	208.6	450514		600686	6
50/54	222	181	203	605	47.1	52	39.6	129.3	36.3	205.2	664779		886371	9
45/49	215	172	202	589	42.7	47	38.4	122.9	36.1	197.3	1704857		2273143	23
40/44	216	195	216	627	38.4	42	38.6	139.3	38.6	216.4	3038657		4051543	41
35/39	275	239	266	780	34.1	37	49.1	170.7	47.5	267.3	5196729		6928971	69
30/34	295	216	267	778	29.8	32	52.7	154.3	47.7	254.6	6325329		8433771	84
25/29	201	146	172	519	24.9	27	35.9	104.3	30.7	170.9	5167800		6890400	69
20/24	139	96	116	351	20.2	22	24.8	68.6	20.7	114.1	4066779		5422371	54
15/19	99	64	73	236	15.5	17	17.7	45.7	13.0	76.4	3136629		4182171	42
10/14	62	43	57	162	10.6	12	11.1	30.7	10.2	52.0	2413221		3217629	32
05/09	52	30	40	123	5.8	7	9.3	21.4	7.1	37.9	1962514		2616686	26
00/04	42	18	25	85	1.2	2	7.5	12.9	4.5	24.8	1420779		1894371	19
-5/-1	18	6	11	35	-3.2	-3	3.2	4.3	2.0	9.5	592843		790457	8
-10/-6	13	5	6	24	-7.5	-8	2.3	3.6	1.1	7.0	473850		631800	6
-15/-11	6	2	4	12	-12.1	-13	1.1	1.4	0.7	3.2	236057		314743	3
-20/-16	2	1	1	4	-17	-18	0.4	0.7	0.2	1.3	98550		131400	1
-25/-21	1	0	0	2	-22.1	-23	0.2	0.0	0.0	0.2	15043		20057	0
-30/-26	0	0	0	0	-25.4	-28	0.0	0.0	0.0	0.0	0		0	0
	2920	2911	2926	8759						3123			2672	493 TOTAL
			8757									$$	230	472 $701.45

COST

Cost for 1,000 cfm of outside air in the Juvenile Justice Center $701.45

per 1000 cfm	therms		kWh	
existing	1494		6,266	
new	493		2,672	
savings per 1000	1001		3,594	$309.10
savings at 10,500 cfm	10,511		37,739	
savings $	$10,058.55		$3,245.52	
total		$13,304.07		

Existing JJC

Period of Record = 1967 to 1996

Annual Totals

Temperature Range (oF)	01 to "08	Hour Group LST 09 to 16	17 to 00	Total Obs	MCWB (oF)
100/104	0	1	0	1	78.9
95/99	0	10	1	11	76.8
90/94	0	50	11	62	74.8
85/89	2	121	40	163	72.3
80/84	22	219	99	340	69.6
75/79	90	269	181	540	67
70/74	201	244	244	689	64.4
65/69	254	199	244	696	60.5
60/64	259	203	237	699	56.3
55/59	234	181	210	626	51.7
50/54	222	181	203	605	47.1
45/49	215	172	202	589	42.7
40/44	216	195	216	627	38.4
35/39	275	239	266	780	34.1
30/34	295	216	267	778	29.8
25/29	201	146	172	519	24.9
20/24	139	96	116	351	20.2
15/19	99	64	73	236	15.5
10/14	62	43	57	162	10.6
05/09	52	30	40	123	5.8
00/04	42	18	25	85	1.2
-5/-1	18	6	11	35	-3.2
-10/-6	13	5	6	24	-7.5
-15/-11	6	2	4	12	-12.1
-20/-16	2	1	1	4	-17
-25/-21	1	0	0	2	-22.1
-30/-26	0	0	0	0	-25.4
	2920	2911	2926	8759	
			8757		

HVAC System

Breakpoint from graph 60 °F

Fan on from 0 to 24

	HOURS ON			
	01 to 08	09 to 16	17 to 00	SUM
102	0.0	1.0	0.0	1.0
97	0.0	10.0	1.0	11.0
92	0.0	50.0	11.0	61.0
87	2.0	121.0	40.0	163.0
82	22.0	219.0	99.0	340.0
77	90.0	269.0	181.0	540.0
72	201.0	244.0	244.0	689.0
67	254.0	199.0	244.0	697.0
62	259.0	203.0	237.0	699.0
57	234.0	181.0	210.0	625.0
52	222.0	181.0	203.0	606.0
47	215.0	172.0	202.0	589.0
42	216.0	195.0	216.0	627.0
37	275.0	239.0	266.0	780.0
32	295.0	216.0	267.0	778.0
27	201.0	146.0	172.0	519.0
22	139.0	96.0	116.0	351.0
17	99.0	64.0	73.0	236.0
12	62.0	43.0	57.0	162.0
7	52.0	30.0	40.0	122.0
2	42.0	18.0	25.0	85.0
-3	18.0	6.0	11.0	35.0
-8	13.0	5.0	6.0	24.0
-13	6.0	2.0	4.0	12.0
-18	2.0	1.0	1.0	4.0
-23	1.0	0.0	0.0	1.0
-28	0.0	0.0	0.0	0.0
				8757

COST

Chiller	1.26	kW/ton	0.086	$/kWh
Heat	0.75	%	0.957	$/therm

BTU/1000 cfm

Assumes 55°F SAT

BTU/1000 cfm	Tons	Heat Required	Cooling kWh required	Therms Required
50760	4.23		5.3298	
498960	42		52	
2437560	203		256	
5633280	469		591	
9914400	826		1041	
12830400	1069		1347	
12650040	1054		1328	
9033120	753		948	
5284440	440		555	
1350000	113		142	
1963440		2617920		26
5088960		6785280		68
8803080		11737440		117
15163200		20217600		202
19325520		25767360		258
15694560		20926080		209
12509640		16679520		167
9685440		12913920		129
7523280		10031040		100
6324480		8432640		84
4865400		6487200		65
2192400		2923200		29
1632960		2177280		22
881280		1175040		12
315360		420480		4
84240		112320		1
0		0		0
			6266.711	1494 TOTAL
		$$	538.9371	1429.799 $1,968.74

Cost for 1,000 cfm of outside air in the Juvenile Justice Center is $1,968.74

	btuh	kWh			
existing	792.8431	6266.711	973.04	211.1216	751.9222

OUTSIDE AIR CONTROL BY DEMAND RESPOSE

	COOLING kWh per 1000 cfm-yr	% Airflow	Weighted COOLING kWh per 1000 cfm-yr	Heating therms per 1000 cfm-yr	% Airflow	Weighted Heating therms per 1000 cfm-yr	
Offices	2672	0.63	1683.36	493	0.63	310.59	
Pods	6267	0.37	2318.79	1494	0.37	552.78	
			kWh			therms	
Weighted Average			4002.15			863.37	
			kWh Saved/yr			therms saved/yr	
1000 cfm OA Reduction	11.7		46825	$4,027		10101	$9,667
					Total Dollars		$13,694

Cooling kWh and Heating Therms from K-1 Existing and Modified Spreadsheets
% Airflow Based on 6,125 cfm OA from Pod units and 10,500 cfm from office units

PATRICK ENGINEERING INC.

Project No	20903.047			
Project	Kane County			
Calculated by	DEK	Date	2/28/10	
Checked by	CJB	Date	3/6/10	
		Sheet	1 of	1

Title ECRM K-5-JJC
Vending Machine Control

PROBLEM STATEMENT: Determine the cost savings of installing control units for the vending machines in the Building.

GIVEN:

1. Snack units draw about 70 watts and cold drink units average about 400 watts.
2. Case studies have documented 35-80% savings due to control units.
3. Control units for refrigerated and snack machines cost $180 and $80 respectively.

ASSUMPTIONS:

1. The electrical cost will be = $0.086/kWh

CALCULATION:

Refrigerated Machine Usage Reduction: 400 W * 8760 hr/yr / 1000 W/kW = 3500 kWh/yr
35% of 3500 kWh/yr = 1225 kWh/yr

Snack Machine Power reduction: 70 W * 8760 hr/yr / 1000 W/kW = 610 kWh/yr
35% of 610 kWh/yr = 215 kWh/yr

Total Savings

Type of Machine	Quantity	Reduction per Machine (kWh/yr)	Savings (kWh/yr)
Refrigerated	3	1,225	3,675
Snack	1	215	215
		Total:	3,890

Economic Analysis

Energy Savings = (3,890 kWh/yr) ($0.086/kWh) = $335/yr

Installed Cost = (3 x $180) + (1 x $80) = $620 (Vending Mizer price sheet)

Simple Payback = ($620) / ($335/yr) = 1.9 years

Heat Load interaction = 3,890 kWh x 251/365 x 3413 Btu/kWh x th/100,000 Btu x 1/0.85 = 107 therms

107 th x $0.96 = $103

Cooling savings = 3,890 x 114/365 x 0.64kW/ton x 3413 Btu/kWh x ton-hr/12,000 Btu = 221 kWh/yr

221 kWh x $0.085/kWh = $19

Total kWh = 3890 + 221= 4,111 kWh = $349. Gas = -$103. Total = $349- $103 = $246.

Summary of Judicial Center Lighting ECRMs

ECM	Description	Natural Gas Savings (therm/yr)	Electrical Savings (kWh/yr)	Monetary Savings ($/yr)	Project Cost ($)	Simple Payback (yrs)
L1	Linear Fluorescent Lighting Retrofit	(1,451)	55,522	$3,325	$21,003	6.3
L2	Incandescent Lamp Replacement	(202)	7,744	$464	$585	1.3
L3	Exit Sign Retrofit/ Replacement	(68)	2,592	$155	$600	3.9
L4	Occupancy Sensors	(1,011)	38,680	$2,317	$19,430	8.4
L5	Exterior Lighting Retrofit	0	52,314	$4,447	$18,900	4.3
L6	Install Photocell on Exterior Lighting	0	7,282	$619	$680	1.1
L7	Daylight Harvesting					

Judicial Center - Input

Local Seasonal Weather Information		
Average Winter Temp.	39.1	(°F)
Average Summer Temp.	71.5	(°F)
Heating Season Length	251	(days/yr)
Cooling Season Length	114	(days/yr)
Heating Season Length	35.9	(wks/yr)
Cooling Season Length	16.3	(wks/yr)
Annual Daylight Hours (Chicago)	4380	(days/yr)

HVAC System Information		
Heating System Eff.	85%	(%)
Cooling System Eff.	0.64	(kW/ton)
Winter Temp. Setpoint	74	(°F)
Summer Temp. Setpoint	68	(°F)

Utility Cost Information		
Natural Gas Rate	$0.961	($/therm)
Electricity Usage Rate	$0.085	($/kWh)
Electricity Demand Rate	$0.00	($/kW-mo)

HVAC Energy Consumption		
Heating Energy Use	0	(kWh/yr)
Heating Energy Use	3,489	(therm/yr)
Cooling Energy Use	11,708	(kWh/yr)
Cooling Energy Use	0	(therm/yr)

Judicial Center - Lighting Input

Wattages				
Fixture Type	**# of Lamps**	**Lamp Wattage**	**Ballast Factor**	**Fixture Wattage**
4-foot 1-lamp 32W Std T8	1	32	1.00	32
4-foot 2-lamp 32W Std T8	2	32	1.00	64
4-foot 3-lamp 32W Std T8	3	32	1.00	96
4-foot 4-lamp 32W Std T8	4	32	1.00	128
4-foot 1-lamp 32W HP T8	1	32	0.88	28.16
4-foot 2-lamp 32W HP T8	2	32	0.88	56.32
4-foot 3-lamp 32W HP T8	3	32	0.88	84.48
4-foot 4-lamp 32W HP T8	4	32	0.88	112.64
4-foot 1-lamp 28W HL T8	1	28	1.00	28
4-foot 2-lamp 28W HL T8	2	28	1.00	56
4-foot 3-lamp 28W HL T8	3	28	1.00	84
4-foot 4-lamp 28W HL T8	4	28	1.00	112
4-foot 1-lamp 34W Std T12	1	34	1.10	37.4
4-foot 2-lamp 34W Std T12	2	34	1.10	74.8
4-foot 3-lamp 34W Std T12	3	34	1.10	112.2
4-foot 4-lamp 34W Std T12	4	34	1.10	149.6
4-foot 2-lamp 31W U-bend T8	2	31	1.00	62
4-foot 3-lamp 31W U-bend T8	3	31	1.00	93
2-foot 2-lamp 17W T8	2	17	1.00	34

Pricing	
Price	**Replacement Fixture**
$2.00	32W Standard T8 Lamp
$2.50	28W High Lumen T8 Lamp
$2.50	32W High Lumen T8 Lamp
$2.00	17W High Lumen T8 Lamp
$10.00	23W PAR CFL
$15.00	1-Lamp NBF T8 Ballast
$15.00	2-Lamp NBF T8 Ballast
$15.00	3-Lamp NBF T8 Ballast
$15.00	4-Lamp NBF T8 Ballast
$15.00	2-Lamp LBF T8 Ballast
$10.00	2-foot Retrofit kit (U-tube to F17)
$30.00	Wall Switch IR Sensor
$80.00	Ceiling IR Sensor
$80.00	Ceiling IR/ Ultrasonic Sensor

Hours of Operation				
Room Type	**Hrs/ Day**	**Days/Wk**	**Wks/ Yr**	**Annual Hours**
CR = Courtrooms	8.0	5.5	52	2288
0 = Offices	9.0	5.0	52	2340
CF = Conference Rooms, Storage	4.0	5.0	52	1040
C = Common Areas (break, copy, etc.)	14.0	5.0	52	3640
H = Halls & Lobbys	14.0	5.5	52	4004
RR = Restrooms	9.0	5.5	52	2574
M = Mechanical/ Electrical Rooms	14.0	5.0	52	3640

L1: Linear Fluorescent Lighting Retrofit (Judicial Center)

Line	Room	Space Type	Present Lighting			Proposed Lighting			Time On	Demand Reduction	Electricity Savings	Capital	Labor	Total Cost
			Qty	Fixture	Watts	Qty	Fixture	Watts	(hrs/yr)	(kW)	(kWh/yr)	Cost ($)	Cost ($)	($)
1	CR201	CR	10	4-foot 1-lamp Std 32W T8	32	10	Relamp w/ RW 28W T8	28	2288	0.04	92	$2.50	$5.00	$75.00
2	CR203	CR	6	4-foot 1-lamp Std 32W T8	32	6	Relamp w/ RW 28W T8	28	2288	0.02	55	$2.50	$5.00	$45.00
3	CR209	CR	6	4-foot 1-lamp Std 32W T8	32	6	Relamp w/ RW 28W T8	28	2288	0.02	55	$2.50	$5.00	$45.00
4	CR217	CR	6	4-foot 1-lamp Std 32W T8	32	6	Relamp w/ RW 28W T8	28	2288	0.02	55	$2.50	$5.00	$45.00
5	CR305	CR	6	4-foot 1-lamp Std 32W T8	32	6	Relamp w/ RW 28W T8	28	2288	0.02	55	$2.50	$5.00	$45.00
6	CR311	CR	6	4-foot 1-lamp Std 32W T8	32	6	Relamp w/ RW 28W T8	28	2288	0.02	55	$2.50	$5.00	$45.00
7	CR313	CR	6	4-foot 1-lamp Std 32W T8	32	6	Relamp w/ RW 28W T8	28	2288	0.02	55	$2.50	$5.00	$45.00
8	CR319	CR	6	4-foot 1-lamp Std 32W T8	32	6	Relamp w/ RW 28W T8	28	2288	0.02	55	$2.50	$5.00	$45.00
9	REST ROOM	RR	1	4-foot 1-lamp Std 32W T8	32	1	Relamp w/ RW 28W T8	28	2574	0.00	10	$2.50	$5.00	$7.50
10	REST ROOM	RR	1	4-foot 1-lamp Std 32W T8	32	1	Relamp w/ RW 28W T8	28	2574	0.00	10	$2.50	$5.00	$7.50
11	REST ROOM	RR	1	4-foot 1-lamp Std 32W T8	32	1	Relamp w/ RW 28W T8	28	2574	0.00	10	$2.50	$5.00	$7.50
12	REST ROOM	RR	1	4-foot 1-lamp Std 32W T8	32	1	Relamp w/ RW 28W T8	28	2574	0.00	10	$2.50	$5.00	$7.50
13	REST ROOM	RR	2	4-foot 1-lamp Std 32W T8	32	2	Relamp w/ RW 28W T8	28	2574	0.01	21	$2.50	$5.00	$15.00
14	REST ROOM	RR	2	4-foot 1-lamp Std 32W T8	32	2	Relamp w/ RW 28W T8	28	2574	0.01	21	$2.50	$5.00	$15.00
15	REST ROOM	RR	2	4-foot 1-lamp Std 32W T8	32	2	Relamp w/ RW 28W T8	28	2574	0.01	21	$2.50	$5.00	$15.00
16	REST ROOM	RR	2	4-foot 1-lamp Std 32W T8	32	2	Relamp w/ RW 28W T8	28	2574	0.01	21	$2.50	$5.00	$15.00
17	RESTROOM	RR	2	4-foot 1-lamp Std 32W T8	32	2	Relamp w/ RW 28W T8	28	2574	0.01	21	$2.50	$5.00	$15.00
18	RESTROOM	RR	2	4-foot 1-lamp Std 32W T8	32	2	Relamp w/ RW 28W T8	28	2574	0.01	21	$2.50	$5.00	$15.00
19	MEN	RR	1	4-foot 1-lamp Std 32W T8	32	1	Relamp w/ RW 28W T8	28	2574	0.00	10	$2.50	$5.00	$7.50
20	WOMEN	RR	1	4-foot 1-lamp Std 32W T8	32	1	Relamp w/ RW 28W T8	28	2574	0.00	10	$2.50	$5.00	$7.50
21	MEN	RR	1	4-foot 1-lamp Std 32W T8	32	1	Relamp w/ RW 28W T8	28	2574	0.00	10	$2.50	$5.00	$7.50
22	WOMEN	RR	1	4-foot 1-lamp Std 32W T8	32	1	Relamp w/ RW 28W T8	28	2574	0.00	10	$2.50	$5.00	$7.50
23	HALL 2ND	H	70	4-foot 1-lamp Std 32W T8	32	70	Relamp w/ RW 28W T8	28	4004	0.28	1,121	$2.50	$5.00	$525.00
			142											
24	CR303	C	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ RW 28W T8	56	3640	0.02	58	$5.00	$5.00	$20.00
25	REST ROOM	RR	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56	2574	0.01	21	$5.00	$5.00	$10.00
26	REST ROOM	RR	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56	2574	0.01	21	$5.00	$5.00	$10.00
27	B307	CF	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56	1040	0.01	8	$5.00	$5.00	$10.00
28	COPY ROOM	C	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ RW 28W T8	56	3640	0.02	58	$5.00	$5.00	$20.00
29	MAIN AREA	C	68	4-foot 2-lamp Std 32W T8	64	68	Relamp w/ RW 28W T8	56	3640	0.54	1,980	$5.00	$5.00	$680.00
30	CHAPA	O	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56	2340	0.01	19	$5.00	$5.00	$10.00
31	LL200	C	184	4-foot 2-lamp Std 32W T8	64	184	Relamp w/ RW 28W T8	56	3640	1.47	5,358	$5.00	$5.00	$1,840.00
32	PENTHOUSE	M	32	4-foot 2-lamp Std 32W T8	64	32	Relamp w/ RW 28W T8	56	3640	0.26	932	$5.00	$5.00	$320.00
33	RR	RR	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ RW 28W T8	56	2574	0.02	41	$5.00	$5.00	$20.00
34	RR	RR	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ RW 28W T8	56	2574	0.02	41	$5.00	$5.00	$20.00
35	SW Facing Corridor	H	56	4-foot 2-lamp Std 32W T8	64	56	Relamp w/ RW 28W T8	56	4004	0.45	1,794	$5.00	$5.00	$560.00
36	CS 101	CF	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56	1040	0.01	8	$5.00	$5.00	$10.00
37	CS 104	CF	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56	1040	0.01	8	$5.00	$5.00	$10.00
38	CS 122 & CS 124	O	12	4-foot 2-lamp Std 32W T8	64	12	Relamp w/ RW 28W T8	56	2340	0.10	225	$5.00	$5.00	$120.00
39	Restroom	RR	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56	2574	0.01	21	$5.00	$5.00	$10.00
40	CR 101	CR	6	4-foot 2-lamp Std 32W T8	64	6	Relamp w/ RW 28W T8	56	2288	0.05	110	$5.00	$5.00	$60.00
41	CR 111	CR	6	4-foot 2-lamp Std 32W T8	64	6	Relamp w/ RW 28W T8	56	2288	0.05	110	$5.00	$5.00	$60.00
42	CR 113	CR	6	4-foot 2-lamp Std 32W T8	64	6	Relamp w/ RW 28W T8	56	2288	0.05	110	$5.00	$5.00	$60.00
43	CR 123	CR	6	4-foot 2-lamp Std 32W T8	64	6	Relamp w/ RW 28W T8	56	2288	0.05	110	$5.00	$5.00	$60.00
44	100	C	52	4-foot 2-lamp Std 32W T8	64	52	Relamp w/ RW 28W T8	56	3640	0.42	1,514	$5.00	$5.00	$520.00
45	101	C	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ RW 28W T8	56	3640	0.02	58	$5.00	$5.00	$20.00
46	103	C	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56	3640	0.01	29	$5.00	$5.00	$10.00
47	104	C	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56	3640	0.01	29	$5.00	$5.00	$10.00
48	Men's RR	RR	3	4-foot 2-lamp Std 32W T8	64	3	Relamp w/ RW 28W T8	56	2574	0.02	62	$5.00	$5.00	$30.00
49	Women's RR	RR	3	4-foot 2-lamp Std 32W T8	64	3	Relamp w/ RW 28W T8	56	2574	0.02	62	$5.00	$5.00	$30.00
50	Men's RR	RR	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ RW 28W T8	56	2574	0.02	41	$5.00	$5.00	$20.00
51	Women's RR	RR	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ RW 28W T8	56	2574	0.02	41	$5.00	$5.00	$20.00
52	B109	O	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56	2340	0.01	19	$5.00	$5.00	$10.00
53	CR 134	CF	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56	1040	0.01	8	$5.00	$5.00	$10.00
54	Main Entry Screening	H	6	4-foot 2-lamp Std 32W T8	64	6	Relamp w/ RW 28W T8	56	4004	0.05	192	$5.00	$5.00	$60.00
55	Main Entry Valence	H	16	4-foot 2-lamp Std 32W T8	64	16	Relamp w/ RW 28W T8	56	4004	0.13	513	$5.00	$5.00	$160.00
56	Kitchen Hood	C	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56	3640	0.01	29	$5.00	$5.00	$10.00
57	Restroom	RR	7	4-foot 2-lamp Std 32W T8	64	7	Relamp w/ RW 28W T8	56	2574	0.06	144	$5.00	$5.00	$70.00
58	Restroom	RR	7	4-foot 2-lamp Std 32W T8	64	7	Relamp w/ RW 28W T8	56	2574	0.06	144	$5.00	$5.00	$70.00
59	Kitchen Offices	O	10	4-foot 2-lamp Std 32W T8	64	10	Relamp w/ RW 28W T8	56	2340	0.08	187	$5.00	$5.00	$100.00
60	CR 001	CR	20	4-foot 2-lamp Std 32W T8	64	20	Relamp w/ RW 28W T8	56	2288	0.16	366	$5.00	$5.00	$200.00
61	Lobby	H	7	4-foot 2-lamp Std 32W T8	64	7	Relamp w/ RW 28W T8	56	4004	0.06	224	$5.00	$5.00	$70.00
62	Hall	H	8	4-foot 2-lamp Std 32W T8	64	8	Relamp w/ RW 28W T8	56	4004	0.06	256	$5.00	$5.00	$80.00
63	Stairwell 1	H	3	4-foot 2-lamp Std 32W T8	64	3	Relamp w/ RW 28W T8	56	4004	0.02	96	$5.00	$5.00	$30.00
64	Women's Restroom	RR	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ RW 28W T8	56	2574	0.02	41	$5.00	$5.00	$20.00

65	Men's Restroom	RR	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ RW 28W T8	56	2574	0.02	41	$5.00	$5.00	$20.00
66	Hall to Maintenance area	H	3	4-foot 2-lamp Std 32W T8	64	3	Relamp w/ RW 28W T8	56	4004	0.02	96	$5.00	$5.00	$30.00
67	Receiving	C	11	4-foot 2-lamp Std 32W T8	64	11	Relamp w/ RW 28W T8	56	3640	0.09	320	$5.00	$5.00	$110.00
68	B 009	C	5	4-foot 2-lamp Std 32W T8	64	5	Relamp w/ RW 28W T8	56	3640	0.04	146	$5.00	$5.00	$50.00
69	CR 011	CR	3	4-foot 2-lamp Std 32W T8	64	3	Relamp w/ RW 28W T8	56	2288	0.02	55	$5.00	$5.00	$30.00
70	CR 009	CR	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56	2288	0.01	18	$5.00	$5.00	$10.00
71	Elevator Machine Room	M	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56	3640	0.01	29	$5.00	$5.00	$10.00
72	Elevator	H	3	4-foot 2-lamp Std 32W T8	64	3	Relamp w/ RW 28W T8	56	4004	0.02	96	$5.00	$5.00	$30.00
73	B 019	O	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56	2340	0.01	19	$5.00	$5.00	$10.00
74	C 001	CF	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56	1040	0.01	8	$5.00	$5.00	$10.00
75	R 0003	O	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56	2340	0.01	19	$5.00	$5.00	$10.00
76	B 018	O	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56	2340	0.01	19	$5.00	$5.00	$10.00
77	Women's Restroom	RR	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ RW 28W T8	56	2574	0.02	41	$5.00	$5.00	$20.00
78	Men's Restroom	RR	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ RW 28W T8	56	2574	0.02	41	$5.00	$5.00	$20.00
79	Janitor	CF	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ RW 28W T8	56	1040	0.01	8	$5.00	$5.00	$10.00
80	Stairwell	H	3	4-foot 2-lamp Std 32W T8	64	3	Relamp w/ RW 28W T8	56	4004	0.02	96	$5.00	$5.00	$30.00
81	Chiller Room	M	12	4-foot 2-lamp Std 32W T8	64	12	Relamp w/ RW 28W T8	56	3640	0.10	349	$5.00	$5.00	$120.00
82	Boiler Room	M	11	4-foot 2-lamp Std 32W T8	64	11	Relamp w/ RW 28W T8	56	3640	0.09	320	$5.00	$5.00	$110.00
83	Penthouse	M	10	4-foot 2-lamp Std 32W T8	64	10	Relamp w/ RW 28W T8	56	3640	0.08	291	$5.00	$5.00	$100.00
			620											
84	CR201A	CF	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84	1040	0.01	12	$7.50	$5.00	$12.50
85	CR201B	CF	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84	1040	0.01	12	$7.50	$5.00	$12.50
86	CR207	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84	2340	0.01	28	$7.50	$5.00	$12.50
87	CR209	CR	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84	2288	0.01	27	$7.50	$5.00	$12.50
88	CR213	CF	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84	1040	0.01	12	$7.50	$5.00	$12.50
89	CR215	CF	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84	1040	0.01	12	$7.50	$5.00	$12.50
90	CR307	CF	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84	1040	0.01	12	$7.50	$5.00	$12.50
91	CR309	CF	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84	1040	0.01	12	$7.50	$5.00	$12.50
92	CR313HC	CR	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2288	0.02	55	$7.50	$5.00	$25.00
93	CR315HC	CR	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2288	0.02	55	$7.50	$5.00	$25.00
94	CR317HC	CR	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2288	0.02	55	$7.50	$5.00	$25.00
95	CRIMINAL RECEPTION	C	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84	3640	0.05	175	$7.50	$5.00	$50.00
96	GRAND JURY CONF	CF	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84	1040	0.06	62	$7.50	$5.00	$62.50
97	GRAND JURY OFFICE	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84	2340	0.06	140	$7.50	$5.00	$62.50
98	SUPEONA	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84	2340	0.01	28	$7.50	$5.00	$12.50
99	COURT ADMIN	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84	2340	0.06	140	$7.50	$5.00	$62.50
100	CR339	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84	2340	0.06	140	$7.50	$5.00	$62.50
101	ADMIN	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
102	CR335	CF	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84	1040	0.06	62	$7.50	$5.00	$62.50
103	CR333	CF	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84	1040	0.06	62	$7.50	$5.00	$62.50
104	CR331	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84	2340	0.06	140	$7.50	$5.00	$62.50
105	CR329	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84	2340	0.06	140	$7.50	$5.00	$62.50
106	CR327	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84	2340	0.06	140	$7.50	$5.00	$62.50
107	CR325	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84	2340	0.06	140	$7.50	$5.00	$62.50
108	CR323	CF	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84	1040	0.06	62	$7.50	$5.00	$62.50
109	ST ATTORN WAIT	C	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84	3640	0.05	175	$7.50	$5.00	$50.00
110	ST ATTORN RECPT	C	3	4-foot 3-lamp Std 32W T8	96	3	Relamp w/ RW 28W T8	84	3640	0.04	131	$7.50	$5.00	$37.50
111	SA301	C	9	4-foot 3-lamp Std 32W T8	96	9	Relamp w/ RW 28W T8	84	3640	0.11	393	$7.50	$5.00	$112.50
112	SA345	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
113	SA347	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
114	SA349	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
115	SA351	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
116	SA363	O	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84	2340	0.05	112	$7.50	$5.00	$50.00
117	SA361	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
118	SA359	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
119	SA357	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
120	SA364	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
121	SA362	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
122	SA360	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
123	SA358	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
124	SA355	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84	2340	0.06	140	$7.50	$5.00	$62.50
125	SA354	O	3	4-foot 3-lamp Std 32W T8	96	3	Relamp w/ RW 28W T8	84	2340	0.04	84	$7.50	$5.00	$37.50
126	SA352	CF	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	1040	0.02	25	$7.50	$5.00	$25.00
127	SA344	O	3	4-foot 3-lamp Std 32W T8	96	3	Relamp w/ RW 28W T8	84	2340	0.04	84	$7.50	$5.00	$37.50
128	SA342	O	3	4-foot 3-lamp Std 32W T8	96	3	Relamp w/ RW 28W T8	84	2340	0.04	84	$7.50	$5.00	$37.50
129	SA340	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
130	SA338	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
131	COPY RM	C	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	3640	0.02	87	$7.50	$5.00	$25.00
132	SA341A	O	10	4-foot 3-lamp Std 32W T8	96	10	Relamp w/ RW 28W T8	84	2340	0.12	281	$7.50	$5.00	$125.00

133	SA336A	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84	2340	0.06	140	$7.50	$5.00	$62.50
134	CHILD SUPPORT	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
135	GREG SIMS	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
136	DEBURGT	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
137	SA334	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
138	SA328	O	3	4-foot 3-lamp Std 32W T8	96	3	Relamp w/ RW 28W T8	84	2340	0.04	84	$7.50	$5.00	$37.50
139	SA326	O	3	4-foot 3-lamp Std 32W T8	96	3	Relamp w/ RW 28W T8	84	2340	0.04	84	$7.50	$5.00	$37.50
140	SA314	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
141	SA315	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
142	SA313	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
143	SA311	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
144	SA312	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
145	SA308	O	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84	2340	0.05	112	$7.50	$5.00	$50.00
146	SA RECEPTIONIST	C	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84	3640	0.05	175	$7.50	$5.00	$50.00
147	SA	C	3	4-foot 3-lamp Std 32W T8	96	3	Relamp w/ RW 28W T8	84	3640	0.04	131	$7.50	$5.00	$37.50
148	SA322	C	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84	3640	0.01	44	$7.50	$5.00	$12.50
149	SA323	O	3	4-foot 3-lamp Std 32W T8	96	3	Relamp w/ RW 28W T8	84	2340	0.04	84	$7.50	$5.00	$37.50
150	SA321	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
151	SA320	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
152	SA318	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
153	SA319	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
154	SA307	CF	3	4-foot 3-lamp Std 32W T8	96	3	Relamp w/ RW 28W T8	84	1040	0.04	37	$7.50	$5.00	$37.50
155	SA305	O	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84	2340	0.05	112	$7.50	$5.00	$50.00
156	SA304	O	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84	2340	0.05	112	$7.50	$5.00	$50.00
157	PD200	C	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84	3640	0.05	175	$7.50	$5.00	$50.00
158	PD RECEPTIONIST	C	8	4-foot 3-lamp Std 32W T8	96	8	Relamp w/ RW 28W T8	84	3640	0.10	349	$7.50	$5.00	$100.00
159	LIBRARY	O	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84	2340	0.05	112	$7.50	$5.00	$50.00
160	FILE RM	C	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84	3640	0.05	175	$7.50	$5.00	$50.00
161	CUBES	C	6	4-foot 3-lamp Std 32W T8	96	6	Relamp w/ RW 28W T8	84	3640	0.07	262	$7.50	$5.00	$75.00
162	AMATO	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
163	OFFICE 1	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
164	OFFICE	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
165	KERMIE	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
166	HANGER	O	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84	2340	0.05	112	$7.50	$5.00	$50.00
167	PD207	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
168	PD208	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
169	PD209	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84	2340	0.01	28	$7.50	$5.00	$12.50
170	PD210	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
171	PD211	CF	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84	1040	0.01	12	$7.50	$5.00	$12.50
172	PD212	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
173	PD213	C	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	3640	0.02	87	$7.50	$5.00	$25.00
174	PD214	O	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84	2340	0.05	112	$7.50	$5.00	$50.00
175	PD124	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
176	PD220	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84	2340	0.01	28	$7.50	$5.00	$12.50
177	PD221	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
178	PD223	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
179	PD225	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
180	PD224	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
181	PD226	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
182	PD227	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
183	PD228	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
184	PD229	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
185	YOON	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
186	KATHY	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
187	LOREK	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
188	CORNER	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
189	FILE RM 2	C	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84	3640	0.05	175	$7.50	$5.00	$50.00
190	FILE RM 3	C	8	4-foot 3-lamp Std 32W T8	96	8	Relamp w/ RW 28W T8	84	3640	0.10	349	$7.50	$5.00	$100.00
191	STICKER	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
192	JULIA	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
193	PD236	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
194	PD238	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
195	PD240	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
196	HOOK	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
197	PD242	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
198	LAWYERS	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
199	HANGER 2	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
200	PD244	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
201	HALL	H	10	4-foot 3-lamp Std 32W T8	96	10	Relamp w/ RW 28W T8	84	4004	0.12	480	$7.50	$5.00	$125.00

202	COMMON	C	18	4-foot 3-lamp Std 32W T8	96	18	Relamp w/ RW 28W T8	84	3640	0.22	786	$7.50	$5.00	$225.00
203	LL204	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
204	LL202	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
205	CR235	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84	2340	0.06	140	$7.50	$5.00	$62.50
206	CR233	CF	10	4-foot 3-lamp Std 32W T8	96	10	Relamp w/ RW 28W T8	84	1040	0.12	125	$7.50	$5.00	$125.00
207	CR231	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84	2340	0.06	140	$7.50	$5.00	$62.50
208	CR229	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84	2340	0.06	140	$7.50	$5.00	$62.50
209	CR227	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84	2340	0.06	140	$7.50	$5.00	$62.50
210	CR225	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84	2340	0.06	140	$7.50	$5.00	$62.50
211	CR224	CF	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84	1040	0.01	12	$7.50	$5.00	$12.50
212	CR223	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84	2340	0.06	140	$7.50	$5.00	$62.50
213	STORAGE	CF	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	1040	0.02	25	$7.50	$5.00	$25.00
214	CS 123	O	6	4-foot 3-lamp Std 32W T8	96	6	Relamp w/ RW 28W T8	84	2340	0.07	168	$7.50	$5.00	$75.00
215	CS 125	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
216	CS127	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84	2340	0.01	28	$7.50	$5.00	$12.50
217	CS129	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
218	CS128	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84	2340	0.06	140	$7.50	$5.00	$62.50
219	Conference	CF	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84	1040	0.05	50	$7.50	$5.00	$50.00
220	CS131	O	3	4-foot 3-lamp Std 32W T8	96	3	Relamp w/ RW 28W T8	84	2340	0.04	84	$7.50	$5.00	$37.50
221	Open Area	H	12	4-foot 3-lamp Std 32W T8	96	12	Relamp w/ RW 28W T8	84	4004	0.14	577	$7.50	$5.00	$150.00
222	CS134	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84	2340	0.01	28	$7.50	$5.00	$12.50
223	CS 132	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
224	CS 140	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84	2340	0.01	28	$7.50	$5.00	$12.50
225	CS 142	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84	2340	0.01	28	$7.50	$5.00	$12.50
226	CS 145	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84	2340	0.01	28	$7.50	$5.00	$12.50
227	CS 143	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
228	CS 161	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
229	CS 144	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
230	CS 146	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
231	CS 148	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
232	Open Area	H	9	4-foot 3-lamp Std 32W T8	96	9	Relamp w/ RW 28W T8	84	4004	0.11	432	$7.50	$5.00	$112.50
233	153 Storage	CF	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84	1040	0.05	50	$7.50	$5.00	$50.00
234	CS 151	O	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84	2340	0.05	112	$7.50	$5.00	$50.00
235	CS 149	O	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84	2340	0.05	112	$7.50	$5.00	$50.00
236	CS 115	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84	2340	0.01	28	$7.50	$5.00	$12.50
237	CS 117	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84	2340	0.01	28	$7.50	$5.00	$12.50
238	CS 119	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84	2340	0.01	28	$7.50	$5.00	$12.50
239	CS 121	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84	2340	0.01	28	$7.50	$5.00	$12.50
240	Court Services	C	9	4-foot 3-lamp Std 32W T8	96	9	Relamp w/ RW 28W T8	84	3640	0.11	393	$7.50	$5.00	$112.50
241	Circuit Clerk	O	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84	2340	0.05	112	$7.50	$5.00	$50.00
242	Hall	H	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ RW 28W T8	84	4004	0.05	192	$7.50	$5.00	$50.00
243	CS 105	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
244	CS 106	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
245	CS 107	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
246	CS 108	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
247	CS 109	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
248	CS 111	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
249	CS 113	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
250	CS 115	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
251	CS 117	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
252	CS 118	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
253	CS 120	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
254	111 A	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84	2340	0.01	28	$7.50	$5.00	$12.50
255	111 B	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84	2340	0.01	28	$7.50	$5.00	$12.50
256	123A	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84	2340	0.01	28	$7.50	$5.00	$12.50
257	B107	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84	2340	0.06	140	$7.50	$5.00	$62.50
258	File Room	C	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	3640	0.02	87	$7.50	$5.00	$25.00
259	CR 133	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84	2340	0.06	140	$7.50	$5.00	$62.50
260	CR 135	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84	2340	0.06	140	$7.50	$5.00	$62.50
261	CR 137	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84	2340	0.06	140	$7.50	$5.00	$62.50
262	CR 139	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84	2340	0.06	140	$7.50	$5.00	$62.50
263	CR 141	C	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84	3640	0.06	218	$7.50	$5.00	$62.50
264	CR 143	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84	2340	0.06	140	$7.50	$5.00	$62.50
265	CR 145	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
266	CR 147	O	6	4-foot 3-lamp Std 32W T8	96	6	Relamp w/ RW 28W T8	84	2340	0.07	168	$7.50	$5.00	$75.00
267	Dining Area Entry	C	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84	3640	0.01	44	$7.50	$5.00	$12.50
268	Janitor Closet	CF	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84	1040	0.01	12	$7.50	$5.00	$12.50
269	Security Roll Call	C	6	4-foot 3-lamp Std 32W T8	96	6	Relamp w/ RW 28W T8	84	3640	0.07	262	$7.50	$5.00	$75.00
270	CR 007	O	5	4-foot 3-lamp Std 32W T8	96	5	Relamp w/ RW 28W T8	84	2340	0.06	140	$7.50	$5.00	$62.50

271	R 0003	C	12	4-foot 3-lamp Std 32W T8	96	12	Relamp w/ RW 28W T8	84	3640	0.14	524	$7.50	$5.00	$150.00
272	Vault	C	6	4-foot 3-lamp Std 32W T8	96	6	Relamp w/ RW 28W T8	84	3640	0.07	262	$7.50	$5.00	$75.00
273	BR 155	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84	2340	0.01	28	$7.50	$5.00	$12.50
274	BR 157	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84	2340	0.01	28	$7.50	$5.00	$12.50
275	BR 159	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84	2340	0.01	28	$7.50	$5.00	$12.50
276	BR 160	O	1	4-foot 3-lamp Std 32W T8	96	1	Relamp w/ RW 28W T8	84	2340	0.01	28	$7.50	$5.00	$12.50
277	BR 174	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ RW 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
			601											
278	SA316	C	2	4-foot 4-lamp Std 32W T8	128	2	Relamp w/ RW 28W T8	112	3640	0.03	116	$10.00	$5.00	$30.00
279	Entrance	H	4	4-foot 4-lamp Std 32W T8	128	4	Relamp w/ RW 28W T8	112	4004	0.06	256	$10.00	$5.00	$60.00
280	Kitchen	C	13	4-foot 4-lamp Std 32W T8	128	13	Relamp w/ RW 28W T8	112	3640	0.21	757	$10.00	$5.00	$195.00
			19											
281	COPY ROOM	C	1	4-foot 2-lamp 31W U-bend T8	62	1	2-foot 2-lamp 17W T8	34	3640	0.03	102	$14.00	$30.00	$44.00
282	CR339	O	1	4-foot 2-lamp 31W U-bend T8	62	1	2-foot 2-lamp 17W T8	34	2340	0.03	66	$14.00	$30.00	$44.00
283	CR322	C	1	4-foot 2-lamp 31W U-bend T8	62	1	2-foot 2-lamp 17W T8	34	3640	0.03	102	$14.00	$30.00	$44.00
284	RECEPTION WAIT	C	6	4-foot 2-lamp 31W U-bend T8	62	6	2-foot 2-lamp 17W T8	34	3640	0.17	612	$14.00	$30.00	$264.00
285	ST ATTORN WAIT	C	1	4-foot 2-lamp 31W U-bend T8	62	1	2-foot 2-lamp 17W T8	34	3640	0.03	102	$14.00	$30.00	$44.00
286	ST ATTORN RECPT	C	1	4-foot 2-lamp 31W U-bend T8	62	1	2-foot 2-lamp 17W T8	34	3640	0.03	102	$14.00	$30.00	$44.00
287	MAIN AREA	C	11	4-foot 2-lamp 31W U-bend T8	62	11	2-foot 2-lamp 17W T8	34	3640	0.31	1,121	$14.00	$30.00	$484.00
288	GRAND JURY RECP	C	3	4-foot 2-lamp 31W U-bend T8	62	3	2-foot 2-lamp 17W T8	34	3640	0.08	306	$14.00	$30.00	$132.00
289	SA369	C	6	4-foot 2-lamp 31W U-bend T8	62	6	2-foot 2-lamp 17W T8	34	3640	0.17	612	$14.00	$30.00	$264.00
290	SLOP RM	CF	1	4-foot 2-lamp 31W U-bend T8	62	1	2-foot 2-lamp 17W T8	34	1040	0.03	29	$14.00	$30.00	$44.00
291	LIBRARY	O	1	4-foot 2-lamp 31W U-bend T8	62	1	2-foot 2-lamp 17W T8	34	2340	0.03	66	$14.00	$30.00	$44.00
292	SLOP RM	CF	1	4-foot 2-lamp 31W U-bend T8	62	1	2-foot 2-lamp 17W T8	34	1040	0.03	29	$14.00	$30.00	$44.00
293	PD218	CF	1	4-foot 2-lamp 31W U-bend T8	62	1	2-foot 2-lamp 17W T8	34	1040	0.03	29	$14.00	$30.00	$44.00
294	PD235	CF	1	4-foot 2-lamp 31W U-bend T8	62	1	2-foot 2-lamp 17W T8	34	1040	0.03	29	$14.00	$30.00	$44.00
295	HALL	H	23	4-foot 2-lamp 31W U-bend T8	62	23	2-foot 2-lamp 17W T8	34	4004	0.64	2,579	$14.00	$30.00	$1,012.00
296	SECURE HALLWAY	H	12	4-foot 2-lamp 31W U-bend T8	62	12	2-foot 2-lamp 17W T8	34	4004	0.34	1,345	$14.00	$30.00	$528.00
297	Corridor	H	3	4-foot 2-lamp 31W U-bend T8	62	3	2-foot 2-lamp 17W T8	34	4004	0.08	336	$14.00	$30.00	$132.00
298	B106 Janitor Closet	CF	1	4-foot 2-lamp 31W U-bend T8	62	1	2-foot 2-lamp 17W T8	34	1040	0.03	29	$14.00	$30.00	$44.00
299	Hall	H	2	4-foot 2-lamp 31W U-bend T8	62	2	2-foot 2-lamp 17W T8	34	4004	0.06	224	$14.00	$30.00	$88.00
300	Corridor	H	6	4-foot 2-lamp 31W U-bend T8	62	6	2-foot 2-lamp 17W T8	34	4004	0.17	673	$14.00	$30.00	$264.00
301	100	C	5	4-foot 2-lamp 31W U-bend T8	62	5	2-foot 2-lamp 17W T8	34	3640	0.14	510	$14.00	$30.00	$220.00
302	Corridor	H	13	4-foot 2-lamp 31W U-bend T8	62	13	2-foot 2-lamp 17W T8	34	4004	0.36	1,457	$14.00	$30.00	$572.00
303	Hall to CR 145	H	1	4-foot 2-lamp 31W U-bend T8	62	1	2-foot 2-lamp 17W T8	34	4004	0.03	112	$14.00	$30.00	$44.00
304	149 Waiting Room	C	8	4-foot 2-lamp 31W U-bend T8	62	8	2-foot 2-lamp 17W T8	34	3640	0.22	815	$14.00	$30.00	$352.00
305	Security Lobby	C	1	4-foot 2-lamp 31W U-bend T8	62	1	2-foot 2-lamp 17W T8	34	3640	0.03	102	$14.00	$30.00	$44.00
306	Security Office	O	1	4-foot 2-lamp 31W U-bend T8	62	1	2-foot 2-lamp 17W T8	34	2340	0.03	66	$14.00	$30.00	$44.00
307	Corridor	H	3	4-foot 2-lamp 31W U-bend T8	62	3	2-foot 2-lamp 17W T8	34	4004	0.08	336	$14.00	$30.00	$132.00
308	Corridor	H	13	4-foot 2-lamp 31W U-bend T8	62	13	2-foot 2-lamp 17W T8	34	4004	0.36	1,457	$14.00	$30.00	$572.00
309	B 017	O	1	4-foot 2-lamp 31W U-bend T8	62	1	2-foot 2-lamp 17W T8	34	2340	0.03	66	$14.00	$30.00	$44.00
310	Receiving Entry	C	1	4-foot 2-lamp 31W U-bend T8	62	1	2-foot 2-lamp 17W T8	34	3640	0.03	102	$14.00	$30.00	$44.00
			130											
311	GRAND JURY CONF	CF	5	4-foot 3-lamp 31W U-bend T8	93	5	2-foot 2-lamp 17W T8	34	1040	0.30	307	$14.00	$30.00	$220.00

Direct Savings Summary		
Electricity Savings	52,535	(kWh/yr)
Demand Reduction	16.98	(kW)
Direct Electricity Savings	$4,465.49	($/yr)
Demand Savings	$0.00	($/yr)
Total Direct Savings	$4,465.49	($/yr)

Economic Analysis		
Total Electricity Savings	55,522	(kWh/yr)
Total Natural Gas Savings	-1,451	(therm/yr)
Net Savings	$3,325.33	($/yr)
Total Cost	$21,002.50	($)
Simple Payback	6.3	(yrs)

HVAC Interaction Summary		
Cooling Load Reduction	2,987	(kWh/yr)
Heating Load Reduction	-1,451	(therm/yr)
Electricity Savings	$253.87	($/yr)
Natural Gas Savings	-$1,394.03	($/yr)
Net HVAC Savings	-$1,140.16	($/yr)

Rows	Fixtures	# Fixtures	Lamps	Lamps removed
1 to 23	1 to 1	142	142	
24 to 83	2 to 2	620	1240	
84 to 277	3 to 3	601	1803	
278 to 280	4 to 4	19	76	
281 to 310	2 to 2	130	260	
311	3 to 2	5	10	5
		1517	3531	5

L2: Incandescent Lamp Replacement (Judicial Center)

Room	Space Type	Present Lighting			Proposed Lighting			Time On (hrs/yr)	Demand Reduction (kW)	Electricity Savings (kWh/yr)	Capital Cost ($)	Labor Cost ($)	Total Cost ($)
		Qty	Fixture	Watts	Qty	Fixture	Watts						
CR339	O	10	100W INCANDESCENT	100	10	23W PAR CFL	23	2340	0.77	1,802	$10.00	$5.00	$150.00
CR336	O	8	100W INCANDESCENT	100	8	23W PAR CFL	23	2340	0.62	1,441	$10.00	$5.00	$120.00
SA	C	6	100W INCANDESCENT	100	6	23W PAR CFL	23	3640	0.46	1,682	$10.00	$5.00	$90.00
PD205	O	2	100W INCANDESCENT	100	2	23W PAR CFL	23	2340	0.15	360	$10.00	$5.00	$30.00
CR143	C	5	100W INCANDESCENT	100	5	23W PAR CFL	23	3640	0.39	1,401	$10.00	$5.00	$75.00
1st Floor Conference	CF	8	100W INCANDESCENT	100	8	23W PAR CFL	23	1040	0.62	641	$10.00	$5.00	$120.00
					39								
CR201		50	150W INCANDESCENT	150	50	No change - on dimmers	150	2288	0.00	0			$0.00
CR203		31	150W INCANDESCENT	150	31	No change - on dimmers	150	2288	0.00	0			$0.00
CR209		31	150W INCANDESCENT	150	31	No change - on dimmers	150	2288	0.00	0			$0.00
CR211		31	150W INCANDESCENT	150	31	No change - on dimmers	150	2288	0.00	0			$0.00
CR217		31	150W INCANDESCENT	150	31	No change - on dimmers	150	2288	0.00	0			$0.00
CR305		31	150W INCANDESCENT	150	31	No change - on dimmers	150	2288	0.00	0			$0.00
CR311		31	150W INCANDESCENT	150	31	No change - on dimmers	150	2288	0.00	0			$0.00
CR313		31	150W INCANDESCENT	150	31	No change - on dimmers	150	2288	0.00	0			$0.00
CR319		31	150W INCANDESCENT	150	31	No change - on dimmers	150	2288	0.00	0			$0.00
SA373		21	150W INCANDESCENT	150	21	No change - on dimmers	150	3640	0.00	0			$0.00
PD205		2	150W INCANDESCENT	150	2	No change - on dimmers	150	3640	0.00	0			$0.00
CR 101		21	150W INCANDESCENT	150	21	No change - on dimmers	150	2288	0.00	0			$0.00
CR 111		18	150W INCANDESCENT	150	18	No change - on dimmers	150	2288	0.00	0			$0.00
CR 113		18	150W INCANDESCENT	150	18	No change - on dimmers	150	2288	0.00	0			$0.00
CR 123		18	150W INCANDESCENT	150	18	No change - on dimmers	150	2288	0.00	0			$0.00

Direct Savings Summary		
Electricity Savings	7,327	(kWh/yr)
Demand Reduction	3.00	(kW)
Direct Electricity Savings	$622.82	($/yr)
Demand Savings	$0.00	($/yr)
Total Direct Savings	$622.82	($/yr)

Economic Analysis		
Total Electricity Savings	7,744	(kWh/yr)
Total Natural Gas Savings	-202	(therm/yr)
Net Savings	$463.80	($/yr)
Total Cost	$585.00	($)
Simple Payback	1.3	(yrs)

HVAC Interaction Summary		
Cooling Load Reduction	417	(kWh/yr)
Heating Load Reduction	-202	(therm/yr)
Electricity Savings	$35.41	($/yr)
Natural Gas Savings	-$194.43	($/yr)
Net HVAC Savings	-$159.02	($/yr)

Fixtures
39

L3: Exit Sign Retrofit/ Replacement (Judicial Center)

Option	Area	Number of Fixtures	Present Fixture Type	Present Fixture Wattage	New Fixture Type	New Fixture Wattage (W)	Demand Reduction per unit (kW)	Energy Use Reduction per unit (kWh/yr)	Capital Cost ($)	Installation Cost ($)	Total Cost ($)
1	Judicial Center Building	20	8W CFL Exit	16	LED Exit Retrofit	2	0.01	123	$20.00	$10.00	$600.00
2	Judicial Center Building	20	8W CFL Exit	16	Photoluminescent	0	0.02	140	$120.00	$10.00	$2,600.00
		52	LED Exit	5	Photoluminescent	0	0.01	44	$120.00	$10.00	$6,760.00

Option 1: LED Retrofit Kits

Direct Savings	
Total Energy Use Reduction (kWh/yr)	2,453
Total Demand Reduction (kW)	0.28
Energy Savings ($/yr)	$208.49
Demand Savings ($/yr)	$0.00
Total Direct Savings ($/yr)	$208.49

HVAC Interaction	
Cooling Load Reduction (kWh/yr)	139
Heat Load Reduction (therm/yr)	-68
Cooling Energy Savings ($/yr)	$11.85
Natural Gas Cost Increase ($/yr)	($65.09)
Net HVAC Savings ($/yr)	-$53.23

Economic Analysis	
Total Electricity Use Reduction (kWh/yr)	2,592
Natural Gas Use Savings (therm/yr)	-68
Net Savings ($/yr)	$155.26
Total Cost ($)	$600.00
Simple Payback (yrs)	3.9

Option 2: Photoluminescent Signs

Direct Savings	
Total Energy Use Reduction (kWh/yr)	5,081
Total Demand Reduction (kW)	0.58
Energy Savings ($/yr)	$431.87
Demand Savings ($/yr)	$0.00
Total Direct Savings ($/yr)	$431.87

HVAC Interaction	
Cooling Load Reduction (kWh/yr)	289
Heat Load Reduction (therm/yr)	-140
Cooling Energy Savings ($/yr)	$24.55
Natural Gas Cost Increase ($/yr)	($134.82)
Net HVAC Savings ($/yr)	-$110.27

Economic Analysis	
Total Electricity Use Reduction (kWh/yr)	5,370
Natural Gas Use Savings (therm/yr)	-140
Net Savings ($/yr)	$321.60
Total Cost ($)	$9,360.00
Simple Payback (yrs)	29.1

L4: Occupancy Sensors (Judicial Center)

Room Type	Number of Sensors	Load (W)	Predicted Savings (%)	Time On (hr/year)	Electricity Savings (kWh/yr)	Sensor Type	Capital Cost per Sensor ($)	Labor Cost Per Sensor ($)	Electricity Savings ($)	Total Cost ($)	Payback (Yrs)
Existing Restrooms	29	3136	40%	2574	3,229	Ceiling IR	$80.00	$150.00	$274.45	$6,670.00	24.3
Existing Offices	153	38010	25%	2340	22,236	Wall Switch IR	$30.00	$20.00	$1,890.05	$7,650.00	4.0
Existing Mechanical Rooms	12	4160	35%	3640	5,300	Combination	$80.00	$150.00	$450.49	$2,760.00	6.1
Existing Conference Rooms	24	5421	35%	1040	1,973	Wall Switch IR	$30.00	$20.00	$167.73	$1,200.00	7.2
Existing Break & Misc Common Rms	16	5448	35%	3640	6,941	Wall Switch IR	$30.00	$20.00	$589.96	$800.00	1.4
Existing Copy Rooms	3	1728	35%	3640	2,201	Wall Switch IR	$30.00	$20.00	$187.13	$150.00	0.8
Existing File Rooms	4	382	35%	3640	487	Wall Switch IR	$30.00	$20.00	$41.37	$200.00	4.8
Proposed Restrooms	29	2,744	40%	2574	2,825	Ceiling IR	$80.00	$150.00	$240.14	$6,670.00	27.8
Proposed Offices	153	33,198	25%	2340	19,421	Wall Switch IR	$30.00	$20.00	$1,650.77	$7,650.00	4.6
Proposed Mechanical Rooms	12	3,640	35%	3640	4,637	Combination	$80.00	$150.00	$394.18	$2,760.00	7.0
Proposed Conference Rooms	24	4,466	35%	1040	1,626	Wall Switch IR	$30.00	$20.00	$138.18	$1,200.00	8.7
Proposed Break & Misc Common Rms	16	4,524	35%	3640	5,764	Wall Switch IR	$30.00	$20.00	$489.90	$800.00	1.6
Proposed Copy Rooms	3	314	35%	3640	400	Wall Switch IR	$30.00	$20.00	$34.00	$150.00	4.4
Proposed File Rooms	4	1,512	35%	3640	1,926	Wall Switch IR	$30.00	$20.00	$163.73	$200.00	1.2
		50,398									

Option 1: Sensors on Existing Fixtures

Direct Savings Summary		
Electricity Savings	42,367	(kWh/yr)
Total Direct Savings	$3,601.17	($/yr)

HVAC Interaction Summary		
Cooling Load Reduction	2,409	(kWh/yr)
Heating Load Reduction	-1,170	(therm/yr)
Electricity Savings	$204.73	($/yr)
Natural Gas Savings	-$1,124.21	($/yr)
Net HVAC Savings	-$919.47	($/yr)

Economic Analysis		
Total Electricity Savings	44,775	(kWh/yr)
Total Natural Gas Savings	-1,170	(therm/yr)
Net Savings	$2,681.69	($/yr)
Total Cost	$19,430.00	($)
Combined Simple Payback	7.2	(yrs)

Option 2: Sensors on Proposed Fixtures

Direct Savings Summary		
Electricity Savings	36,599	(kWh/yr)
Total Direct Savings	$3,110.91	($/yr)

HVAC Interaction Summary		
Cooling Load Reduction	2,081	(kWh/yr)
Heating Load Reduction	-1,011	(therm/yr)
Electricity Savings	$176.86	($/yr)
Natural Gas Savings	-$971.16	($/yr)
Net HVAC Savings	-$794.30	($/yr)

Economic Analysis		
Total Electricity Savings	38,680	(kWh/yr)
Total Natural Gas Savings	-1,011	(therm/yr)
Net Savings	$2,316.61	($/yr)
Total Cost	$19,430.00	($)
Combined Simple Payback	8.4	(yrs)

Note: The following are energy savings predictions published by EPRI. The predictions fall in the range published by the U.S. EPA.

Private Offices: 25%
Conference Rooms: 35%
Restrooms: 40%

Line	Room	Space Type	Present Lighting			Total Existing Watts per Area	Proposed Lighting			Total New Watts per Area	Time On (hrs/yr)
			Qty	Fixture	Watts		Qty	Fixture	Watts		
132	COPY RM	C	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	3640
282	COPY ROOM	C	1	4-foot 2-lamp 31W U-bend T8	62	62	1	2-foot 2-lamp 17W T8	34	34	3640
28	COPY ROOM	C	2	4-foot 2-lamp Std 32W T8	64	128	2	Relamp w/ high lumen 28W T8	56	112	3640
161	FILE RM	C	4	4-foot 3-lamp Std 32W T8	96	384	4	Relamp w/ high lumen 28W T8	84	336	3640
190	FILE RM 2	C	4	4-foot 3-lamp Std 32W T8	96	384	4	Relamp w/ high lumen 28W T8	84	336	3640
191	FILE RM 3	C	8	4-foot 3-lamp Std 32W T8	96	768	8	Relamp w/ high lumen 28W T8	84	672	3640
259	File Room	C	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	3640
302	100	C	5	4-foot 2-lamp 31W U-bend T8	62	310	5	2-foot 2-lamp 17W T8	34	170	3640
45	101	C	2	4-foot 2-lamp Std 32W T8	64	128	2	Relamp w/ high lumen 28W T8	56	112	3640
46	103	C	1	4-foot 2-lamp Std 32W T8	64	64	1	Relamp w/ high lumen 28W T8	56	56	3640
47	104	C	1	4-foot 2-lamp Std 32W T8	64	64	1	Relamp w/ high lumen 28W T8	56	56	3640
69	B 009	C	5	4-foot 2-lamp Std 32W T8	64	320	5	Relamp w/ high lumen 28W T8	56	280	3640
264	CR 141	C	5	4-foot 3-lamp Std 32W T8	96	480	5	Relamp w/ high lumen 28W T8	84	420	3640
24	CR303	C	2	4-foot 2-lamp Std 32W T8	64	128	2	Relamp w/ high lumen 28W T8	56	112	3640
284	CR322	C	1	4-foot 2-lamp 31W U-bend T8	62	62	1	2-foot 2-lamp 17W T8	34	34	3640
158	PD200	C	4	4-foot 3-lamp Std 32W T8	96	384	4	Relamp w/ high lumen 28W T8	84	336	3640
174	PD213	C	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	3640
272	R 0003	C	12	4-foot 3-lamp Std 32W T8	96	1152	12	Relamp w/ high lumen 28W T8	84	1008	3640
112	SA301	C	9	4-foot 3-lamp Std 32W T8	96	864	9	Relamp w/ high lumen 28W T8	84	756	3640
279	SA316	C	2	4-foot 4-lamp Std 32W T8	128	256	2	Relamp w/ high lumen 28W T8	112	224	3640
149	SA322	C	1	4-foot 3-lamp Std 32W T8	96	96	1	Relamp w/ high lumen 28W T8	84	84	3640
290	SA369	C	6	4-foot 2-lamp 31W U-bend T8	62	372	6	2-foot 2-lamp 17W T8	34	204	3640
270	Security Roll Call	C	6	4-foot 3-lamp Std 32W T8	96	576	6	Relamp w/ high lumen 28W T8	84	504	3640
27	B307	CF	1	4-foot 2-lamp Std 32W T8	64	64	1	Relamp w/ high lumen 28W T8	56	56	1040
75	C 001	CF	1	4-foot 2-lamp Std 32W T8	64	64	1	Relamp w/ high lumen 28W T8	56	56	1040
220	Conference	CF	4	4-foot 3-lamp Std 32W T8	96	384	4	Relamp w/ high lumen 28W T8	84	336	1040
53	CR 134	CF	1	4-foot 2-lamp Std 32W T8	64	64	1	Relamp w/ high lumen 28W T8	56	56	1040
85	CR201A	CF	1	4-foot 3-lamp Std 32W T8	96	96	1	Relamp w/ high lumen 28W T8	84	84	1040
86	CR201B	CF	1	4-foot 3-lamp Std 32W T8	96	96	1	Relamp w/ high lumen 28W T8	84	84	1040
89	CR213	CF	1	4-foot 3-lamp Std 32W T8	96	96	1	Relamp w/ high lumen 28W T8	84	84	1040
90	CR215	CF	1	4-foot 3-lamp Std 32W T8	96	96	1	Relamp w/ high lumen 28W T8	84	84	1040
212	CR224	CF	1	4-foot 3-lamp Std 32W T8	96	96	1	Relamp w/ high lumen 28W T8	84	84	1040
207	CR233	CF	10	4-foot 3-lamp Std 32W T8	96	960	10	Relamp w/ high lumen 28W T8	84	840	1040
91	CR307	CF	1	4-foot 3-lamp Std 32W T8	96	96	1	Relamp w/ high lumen 28W T8	84	84	1040
92	CR309	CF	1	4-foot 3-lamp Std 32W T8	96	96	1	Relamp w/ high lumen 28W T8	84	84	1040
109	CR323	CF	5	4-foot 3-lamp Std 32W T8	96	480	5	Relamp w/ high lumen 28W T8	84	420	1040
104	CR333	CF	5	4-foot 3-lamp Std 32W T8	96	480	5	Relamp w/ high lumen 28W T8	84	420	1040
103	CR335	CF	5	4-foot 3-lamp Std 32W T8	96	480	5	Relamp w/ high lumen 28W T8	84	420	1040
36	CS 101	CF	1	4-foot 2-lamp Std 32W T8	64	64	1	Relamp w/ high lumen 28W T8	56	56	1040

37	CS 104	CF	1	4-foot 2-lamp Std 32W T8	64	64	1	Relamp w/ high lumen 28W T8	56	56	1040
312	GRAND JURY CONF	CF	5	4-foot 3-lamp 31W U-bend T8	93	465	5	2-foot 2-lamp 17W T8	34	170	1040
97	GRAND JURY CONF	CF	5	4-foot 3-lamp Std 32W T8	96	480	5	Relamp w/ high lumen 28W T8	84	420	1040
172	PD211	CF	1	4-foot 3-lamp Std 32W T8	96	96	1	Relamp w/ high lumen 28W T8	84	84	1040
294	PD218	CF	1	4-foot 2-lamp 31W U-bend T8	62	62	1	2-foot 2-lamp 17W T8	34	34	1040
295	PD235	CF	1	4-foot 2-lamp 31W U-bend T8	62	62	1	2-foot 2-lamp 17W T8	34	34	1040
155	SA307	CF	3	4-foot 3-lamp Std 32W T8	96	288	3	Relamp w/ high lumen 28W T8	84	252	1040
127	SA352	CF	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	1040
83	Boiler Room	M	11	4-foot 2-lamp Std 32W T8	64	704	11	Relamp w/ high lumen 28W T8	56	616	3640
82	Chiller Room	M	12	4-foot 2-lamp Std 32W T8	64	768	12	Relamp w/ high lumen 28W T8	56	672	3640
32	PENTHOUSE	M	32	4-foot 2-lamp Std 32W T8	64	2048	32	Relamp w/ high lumen 28W T8	56	1792	3640
84	Penthouse	M	10	4-foot 2-lamp Std 32W T8	64	640	10	Relamp w/ high lumen 28W T8	56	560	3640
255	111 A	O	1	4-foot 3-lamp Std 32W T8	96	96	1	Relamp w/ high lumen 28W T8	84	84	2340
256	111 B	O	1	4-foot 3-lamp Std 32W T8	96	96	1	Relamp w/ high lumen 28W T8	84	84	2340
257	123A	O	1	4-foot 3-lamp Std 32W T8	96	96	1	Relamp w/ high lumen 28W T8	84	84	2340
102	ADMIN	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
163	AMATO	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
310	B 017	O	1	4-foot 2-lamp 31W U-bend T8	62	62	1	2-foot 2-lamp 17W T8	34	34	2340
77	B 018	O	1	4-foot 2-lamp Std 32W T8	64	64	1	Relamp w/ high lumen 28W T8	56	56	2340
74	B 019	O	1	4-foot 2-lamp Std 32W T8	64	64	1	Relamp w/ high lumen 28W T8	56	56	2340
258	B107	O	5	4-foot 3-lamp Std 32W T8	96	480	5	Relamp w/ high lumen 28W T8	84	420	2340
52	B109	O	1	4-foot 2-lamp Std 32W T8	64	64	1	Relamp w/ high lumen 28W T8	56	56	2340
274	BR 155	O	1	4-foot 3-lamp Std 32W T8	96	96	1	Relamp w/ high lumen 28W T8	84	84	2340
275	BR 157	O	1	4-foot 3-lamp Std 32W T8	96	96	1	Relamp w/ high lumen 28W T8	84	84	2340
276	BR 159	O	1	4-foot 3-lamp Std 32W T8	96	96	1	Relamp w/ high lumen 28W T8	84	84	2340
277	BR 160	O	1	4-foot 3-lamp Std 32W T8	96	96	1	Relamp w/ high lumen 28W T8	84	84	2340
278	BR 174	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
30	CHAPA	O	1	4-foot 2-lamp Std 32W T8	64	64	1	Relamp w/ high lumen 28W T8	56	56	2340
135	CHILD SUPPORT	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
242	Circuit Clerk	O	4	4-foot 3-lamp Std 32W T8	96	384	4	Relamp w/ high lumen 28W T8	84	336	2340
189	CORNER	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
100	COURT ADMIN	O	5	4-foot 3-lamp Std 32W T8	96	480	5	Relamp w/ high lumen 28W T8	84	420	2340
271	CR 007	O	5	4-foot 3-lamp Std 32W T8	96	480	5	Relamp w/ high lumen 28W T8	84	420	2340
260	CR 133	O	5	4-foot 3-lamp Std 32W T8	96	480	5	Relamp w/ high lumen 28W T8	84	420	2340
261	CR 135	O	5	4-foot 3-lamp Std 32W T8	96	480	5	Relamp w/ high lumen 28W T8	84	420	2340
262	CR 137	O	5	4-foot 3-lamp Std 32W T8	96	480	5	Relamp w/ high lumen 28W T8	84	420	2340
263	CR 139	O	5	4-foot 3-lamp Std 32W T8	96	480	5	Relamp w/ high lumen 28W T8	84	420	2340
265	CR 143	O	5	4-foot 3-lamp Std 32W T8	96	480	5	Relamp w/ high lumen 28W T8	84	420	2340
266	CR 145	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
267	CR 147	O	6	4-foot 3-lamp Std 32W T8	96	576	6	Relamp w/ high lumen 28W T8	84	504	2340
87	CR207	O	1	4-foot 3-lamp Std 32W T8	96	96	1	Relamp w/ high lumen 28W T8	84	84	2340
213	CR223	O	5	4-foot 3-lamp Std 32W T8	96	480	5	Relamp w/ high lumen 28W T8	84	420	2340
211	CR225	O	5	4-foot 3-lamp Std 32W T8	96	480	5	Relamp w/ high lumen 28W T8	84	420	2340
210	CR227	O	5	4-foot 3-lamp Std 32W T8	96	480	5	Relamp w/ high lumen 28W T8	84	420	2340

209	CR229	O	5	4-foot 3-lamp Std 32W T8	96	480	5	Relamp w/ high lumen 28W T8	84	420	2340
208	CR231	O	5	4-foot 3-lamp Std 32W T8	96	480	5	Relamp w/ high lumen 28W T8	84	420	2340
206	CR235	O	5	4-foot 3-lamp Std 32W T8	96	480	5	Relamp w/ high lumen 28W T8	84	420	2340
108	CR325	O	5	4-foot 3-lamp Std 32W T8	96	480	5	Relamp w/ high lumen 28W T8	84	420	2340
107	CR327	O	5	4-foot 3-lamp Std 32W T8	96	480	5	Relamp w/ high lumen 28W T8	84	420	2340
106	CR329	O	5	4-foot 3-lamp Std 32W T8	96	480	5	Relamp w/ high lumen 28W T8	84	420	2340
105	CR331	O	5	4-foot 3-lamp Std 32W T8	96	480	5	Relamp w/ high lumen 28W T8	84	420	2340
283	CR339	O	1	4-foot 2-lamp 31W U-bend T8	62	62	1	2-foot 2-lamp 17W T8	34	34	2340
101	CR339	O	5	4-foot 3-lamp Std 32W T8	96	480	5	Relamp w/ high lumen 28W T8	84	420	2340
244	CS 105	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
245	CS 106	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
246	CS 107	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
247	CS 108	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
248	CS 109	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
249	CS 111	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
250	CS 113	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
237	CS 115	O	1	4-foot 3-lamp Std 32W T8	96	96	1	Relamp w/ high lumen 28W T8	84	84	2340
251	CS 115	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
238	CS 117	O	1	4-foot 3-lamp Std 32W T8	96	96	1	Relamp w/ high lumen 28W T8	84	84	2340
252	CS 117	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
253	CS 118	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
239	CS 119	O	1	4-foot 3-lamp Std 32W T8	96	96	1	Relamp w/ high lumen 28W T8	84	84	2340
254	CS 120	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
240	CS 121	O	1	4-foot 3-lamp Std 32W T8	96	96	1	Relamp w/ high lumen 28W T8	84	84	2340
38	CS 122 & CS 124	O	12	4-foot 2-lamp Std 32W T8	64	768	12	Relamp w/ high lumen 28W T8	56	672	2340
215	CS 123	O	6	4-foot 3-lamp Std 32W T8	96	576	6	Relamp w/ high lumen 28W T8	84	504	2340
216	CS 125	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
224	CS 132	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
225	CS 140	O	1	4-foot 3-lamp Std 32W T8	96	96	1	Relamp w/ high lumen 28W T8	84	84	2340
226	CS 142	O	1	4-foot 3-lamp Std 32W T8	96	96	1	Relamp w/ high lumen 28W T8	84	84	2340
228	CS 143	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
230	CS 144	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
227	CS 145	O	1	4-foot 3-lamp Std 32W T8	96	96	1	Relamp w/ high lumen 28W T8	84	84	2340
231	CS 146	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
232	CS 148	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
236	CS 149	O	4	4-foot 3-lamp Std 32W T8	96	384	4	Relamp w/ high lumen 28W T8	84	336	2340
235	CS 151	O	4	4-foot 3-lamp Std 32W T8	96	384	4	Relamp w/ high lumen 28W T8	84	336	2340
229	CS 161	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
217	CS127	O	1	4-foot 3-lamp Std 32W T8	96	96	1	Relamp w/ high lumen 28W T8	84	84	2340
219	CS128	O	5	4-foot 3-lamp Std 32W T8	96	480	5	Relamp w/ high lumen 28W T8	84	420	2340
218	CS129	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
221	CS131	O	3	4-foot 3-lamp Std 32W T8	96	288	3	Relamp w/ high lumen 28W T8	84	252	2340
223	CS134	O	1	4-foot 3-lamp Std 32W T8	96	96	1	Relamp w/ high lumen 28W T8	84	84	2340
137	DEBURGT	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
98	GRAND JURY OFFICE	O	5	4-foot 3-lamp Std 32W T8	96	480	5	Relamp w/ high lumen 28W T8	84	420	2340
136	GREG SIMS	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340

167	HANGER	O	4	4-foot 3-lamp Std 32W T8	96	384	4	Relamp w/ high lumen 28W T8	84	336	2340
200	HANGER 2	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
197	HOOK	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
193	JULIA	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
187	KATHY	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	'84	168	2340
166	KERMIE	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
59	Kitchen Offices	O	10	4-foot 2-lamp Std 32W T8	64	640	10	Relamp w/ high lumen 28W T8	56	560	2340
199	LAWYERS	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
205	LL202	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
204	LL204	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
188	LOREK	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
165	OFFICE	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
164	OFFICE 1	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
176	PD124	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
168	PD207	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
169	PD208	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
170	PD209	O	1	4-foot 3-lamp Std 32W T8	96	96	1	Relamp w/ high lumen 28W T8	84	84	2340
171	PD210	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
173	PD212	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
175	PD214	O	4	4-foot 3-lamp Std 32W T8	96	384	4	Relamp w/ high lumen 28W T8	84	336	2340
177	PD220	O	1	4-foot 3-lamp Std 32W T8	96	96	1	Relamp w/ high lumen 28W T8	84	84	2340
178	PD221	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
179	PD223	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
181	PD224	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
180	PD225	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
182	PD226	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
183	PD227	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
184	PD228	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
185	PD229	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
194	PD236	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
195	PD238	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
196	PD240	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
198	PD242	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
201	PD244	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
76	R 0003	O	1	4-foot 2-lamp Std 32W T8	64	64	1	Relamp w/ high lumen 28W T8	56	56	2340
157	SA304	O	4	4-foot 3-lamp Std 32W T8	96	384	4	Relamp w/ high lumen 28W T8	84	336	2340
156	SA305	O	4	4-foot 3-lamp Std 32W T8	96	384	4	Relamp w/ high lumen 28W T8	84	336	2340
146	SA308	O	4	4-foot 3-lamp Std 32W T8	96	384	4	Relamp w/ high lumen 28W T8	84	336	2340
144	SA311	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
145	SA312	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
143	SA313	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
141	SA314	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
142	SA315	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
153	SA318	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
154	SA319	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
152	SA320	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340

151	SA321	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
150	SA323	O	3	4-foot 3-lamp Std 32W T8	96	288	3	Relamp w/ high lumen 28W T8	84	252	2340
140	SA326	O	3	4-foot 3-lamp Std 32W T8	96	288	3	Relamp w/ high lumen 28W T8	84	252	2340
139	SA328	O	3	4-foot 3-lamp Std 32W T8	96	288	3	Relamp w/ high lumen 28W T8	84	252	2340
138	SA334	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
134	SA336A	O	5	4-foot 3-lamp Std 32W T8	96	480	5	Relamp w/ high lumen 28W T8	84	420	2340
131	SA338	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
130	SA340	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
133	SA341A	O	10	4-foot 3-lamp Std 32W T8	96	960	10	Relamp w/ high lumen 28W T8	84	840	2340
129	SA342	O	3	4-foot 3-lamp Std 32W T8	96	288	3	Relamp w/ high lumen 28W T8	84	252	2340
128	SA344	O	3	4-foot 3-lamp Std 32W T8	96	288	3	Relamp w/ high lumen 28W T8	84	252	2340
113	SA345	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
114	SA347	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
115	SA349	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
116	SA351	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
126	SA354	O	3	4-foot 3-lamp Std 32W T8	96	288	3	Relamp w/ high lumen 28W T8	84	252	2340
125	SA355	O	5	4-foot 3-lamp Std 32W T8	96	480	5	Relamp w/ high lumen 28W T8	84	420	2340
120	SA357	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
124	SA358	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
119	SA359	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
123	SA360	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
118	SA361	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
122	SA362	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
117	SA363	O	4	4-foot 3-lamp Std 32W T8	96	384	4	Relamp w/ high lumen 28W T8	84	336	2340
121	SA364	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
307	Security Office	O	1	4-foot 2-lamp 31W U-bend T8	62	62	1	2-foot 2-lamp 17W T8	34	34	2340
192	STICKER	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
99	SUPEONA	O	1	4-foot 3-lamp Std 32W T8	96	96	1	Relamp w/ high lumen 28W T8	84	84	2340
186	YOON	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168	2340
25	REST ROOM	RR	1	4-foot 2-lamp Std 32W T8	64	64	1	Relamp w/ high lumen 28W T8	56	56	2574
26	REST ROOM	RR	1	4-foot 2-lamp Std 32W T8	64	64	1	Relamp w/ high lumen 28W T8	56	56	2574
19	MEN	RR	1	4-foot 1-lamp Std 32W T8	32	32	1	Relamp w/ high lumen 28W T8	28	28	2574
21	MEN	RR	1	4-foot 1-lamp Std 32W T8	32	32	1	Relamp w/ high lumen 28W T8	28	28	2574
65	Men's Restroom	RR	2	4-foot 2-lamp Std 32W T8	64	128	2	Relamp w/ high lumen 28W T8	56	112	2574
79	Men's Restroom	RR	2	4-foot 2-lamp Std 32W T8	64	128	2	Relamp w/ high lumen 28W T8	56	112	2574
48	Men's RR	RR	3	4-foot 2-lamp Std 32W T8	64	192	3	Relamp w/ high lumen 28W T8	56	168	2574
50	Men's RR	RR	2	4-foot 2-lamp Std 32W T8	64	128	2	Relamp w/ high lumen 28W T8	56	112	2574
9	REST ROOM	RR	1	4-foot 1-lamp Std 32W T8	32	32	1	Relamp w/ high lumen 28W T8	28	28	2574
10	REST ROOM	RR	1	4-foot 1-lamp Std 32W T8	32	32	1	Relamp w/ high lumen 28W T8	28	28	2574
11	REST ROOM	RR	1	4-foot 1-lamp Std 32W T8	32	32	1	Relamp w/ high lumen 28W T8	28	28	2574
12	REST ROOM	RR	1	4-foot 1-lamp Std 32W T8	32	32	1	Relamp w/ high lumen 28W T8	28	28	2574
13	REST ROOM	RR	2	4-foot 1-lamp Std 32W T8	32	64	2	Relamp w/ high lumen 28W T8	28	56	2574
14	REST ROOM	RR	2	4-foot 1-lamp Std 32W T8	32	64	2	Relamp w/ high lumen 28W T8	28	56	2574
15	REST ROOM	RR	2	4-foot 1-lamp Std 32W T8	32	64	2	Relamp w/ high lumen 28W T8	28	56	2574
16	REST ROOM	RR	2	4-foot 1-lamp Std 32W T8	32	64	2	Relamp w/ high lumen 28W T8	28	56	2574

17	RESTROOM	RR	2	4-foot 1-lamp Std 32W T8	32	64	2	Relamp w/ high lumen 28W T8	28	56	2574
18	RESTROOM	RR	2	4-foot 1-lamp Std 32W T8	32	64	2	Relamp w/ high lumen 28W T8	28	56	2574
39	Restroom	RR	1	4-foot 2-lamp Std 32W T8	64	64	1	Relamp w/ high lumen 28W T8	56	56	2574
57	Restroom	RR	7	4-foot 2-lamp Std 32W T8	64	448	7	Relamp w/ high lumen 28W T8	56	392	2574
58	Restroom	RR	7	4-foot 2-lamp Std 32W T8	64	448	7	Relamp w/ high lumen 28W T8	56	392	2574
33	RR	RR	2	4-foot 2-lamp Std 32W T8	64	128	2	Relamp w/ high lumen 28W T8	56	112	2574
34	RR	RR	2	4-foot 2-lamp Std 32W T8	64	128	2	Relamp w/ high lumen 28W T8	56	112	2574
20	WOMEN	RR	1	4-foot 1-lamp Std 32W T8	32	32	1	Relamp w/ high lumen 28W T8	28	28	2574
22	WOMEN	RR	1	4-foot 1-lamp Std 32W T8	32	32	1	Relamp w/ high lumen 28W T8	28	28	2574
64	Women's Restroom	RR	2	4-foot 2-lamp Std 32W T8	64	128	2	Relamp w/ high lumen 28W T8	56	112	2574
78	Women's Restroom	RR	2	4-foot 2-lamp Std 32W T8	64	128	2	Relamp w/ high lumen 28W T8	56	112	2574
49	Women's RR	RR	3	4-foot 2-lamp Std 32W T8	64	192	3	Relamp w/ high lumen 28W T8	56	168	2574
51	Women's RR	RR	2	4-foot 2-lamp Std 32W T8	64	128	2	Relamp w/ high lumen 28W T8	56	112	2574

L5: Exterior Lighting Retrofit (Judicial Center)

Option	Location	Present Lighting			Proposed Lighting			Time On (hrs/yr)	Demand Reduction (kW)	Electricity Savings (kWh/yr)	Capital Cost ($)	Labor Cost ($)	Line Cost ($)
		Qty	Fixture	Watts	Qty	Fixture	Watts						
1	Exterior Parking Lot	79	250W Metal Halide	295	79	150W Pulse Start MH Retrofit	190	4745	8.30	39,360	$150.00	$30.00	$14,220.00
1	Exterior Wall Packs	26	250W Metal Halide	295	26	150W Pulse Start MH Retrofit	190	4745	2.73	12,954	$150.00	$30.00	$4,680.00
		105							11.03	52,314			
2	Exterior Parking Lot	4	250W Metal Halide	295	4	96W LED Shoebox Fixture	96	4745	0.80	3,777	$1,000.00	$150.00	$4,600.00
2	Exterior Wall Packs	0	250W Metal Halide	295	0	56W LED Wallpack	56	4745	0.00	0	$750.00	$150.00	$0.00
3	Exterior Parking Lot	0	250W Metal Halide	295	0	120W Induction Shoebox	120	4745	0.00	0	$550.00	$150.00	$0.00
3	Exterior Wall Packs	2	250W Metal Halide	295	2	120W Induction Wall Pack	120	4745	0.35	1,661	$400.00	$150.00	$1,100.00

Direct Savings Summary				
	Opt 1	Opt 2	Opt 3	
Electricity Savings	52,314	3,777	1,661	(kWh/yr)
Demand Reduction	11.03	0.80	0.35	(kW)
Direct Electricity Savings	$4,446.66	$321.05	$141.16	($/yr)
Demand Savings	$0.00	$0.00	$0.00	($/yr)
Total Direct Savings	$4,446.66	$321.05	$141.16	($/yr)

HVAC Interaction Summary				
	Opt 1	Opt 2	Opt 3	
Cooling Load Reduction	0	0	0	(kWh/yr)
Heating Load Reduction	0	0	0	(therm/yr)
Electricity Savings	$0.00	$0.00	$0.00	($/yr)
Natural Gas Savings	$0.00	$0.00	$0.00	($/yr)
Net HVAC Savings	$0.00	$0.00	$0.00	($/yr)

Economic Analysis				
	Opt 1	Opt 2	Opt 3	
Total Electricity Savings	52,314	3,777	1,661	(kWh/yr)
Total Natural Gas Savings	0	0	0	(therm/yr)
Net Savings	$4,446.66	$321.05	$141.16	($/yr)
Total Cost	$18,900.00	$4,600.00	$1,100.00	($)
Simple Payback	4.3	14.3	7.8	(yrs)

Pricing for LED fixtures from LEDtronics
Pricing for Induction lighting from FSG

L6: Photocells on Exterior Fixtures (Judicial Center)

Option	Location	Nominal Fixture Wattage	Load (W)	Current Annual Hours	Annual Hours on Sensors	Electricity Savings (kWh/yr)	Number of Sensors	Capital Cost per Sensor ($)	Labor Cost Per Sensor ($)	Total Cost ($)
1	Existing Exterior Parking Lot	250	23,305	4745	4380	8,506	1	$100.00	$240.00	$340.00
1	Existing Exterior Wall Packs	250	7,670	4745	4380	2,800	1	$100.00	$240.00	$340.00
2	Pulse Start MH Exterior Parking Lot	150	15,010	4745	4380	5,479	1	$100.00	$240.00	$340.00
2	Pulse Start MH Exterior Wall Packs	150	4,940	4745	4380	1,803	1	$100.00	$240.00	$340.00
			19,950			7,282				
3	LED Exterior Parking Lot	96	384	4745	4380	140	1	$100.00	$240.00	$340.00
3	LED Exterior Wall Packs	56	0	4745	4380	0	1	$100.00	$240.00	$340.00
4	Induction Exterior Parking Lot	120	0	4745	4380	0	1	$100.00	$240.00	$340.00
4	Induction Exterior Wall Packs	120	240	4745	4380	88	1	$100.00	$240.00	$340.00

Direct Savings Summary					
	Opt 1	Opt 2	Opt 3	Opt 4	
Electricity Savings	11,306	7,282	140	88	(kWh/yr)
Total Direct Savings	$961.00	$618.95	$11.91	$7.45	($/yr)

HVAC Interaction Summary					
	Opt 1	Opt 2	Opt 3	Opt 4	
Cooling Load Reduction	0	0	0	0	(kWh/yr)
Heating Load Reduction	0	0	0	0	(therm/yr)
Electricity Savings	$0.00	$0.00	$0.00	$0.00	($/yr)
Natural Gas Savings	$0.00	$0.00	$0.00	$0.00	($/yr)
Net HVAC Savings	$0.00	$0.00	$0.00	$0.00	($/yr)

Economic Analysis					
	Opt 1	Opt 2	Opt 3	Opt 4	
Total Electricity Savings	11,306	7,282	140	88	(kWh/yr)
Total Natural Gas Savings	0	0	0	0	(therm/yr)
Net Savings	$961.00	$618.95	$11.91	$7.45	($/yr)
Total Cost	$680.00	$680.00	$680.00	$680.00	($)
Combined Simple Payback	0.7	1.1	57.1	91.3	(yrs)

Pricing for sensor from Grainger

PATRICK ENGINEERING INC.

Project No	20903.047			
Project	Kane County			
Calculated by	DEK	Date	2/28/10	
Checked by	CJB	Date	3/9/10	
Title	Daylight Harvesting ECRM L-7-JC	Sheet	1	of 2

PROBLEM STATEMENT: Determine the savings by utilizing ambient light sensors and dimming ballast in the existing fluorescent light fixtures in the corridors outside the courtrooms in the Judicial Center to reduce light output from fixtures to the amount required for corridors.

GIVEN:

1. The T-8 fixtures will consume 56 W/fixture.
2. Electricity for the Judicial Center costs about $0.085/kWh.
3. A.C. efficiency is 0.64 kWh/ton. (300 ton York with VFD IPLV)
4. One therm of gas costs about $0.96.
5. 12 areas to be controlled, 14 fixtures per area.
6. Chicago Climatic Data, 57% sunshine on an annual basis (Climate Atlas of Illinois).
7. Daylight averages 12 hours per day on an annual basis.

ASSUMPTIONS:

1. Lights can be turned off 57% of time during daylight periods.
2. The corridors lights are on 15.5 hr/day on average, 365 days/yr (based on building occupancy).
3. The heating season length of St. Charles is comparable to the 251 day heating season of Chicago. (Technical Assistance Program Manual).
4. The boiler efficiency is about 0.85 based on information provided during a site visit since the heating is provided by a modular hot water system.

CALCULATION:

Savings = W/fixture * Number of Fixtures * % Reduction * Daylight Hours/Day * Days/year/1000W/kW =

Savings = 56W/Fixture * 168 Fixtures * 0.57 * 12 hr/day * 365 days/yr/1000W/kW
= 23,488 kWh/yr

HVAC Interaction

Heat Load Addition = (23,488 kWh/yr) (251/365) (3413Btu/kWh) / [(0.85) (100,000 Btu/therm)]
= 648 therms

Natural Gas Cost Increase = (648 therms) ($0.96/therm) = $623/yr

Cooling Load Reduction = (23,488 kWh/yr) (114/365) (3413Btu/kWh) (0.64 kWh/ton) / (12,000 Btu/ton)
= 1,335 kWh/yr

Economic Analysis

Total Energy Usage Reduction = 23,488 kWh/yr + 1,335 kWh/yr = 24,823 kWh/yr

Total Energy Savings = (24,823 kWh/yr) ($0.085/kWh) = $2,110/yr

Net Savings = Total Energy Savings – Natural Gas Cost Increase
= $2,110/yr - $623/yr = $1,487

Distributor cost per fixture for small orders: $45/ ballast plus $25/ballast installation =$70/fixture.

Total ballast cost: ($70/fixture) (168 fixtures) = $11,760

PATRICK ENGINEERING INC.

Project No	20903.047			
Project	Kane County			
Calculated by	DEK	Date	2/28/10	
Checked by	CJB	Date	3/9/10	
Title	Daylight Harvesting ECRM L-7-JC	Sheet	2	of 2

Control Cost: ($80/control) ((12 controls) = $960

Installation: ($50/control) (12 controls) = $600

Total Installed Cost of Controls = $960 + $600 = $1,560

Total Cost = $11,760 + $1,560 = $13,320

Simple Payback = ($13,320) / ($1,487/yr) = 9.0 years

PATRICK ENGINEERING INC.

Project No	20903.047			
Project	Kane County			
Calculated by	DEK	Date	2/28/10	
Checked by	CJB	Date	3/5/10	
Title Stairwell Lights ECM L-9		Sheet	1	of 2

PROBLEM STATEMENT: Determine the savings for replacing the existing fluorescent light fixtures in the stairwells that are on continuously in the Judicial Center, with new T-8 fixtures that incorporate a dimming ballast and occupancy sensors.

GIVEN:

1. The T-8 fixtures will consume 56 W/fixture when on, and only 10% of that when idle (See Exhibit XX)
2. Electricity for the Judicial Center costs about $0.085/kWh.
3. A.C. efficiency is 0.64 kWh/ton. (300 ton York with VFD IPLV)
4. One therm of gas costs about $0.96.

ASSUMPTIONS:

1. The stairwells are used 4 hr/day on average, 260 day/yr for a total of 1,040 hr/yr. (base on building occupancy)
2. The heating season length of St. Charles is comparable to the 251 day heating season of Chicago. (Technical Assistance Program Manual).
3. The boiler efficiency is about 0.85 based on information provided during a site visit since the heating is provided by a modular hot water system.

CALCULATION:

Present Lighting

Lamp	# of Fixtures	Wattage per fixture (W)	Usage (hr/yr)	Consumption (kWh/yr)
2 -34 W T-12	16	84	8,760	11,773
			Total:	11,773

Proposed Lighting

Full output = 58 W/fixture

Idle output = 10% of Full output = 6 W/fixture

Operating Mode	Wattage (W)	Usage (hr/yr)	Consumption per Fixture (kWh/yr)
Idle	6	7,720	46
On	58	1,040	60
		Total:	106

Total Consumption = (106 kWh/yr-fixture) (16 fixtures) = 1,696 kWh/yr

Energy Usage Reduction = 11,773 kWh/yr – 1,696 kWh/yr = 10,077 kWh/yr

HVAC Interaction

Heat Load Addition = (10,077 kWh/yr) (251/365) (3413Btu/kWh) / [(0.85) (100,000 Btu/therm)]

= 278 therms

Natural Gas Cost Increase = (278 therms) ($0.961/therm) = $267/yr

Cooling Load Reduction = (10,077 kWh/yr) (114/365) (3413Btu/kWh) (0.64 kWh/ton) / (12,000 Btu/ton)
= 573 kWh/yr

Economic Analysis

Total Energy Usage Reduction = 10,077 kWh/yr + 573 kWh/yr = 10,650 kWh/yr

Total Energy Savings = (10,650 kWh/yr) ($0.085/kWh) = $905/yr

Net Savings = Total Energy Savings – Natural Gas Cost Increase
= $905/yr - $267/yr = $638

Distributor cost per fixture for small orders: $165/ fixture.

Total fixture cost: ($165/fixture) (16 fixtures) = $2,640

Installation: ($25/fixture) (16 fixtures) = $400

Total Installed Cost = $2,640 + $400 = $3,040

Simple Payback = ($3,040) / ($638/yr) = 4.8 years

Period of Record = 1967 to 1996

Breakpoint from graph 60 °F
Fan on from 6 to 21:30

														COST	
										Chiller	0.64	kW/ton	0.085	$/kWh	
										Heat	0.85	%	0.961	$/therm	
	Annual Totals														
	Hour				M					BTU/1000 cfm					
	Group LST				C					Assumes 55°F SAT					
Temperature	01	09	17		W		HOURS ON								
Range	to	to	to	Total	B						Tons	Heat Required			
													Cooling kWh		Therms
(oF)	"08	16	00	Obs	(oF)		01 to 08	09 to 16	17 to 00	SUM			required		Required
100/104	0	1	0	1	78.9	102	0	1	0	1	50760	4.2	2.71		
95/99	0	10	1	11	76.8	97	0	10	0.7	10.7	484785	40.4	25.86		
90/94	0	50	11	62	74.8	92	0	50	7.6	57.6	2300198	191.7	122.68		
85/89	2	121	40	163	72.3	87	0.5	121	27.5	149.0	5149440	429.1	274.64		
80/84	22	219	99	340	69.6	82	5.5	219	68.1	292.6	8531123	710.9	454.99		
75/79	90	269	181	540	67	77	22.5	269	124.4	415.9	9882675	823.6	527.08		
70/74	201	244	244	689	64.4	72	50.25	244	167.8	462.0	8482320	706.9	452.39		
65/69	254	199	244	696	60.5	67	63.5	199	167.8	430.3	5576040	464.7	297.39		
60/64	259	203	237	699	56.3	62	64.75	203	162.9	430.7	3255998	271.3	173.65		
55/59	234	181	210	626	51.7	57	58.5	181	144.4	383.9	829170	69.1	44.22		
50/54	222	181	203	605	47.1	52	55.5	181	139.6	376.1	1218443		1433462		14.33
45/49	215	172	202	589	42.7	47	53.75	172	138.9	364.6	3150360		3706306		37.06
40/44	216	195	216	627	38.4	42	54	195	148.5	397.5	5580900		6565765		65.66
35/39	275	239	266	780	34.1	37	68.75	239	182.9	490.6	9537750		11220882		112.21
30/34	295	216	267	778	29.8	32	73.75	216	183.6	473.3	11757083		13831862		138.32
25/29	201	146	172	519	24.9	27	50.25	146	118.3	314.5	9510480		11188800		111.89
20/24	139	96	116	351	20.2	22	34.75	96	79.8	210.5	7502220		8826141		88.26
15/19	99	64	73	236	15.5	17	24.75	64	50.2	138.9	5701995		6708229		67.08
10/14	62	43	57	162	10.6	12	15.5	43	39.2	97.7	4536608		5337185		53.37
05/09	52	30	40	123	5.8	7	13	30	27.5	70.5	3654720		4299671		43.00
00/04	42	18	25	85	1.2	2	10.5	18	17.2	45.7	2615153		3076650		30.77
-5/-1	18	6	11	35	-3.2	-3	4.5	6	7.6	18.1	1131435		1331100		13.31
-10/-6	13	5	6	24	-7.5	-8	3.25	5	4.1	12.4	841995		990582		9.91
-15/-11	6	2	4	12	-12.1	-13	1.5	2	2.8	6.3	459000		540000		5.40
-20/-16	2	1	1	4	-17	-18	0.5	1	0.7	2.2	172463		202897		2.03
-25/-21	1	0	0	2	-22.1	-23	0.25	0	0.0	0.3	21060		24776		0.25
-30/-26	0	0	0	0	-25.4	-28	0	0	0.0	0.0	0		0		0.00
	2920	2911	2926	8759						5652.6			2375.6		792.8 TOTAL
												$$	201.9		761.9 $963.85
			8757												

Cost for 1,000 cfm of outside air in the Judicial Center is $963.85

PATRICK ENGINEERING INC.

Project No	20903.047			
Project	Kane County			
Calculated by	DEK	Date	3/11/10	
Checked by	CJB	Date	3/11/10	
Title EMS Replacement ECRM K-4-JC		Sheet	1	of 2

PROBLEM STATEMENT: Determine the savings for replacing the existing Energy Management System with a new system compatible with the central Facility Management System.

GIVEN:

1. The proposed system will replace existing system point for point.
2. Electricity for the Judicial Center costs about $0.085/kWh.
3. One therm of gas costs about $0.96.

ASSUMPTIONS:

1. Natural Gas consumption for heating is 104,795 therms/year based on utility bill analysis.
2. Air Conditioning and HVAC consumption of electricity is 441,201kWh/year.
3. Assume 3% incremental savings over present system with improved control averaging up to 1 degree F in conditioned space.

CALCULATION:

Gas Savings = Annual Heating Use * 3% = 104,795 therms/year * 3% = 3,143 therms/year

Electric Savings = Annual AC & HVAC Use * 3% = 441,201 kWh/yr * 3% = 13,236 kWh/year

Economic Analysis

Total Energy Savings = (13,236 kWh/yr) ($0.085/kWh) + (3,143 th/yr) ($0.96) = $4,142/yr

Total Installed Cost = $400,000 based on conversation with control vendor

Simple Payback = ($400,000) / ($4,142/yr) = 96.6 years

PATRICK ENGINEERING INC.

Project No	20903.047			
Project	Kane County			
Calculated by	DEK	Date	2/28/10	
Checked by	CJB	Date	3/1/10	
Title ECRM K-5-JC Vending Machine Control		Sheet	1	of 1

PROBLEM STATEMENT: Determine the cost savings of installing control units for the vending machines in the Building.

GIVEN:

1. Snack units draw about 70 watts and cold drink units average about 400 watts.
2. Case studies have documented 35-80% savings due to control units.
3. Control units for refrigerated and snack machines cost $180 and $80 respectively.

ASSUMPTIONS:

1. The electrical cost will be = $0.085/kWh

CALCULATION:

Refrigerated Machine Usage Reduction: 400 W * 8760 hr/yr / 1000 W/kW = 3500 kWh/yr
35% of 3500 kWh/yr = 1225 kWh/yr

Snack Machine Power reduction: 70 W * 8760 hr/yr / 1000 W/kW = 610 kWh/yr
35% of 610 kWh/yr = 215 kWh/yr

Total Savings

Type of Machine	Quantity	Reduction per Machine (kWh/yr)	Savings (kWh/yr)
Refrigerated	4	1,225	4,900
Snack	3	215	645
		Total:	5,545

Economic Analysis

Energy Savings = (5,545 kWh/yr) ($0.085/kWh) = $471/yr

Installed Cost = (4 x $180) + (3x $80) = $960 (Vending Mizer price sheet)

Heat Load interaction = 5,545 kWh x 251/365 x 3413 Btu/kWh x th/100,000 Btu x 1/0.85 = 153 therms

153 th x $0.96 = $147

Cooling savings = 5,545 x 114/365 x 0.64kW/ton x 3413 Btu/kWh x ton-hr/12,000 Btu = 315 kWh/yr

315 kWh x $0.085/kWh = $27

Total kWh = 5,545 + 315= 5,860 kWh = $498. Gas = -$147. Total = $471- $147+ $27 = $351.

Simple Payback = ($960) / ($351/yr) = 2.7 years

ECM	Description	Natural Gas Savings (therm/yr)	Electrical Savings (kWh/yr)	Monetary Savings ($/yr)	Project Cost ($)	Simple Payback (yrs)
L1	Linear Fluorescent Lighting Retrofit	(1,098)	38,812	$2,100	$11,029	5.3
L2	Incandescent Lamp Replacement	(11)	403	$22	$9	0.4
L3	FL Exit Sign Retrofit to LED	(74)	2,617	$142	$540	3.8
L4	Occupancy Sensors	(420)	14,838	$803	$3,700	4.6
L5	Exterior Lighting Retrofit	0	8,038	$635	$3,420	5.4
L6	Install Photocell on Exterior Lighting	0	1,812	$143	$1,360	9.5

Building C - Input

Local Seasonal Weather Information		
Average Winter Temp.	39.1	(˚F)
Average Summer Temp.	71.5	(˚F)
Heating Season Length	251	(days/yr)
Cooling Season Length	114	(days/yr)
Heating Season Length	35.9	(wks/yr)
Cooling Season Length	16.3	(wks/yr)
Annual Daylight Hours (Chicago)	4380	(days/yr)

HVAC System Information		
Heating System Eff.	75%	(%)
Cooling System Eff.	1.2	(kW/ton)
Winter Temp. Setpoint	74	(˚F)
Summer Temp. Setpoint	68	(˚F)

Utility Cost Information		
Natural Gas Rate	$0.880	($/therm)
Electricity Usage Rate	$0.079	($/kWh)
Electricity Demand Rate	$0.00	($/kW-mo)

Building C - Lighting Input

Wattages				
Fixture Type	# of Lamps	Lamp Wattage	Ballast Factor	Fixture Wattage
4-foot 1-lamp 32W Std T8	1	32	1.00	32
4-foot 2-lamp 32W Std T8	2	32	1.00	64
4-foot 3-lamp 32W Std T8	3	32	1.00	96
4-foot 4-lamp 32W Std T8	4	32	1.00	128
4-foot 1-lamp 32W HP T8	1	32	0.88	28
4-foot 2-lamp 32W HP T8	2	32	0.88	56
4-foot 3-lamp 32W HP T8	3	32	0.88	84
4-foot 4-lamp 32W HP T8	4	32	0.88	113
4-foot 1-lamp 28W HL T8	1	28	1.00	28
4-foot 2-lamp 28W HL T8	2	28	1.00	56
4-foot 3-lamp 28W HL T8	3	28	1.00	84
4-foot 4-lamp 28W HL T8	4	28	1.00	112
4-foot 2-lamp 32W T8-M	2	32	1.10	70
4-foot 4-lamp 32W T8-M	4	32	1.10	141
4-foot 1-lamp 34W Std T12	1	34	1.10	37
4-foot 2-lamp 34W Std T12	2	34	1.10	75
4-foot 3-lamp 34W Std T12	3	34	1.10	112
4-foot 4-lamp 34W Std T12	4	34	1.10	150
8-foot 2-lamp 60W T12	2	60	1.10	132
4-foot 2-lamp 31W U-bend T8	2	31	1.00	62
4-foot 3-lamp 31W U-bend T8	3	31	1.00	93
4-foot 1-lamp 34W U-bend T12	1	34	1.10	37
3-foot 2-lamp 25W Std T12	2	25	1.10	55
3-foot 2-lamp 25W HP T8	2	25	0.88	44
2-foot 2-lamp 17W T8	2	17	1.00	34

Pricing	
Price	Replacement Fixture
$2.00	32W Standard T8 Lamp
$2.50	28W High Lumen T8 Lamp
$2.50	32W High Lumen T8 Lamp
$2.00	25W High Lumen T8 Lamp
$2.00	17W High Lumen T8 Lamp
$10.00	23W PAR CFL
$15.00	1-Lamp NBF T8 Ballast
$15.00	2-Lamp NBF T8 Ballast
$15.00	3-Lamp NBF T8 Ballast
$15.00	4-Lamp NBF T8 Ballast
$15.00	2-Lamp LBF T8 Ballast
$4.00	9W CFL
$10.00	2-foot Retrofit kit (U-tube to F17)
$30.00	Wall Switch IR Sensor
$80.00	Ceiling IR Sensor
$80.00	Ceiling IR/ Ultrasonic Sensor

Hours of Operation				
Room Type	Hrs/ Day	Days/Wk	Wks/ Yr	Annual Hours
CR = Courtrooms	8.0	5.5	52	2288
0 = Offices	9.0	5.0	52	2340
CF = Conference Rooms, Storage	4.0	5.0	52	1040
C = Common Areas (break, copy, etc.	14.0	5.0	52	3640
H = Halls & Lobbys	14.0	5.5	52	4004
RR = Restrooms	9.0	5.5	52	2574
M = Mechanical/ Electrical Rooms	14.0	5.0	52	3640

L1: Linear Fluorescent Lighting Retrofit (Building C)

Line	Room	Space Type	Present Lighting			Proposed Lighting			Time On (hrs/yr)	Demand Reduction (kW)	Electricity Savings (kWh/yr)	Capital Cost ($)	Labor Cost ($)	Total Cost ($)
			Qty	Fixture	Watts	Qty	Fixture	Watts						
1	Elevator Entry	H	1	3-foot 2-lamp 25W T12	55	1	3-foot 2-lamp HP T8	44	4004	0.01	44	$19.00	$30.00	$49.00
2	Mechchanical 1st	M	7	4-foot 1-lamp 34W T12	37	7	4-foot 1-lamp HP T8	28	3640	0.06	235	$17.50	$30.00	$332.50
3	Records	C	30	4-foot 1-lamp 34W T12	37	30	4-foot 1-lamp HP T8	28	3640	0.28	1,009	$17.50	$30.00	$1,425.00
4	Elevator	H	1	4-foot 2-lamp 34W T12	75	1	4-foot 2-lamp HP T8	56	4004	0.02	75	$20.00	$30.00	$50.00
5	Lunch	C	1	4-foot 2-lamp 34W T12	75	1	4-foot 2-lamp HP T8	56	3640	0.02	68	$20.00	$30.00	$50.00
6	Stairwell	H	2	4-foot 2-lamp 34W T12	75	2	4-foot 2-lamp HP T8	56	4004	0.04	151	$20.00	$30.00	$100.00
7	Stairwell	H	2	4-foot 2-lamp 34W T12	75	2	4-foot 2-lamp HP T8	56	4004	0.04	151	$20.00	$30.00	$100.00
8	Storage 2nd	CF	5	4-foot 2-lamp 34W T12	75	5	4-foot 2-lamp HP T8	56	1040	0.09	98	$20.00	$30.00	$250.00
9	Assesment	O	33	4-foot 4-lamp 34W T12	150	33	4-foot 2-lamp HP T8 w/ Refl	56	2340	3.08	7,203	$30.00	$30.00	$1,980.00
10	Copy	C	5	4-foot 4-lamp 34W T12	150	5	4-foot 2-lamp HP T8 w/ Refl	56	3640	0.47	1,698	$30.00	$30.00	$300.00
11	IT	O	2	4-foot 4-lamp 34W T12	150	2	4-foot 2-lamp HP T8 w/ Refl	56	2340	0.19	437	$30.00	$30.00	$120.00
12	Lunch	C	6	4-foot 4-lamp 34W T12	150	6	4-foot 2-lamp HP T8 w/ Refl	56	3640	0.56	2,037	$30.00	$30.00	$360.00
13	Mark	O	5	4-foot 4-lamp 34W T12	150	5	4-foot 2-lamp HP T8 w/ Refl	56	2340	0.47	1,091	$30.00	$30.00	$300.00
14	Men's Restroom	RR	2	4-foot 4-lamp 34W T12	150	2	4-foot 2-lamp HP T8 w/ Refl	56	2574	0.19	480	$30.00	$30.00	$120.00
15	Men's Restroom	RR	2	4-foot 4-lamp 34W T12	150	2	4-foot 2-lamp HP T8 w/ Refl	56	2574	0.19	480	$30.00	$30.00	$120.00
16	Records	C	33	4-foot 4-lamp 34W T12	150	33	4-foot 2-lamp HP T8 w/ Refl	56	3640	3.08	11,205	$30.00	$30.00	$1,980.00
17	Women's Restroom	RR	4	4-foot 4-lamp 34W T12	150	4	4-foot 2-lamp HP T8 w/ Refl	56	2574	0.37	960	$30.00	$30.00	$240.00
18	Women's Restroom	RR	4	4-foot 4-lamp 34W T12	150	4	4-foot 2-lamp HP T8 w/ Refl	56	2574	0.37	960	$30.00	$30.00	$240.00
19	209	O	4	4-foot 2-lamp Std 32W T8	64	4	Relamp w/ high lumen 28W T8	56	2340	0.03	75	$5.00	$5.00	$40.00
20	211	O	21	4-foot 2-lamp Std 32W T8	64	21	Relamp w/ high lumen 28W T8	56	2340	0.17	393	$5.00	$5.00	$210.00
21	212	O	5	4-foot 2-lamp Std 32W T8	64	5	Relamp w/ high lumen 28W T8	56	2340	0.04	94	$5.00	$5.00	$50.00
22	213	O	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ high lumen 28W T8	56	2340	0.02	37	$5.00	$5.00	$20.00
23	214	O	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ high lumen 28W T8	56	2340	0.02	37	$5.00	$5.00	$20.00
24	216	O	6	4-foot 2-lamp Std 32W T8	64	6	Relamp w/ high lumen 28W T8	56	2340	0.05	112	$5.00	$5.00	$60.00
25	217	O	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ high lumen 28W T8	56	2340	0.02	37	$5.00	$5.00	$20.00
26	218	O	5	4-foot 2-lamp Std 32W T8	64	5	Relamp w/ high lumen 28W T8	56	2340	0.04	94	$5.00	$5.00	$50.00
27	219	O	3	4-foot 2-lamp Std 32W T8	64	3	Relamp w/ high lumen 28W T8	56	2340	0.02	56	$5.00	$5.00	$30.00
28	20 Years	O	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ high lumen 28W T8	56	2340	0.02	37	$5.00	$5.00	$20.00
29	211 Hall	H	3	4-foot 2-lamp Std 32W T8	64	3	Relamp w/ high lumen 28W T8	56	4004	0.02	96	$5.00	$5.00	$30.00
30	Break	C	4	4-foot 2-lamp Std 32W T8	64	4	Relamp w/ high lumen 28W T8	56	3640	0.03	116	$5.00	$5.00	$40.00
31	Break Room	C	1	4-foot 2-lamp Std 32W T8	64	1	Relamp w/ high lumen 28W T8	56	3640	0.01	29	$5.00	$5.00	$10.00
32	Computer Room	O	10	4-foot 2-lamp Std 32W T8	64	10	Relamp w/ high lumen 28W T8	56	2340	0.08	187	$5.00	$5.00	$100.00
33	Conference B	CF	4	4-foot 2-lamp Std 32W T8	64	4	Relamp w/ high lumen 28W T8	56	1040	0.03	33	$5.00	$5.00	$40.00
34	File Room	C	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ high lumen 28W T8	56	3640	0.02	58	$5.00	$5.00	$20.00
35	GIS	O	8	4-foot 2-lamp Std 32W T8	64	8	Relamp w/ high lumen 28W T8	56	2340	0.06	150	$5.00	$5.00	$80.00
36	GIS 2	O	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ high lumen 28W T8	56	2340	0.02	37	$5.00	$5.00	$20.00
37	GIS 3	O	5	4-foot 2-lamp Std 32W T8	64	5	Relamp w/ high lumen 28W T8	56	2340	0.04	94	$5.00	$5.00	$50.00
38	GIS 4	O	3	4-foot 2-lamp Std 32W T8	64	3	Relamp w/ high lumen 28W T8	56	2340	0.02	56	$5.00	$5.00	$30.00
39	Sector 7G	O	3	4-foot 2-lamp Std 32W T8	64	3	Relamp w/ high lumen 28W T8	56	2340	0.02	56	$5.00	$5.00	$30.00
40	Stairway	H	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ high lumen 28W T8	56	4004	0.02	64	$5.00	$5.00	$20.00
41	Stairway	H	2	4-foot 2-lamp Std 32W T8	64	2	Relamp w/ high lumen 28W T8	56	4004	0.02	64	$5.00	$5.00	$20.00
42	Storage 2nd	CF	7	4-foot 2-lamp Std 32W T8	64	7	Relamp w/ high lumen 28W T8	56	1040	0.06	58	$5.00	$5.00	$70.00
43	Tom	O	5	4-foot 2-lamp Std 32W T8	64	5	Relamp w/ high lumen 28W T8	56	2340	0.04	94	$5.00	$5.00	$50.00
44	Tract Department	O	19	4-foot 3-lamp Std 32W T8	96	19	Relamp w/ high lumen 28W T8	84	2340	0.23	534	$7.50	$5.00	$237.50
45	Board of Review	O	6	4-foot 4-lamp Std 32W T8	128	6	Relamp w/ high lumen 28W T8	112	2340	0.10	225	$10.00	$5.00	$90.00
46	Tract Copy	C	9	4-foot 4-lamp Std 32W T8	128	9	Relamp w/ high lumen 28W T8	112	3640	0.14	524	$10.00	$5.00	$135.00
47	Break Room	C	6	4-foot 2-lamp 31W U-bend T8	62	6	2-foot 2-lamp 17W T8	34	3640	0.17	612	$14.00	$30.00	$264.00

48	Break Room	C	6	4-foot 2-lamp 31W U-bend T8	62	6	2-foot 2-lamp 17W T8	34	3640	0.17	612	$14.00	$30.00	$264.00
49	Common Hall	H	3	4-foot 2-lamp 31W U-bend T8	62	3	2-foot 2-lamp 17W T8	34	4004	0.08	336	$14.00	$30.00	$132.00
50	Hall	H	5	4-foot 2-lamp 31W U-bend T8	62	5	2-foot 2-lamp 17W T8	34	4004	0.14	561	$14.00	$30.00	$220.00
51	Hall	H	10	4-foot 2-lamp 31W U-bend T8	62	10	2-foot 2-lamp 17W T8	34	4004	0.28	1,121	$14.00	$30.00	$440.00

Direct Savings Summary		
Electricity Savings	35,073	(kWh/yr)
Demand Reduction	11.73	(kW)
Direct Electricity Savings	$2,770.79	($/yr)
Demand Savings	$0.00	($/yr)
Total Direct Savings	$2,770.79	($/yr)

Economic Analysis		
Total Electricity Savings	38,812	(kWh/yr)
Total Natural Gas Savings	-1,098	(therm/yr)
Net Savings	$2,100.29	($/yr)
Total Cost	$11,029.00	($)
Simple Payback	5.3	(yrs)

L2: Incandescent Lamp Replacement (Building C)

Room	Space Type	Present Lighting			Proposed Lighting			Time On (hrs/yr)	Demand Reduction (kW)	Electricity Savings (kWh/yr)	Capital Cost ($)	Labor Cost ($)	Total Cost ($)
		Qty	Fixture	Watts	Qty	Fixture	Watts						
Entry	H	1	25W INCANDESCENT	100	1	9W CFL	9	4004	0.09	364	$4.00	$5.00	$9.00

Direct Savings Summary		
Electricity Savings	364	(kWh/yr)
Demand Reduction	0.09	(kW)
Direct Electricity Savings	$28.78	($/yr)
Demand Savings	$0.00	($/yr)
Total Direct Savings	$28.78	($/yr)

HVAC Interaction Summary		
Cooling Load Reduction	39	(kWh/yr)
Heating Load Reduction	-11	(therm/yr)
Electricity Savings	$3.07	($/yr)
Natural Gas Savings	-$10.03	($/yr)
Net HVAC Savings	-$6.97	($/yr)

Economic Analysis		
Total Electricity Savings	403	(kWh/yr)
Total Natural Gas Savings	-11	(therm/yr)
Net Savings	$21.82	($/yr)
Total Cost	$9.00	($)
Simple Payback	0.4	(yrs)

L3: Exit Sign Retrofit/ Replacement (Building C)

Area	Number of Fixtures	Present Fixture Type	Present Fixture Wattage	New Fixture Type	New Fixture Wattage (W)	Demand Reduction per unit (kW)	Energy Use Reduction per unit (kWh/yr)	Capital Cost ($)	Installation Cost ($)	Total Cost ($)
Building C	18	8W FL Exit	16	LED	1	0.02	131	$20.00	$10.00	$540.00

Direct Savings	
Total Energy Use Reduction (kWh/yr)	2,365
Total Demand Reduction (kW)	0.27
Energy Savings ($/yr)	$186.85
Demand Savings ($/yr)	$0.00
Total Direct Savings ($/yr)	$186.85

HVAC Interaction	
Cooling Load Reduction (kWh/yr)	252
Heat Load Reduction (therm/yr)	-74
Cooling Energy Savings ($/yr)	$19.92
Natural Gas Cost Increase ($/yr)	($65.13)
Net HVAC Savings ($/yr)	-$45.22

Economic Analysis	
Total Electricity Use Reduction (kWh/yr)	2,617
Natural Gas Use Savings (therm/yr)	-74
Net Savings ($/yr)	$141.63
Total Cost ($)	$540.00
Simple Payback (yrs)	3.8

L4: Occupancy Sensors (Building C)

Room Type	Number of Sensors	Load (W)	Predicted Savings (%)	Time On (hr/year)	Electricity Savings (kWh/yr)	Sensor Type	Capital Cost per Sensor ($)	Labor Cost Per Sensor ($)	Electricity Savings ($)	Total Cost ($)	Payback (Yrs)
Existing Restrooms	4	1795	40%	2574	1,848	Ceiling IR	$80.00	$150.00	$157.11	$920.00	5.9
Existing Offices	26	14208	25%	2340	8,312	Wall Switch IR	$30.00	$20.00	$706.49	$1,300.00	1.8
Existing Mechanical Rooms	1	262	35%	3640	334	Combination	$80.00	$150.00	$28.35	$230.00	8.1
Existing Conference Rooms	3	1078	35%	1040	392	Wall Switch IR	$30.00	$20.00	$33.35	$150.00	4.5
Existing Large Common Rooms	7	7211	35%	3640	9,187	Combination	$80.00	$20.00	$780.86	$700.00	0.9
Existing Break & Misc Common Rms	8	2912	35%	3640	3,710	Wall Switch IR	$30.00	$20.00	$315.38	$400.00	1.3
					0						
Proposed Restrooms	4	676	40%	2574	696	Ceiling IR	$80.00	$150.00	$59.15	$920.00	15.6
Proposed Offices	26	9,449	25%	2340	5,528	Wall Switch IR	$30.00	$20.00	$469.84	$1,300.00	2.8
Proposed Mechanical Rooms	1	197	35%	3640	251	Combination	$80.00	$150.00	$21.35	$230.00	10.8
Proposed Conference Rooms	3	896	35%	1040	326	Wall Switch IR	$30.00	$20.00	$27.72	$150.00	5.4
Proposed Large Common Rooms	7	3,711	35%	3640	4,728	Combination	$80.00	$20.00	$401.90	$700.00	1.7
Proposed Break & Misc Common Rms	8	1,476	35%	3640	1,880	Wall Switch IR	$30.00	$20.00	$159.78	$400.00	2.5

Option 1: Sensors on Existing Fixtures

Direct Savings Summary		
Electricity Savings	23,783	(kWh/yr)
Total Direct Savings	$1,878.85	($/yr)

HVAC Interaction Summary		
Cooling Load Reduction	2,535	(kWh/yr)
Heating Load Reduction	-744	(therm/yr)
Electricity Savings	$200.28	($/yr)
Natural Gas Savings	-$654.94	($/yr)
Net HVAC Savings	-$454.66	($/yr)

Economic Analysis		
Total Electricity Savings	26,318	(kWh/yr)
Total Natural Gas Savings	-744	(therm/yr)
Net Savings	$1,424.19	($/yr)
Total Cost	$3,700.00	($)
Combined Simple Payback	2.6	(yrs)

Option 2: Sensors on Proposed Fixtures

Direct Savings Summary		
Electricity Savings	13,409	(kWh/yr)
Total Direct Savings	$1,059.29	($/yr)

HVAC Interaction Summary		
Cooling Load Reduction	1,429	(kWh/yr)
Heating Load Reduction	-420	(therm/yr)
Electricity Savings	$112.92	($/yr)
Natural Gas Savings	-$369.26	($/yr)
Net HVAC Savings	-$256.34	($/yr)

Economic Analysis		
Total Electricity Savings	14,838	(kWh/yr)
Total Natural Gas Savings	-420	(therm/yr)
Net Savings	$802.95	($/yr)
Total Cost	$3,700.00	($)
Combined Simple Payback	4.6	(yrs)

Note: The following are energy savings predictions published by EPRI. The predictions fall in the range published by the U.S. EPA.

Private Offices: 25%
Conference Rooms: 35%
Restrooms: 40%

Line	Room	Space Type	Present Lighting			Total Existing Watts per Area	Proposed Lighting			Total New Watts per Area
			Qty	Fixture	Watts		Qty	Fixture	Watts	
30	Break	C	4	4-foot 2-lamp Std 32W T8	64	256	4	Relamp w/ high lumen 28W T8	56	224
47	Break Room	C	6	4-foot 2-lamp 31W U-bend T8	62	372	6	2-foot 2-lamp 17W T8	34	204
48	Break Room	C	6	4-foot 2-lamp 31W U-bend T8	62	372	6	2-foot 2-lamp 17W T8	34	204
31	Break Room	C	1	4-foot 2-lamp Std 32W T8	64	64	1	Relamp w/ high lumen 28W T8	56	56
10	Copy	C	5	4-foot 4-lamp 34W T12	150	748	5	4-foot 2-lamp HP T8 w/ Refl	56	282
34	File Room	C	2	4-foot 2-lamp Std 32W T8	64	128	2	Relamp w/ high lumen 28W T8	56	112
5	Lunch	C	1	4-foot 2-lamp 34W T12	75	75	1	4-foot 2-lamp HP T8	56	56
12	Lunch	C	6	4-foot 4-lamp 34W T12	150	898	6	4-foot 2-lamp HP T8 w/ Refl	56	338
3	Records	C	30	4-foot 1-lamp 34W T12	37	1122	30	4-foot 1-lamp HP T8	28	845
16	Records	C	33	4-foot 4-lamp 34W T12	150	4937	33	4-foot 2-lamp HP T8 w/ Refl	56	1859
46	Tract Copy	C	9	4-foot 4-lamp Std 32W T8	128	1152	9	Relamp w/ high lumen 28W T8	112	1008
33	Conference B	CF	4	4-foot 2-lamp Std 32W T8	64	256	4	Relamp w/ high lumen 28W T8	56	224
8	Storage 2nd	CF	5	4-foot 2-lamp 34W T12	75	374	5	4-foot 2-lamp HP T8	56	280
42	Storage 2nd	CF	7	4-foot 2-lamp Std 32W T8	64	448	7	Relamp w/ high lumen 28W T8	56	392
2	Mechchanical 1st	M	7	4-foot 1-lamp 34W T12	37	262	7	4-foot 1-lamp HP T8	28	197
19	209	O	4	4-foot 2-lamp Std 32W T8	64	256	4	Relamp w/ high lumen 28W T8	56	224
20	211	O	21	4-foot 2-lamp Std 32W T8	64	1344	21	Relamp w/ high lumen 28W T8	56	1176
21	212	O	5	4-foot 2-lamp Std 32W T8	64	320	5	Relamp w/ high lumen 28W T8	56	280
22	213	O	2	4-foot 2-lamp Std 32W T8	64	128	2	Relamp w/ high lumen 28W T8	56	112
23	214	O	2	4-foot 2-lamp Std 32W T8	64	128	2	Relamp w/ high lumen 28W T8	56	112
24	216	O	6	4-foot 2-lamp Std 32W T8	64	384	6	Relamp w/ high lumen 28W T8	56	336
25	217	O	2	4-foot 2-lamp Std 32W T8	64	128	2	Relamp w/ high lumen 28W T8	56	112
26	218	O	5	4-foot 2-lamp Std 32W T8	64	320	5	Relamp w/ high lumen 28W T8	56	280
27	219	O	3	4-foot 2-lamp Std 32W T8	64	192	3	Relamp w/ high lumen 28W T8	56	168
28	20 Years	O	2	4-foot 2-lamp Std 32W T8	64	128	2	Relamp w/ high lumen 28W T8	56	112
9	Assesment	O	33	4-foot 4-lamp 34W T12	150	4937	33	4-foot 2-lamp HP T8 w/ Refl	56	1859
45	Board of Review	O	6	4-foot 4-lamp Std 32W T8	128	768	6	Relamp w/ high lumen 28W T8	112	672
32	Computer Room	O	10	4-foot 2-lamp Std 32W T8	64	640	10	Relamp w/ high lumen 28W T8	56	560
35	GIS	O	8	4-foot 2-lamp Std 32W T8	64	512	8	Relamp w/ high lumen 28W T8	56	448
36	GIS 2	O	2	4-foot 2-lamp Std 32W T8	64	128	2	Relamp w/ high lumen 28W T8	56	112
37	GIS 3	O	5	4-foot 2-lamp Std 32W T8	64	320	5	Relamp w/ high lumen 28W T8	56	280
38	GIS 4	O	3	4-foot 2-lamp Std 32W T8	64	192	3	Relamp w/ high lumen 28W T8	56	168
11	IT	O	2	4-foot 4-lamp 34W T12	150	299	2	4-foot 2-lamp HP T8 w/ Refl	56	113
13	Mark	O	5	4-foot 4-lamp 34W T12	150	748	5	4-foot 2-lamp HP T8 w/ Refl	56	282
39	Sector 7G	O	3	4-foot 2-lamp Std 32W T8	64	192	3	Relamp w/ high lumen 28W T8	56	168
43	Tom	O	5	4-foot 2-lamp Std 32W T8	64	320	5	Relamp w/ high lumen 28W T8	56	280
44	Tract Department	O	19	4-foot 3-lamp Std 32W T8	96	1824	19	Relamp w/ high lumen 28W T8	84	1596

14	Men's Restroom	RR	2	4-foot 4-lamp 34W T12	150	299	2	4-foot 2-lamp HP T8 w/ Refl	56	113
15	Men's Restroom	RR	2	4-foot 4-lamp 34W T12	150	299	2	4-foot 2-lamp HP T8 w/ Refl	56	113
17	Women's Restroom	RR	4	4-foot 4-lamp 34W T12	150	598	4	4-foot 2-lamp HP T8 w/ Refl	56	225
18	Women's Restroom	RR	4	4-foot 4-lamp 34W T12	150	598	4	4-foot 2-lamp HP T8 w/ Refl	56	225

L5: Exterior Lighting Retrofit (Building C)

Option	Location	Present Lighting			Proposed Lighting			Time On (hrs/yr)	Demand Reduction (kW)	Electricity Savings (kWh/yr)	Capital Cost ($)	Labor Cost ($)	Line Cost ($)
		Qty	Fixture	Watts	Qty	Fixture	Watts						
1	East Parking Lot	12	250W Metal Halide	295	12	150W Pulse Start MH Retrofit	190	4745	1.26	5,979	$150.00	$30.00	$2,160.00
1	West Decorative Pole	2	150W HPS	190	2	100W Pulse Start MH Retrofit	128	4745	0.12	588	$150.00	$30.00	$360.00
1	Exterior Wall Packs	5	150W Metal Halide	190	5	100W Pulse Start MH Retrofit	128	4745	0.31	1,471	$150.00	$30.00	$900.00
1	Exterior Door Lights	1	70W Metal Halide	95	1	70W Pulse Start MH Retrofit	95	4745	0.00	0	$100.00	$30.00	$130.00
2	East Parking Lot	12	250W Metal Halide	295	12	96W LED Shoebox Fixture	96	4745	2.39	11,331	$1,000.00	$150.00	$13,800.00
2	West Decorative Pole	2	150W HPS	190	2	56W LED Acorn	56	4745	0.27	1,272	$750.00	$150.00	$1,800.00
2	Exterior Wall Packs	5	150W Metal Halide	190	5	56W LED Wallpack	56	4745	0.67	3,179	$750.00	$150.00	$4,500.00
2	Exterior Door Lights	1	70W Metal Halide	95	1	20W LED Luminaire	20	4745	0.08	356	$550.00	$150.00	$700.00
3	East Parking Lot	12	250W Metal Halide	295	12	120W Induction Shoebox Fixture	120	4745	2.10	9,965	$550.00	$150.00	$8,400.00
3	West Decorative Pole	2	150W HPS	190	2	80W Induction Decorative Fixture	80	4745	0.22	1,044	$500.00	$150.00	$1,300.00
3	Exterior Wall Packs	5	150W Metal Halide	190	5	80W Induction Wall Pack	80	4745	0.55	2,610	$350.00	$150.00	$2,500.00
3	Exterior Door Lights	1	70W Metal Halide	95	1	40W Induction Luminaire	40	4745	0.06	261	$250.00	$150.00	$400.00

Direct Savings Summary				
	Opt 1	Opt 2	Opt 3	
Electricity Savings	8,038	16,138	13,879	(kWh/yr)
Demand Reduction	1.69	3.40	2.93	(kW)
Direct Electricity Savings	$635.00	$1,274.88	$1,096.45	($/yr)
Demand Savings	$0.00	$0.00	$0.00	($/yr)
Total Direct Savings	$635.00	$1,274.88	$1,096.45	($/yr)

HVAC Interaction Summary				
	Opt 1	Opt 2	Opt 3	
Cooling Load Reduction	0	0	0	(kWh/yr)
Heating Load Reduction	0	0	0	(therm/yr)
Electricity Savings	$0.00	$0.00	$0.00	($/yr)
Natural Gas Savings	$0.00	$0.00	$0.00	($/yr)
Net HVAC Savings	$0.00	$0.00	$0.00	($/yr)

Economic Analysis				
	Opt 1	Opt 2	Opt 3	
Total Electricity Savings	8,038	16,138	13,879	(kWh/yr)
Total Natural Gas Savings	0	0	0	(therm/yr)
Net Savings	$635.00	$1,274.88	$1,096.45	($/yr)
Total Cost	$3,420.00	$20,800.00	$12,600.00	($)
Simple Payback	5.4	16.3	11.5	(yrs)

Pricing for LED fixtures from LEDtronics
Pricing for Induction lighting from FSG

L6: Photocells on Exterior Fixtures (Building C)

Option	Location	Nominal Fixture Wattage	Load (W)	Current Annual Hours	Annual Hours on Sensors	Electricity Savings (kWh/yr)	Number of Sensors
1	Existing East Parking Lot	250	3,540	4745	4380	1,292	1
1	Existing West Decorative Pole	150	380	4745	4380	139	1
1	Existing Exterior Wall Packs	150	950	4745	4380	347	1
1	Existing Exterior Door Lights	70	95	4745	4380	35	1
2	Pulse Start East Parking Lot	150	2,280	4745	4380	832	1
2	Pulse Start West Decorative Pole	100	256	4745	4380	93	1
2	Pulse Start Exterior Wall Packs	100	640	4745	4380	234	1
2	Pulse Start Exterior Door Lights	70	95	4745	4380	35	1
3	LED East Parking Lot	96	1,152	4745	4380	420	1
3	LED West Decorative Pole	56	112	4745	4380	41	1
3	LED Exterior Wall Packs	56	280	4745	4380	102	1
3	LED Exterior Door Lights	20	20	4745	4380	7	1
4	Induction East Parking Lot	120	1,440	4745	4380	526	1
4	Induction West Decorative Pole	80	160	4745	4380	58	1
4	Induction Exterior Wall Packs	80	400	4745	4380	146	1
4	Induction Exterior Door Lights	40	40	4745	4380	15	1

Direct Savings Summary					
	Opt 1	Opt 2	Opt 3	Opt 4	
Electricity Savings	1,812	1,194	571	745	(kWh/yr)
Total Direct Savings	$143.17	$94.32	$45.10	$58.82	($/yr)

HVAC Interaction Summary					
	Opt 1	Opt 2	Opt 3	Opt 4	
Cooling Load Reduction	0	0	0	0	(kWh/yr)
Heating Load Reduction	0	0	0	0	(therm/yr)
Electricity Savings	$0.00	$0.00	$0.00	$0.00	($/yr)
Natural Gas Savings	$0.00	$0.00	$0.00	$0.00	($/yr)
Net HVAC Savings	$0.00	$0.00	$0.00	$0.00	($/yr)

Economic Analysis					
	Opt 1	Opt 2	Opt 3	Opt 4	
Total Electricity Savings	1,812	1,194	571	745	(kWh/yr)
Total Natural Gas Savings	0	0	0	0	(therm/yr)
Net Savings	$143.17	$94.32	$45.10	$58.82	($/yr)
Total Cost	$1,360.00	$1,360.00	$1,360.00	$1,360.00	($)
Combined Simple Payback	9.5	14.4	30.2	23.1	(yrs)

PATRICK ENGINEERING INC.

Project No	20903.047			
Project	Kane County			
Calculated by	DEK	Date	2/28/10	
Checked by	CJB	Date	3/5/10	
Title	Stairwell Lights ECRM L-9 Bldg C	Sheet	1	of 2

PROBLEM STATEMENT: Determine the savings for replacing the existing fluorescent light fixtures in the stairwells that are on continuously in Building C, with new T-8 fixtures that incorporate a dimming ballast and occupancy sensors

GIVEN:

1. The T-8 fixtures will consume 56 W/fixture when on, and only 10% of that when idle (See Exhibit XX)
2. Electricity for the Building C costs about $0.079/kWh.
3. A.C. efficiency is 1.2 kWh/ton. (Based on Rooftop Nameplate Info)
4. One therm of gas costs about $0.88.

ASSUMPTIONS:

1. Stairwells are used 4 hr/day on average, 260 day/yr for a total of 1,040 hr/yr. (based on building occupancy)
2. The heating season length of Geneva is comparable to the 251 day heating season of Chicago. (Technical Assistance Program Manual).
3. The boiler efficiency is about 0.75. (Based on Rooftop Nameplate Info)

CALCULATION:

Present Lighting

Lamp	# of Fixtures	Wattage per fixture (W)	Usage (hr/yr)	Consumption (kWh/yr)
2 -28 W T-8	8	56	8,760	3,924
			Total:	3,924

Proposed Lighting

Full output = 56 W/fixture

Idle output = 10% of Full output = 6 W/fixture

Operating Mode	Wattage (W)	Usage (hr/yr)	Consumption per Fixture (kWh/yr)
Idle	6	7,720	46
On	56	1,040	58
		Total:	104

Total Consumption = (104 kWh/yr-fixture) (8 fixtures) = 832 kWh/yr

Energy Usage Reduction = 3,924 kWh/yr – 832 kWh/yr = 3,092 kWh/yr

HVAC Interaction

Heat Load Addition = (3,092 kWh/yr) (251/365) (3413Btu/kWh) / [(0.75) (100,000 Btu/therm)]

= 97 therms

Natural Gas Cost Increase = (97 therms) ($0.88/therm) = $85/yr

Cooling Load Reduction = (3,092 kWh/yr) (114/365) (3413Btu/kWh) (1.2 kWh/ton) / (12,000 Btu/ton)
= 330 kWh/yr

Economic Analysis

Total Energy Usage Reduction = 3,092 kWh/yr + 330 kWh/yr = 3,422 kWh/yr

Total Energy Savings = (3,422 kWh/yr) ($0.079/kWh) = $270/yr

Net Savings = Total Energy Savings – Natural Gas Cost Increase
= $270/yr - $85/yr = $185

Distributor cost per fixture for small orders: $165/ fixture.

Total fixture cost: ($165/fixture) (8 fixtures) = $1,320

Installation: ($25/fixture) (8 fixtures) = $200

Total Installed Cost = $1,320 + $200 = $1,520

Simple Payback = ($1,520) / ($270/yr) = 5.6 years

Period of Record = 1967 to 1996

Breakpoint from graph 60 °F
Fan on from 00 to 24

COST
Chiller 1.2 kW/ton 0.079 $/kWh
Heat 0.75 % 0.88 $/therm

BTU/1000 cfm
Assumes 55°F SAT

Temperature Range (oF)	Annual Totals Hour Group LST 01 to "08	09 to 16	17 to 00	Total Obs	MCWB (oF)	HOURS ON 01 to 08	09 to 16	17 to 00	SUM	Tons	Heat Required	Cooling kWh required	Therms Required
100/104	0	1	0	1	78.9	102	0	1	0	1	50760	4.23	5.076	
95/99	0	10	1	11	76.8	97	0	10	0.75	10.75	487620	40.635	48.762	
90/94	0	50	11	62	74.8	92	0	50	8.25	58.25	2327670	193.9725	232.767	
85/89	2	121	40	163	72.3	87	0.5	121	30	151.5	5235840	436.32	523.584	
80/84	22	219	99	340	69.6	82	5.5	219	74.25	298.75	8711550	725.9625	871.155	
75/79	90	269	181	540	67	77	22.5	269	135.75	427.25	10151460	845.955	1015.146	
70/74	201	244	244	689	64.4	72	50.25	244	183	477.25	8762310	730.1925	876.231	
65/69	254	199	244	696	60.5	67	63.5	199	183	445.5	5773680	481.14	577.368	
60/64	259	203	237	699	56.3	62	64.75	203	177.75	445.5	3367980	280.665	336.798	
55/59	234	181	210	626	51.7	57	58.5	181	157.5	397	857520	1143360		11.4336
50/54	222	181	203	605	47.1	52	55.5	181	152.25	388.75	1259550	1679400		16.794
45/49	215	172	202	589	42.7	47	53.75	172	151.5	377.25	3259440	4345920		43.4592
40/44	216	195	216	627	38.4	42	54	195	162	411	5770440	7693920		76.9392
35/39	275	239	266	780	34.1	37	68.75	239	199.5	507.25	9860940	13147920		131.4792
30/34	295	216	267	778	29.8	32	73.75	216	200.25	490	12171600	16228800		162.288
25/29	201	146	172	519	24.9	27	50.25	146	129	325.25	9835560	13114080		131.1408
20/24	139	96	116	351	20.2	22	34.75	96	87	217.75	7760610	10347480		103.4748
15/19	99	64	73	236	15.5	17	24.75	64	54.75	143.5	5889240	7852320		78.5232
10/14	62	43	57	162	10.6	12	15.5	43	42.75	101.25	4702050	6269400		62.694
05/09	52	30	40	123	5.8	7	13	30	30	73	3784320	5045760		50.4576
00/04	42	18	25	85	1.2	2	10.5	18	18.75	47.25	2704590	3606120		36.0612
-5/-1	18	6	11	35	-3.2	-3	4.5	6	8.25	18.75	1174500	1566000		15.66
-10/-6	13	5	6	24	-7.5	-8	3.25	5	4.5	12.75	867510	1156680		11.5668
-15/-11	6	2	4	12	-12.1	-13	1.5	2	3	6.5	477360	636480		6.3648
-20/-16	2	1	1	4	-17	-18	0.5	1	0.75	2.25	177390	236520		2.3652
-25/-21	1	0	0	2	-22.1	-23	0.25	0	0	0.25	21060	28080		0.2808
-30/-26	0	0	0	0	-25.4	-28	0	0	0	0	0	0		0
	2920	2911	2926	8759						5835.5			4486.887	940.9824 TOTAL
			8757									$$	354.4641	828.0645 $1,182.53

Cost for 1,000 cfm of outside air in the Building C is $1,182.53

Period of Record = 1967 to 1996

Breakpoint from graph 60 °F
Fan on from 00 to 24

COST
Chiller 1.2 kW/ton 0.079 $/kWh
Heat 0.75 % 0.88 $/therm

BTU/1000 cfm
Assumes 55°F SAT

01 to "08	Annual Totals Hour Group LST 09 to 16	17 to 00	Total Obs	MCWB (oF)	HOURS ON 01 to 08	09 to 16	17 to 00	SUM	Tons	Heat Required	Cooling kWh required	Therms Required
0	1	0	1	78.9	102	0	0.714286	0	0.714286	36257.14	3.021429	3.625714	
0	10	1	11	76.8	97	0	7.142857	0.446429	7.589286	344250	28.6875	34.425	
0	50	11	62	74.8	92	0	35.71429	4.910714	40.625	1623375	135.2813	162.3375	
2	121	40	163	72.3	87	0.357143	86.42857	17.85714	104.6429	3616457	301.3714	361.6457	
22	219	99	340	69.6	82	3.928571	156.4286	44.19643	204.5536	5964782	497.0652	596.4782	
90	269	181	540	67	77	16.07143	192.1429	80.80357	289.0179	6867064	572.2554	686.7064	
201	244	244	689	64.4	72	35.89286	174.2857	108.9286	319.1071	5858807	488.2339	585.8807	
254	199	244	696	60.5	67	45.35714	142.1429	108.9286	296.4286	3841714	320.1429	384.1714	
259	203	237	699	56.3	62	46.25	145	105.8036	297.0536	2245725	187.1438	224.5725	
234	181	210	626	51.7	57	41.78571	129.2857	93.75	264.8214	572014.3	762685.7		7.626857
222	181	203	605	47.1	52	39.64286	129.2857	90.625	259.5536	840953.6	1121271		11.21271
215	172	202	589	42.7	47	38.39286	122.8571	90.17857	251.4286	2172343	2896457		28.96457
216	195	216	627	38.4	42	38.57143	139.2857	96.42857	274.2857	3850971	5134629		51.34629
275	239	266	780	34.1	37	49.10714	170.7143	118.75	338.5714	6581829	8775771		87.75771
295	216	267	778	29.8	32	52.67857	154.2857	119.1964	326.1607	8101832	10802443		108.0244
201	146	172	519	24.9	27	35.89286	104.2857	76.78571	216.9643	6561000	8748000		87.48
139	96	116	351	20.2	22	24.82143	68.57143	51.78571	145.1786	5174164	6898886		68.98886
99	64	73	236	15.5	17	17.67857	45.71429	32.58929	95.98214	3939107	5252143		52.52143
62	43	57	162	10.6	12	11.07143	30.71429	25.44643	67.23214	3122261	4163014		41.63014
52	30	40	123	5.8	7	9.285714	21.42857	17.85714	48.57143	2517943	3357257		33.57257
42	18	25	85	1.2	2	7.5	12.85714	11.16071	31.51786	1804082	2405443		24.05443
18	6	11	35	-3.2	-3	3.214286	4.285714	4.910714	12.41071	777407.1	1036543		10.36543
13	5	6	24	-7.5	-8	2.321429	3.571429	2.678571	8.571429	583200	777600		7.776
6	2	4	12	-12.1	-13	1.071429	1.428571	1.785714	4.285714	314742.9	419657.1		4.196571
2	1	1	4	-17	-18	0.357143	0.714286	0.446429	1.517857	119667.9	159557.1		1.595571
1	0	0	2	-22.1	-23	0.178571	0	0	0.178571	15042.86	20057.14		0.200571
0	0	0	0	-25.4	-28	0	0	0	0	0	0		0
2920	2911	2926	8759						3906.964			3039.843	627.3141 TOTAL
		8757									$$	240.1476	552.0364 $792.18
												1447.044	313.6683
												114.3165	276.0281 $390.34
												8609.911	1866.326
												680.1829	1642.367 $2,322.55

Cost for 1,000 cfm of outside air in the Building C is $792.18

			cfm		OA cfm		
3 Rooftop Units	25 ton		8750	estimated	5950		$0.00
	30 ton		10500				
	30 ton		10500	IMC 2009	2975		
TOTAL			29750				
					2975	9043.534	1866.26
						17653.44	3732.586
						1394.622	3284.675 $4,679.30

PATRICK ENGINEERING INC.

Project No	20903.047			
Project	Kane County			
Calculated by	DEK	Date	2/28/10	
Checked by	CJB	Date	3/6/10	
		Sheet	1 of	1

Title ECRM K-5-BLDG C
Vending Machine Control

PROBLEM STATEMENT: Determine the cost savings of installing control units for the vending machines in the Building.

GIVEN:

1. Snack units draw about 70 watts and cold drink units average about 400 watts.
2. Case studies have documented 35-80% savings due to control units.
3. Control units for refrigerated and snack machines cost $180 and $80 respectively.

ASSUMPTIONS:

1. The electrical cost will be = $0.079/kWh

CALCULATION:

Refrigerated Machine Usage Reduction: 400 W * 8760 hr/yr / 1000 W/kW = 3500 kWh/yr
35% of 3500 kWh/yr = 1225 kWh/yr

Snack Machine Power reduction: 70 W * 8760 hr/yr / 1000 W/kW = 610 kWh/yr
35% of 610 kWh/yr = 215 kWh/yr

Total Savings

Type of Machine	Quantity	Reduction per Machine (kWh/yr)	Savings (kWh/yr)
Refrigerated	1	1,225	1,225
Snack	1	215	215
		Total:	1,440

Economic Analysis

Energy Savings = (1,440 kWh/yr) ($0.079/kWh) = $114/yr

Installed Cost = (1 x $180) + (1 x $80) = $260 (Vending Mizer price sheet)

Heat Load interaction = 1,440 kWh x 251/365 x 3413 Btu/kWh x th/100,000 Btu x 1/0.75 = 45 therms

45 therms x $0.88 = $40

Cooling savings = 1,440 kWh x 114/365 x 1.2 kW/ton x 3413 Btu/kWh x ton-hr/12,000 Btu = 154 kWh/yr

154 kWh x $0.079/kWh = $12

Total kWh = 1,440 + 154 = 1,594 kWh = $126. Gas = -$40. Total = $126- $40 = $86.

Simple Payback = ($260) / ($86/yr) = 3.0 years

BUILDING

B & I

ECM	Description	Natural Gas Savings (therm/yr)	Electrical Savings (kWh/yr)	Monetary Savings ($/yr)	Project Cost ($)	Simple Payback (yrs)
L1	Linear Fluorescent Lighting Retrofit	(708)	25,039	$1,355	$6,169	4.6
L2	Incandescent Lamp Replacement	(16)	572	$31	$66	2.1
L3	LED Exit Sign Replacement	(8)	291	$16	$780	49.6
L4	Occupancy Sensors	(505)	17,841	$965	$2,700	2.8
L5	Exterior Lighting Retrofit	0	1,177	$93	$720	7.7
L6	Install Photocell on Exterior Lighting	0	187	$15	$340	23.0

Building B&I - Input

Local Seasonal Weather Information		
Average Winter Temp.	39.1	(˚F)
Average Summer Temp.	71.5	(˚F)
Heating Season Length	251	(days/yr)
Cooling Season Length	114	(days/yr)
Heating Season Length	35.9	(wks/yr)
Cooling Season Length	16.3	(wks/yr)
Annual Daylight Hours (Chicago)	4380	(days/yr)

HVAC System Information		
Heating System Eff.	75%	(%)
Cooling System Eff.	1.2	(kW/ton)
Winter Temp. Setpoint	74	(˚F)
Summer Temp. Setpoint	68	(˚F)

Utility Cost Information		
Natural Gas Rate	$0.880	($/therm)
Electricity Usage Rate	$0.079	($/kWh)
Electricity Demand Rate	$0.00	($/kW-mo)

Building B&I - Lighting Input

Wattages				
Fixture Type	# of Lamps	Lamp Wattage	Ballast Factor	Fixture Wattage
4-foot 1-lamp 32W Std T8	1	32	1.00	32
4-foot 2-lamp 32W Std T8	2	32	1.00	64
4-foot 3-lamp 32W Std T8	3	32	1.00	96
4-foot 4-lamp 32W Std T8	4	32	1.00	128
4-foot 1-lamp 32W HP T8	1	32	0.88	28
4-foot 2-lamp 32W HP T8	2	32	0.88	56
4-foot 3-lamp 32W HP T8	3	32	0.88	84
4-foot 4-lamp 32W HP T8	4	32	0.88	113
4-foot 1-lamp 28W HL T8	1	28	1.00	28
4-foot 2-lamp 28W HL T8	2	28	1.00	56
4-foot 3-lamp 28W HL T8	3	28	1.00	84
4-foot 4-lamp 28W HL T8	4	28	1.00	112
4-foot 2-lamp 32W T8-M	2	32	1.10	70
4-foot 4-lamp 32W T8-M	4	32	1.10	141
4-foot 1-lamp 34W Std T12	1	34	1.10	37
4-foot 2-lamp 34W Std T12	2	34	1.10	75
4-foot 3-lamp 34W Std T12	3	34	1.10	112
4-foot 4-lamp 34W Std T12	4	34	1.10	150
8-foot 2-lamp 60W T12	2	60	1.10	132
4-foot 2-lamp 31W U-bend T8	2	31	1.00	62
4-foot 3-lamp 31W U-bend T8	3	31	1.00	93
4-foot 1-lamp 34W U-bend T12	1	34	1.10	37
2-foot 2-lamp 17W T8	1	17	1.00	17
2-foot 2-lamp 17W T8	2	17	1.00	34

Pricing	
Price	Replacement Fixture
$2.00	32W Standard T8 Lamp
$2.50	28W High Lumen T8 Lamp
$2.50	32W High Lumen T8 Lamp
$2.00	17W High Lumen T8 Lamp
$10.00	23W PAR CFL
$15.00	1-Lamp NBF T8 Ballast
$15.00	2-Lamp NBF T8 Ballast
$15.00	1-Lamp LBF T8 Ballast
$15.00	2-Lamp LBF T8 Ballast
$4.00	9W CFL
$10.00	2-foot Retrofit kit (U-tube to F17)
$30.00	Wall Switch IR Sensor
$80.00	Ceiling IR Sensor
$80.00	Ceiling IR/ Ultrasonic Sensor

Hours of Operation				
Room Type	Hrs/ Day	Days/Wk	Wks/ Yr	Annual Hours
CR = Courtrooms	8.0	5.5	52	2288
0 = Offices	9.0	5.0	52	2340
CF = Conference Rooms, Storage	4.0	5.0	52	1040
C = Common Areas (break, copy, etc.	14.0	5.0	52	3640
H = Halls & Lobbys	14.0	5.5	52	4004
RR = Restrooms	9.0	5.5	52	2574
M = Mechanical/ Electrical Rooms	14.0	5.0	52	3640

L1: Linear Fluorescent Lighting Retrofit (Building B&I)

Line	Room	Space Type	Present Lighting			Proposed Lighting			Time On (hrs/yr)	Demand Reduction (kW)	Electricity Savings (kWh/yr)	Capital Cost ($)	Labor Cost ($)	Total Cost ($)
			Qty	Fixture	Watts	Qty	Fixture	Watts						
1	Back Entrance	H	3	4-foot 2-lamp Std 32W T8	64	3	Relamp w/ high lumen 28W T8	56	4004	0.02	96	$5.00	$5.00	$30.00
2	Electric Room	M	3	4-foot 2-lamp Std 32W T8	64	3	Relamp w/ high lumen 28W T8	56	3640	0.02	87	$5.00	$5.00	$30.00
3	Entrance Way	H	10	4-foot 2-lamp Std 32W T8	64	10	Relamp w/ high lumen 28W T8	56	4004	0.08	320	$5.00	$5.00	$100.00
4	Envelope Supply	C	3	4-foot 2-lamp Std 32W T8	64	3	Relamp w/ high lumen 28W T8	56	3640	0.02	87	$5.00	$5.00	$30.00
5	Hallway	H	12	4-foot 2-lamp Std 32W T8	64	12	Relamp w/ high lumen 28W T8	56	4004	0.10	384	$5.00	$5.00	$120.00
6	Printer Room	C	3	4-foot 2-lamp Std 32W T8	64	3	Relamp w/ high lumen 28W T8	56	3640	0.02	87	$5.00	$5.00	$30.00
7	Records Area	C	82	4-foot 2-lamp Std 32W T8	64	82	Relamp w/ high lumen 28W T8	56	3640	0.66	2,388	$5.00	$5.00	$820.00
8	Records Room	C	12	4-foot 2-lamp Std 32W T8	64	12	Relamp w/ high lumen 28W T8	56	3640	0.10	349	$5.00	$5.00	$120.00
9	Rest Rooms	RR	5	4-foot 2-lamp Std 32W T8	64	5	Relamp w/ high lumen 28W T8	56	2574	0.04	103	$5.00	$5.00	$50.00
10	Break Room	C	9	4-foot 4-lamp Std 32W T8	128	9	Relamp w/ high lumen 28W T8	112	3640	0.14	524	$10.00	$5.00	$135.00
11	Conference Room	CF	4	4-foot 4-lamp Std 32W T8	128	4	Relamp w/ high lumen 28W T8	112	1040	0.06	67	$10.00	$5.00	$60.00
12	Copy Room	C	3	4-foot 4-lamp Std 32W T8	128	3	Relamp w/ high lumen 28W T8	112	3640	0.05	175	$10.00	$5.00	$45.00
13	Elections Office	O	2	4-foot 4-lamp Std 32W T8	128	2	Relamp w/ high lumen 28W T8	112	2340	0.03	75	$10.00	$5.00	$30.00
14	Office	O	2	4-foot 4-lamp Std 32W T8	128	2	Relamp w/ high lumen 28W T8	112	2340	0.03	75	$10.00	$5.00	$30.00
15	Private Office	O	4	4-foot 4-lamp Std 32W T8	128	4	Relamp w/ high lumen 28W T8	112	2340	0.06	150	$10.00	$5.00	$60.00
16	Private Office	O	4	4-foot 4-lamp Std 32W T8	128	4	Relamp w/ high lumen 28W T8	112	2340	0.06	150	$10.00	$5.00	$60.00
17	Tax Extension Office	O	2	4-foot 4-lamp Std 32W T8	128	2	Relamp w/ high lumen 28W T8	112	2340	0.03	75	$10.00	$5.00	$30.00
18	Voting Office	O	3	4-foot 4-lamp Std 32W T8	128	3	Relamp w/ high lumen 28W T8	112	2340	0.05	112	$10.00	$5.00	$45.00
19	Boiler Room	M	1	4-foot 2-lamp 34W T12	75	1	4-foot 2-lamp HP T8	56	3640	0.02	67	$20.00	$30.00	$50.00
20	Multi-purpose Room	C	30	4-foot 2-lamp 34W T12	75	30	4-foot 2-lamp HP T8	56	3640	0.55	2,018	$20.00	$30.00	$1,500.00
21	Boiler Alcove	M	1	4-foot 4-lamp 34W T12	150	1	4-foot 2-lamp HP T8 w/ Refl	56	3640	0.09	340	$30.00	$30.00	$60.00
22	Mens Restroom	RR	2	4-foot 4-lamp 34W T12	150	2	4-foot 2-lamp HP T8 w/ Refl	56	2574	0.19	480	$30.00	$30.00	$120.00
23	Multi-purpose Room	C	30	4-foot 4-lamp 34W T12	150	30	4-foot 2-lamp HP T8 w/ Refl	56	3640	2.80	10,186	$30.00	$30.00	$1,800.00
24	Records Room	C	12	4-foot 4-lamp 34W T12	150	12	4-foot 2-lamp HP T8 w/ Refl	56	3640	1.12	4,074	$30.00	$30.00	$720.00
25	Back Entrance	H	1	4-foot 1-lamp 34W U-bend T12	37	1	2-foot 1-lamp 17W T8	17	4004	0.02	82	$17.00	$30.00	$47.00
26	Records Room	C	1	4-foot 1-lamp 34W U-bend T12	37	1	2-foot 1-lamp 17W T8	17	3640	0.02	74	$17.00	$30.00	$47.00

Direct Savings Summary		
Electricity Savings	22,627	(kWh/yr)
Demand Reduction	6.40	(kW)
Direct Electricity Savings	$1,787.51	($/yr)
Demand Savings	$0.00	($/yr)
Total Direct Savings	$1,787.51	($/yr)

HVAC Interaction Summary		
Cooling Load Reduction	2,412	(kWh/yr)
Heating Load Reduction	-708	(therm/yr)
Electricity Savings	$190.54	($/yr)
Natural Gas Savings	-$623.10	($/yr)
Net HVAC Savings	-$432.56	($/yr)

Economic Analysis		
Total Electricity Savings	25,039	(kWh/yr)
Total Natural Gas Savings	-708	(therm/yr)
Net Savings	$1,354.95	($/yr)
Total Cost	$6,169.00	($)
Simple Payback	4.6	(yrs)

L2: Incandescent Lamp Replacement (Building B&I)

Room	Space Type	Present Lighting			Proposed Lighting			Time On (hrs/yr)	Demand Reduction (kW)	Electricity Savings (kWh/yr)	Capital Cost ($)	Labor Cost ($)	Total Cost ($)
		Qty	Fixture	Watts	Qty	Fixture	Watts						
Janitor's Closet	CF	1	100W Incandescent	100	1	23W PAR CFL	23	1040	0.08	80	$10.00	$5.00	$15.00
Head Banger	O	1	100W Incandescent	100	1	23W PAR CFL	23	2340	0.08	180	$10.00	$5.00	$15.00
Stairwell	H	4	25 W Incandescent	25	4	9W CFL	9	4004	0.06	256	$4.00	$5.00	$36.00

Direct Savings Summary		
Electricity Savings	517	(kWh/yr)
Demand Reduction	0.22	(kW)
Direct Electricity Savings	$40.80	($/yr)
Demand Savings	$0.00	($/yr)
Total Direct Savings	$40.80	($/yr)

HVAC Interaction Summary		
Cooling Load Reduction	55	(kWh/yr)
Heating Load Reduction	-16	(therm/yr)
Electricity Savings	$4.35	($/yr)
Natural Gas Savings	-$14.22	($/yr)
Net HVAC Savings	-$9.87	($/yr)

Economic Analysis		
Total Electricity Savings	572	(kWh/yr)
Total Natural Gas Savings	-16	(therm/yr)
Net Savings	$30.93	($/yr)
Total Cost	$66.00	($)
Simple Payback	2.1	(yrs)

L3: Exit Sign Retrofit/ Replacement (Building B&I)

Area	Number of Fixtures	Present Fixture Type	Present Fixture Wattage	New Fixture Type	New Fixture Wattage (W)	Demand Reduction per unit (kW)	Energy Use Reduction per unit (kWh/yr)	Capital Cost ($)	Installation Cost ($)	Total Cost ($)
Building B&I	6	LED Exit	5	Photoluminescent	0	0.01	44	$120.00	$10.00	$780.00

Option 1: LED Retrofit Kits

Direct Savings	
Total Energy Use Reduction (kWh/yr)	263
Total Demand Reduction (kW)	0.03
Energy Savings ($/yr)	$20.76
Demand Savings ($/yr)	$0.00
Total Direct Savings ($/yr)	$20.76

HVAC Interaction	
Cooling Load Reduction (kWh/yr)	28
Heat Load Reduction (therm/yr)	-8
Cooling Energy Savings ($/yr)	$2.21
Natural Gas Cost Increase ($/yr)	($7.24)
Net HVAC Savings ($/yr)	-$5.02

Economic Analysis	
Total Electricity Use Reduction (kWh/yr)	291
Natural Gas Use Savings (therm/yr)	-8
Net Savings ($/yr)	$15.74
Total Cost ($)	$780.00
Simple Payback (yrs)	49.6

L4: Occupancy Sensors (Building B&I)

Room Type	Number of Sensors	Load (W)	Predicted Savings (%)	Time On (hr/year)	Electricity Savings (kWh/yr)	Sensor Type	Capital Cost per Sensor ($)	Labor Cost Per Sensor ($)	Electricity Savings ($)	Total Cost ($)	Payback (Yrs)
Existing Restrooms	2	619	40%	2574	638	Ceiling IR	$80.00	$150.00	$54.19	$460.00	8.5
Existing Offices	6	2176	25%	2340	1,273	Wall Switch IR	$30.00	$20.00	$108.20	$300.00	2.8
Existing Mechanical Rooms	3	416	35%	3640	530	Combination	$80.00	$150.00	$45.09	$690.00	15.3
Existing Conference Rooms	1	512	35%	1040	186	Wall Switch IR	$30.00	$20.00	$15.84	$50.00	3.2
Existing Break & Misc Common Rooms	4	1920	35%	3640	2,446	Wall Switch IR	$30.00	$20.00	$207.92	$200.00	1.0
Existing Large Common Rooms	10	14581	35%	3640	18,576	Combination	$80.00	$20.00	$1,578.93	$1,000.00	0.6
Proposed Restrooms	2	393	40%	2574	404	Ceiling IR	$80.00	$150.00	$34.36	$460.00	13.4
Proposed Offices	6	1,904	25%	2340	1,114	Wall Switch IR	$30.00	$20.00	$94.68	$300.00	3.2
Proposed Mechanical Rooms	3	281	35%	3640	358	Combination	$80.00	$150.00	$30.39	$690.00	22.7
Proposed Conference Rooms	1	448	35%	1040	163	Wall Switch IR	$30.00	$20.00	$13.86	$50.00	3.6
Proposed Break & Misc Common Rooms	4	1,680	35%	3640	2,140	Wall Switch IR	$30.00	$20.00	$181.93	$200.00	1.1
Proposed Large Common Rooms	10	9,375	35%	3640	11,944	Combination	$80.00	$20.00	$1,015.22	$1,000.00	1.0

Option 1: Sensors on Existing Fixtures

Direct Savings Summary		
Electricity Savings	23,649	(kWh/yr)
Total Direct Savings	$1,868.28	($/yr)

HVAC Interaction Summary		
Cooling Load Reduction	2,521	(kWh/yr)
Heating Load Reduction	-740	(therm/yr)
Electricity Savings	$199.15	($/yr)
Natural Gas Savings	-$651.26	($/yr)
Net HVAC Savings	-$452.10	($/yr)

Economic Analysis		
Total Electricity Savings	26,170	(kWh/yr)
Total Natural Gas Savings	-740	(therm/yr)
Net Savings	$1,416.18	($/yr)
Total Cost	$2,700.00	($)
Combined Simple Payback	1.9	(yrs)

Option 2: Sensors on Proposed Fixtures

Direct Savings Summary		
Electricity Savings	16,123	(kWh/yr)
Total Direct Savings	$1,273.70	($/yr)

HVAC Interaction Summary		
Cooling Load Reduction	1,719	(kWh/yr)
Heating Load Reduction	-505	(therm/yr)
Electricity Savings	$135.77	($/yr)
Natural Gas Savings	-$444.00	($/yr)
Net HVAC Savings	-$308.22	($/yr)

Economic Analysis		
Total Electricity Savings	17,841	(kWh/yr)
Total Natural Gas Savings	-505	(therm/yr)
Net Savings	$965.48	($/yr)
Total Cost	$2,700.00	($)
Combined Simple Payback	2.8	(yrs)

Note: The following are energy savings predictions published by EPRI. The predictions fall in the range published by the U.S. EPA.

Private Offices: 25%
Conference Rooms: 35%
Restrooms: 40%

Line	Room	Space Type	Present Lighting			Total Existing Watts per Area	Proposed Lighting			Total New Watts per Area	Time On (hrs/yr)
			Qty	Fixture	Watts		Qty	Fixture	Watts		
20	Multi-purpose Room	C	30	4-foot 2-lamp 34W T12	75	2244	30	4-foot 2-lamp HP T8	56	1690	3640
23	Multi-purpose Room	C	30	4-foot 4-lamp 34W T12	150	4488	30	4-foot 2-lamp HP T8 w/ Refl	56	1690	3640
26	Records Room	C	1	4-foot 1-lamp 34W U-bend T12	37	37	1	2-foot 1-lamp 17W T8	56	56	3640
8	Records Room	C	12	4-foot 2-lamp Std 32W T8	64	768	12	Relamp w/ high lumen 28W T8	56	672	3640
24	Records Room	C	12	4-foot 4-lamp 34W T12	150	1795	12	4-foot 2-lamp HP T8 w/ Refl	56	676	3640
7	Records Area	C	82	4-foot 2-lamp Std 32W T8	64	5248	82	Relamp w/ high lumen 28W T8	56	4592	3640
10	Break Room	C	9	4-foot 4-lamp Std 32W T8	128	1152	9	Relamp w/ high lumen 28W T8	112	1008	3640
12	Copy Room	C	3	4-foot 4-lamp Std 32W T8	128	384	3	Relamp w/ high lumen 28W T8	112	336	3640
4	Envelope Supply	C	3	4-foot 2-lamp Std 32W T8	64	192	3	Relamp w/ high lumen 28W T8	56	168	3640
6	Printer Room	C	3	4-foot 2-lamp Std 32W T8	64	192	3	Relamp w/ high lumen 28W T8	56	168	3640
11	Conference Room	CF	4	4-foot 4-lamp Std 32W T8	128	512	4	Relamp w/ high lumen 28W T8	112	448	1040
21	Boiler Alcove	M	1	4-foot 4-lamp 34W T12	150	150	1	4-foot 2-lamp HP T8 w/ Refl	56	56	3640
19	Boiler Room	M	1	4-foot 2-lamp 34W T12	75	75	1	4-foot 2-lamp HP T8	56	56	3640
2	Electric Room	M	3	4-foot 2-lamp Std 32W T8	64	192	3	Relamp w/ high lumen 28W T8	56	168	3640
13	Elections Office	O	2	4-foot 4-lamp Std 32W T8	128	256	2	Relamp w/ high lumen 28W T8	112	224	2340
14	Office	O	2	4-foot 4-lamp Std 32W T8	128	256	2	Relamp w/ high lumen 28W T8	112	224	2340
15	Private Office	O	4	4-foot 4-lamp Std 32W T8	128	512	4	Relamp w/ high lumen 28W T8	112	448	2340
16	Private Office	O	4	4-foot 4-lamp Std 32W T8	128	512	4	Relamp w/ high lumen 28W T8	112	448	2340
17	Tax Extension Office	O	2	4-foot 4-lamp Std 32W T8	128	256	2	Relamp w/ high lumen 28W T8	112	224	2340
18	Voting Office	O	3	4-foot 4-lamp Std 32W T8	128	384	3	Relamp w/ high lumen 28W T8	112	336	2340
22	Mens Restroom	RR	2	4-foot 4-lamp 34W T12	150	299	2	4-foot 2-lamp HP T8 w/ Refl	56	113	2574
9	Rest Rooms	RR	5	4-foot 2-lamp Std 32W T8	64	320	5	Relamp w/ high lumen 28W T8	56	280	2574

L5: Exterior Lighting Retrofit (Building B&I)

Option	Location	Present Lighting			Proposed Lighting			Time On (hrs/yr)	Demand Reduction (kW)	Electricity Savings (kWh/yr)	Capital Cost ($)	Labor Cost ($)	Line Cost ($)
		Qty	Fixture	Watts	Qty	Fixture	Watts						
1	Gym Exterior Pole Fixture	3	250W Mercury Vapor	295	3	150W Pulse Start MH Retrofit	190	4745	0.32	1,495	$150.00	$30.00	$540.00
1	Exterior Wall Packs	4	150W MH	190	4	100W Pulse Start MH Retrofit	128	4745	0.25	1,177	$150.00	$30.00	$720.00
2	Gym Exterior Pole Fixture	3	250W Mercury Vapor	295	3	96W LED Shoebox Fixture	96	4745	0.60	2,833	$1,000.00	$150.00	$3,450.00
2	Exterior Wall Packs	4	150W MH	190	4	56W LED Wallpack	56	4745	0.54	2,543	$750.00	$150.00	$3,600.00
3	Gym Exterior Pole Fixture	3	250W Mercury Vapor	295	3	120W Induction Shoebox Fixture	120	4745	0.53	2,491	$550.00	$150.00	$2,100.00
3	Exterior Wall Packs	4	150W MH	190	4	80W Induction Wall Pack	80	4745	0.44	2,088	$350.00	$150.00	$2,000.00

Direct Savings Summary				
	Opt 1	Opt 2	Opt 3	
Electricity Savings	1,177	2,543	2,088	(kWh/yr)
Demand Reduction	0.25	0.54	0.44	(kW)
Direct Electricity Savings	$92.96	$200.92	$164.94	($/yr)
Demand Savings	$0.00	$0.00	$0.00	($/yr)
Total Direct Savings	$92.96	$200.92	$164.94	($/yr)

HVAC Interaction Summary				
	Opt 1	Opt 2	Opt 3	
Cooling Load Reduction	0	0	0	(kWh/yr)
Heating Load Reduction	0	0	0	(therm/yr)
Electricity Savings	$0.00	$0.00	$0.00	($/yr)
Natural Gas Savings	$0.00	$0.00	$0.00	($/yr)
Net HVAC Savings	$0.00	$0.00	$0.00	($/yr)

Economic Analysis				
	Opt 1	Opt 2	Opt 3	
Total Electricity Savings	1,177	2,543	2,088	(kWh/yr)
Total Natural Gas Savings	0	0	0	(therm/yr)
Net Savings	$92.96	$200.92	$164.94	($/yr)
Total Cost	$720.00	$3,600.00	$2,000.00	($)
Simple Payback	7.7	17.9	12.1	(yrs)

Pricing for LED fixtures from LEDtronics
Pricing for Induction lighting from FSG

L6: Photocells on Exterior Fixtures (Building B&I)

Option	Location	Nominal Fixture Wattage	Load (W)	Current Annual Hours	Annual Hours on Sensors	Electricity Savings (kWh/yr)	Number of Sensors	Capital Cost per Sensor ($)	Labor Cost Per Fixture ($)	Total Cost ($)
1	Existing Exterior Wall Packs	150	760	4745	4380	277	1	$100.00	$240.00	$340.00
2	Pulse Start MH Exterior Wall Packs	100	512	4745	4380	187	1	$100.00	$240.00	$340.00
3	LED Exterior Wall Packs	56	224	4745	4380	82	1	$100.00	$240.00	$340.00
4	Induction Exterior Wall Packs	80	320	4745	4380	117	1	$100.00	$240.00	$340.00

Direct Savings Summary					
	Opt 1	Opt 2	Opt 3	Opt 4	
Electricity Savings	277	187	82	117	(kWh/yr)
Total Direct Savings	$21.91	$14.76	$6.46	$9.23	($/yr)

HVAC Interaction Summary					
	Opt 1	Opt 2	Opt 3	Opt 4	
Cooling Load Reduction	0	0	0	0	(kWh/yr)
Heating Load Reduction	0	0	0	0	(therm/yr)
Electricity Savings	$0.00	$0.00	$0.00	$0.00	($/yr)
Natural Gas Savings	$0.00	$0.00	$0.00	$0.00	($/yr)
Net HVAC Savings	$0.00	$0.00	$0.00	$0.00	($/yr)

Economic Analysis					
	Opt 1	Opt 2	Opt 3	Opt 4	
Total Electricity Savings	277	187	82	117	(kWh/yr)
Total Natural Gas Savings	0	0	0	0	(therm/yr)
Net Savings	$21.91	$14.76	$6.46	$9.23	($/yr)
Total Cost	$340.00	$340.00	$340.00	$340.00	($)
Combined Simple Payback	15.5	23.0	52.6	36.8	(yrs)

Pricing for sensor from Grainger

Period of Record = 1967 to 1996

Breakpoint from graph 64 °F
Fan on from 00 to 24

COST
Chiller 1.2 kW/ton 0.079 $/kWh
Heat 0.75 % 0.88 $/therm

BTU/1000 cfm
Assumes 55°F SAT

Temperature Range (oF)	01 to "08	Annual Totals Hour Group LST 09 to 16	17 to 00	Total Obs	MCWB (oF)	HOURS ON 01 to 08	09 to 16	17 to 00	SUM	Tons	Heat Required	Cooling kWh required	Therms Required	
100/104	0	1	0	1	78.9	102	0	0.714286	0	0.714286	36257.14	3.021429	3.625714		
95/99	0	10	1	11	76.8	97	0	7.142857	0.178571	7.321429	332100	27.675	33.21		
90/94	0	50	11	62	74.8	92	0	35.71429	1.964286	37.67857	1505636	125.4696	150.5636		
85/89	2	121	40	163	72.3	87	0.357143	86.42857	7.142857	93.92857	3246171	270.5143	324.6171		
80/84	22	219	99	340	69.6	82	3.928571	156.4286	17.67857	178.0357	5191521	432.6268	519.1521		
75/79	90	269	181	540	67	77	16.07143	192.1429	32.32143	240.5357	5715129	476.2607	571.5129		
70/74	201	244	244	689	64.4	72	35.89286	174.2857	43.57143	253.75	4658850	388.2375	465.885		
65/69	254	199	244	696	60.5	67	45.35714	142.1429	43.57143	231.0714	2994686	249.5571	299.4686		
60/64	259	203	237	699	56.3	62	46.25	145	42.32143	233.5714	1765800			0	
55/59	234	181	210	626	51.7	57	41.78571	129.2857	37.5	208.5714	450514.3		600685.7	6.006857	
50/54	222	181	203	605	47.1	52	39.64286	129.2857	36.25	205.1786	664778.6		886371.4	8.863714	
45/49	215	172	202	589	42.7	47	38.39286	122.8571	36.07143	197.3214	1704857		2273143	22.73143	
40/44	216	195	216	627	38.4	42	38.57143	139.2857	38.57143	216.4286	3038657		4051543	40.51543	
35/39	275	239	266	780	34.1	37	49.10714	170.7143	47.5	267.3214	5196729		6928971	69.28971	
30/34	295	216	267	778	29.8	32	52.67857	154.2857	47.67857	254.6429	6325329		8433771	84.33771	
25/29	201	146	172	519	24.9	27	35.89286	104.2857	30.71429	170.8929	5167800		6890400	68.904	
20/24	139	96	116	351	20.2	22	24.82143	68.57143	20.71429	114.1071	4066779		5422371	54.22371	
15/19	99	64	73	236	15.5	17	17.67857	45.71429	13.03571	76.42857	3136629		4182171	41.82171	
10/14	62	43	57	162	10.6	12	11.07143	30.71429	10.17857	51.96429	2413221		3217629	32.17629	
05/09	52	30	40	123	5.8	7	9.285714	21.42857	7.142857	37.85714	1962514		2616686	26.16686	
00/04	42	18	25	85	1.2	2	7.5	12.85714	4.464286	24.82143	1420779		1894371	18.94371	
-5/-1	18	6	11	35	-3.2	-3	3.214286	4.285714	1.964286	9.464286	592842.9		790457.1	7.904571	
-10/-6	13	5	6	24	-7.5	-8	2.321429	3.571429	1.071429	6.964286	473850		631800	6.318	
-15/-11	6	2	4	12	-12.1	-13	1.071429	1.428571	0.714286	3.214286	236057.1		314742.9	3.147429	
-20/-16	2	1	1	4	-17	-18	0.357143	0.714286	0.178571	1.25	98550		131400	1.314	
-25/-21	1	0	0	2	-22.1	-23	0.178571	0	0	0.178571	15042.86		20057.14	0.200571	
-30/-26	0	0	0	0	-25.4	-28	0	0	0	0	0		0	0	
	2920	2911	2926	8759					3123.214				2368.035	492.8657	TOTAL
			8757									$$	187.0748	433.7218	$620.80

Cost for 1,000 cfm of outside air in the Building B & I is $620.80

Period of Record = 1967 to 1996

Breakpoint from graph 64 °F
Fan on from 00 to 24

COST
Chiller 1.2 kW/ton 0.079 $/kWh
Heat 0.75 % 0.88 $/therm

BTU/1000 cfm
Assumes 55°F SAT

01 to "08	Annual Totals Hour Group LST 09 to 16	17 to 00	Total Obs	MCWB (oF)	HOURS ON 01 to 08	09 to 16	17 to 00	SUM	Tons	Heat Required	Cooling kWh required	Therms Required	
0	1	0	1	78.9	102	0	0.669643	0	0.669643	33991.07	2.832589	3.399107		
0	10	1	11	76.8	97	0	7.142857	0.178571	7.321429	332100	27.675	33.21		
0	50	11	62	74.8	92	0	35.71429	1.964286	37.67857	1505636	125.4696	150.5636		
2	121	40	163	72.3	87	0.178571	86.42857	7.142857	93.75	3240000	270	324		
22	219	99	340	69.6	82	1.964286	156.4286	17.67857	176.0714	5134243	427.8536	513.4243		
90	269	181	540	67	77	8.035714	192.1429	32.32143	232.5	5524200	460.35	552.42		
201	244	244	689	64.4	72	17.94643	174.2857	43.57143	235.8036	4329354	360.7795	432.9354		
254	199	244	696	60.5	67	22.67857	142.1429	43.57143	208.3929	2700771	225.0643	270.0771		
259	203	237	699	56.3	62	23.125	145	42.32143	210.4464	1590975			0	
234	181	210	626	51.7	57	20.89286	129.2857	37.5	187.6786	405385.7		540514.3	5.405143	
222	181	203	605	47.1	52	19.82143	129.2857	36.25	185.3571	600557.1		800742.9	8.007429	
215	172	202	589	42.7	47	19.19643	122.8571	36.07143	178.125	1539000		2052000	20.52	
216	195	216	627	38.4	42	19.28571	139.2857	38.57143	197.1429	2767886		3690514	36.90514	
275	239	266	780	34.1	37	24.55357	170.7143	47.5	242.7679	4719407		6292543	62.92543	
295	216	267	778	29.8	32	26.33929	154.2857	47.67857	228.3036	5671061		7561414	75.61414	
201	146	172	519	24.9	27	17.94643	104.2857	30.71429	152.9464	4625100		6166800	61.668	
139	96	116	351	20.2	22	12.41071	68.57143	20.71429	101.6964	3624461		4832614	48.32614	
99	64	73	236	15.5	17	8.839286	45.71429	13.03571	67.58929	2773864		3698486	36.98486	
62	43	57	162	10.6	12	5.535714	30.71429	10.17857	46.42857	2156143		2874857	28.74857	
52	30	40	123	5.8	7	4.642857	21.42857	7.142857	33.21429	1721829		2295771	22.95771	
42	18	25	85	1.2	2	3.75	12.85714	4.464286	21.07143	1206129		1608171	16.08171	
18	6	11	35	-3.2	-3	1.607143	4.285714	1.964286	7.857143	492171.4		656228.6	6.562286	
13	5	6	24	-7.5	-8	1.160714	3.571429	1.071429	5.803571	394875		526500	5.265	
6	2	4	12	-12.1	-13	0.535714	1.428571	0.714286	2.678571	196714.3		262285.7	2.622857	
2	1	1	4	-17	-18	0.178571	0.714286	0.178571	1.071429	84471.43		112628.6	1.126286	
1	0	0	2	-22.1	-23	0.089286	0	0	0.089286	7521.429		10028.57	0.100286	
0	0	0	0	-25.4	-28	0	0	0	0	0		0	0	
2920	2911	2926	8759					2862.455				2280.029	439.821	TOTAL
		8757									$$	180.1223	387.0425	$567.16
												88.00554	53.04471	
												6.952437	46.67935	$53.63
												739.2465	445.5756	
												58.40047	392.1065	$450.51

Cost for 1,000 cfm of outside air in the Building B & I is $567.16

3 Rooftop Units	30 ton	cfm	OA cfm			
		10500	estimated	8400		$0.00
	ton	0				
	90 ton	31500		4200		
	TOTAL	42000				
				4200	9576.124	1847.248
					10315.37	2292.824
					814.9142	2017.685 $2,832.60
heating 13,273 therms						
cooling 57,053 kWh				kWh	16020.67 therms	3620.124
					1265.633	3185.709 $4,451.34

3rd Street Courthouse

ECM	Description	Natural Gas Savings (therm/yr)	Electrical Savings (kWh/yr)	Monetary Savings ($/yr)	Project Cost ($)	Simple Payback (yrs)
L1	Linear Fluorescent Lighting Retrofit	(1,721)	61,872	$4,183	$26,309	6.3
L2	Incandescent Lamp Replacement	(373)	13,410	$907	$355	0.4
L3	Retrofit LED Exit signs to Photoluminescent	(9)	332	$22	$910	40.6
L4	Occupancy Sensors	(381)	13,683	$925	$4,940	5.3
L5	Exterior Lighting Retrofit	0	14,207	$1,350	$7,050	5.2
L6	Install Photocell on Exterior Lighting	0	1,774	$151	$1,020	6.8

3rd St. Courthouse - Input

Local Seasonal Weather Information		
Average Winter Temp.	39.1	(°F)
Average Summer Temp.	71.5	(°F)
Heating Season Length	251	(days/yr)
Cooling Season Length	114	(days/yr)
Heating Season Length	35.9	(wks/yr)
Cooling Season Length	16.3	(wks/yr)
Annual Daylight Hours (Chicago)	4380	(days/yr)

HVAC System Information		
Heating System Eff.	78%	(%)
Cooling System Eff.	0.92	(kW/ton)
Winter Temp. Setpoint	74	(°F)
Summer Temp. Setpoint	68	(°F)

Utility Cost Information		
Natural Gas Rate	$0.985	($/therm)
Electricity Usage Rate	$0.095	($/kWh)
Electricity Demand Rate	$0.00	($/kW-mo)

3rd Street Courthouse - Lighting Input

Wattages				
Fixture Type	**# of Lamps**	**Lamp Wattage**	**Ballast Factor**	**Fixture Wattage**
4-foot 1-lamp 32W Std T8	1	32	1.00	32
4-foot 2-lamp 32W Std T8	2	32	1.00	64
4-foot 3-lamp 32W Std T8	3	32	1.00	96
4-foot 4-lamp 32W Std T8	4	32	1.00	128
4-foot 1-lamp 32W HP T8	1	32	0.88	28
4-foot 2-lamp 32W HP T8	2	32	0.88	56
4-foot 3-lamp 32W HP T8	3	32	0.88	84
4-foot 4-lamp 32W HP T8	4	32	0.88	113
4-foot 1-lamp 28W HL T8	1	28	1.00	28
4-foot 2-lamp 28W HL T8	2	28	1.00	56
4-foot 3-lamp 28W HL T8	3	28	1.00	84
4-foot 4-lamp 28W HL T8	4	28	1.00	112
4-foot 2-lamp 32W T8-M	2	32	1.10	70
4-foot 4-lamp 32W T8-M	4	32	1.10	141
4-foot 1-lamp 34W Std T12	1	34	1.10	37
4-foot 2-lamp 34W Std T12	2	34	1.10	75
4-foot 3-lamp 34W Std T12	3	34	1.10	112
4-foot 4-lamp 34W Std T12	4	34	1.10	150
8-foot 2-lamp 60W T12	2	60	1.10	132
4-foot 2-lamp 32W U-bend T8	2	32	1.00	64
4-foot 3-lamp 31W U-bend T8	3	31	1.00	93
4-foot 1-lamp 34W U-bend T12	1	34	1.10	37
2-foot 2-lamp 17W T8	2	17	1.00	34

Pricing	
Price	**Replacement Fixture**
$2.00	32W Standard T8 Lamp
$2.50	28W High Lumen T8 Lamp
$2.50	32W High Lumen T8 Lamp
$2.00	17W High Lumen T8 Lamp
$10.00	23W PAR CFL
$15.00	1-Lamp NBF T8 Ballast
$15.00	2-Lamp NBF T8 Ballast
$15.00	3-Lamp NBF T8 Ballast
$15.00	4-Lamp NBF T8 Ballast
$15.00	2-Lamp LBF T8 Ballast
$10.00	2-foot Retrofit kit (U-tube to F17)
$30.00	Wall Switch IR Sensor
$80.00	Ceiling IR Sensor
$80.00	Ceiling IR/ Ultrasonic Sensor

Hours of Operation				
Room Type	**Hrs/ Day**	**Days/Wk**	**Wks/ Yr**	**Annual Hours**
CR = Courtrooms	8.0	5.5	52	2288
O = Offices	9.0	5.0	52	2340
CF = Conference Rooms, Storage	4.0	5.0	52	1040
C = Common Areas (break, copy, etc.)	14.0	5.0	52	3640
H = Halls & Lobbys	14.0	5.5	52	4004
RR = Restrooms	9.0	5.5	52	2574
M = Mechanical/ Electrical Rooms	14.0	5.0	52	3640

L1: Linear Fluorescent Lighting Retrofit (3rd Street Courthouse)

Line	Room	Space Type	Present Lighting			Proposed Lighting			Time On	Demand Reduction	Electricity Savings	Capital	Labor	Total Cost
			Qty	Fixture	Watts	Qty	Fixture	Watts	(hrs/yr)	(kW)	(kWh/yr)	Cost ($)	Cost ($)	($)
1	060	O	6	4-foot 2-lamp Std 32W T8	64	6	Relamp w/ high lumen 28W T8	56	2340	0.05	112	$5.00	$5.00	$60.00
2	461	O	4	4-foot 2-lamp Std 32W T8	64	4	Relamp w/ high lumen 28W T8	56	2340	0.03	75	$5.00	$5.00	$40.00
3	464	O	6	4-foot 2-lamp Std 32W T8	64	6	Relamp w/ high lumen 28W T8	56	2340	0.05	112	$5.00	$5.00	$60.00
4	Boiler House	M	13	4-foot 2-lamp Std 32W T8	64	13	Relamp w/ high lumen 28W T8	56	3640	0.10	379	$5.00	$5.00	$130.00
5	Break Room	C	3	4-foot 2-lamp Std 32W T8	64	3	Relamp w/ high lumen 28W T8	56	3640	0.02	87	$5.00	$5.00	$30.00
6	Hallway	H	14	4-foot 2-lamp Std 32W T8	64	14	Relamp w/ high lumen 28W T8	56	4004	0.11	448	$5.00	$5.00	$140.00
7	315	O	2	4-foot 2-lamp 32W T8-M	70	2	4-foot 2-lamp HP T8	56	2340	0.03	66	$20.00	$30.00	$100.00
8	330	CR	10	4-foot 2-lamp 32W T8-M	70	10	4-foot 2-lamp HP T8	56	2288	0.14	322	$20.00	$30.00	$500.00
9	330 A	O	2	4-foot 2-lamp 32W T8-M	70	2	4-foot 2-lamp HP T8	56	2340	0.03	66	$20.00	$30.00	$100.00
10	330 B	O	2	4-foot 2-lamp 32W T8-M	70	2	4-foot 2-lamp HP T8	56	2340	0.03	66	$20.00	$30.00	$100.00
11	351	O	4	4-foot 2-lamp 32W T8-M	70	4	4-foot 2-lamp HP T8	56	2340	0.06	132	$20.00	$30.00	$200.00
12	Restroom 3rd	RR	1	4-foot 2-lamp 32W T8-M	70	1	4-foot 2-lamp HP T8	56	2574	0.01	36	$20.00	$30.00	$50.00
13	Restroom 4th	RR	2	4-foot 2-lamp 32W T8-M	70	2	4-foot 2-lamp HP T8	56	2574	0.03	72	$20.00	$30.00	$100.00
14	111	O	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ high lumen 28W T8	84	2340	0.05	112	$7.50	$5.00	$50.00
15	121	O	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ high lumen 28W T8	84	2340	0.05	112	$7.50	$5.00	$50.00
16	154	O	6	4-foot 3-lamp Std 32W T8	96	6	Relamp w/ high lumen 28W T8	84	2340	0.07	168	$7.50	$5.00	$75.00
17	311	O	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ high lumen 28W T8	84	2340	0.05	112	$7.50	$5.00	$50.00
18	320	CR	15	4-foot 3-lamp Std 32W T8	96	15	Relamp w/ high lumen 28W T8	84	2288	0.18	412	$7.50	$5.00	$187.50
19	321	O	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ high lumen 28W T8	84	2340	0.05	112	$7.50	$5.00	$50.00
20	410	CR	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ high lumen 28W T8	84	2288	0.02	55	$7.50	$5.00	$25.00
21	432	O	4	4-foot 3-lamp Std 32W T8	96	4	Relamp w/ high lumen 28W T8	84	2340	0.05	112	$7.50	$5.00	$50.00
22	461	O	10	4-foot 3-lamp Std 32W T8	96	10	Relamp w/ high lumen 28W T8	84	2340	0.12	281	$7.50	$5.00	$125.00
23	462	O	2	4-foot 3-lamp Std 32W T8	96	2	Relamp w/ high lumen 28W T8	84	2340	0.02	56	$7.50	$5.00	$25.00
24	Circuit Court	CR	17	4-foot 3-lamp Std 32W T8	96	17	Relamp w/ high lumen 28W T8	84	2288	0.20	467	$7.50	$5.00	$212.50
25	tes Attornet(420-423?)	O	13	4-foot 3-lamp Std 32W T8	96	13	Relamp w/ high lumen 28W T8	84	2340	0.16	365	$7.50	$5.00	$162.50
26	312	O	3	4-foot 4-lamp 32W T8-M	141	3	4-foot 2-lamp HP T8 w/ Refl	56	2340	0.25	593	$30.00	$30.00	$180.00
27	325	O	5	4-foot 4-lamp 32W T8-M	141	5	4-foot 2-lamp HP T8 w/ Refl	56	2340	0.42	988	$30.00	$30.00	$300.00
28	361	O	4	4-foot 4-lamp 32W T8-M	141	4	4-foot 2-lamp HP T8 w/ Refl	56	2340	0.34	791	$30.00	$30.00	$240.00
29	Maint. Shop	C	1	4-foot 1-lamp Std 34W T12	37	1	4-foot 1-lamp HP T8	28	3640	0.01	34	$17.50	$30.00	$47.50
30	Old Chiller Room	M	1	4-foot 1-lamp Std 34W T12	37	1	4-foot 1-lamp HP T8	28	3640	0.01	34	$17.50	$30.00	$47.50
31	112	O	6	4-foot 2-lamp 34W T12	75	6	4-foot 2-lamp HP T8	56	2340	0.11	259	$20.00	$30.00	$300.00
32	160	CR	10	4-foot 2-lamp 34W T12	75	10	4-foot 2-lamp HP T8	56	2288	0.18	423	$20.00	$30.00	$500.00
33	211	O	8	4-foot 2-lamp 34W T12	75	8	4-foot 2-lamp HP T8	56	2340	0.15	346	$20.00	$30.00	$400.00
34	212	O	5	4-foot 2-lamp 34W T12	75	5	4-foot 2-lamp HP T8	56	2340	0.09	216	$20.00	$30.00	$250.00
35	213	O	8	4-foot 2-lamp 34W T12	75	8	4-foot 2-lamp HP T8	56	2340	0.15	346	$20.00	$30.00	$400.00
36	230	CR	15	4-foot 2-lamp 34W T12	75	15	4-foot 2-lamp HP T8	56	2288	0.28	634	$20.00	$30.00	$750.00
37	260	CR	1	4-foot 2-lamp 34W T12	75	1	4-foot 2-lamp HP T8	56	2288	0.02	42	$20.00	$30.00	$50.00
38	263	O	1	4-foot 2-lamp 34W T12	75	1	4-foot 2-lamp HP T8	56	2340	0.02	43	$20.00	$30.00	$50.00
39	353	O	2	4-foot 2-lamp 34W T12	75	2	4-foot 2-lamp HP T8	56	2340	0.04	86	$20.00	$30.00	$100.00
40	354	O	2	4-foot 2-lamp 34W T12	75	2	4-foot 2-lamp HP T8	56	2340	0.04	86	$20.00	$30.00	$100.00
41	363	O	1	4-foot 2-lamp 34W T12	75	1	4-foot 2-lamp HP T8	56	2340	0.02	43	$20.00	$30.00	$50.00
42	440	CR	6	4-foot 2-lamp 34W T12	75	6	4-foot 2-lamp HP T8	56	2288	0.11	254	$20.00	$30.00	$300.00
43	448	O	6	4-foot 2-lamp 34W T12	75	6	4-foot 2-lamp HP T8	56	2340	0.11	259	$20.00	$30.00	$300.00
44	453	O	14	4-foot 2-lamp 34W T12	75	14	4-foot 2-lamp HP T8	56	2340	0.26	605	$20.00	$30.00	$700.00
45	Cave	O	1	4-foot 2-lamp 34W T12	75	1	4-foot 2-lamp HP T8	56	2340	0.02	43	$20.00	$30.00	$50.00
46	Chem Store	CF	2	4-foot 2-lamp 34W T12	75	2	4-foot 2-lamp HP T8	56	1040	0.04	38	$20.00	$30.00	$100.00
47	Hall	H	3	4-foot 2-lamp 34W T12	75	3	4-foot 2-lamp HP T8	56	4004	0.06	222	$20.00	$30.00	$150.00
48	Hallway (454?)	H	8	4-foot 2-lamp 34W T12	75	8	4-foot 2-lamp HP T8	56	4004	0.15	592	$20.00	$30.00	$400.00
49	Ladies Restroom	RR	2	4-foot 2-lamp 34W T12	75	2	4-foot 2-lamp HP T8	56	2574	0.04	95	$20.00	$30.00	$100.00

50	Lock-up	C	7	4-foot 2-lamp 34W T12	75	7	4-foot 2-lamp HP T8	56	3640	0.13	471	$20.00	$30.00	$350.00
51	Maint. Shop	C	4	4-foot 2-lamp 34W T12	75	4	4-foot 2-lamp HP T8	56	3640	0.07	269	$20.00	$30.00	$200.00
52	Restrooms 4th	RR	2	4-foot 2-lamp 34W T12	75	2	4-foot 2-lamp HP T8	56	2574	0.04	95	$20.00	$30.00	$100.00
53	Storage	CF	1	4-foot 2-lamp 34W T12	75	1	4-foot 2-lamp HP T8	56	1040	0.02	19	$20.00	$30.00	$50.00
54	122	O	6	4-foot 4-lamp 34W T12	150	6	4-foot 2-lamp HP T8 w/ Refl	56	2340	0.56	1,310	$30.00	$30.00	$360.00
55	141	O	8	4-foot 4-lamp 34W T12	150	8	4-foot 2-lamp HP T8 w/ Refl	56	2340	0.75	1,746	$30.00	$30.00	$480.00
56	142	O	4	4-foot 4-lamp 34W T12	150	4	4-foot 2-lamp HP T8 w/ Refl	56	2340	0.37	873	$30.00	$30.00	$240.00
57	153	O	6	4-foot 4-lamp 34W T12	150	6	4-foot 2-lamp HP T8 w/ Refl	56	2340	0.56	1,310	$30.00	$30.00	$360.00
58	160	CR	5	4-foot 4-lamp 34W T12	150	5	4-foot 2-lamp HP T8 w/ Refl	56	2288	0.47	1,067	$30.00	$30.00	$300.00
59	221	O	4	4-foot 4-lamp 34W T12	150	4	4-foot 2-lamp HP T8 w/ Refl	56	2340	0.37	873	$30.00	$30.00	$240.00
60	241	C	18	4-foot 4-lamp 34W T12	150	18	4-foot 2-lamp HP T8 w/ Refl	56	3640	1.68	6,112	$30.00	$30.00	$1,080.00
61	242	O	4	4-foot 4-lamp 34W T12	150	4	4-foot 2-lamp HP T8 w/ Refl	56	2340	0.37	873	$30.00	$30.00	$240.00
62	254	O	8	4-foot 4-lamp 34W T12	150	8	4-foot 2-lamp HP T8 w/ Refl	56	2340	0.75	1,746	$30.00	$30.00	$480.00
63	260	CR	3	4-foot 4-lamp 34W T12	150	3	4-foot 2-lamp HP T8 w/ Refl	56	2288	0.28	640	$30.00	$30.00	$180.00
64	261	O	2	4-foot 4-lamp 34W T12	150	2	4-foot 2-lamp HP T8 w/ Refl	56	2340	0.19	437	$30.00	$30.00	$120.00
65	262	O	1	4-foot 4-lamp 34W T12	150	1	4-foot 2-lamp HP T8 w/ Refl	56	2340	0.09	218	$30.00	$30.00	$60.00
66	430	CR	12	4-foot 4-lamp 34W T12	150	12	4-foot 2-lamp HP T8 w/ Refl	56	2288	1.12	2,561	$30.00	$30.00	$720.00
67	431	O	5	4-foot 4-lamp 34W T12	150	5	4-foot 2-lamp HP T8 w/ Refl	56	2340	0.47	1,091	$30.00	$30.00	$300.00
68	440	CR	21	4-foot 4-lamp 34W T12	150	21	4-foot 2-lamp HP T8 w/ Refl	56	2288	1.96	4,482	$30.00	$30.00	$1,260.00
69	453	O	5	4-foot 4-lamp 34W T12	150	5	4-foot 2-lamp HP T8 w/ Refl	56	2340	0.47	1,091	$30.00	$30.00	$300.00
70	462	O	2	4-foot 4-lamp 34W T12	150	2	4-foot 2-lamp HP T8 w/ Refl	56	2340	0.19	437	$30.00	$30.00	$120.00
71	Old Chiller Room	M	1	4-foot 4-lamp 34W T12	150	1	4-foot 2-lamp HP T8 w/ Refl	56	3640	0.09	340	$30.00	$30.00	$60.00
72	Storage	CF	4	4-foot 4-lamp 34W T12	150	4	4-foot 2-lamp HP T8 w/ Refl	56	1040	0.37	388	$30.00	$30.00	$240.00
73	253	O	2	4-foot 4-lamp 40W T12	192	2	4-foot 2-lamp HP T8 w/ Refl	56	2340	0.27	635	$30.00	$30.00	$120.00
74	Record Storage	C	18	4-foot 1-lamp 40W T12	48	18	4-foot 1-lamp HP T8	28	3640	0.36	1,300	$17.50	$30.00	$855.00
75	Tunnel	H	3	8-foot 2-lamp 60W T12	132	3	4-foot 2-lamp HP T8 w/ Refl	56	4004	0.23	909	$30.00	$30.00	$180.00
76	Storage	CF	4	8-foot 2-lamp 60W T12	132	4	4-foot 2-lamp HP T8 w/ Refl	56	1040	0.30	315	$30.00	$30.00	$240.00
77	111	O	1	4-foot 2-lamp 32W U-bend T8	64	1	2-foot 2-lamp 17W T8	34	2340	0.03	70	$14.00	$30.00	$44.00
78	110	CR	12	4-foot 2-lamp 32W U-bend T8	64	12	2-foot 2-lamp 17W T8	34	2288	0.36	824	$14.00	$30.00	$528.00
79	120	CR	15	4-foot 2-lamp 32W U-bend T8	64	15	2-foot 2-lamp 17W T8	34	2288	0.45	1,030	$14.00	$30.00	$660.00
80	121	O	1	4-foot 2-lamp 32W U-bend T8	64	1	2-foot 2-lamp 17W T8	34	2340	0.03	70	$14.00	$30.00	$44.00
81	140	CR	18	4-foot 2-lamp 32W U-bend T8	64	18	2-foot 2-lamp 17W T8	34	2288	0.54	1,236	$14.00	$30.00	$792.00
82	142	O	2	4-foot 2-lamp 32W U-bend T8	64	2	2-foot 2-lamp 17W T8	34	2340	0.06	140	$14.00	$30.00	$88.00
83	153	O	2	4-foot 2-lamp 32W U-bend T8	64	2	2-foot 2-lamp 17W T8	34	2340	0.06	140	$14.00	$30.00	$88.00
84	210	CR	16	4-foot 2-lamp 32W U-bend T8	64	16	2-foot 2-lamp 17W T8	34	2288	0.48	1,098	$14.00	$30.00	$704.00
85	220	CR	16	4-foot 2-lamp 32W U-bend T8	64	16	2-foot 2-lamp 17W T8	34	2288	0.48	1,098	$14.00	$30.00	$704.00
86	240	CR	18	4-foot 2-lamp 32W U-bend T8	64	18	2-foot 2-lamp 17W T8	34	2288	0.54	1,236	$14.00	$30.00	$792.00
87	242	O	2	4-foot 2-lamp 32W U-bend T8	64	2	2-foot 2-lamp 17W T8	34	2340	0.06	140	$14.00	$30.00	$88.00
88	250	CR	17	4-foot 2-lamp 32W U-bend T8	64	17	2-foot 2-lamp 17W T8	34	2288	0.51	1,167	$14.00	$30.00	$748.00
89	251	O	6	4-foot 2-lamp 32W U-bend T8	64	6	2-foot 2-lamp 17W T8	34	2340	0.18	421	$14.00	$30.00	$264.00
90	360	CR	4	4-foot 2-lamp 32W U-bend T8	64	4	2-foot 2-lamp 17W T8	34	2288	0.12	275	$14.00	$30.00	$176.00
91	360 A	O	4	4-foot 2-lamp 32W U-bend T8	64	4	2-foot 2-lamp 17W T8	34	2340	0.12	281	$14.00	$30.00	$176.00
92	360 Copy	C	4	4-foot 2-lamp 32W U-bend T8	64	4	2-foot 2-lamp 17W T8	34	3640	0.12	437	$14.00	$30.00	$176.00
93	341	O	4	4-foot 2-lamp 32W U-bend T8	64	4	2-foot 2-lamp 17W T8	34	2340	0.12	281	$14.00	$30.00	$176.00
94	340	CR	30	4-foot 2-lamp 32W U-bend T8	64	30	2-foot 2-lamp 17W T8	34	2288	0.90	2,059	$14.00	$30.00	$1,320.00
95	342	O	4	4-foot 2-lamp 32W U-bend T8	64	4	2-foot 2-lamp 17W T8	34	2340	0.12	281	$14.00	$30.00	$176.00
96	410	CR	2	4-foot 2-lamp 32W U-bend T8	64	2	2-foot 2-lamp 17W T8	34	2288	0.06	137	$14.00	$30.00	$88.00
97	Jury Lounge	C	8	4-foot 2-lamp 32W U-bend T8	64	8	2-foot 2-lamp 17W T8	34	3640	0.24	874	$14.00	$30.00	$352.00
98	Lock-up	C	5	4-foot 2-lamp 32W U-bend T8	64	5	2-foot 2-lamp 17W T8	34	3640	0.15	546	$14.00	$30.00	$220.00
99	212	O	1	4-foot 2-lamp 34W U-bend T12	82	1	2-foot 2-lamp 17W T8	34	2340	0.05	111	$14.00	$30.00	$44.00
100	221	O	2	4-foot 2-lamp 34W U-bend T12	82	2	2-foot 2-lamp 17W T8	34	2340	0.10	223	$14.00	$30.00	$88.00
101	Restrooms	RR	2	2-foot 2-lamp T8		2	No change							

Direct Savings Summary		
Electricity Savings	57,197	(kWh/yr)
Demand Reduction	23.00	(kW)
Direct Electricity Savings	$5,433.75	($/yr)
Demand Savings	$0.00	($/yr)
Total Direct Savings	$5,433.75	($/yr)

HVAC Interaction Summary		
Cooling Load Reduction	4,674	(kWh/yr)
Heating Load Reduction	-1,721	(therm/yr)
Electricity Savings	$444.07	($/yr)
Natural Gas Savings	-$1,695.25	($/yr)
Net HVAC Savings	-$1,251.18	($/yr)

Economic Analysis		
Total Electricity Savings	61,872	(kWh/yr)
Total Natural Gas Savings	-1,721	(therm/yr)
Net Savings	$4,182.57	($/yr)
Total Cost	$26,308.50	($)
Simple Payback	6.3	(yrs)

L2: Incandescent Lamp Replacement (3rd Street Courthouse)

Room	Space Type	Present Lighting			Proposed Lighting			Time On (hrs/yr)	Demand Reduction (kW)	Electricity Savings (kWh/yr)	Capital Cost ($)	Labor Cost ($)	Total Cost ($)
		Qty	Fixture	Watts	Qty	Fixture	Watts						
321	O	1	35 W Incandescent	35	1	9W	9	2288	0.03	59		$5.00	$5.00
Hallway	H	6	60 W Incandescent	60	6	13W	13	4004	0.28	1,129		$5.00	$30.00
Restroom 1st	RR	1	67 W Incandescent	67	1	13W	13	2574	0.05	139		$5.00	$5.00
263	O	1	67 W Incandescent	67	1	13W	13	2340	0.05	126		$5.00	$5.00
440	O	4	R75 W Incandescent	75	4	23W	23	2288	0.21	476		$5.00	$20.00
Restroom 3rd	RR	2	100 W Incandescent	100	2	23W PAR CFL	23	2288	0.15	352	$10.00	$5.00	$30.00
Restroom 3rd	RR	2	100 W Incandescent	100	2	23W PAR CFL	23	2288	0.15	352	$10.00	$5.00	$30.00
Restroom 3rd	RR	1	100 W Incandescent	100	1	23W PAR CFL	23	2288	0.08	176	$10.00	$5.00	$15.00
Restroom 3rd	RR	2	100 W Incandescent	100	2	23W PAR CFL	23	2288	0.15	352	$10.00	$5.00	$30.00
Restroom 3rd	RR	2	100 W Incandescent	100	2	23W PAR CFL	23	2288	0.15	352	$10.00	$5.00	$30.00
Storage (030?)	CF	11	200 W Incandescent	200	11	52W	52	1040	1.63	1,693		$5.00	$55.00
Phone Room	C	3	200 W Incandescent	200	3	52W	52	3640	0.44	1,616		$5.00	$15.00
Storage (030?)	CF	1	200 W Incandescent	200	1	52W	52	1040	0.15	154		$5.00	$5.00
350	O	16	200 W Incandescent	200	16	52W	52	2288	2.37	5,418		$5.00	$80.00

Direct Savings Summary		
Electricity Savings	12,397	(kWh/yr)
Demand Reduction	5.91	(kW)
Direct Electricity Savings	$1,177.68	($/yr)
Demand Savings	$0.00	($/yr)
Total Direct Savings	$1,177.68	($/yr)

Economic Analysis		
Total Electricity Savings	13,410	(kWh/yr)
Total Natural Gas Savings	-373	(therm/yr)
Net Savings	$906.51	($/yr)
Total Cost	$355.00	($)
Simple Payback	0.4	(yrs)

HVAC Interaction Summary		
Cooling Load Reduction	1,013	(kWh/yr)
Heating Load Reduction	-373	(therm/yr)
Electricity Savings	$96.25	($/yr)
Natural Gas Savings	-$367.42	($/yr)
Net HVAC Savings	-$271.17	($/yr)

L3: Exit Sign Retrofit/ Replacement (3rd St Courthouse)

Area	Number of Fixtures	Present Fixture Type	Present Fixture Wattage	New Fixture Type	New Fixture Wattage (W)	Demand Reduction per unit (kW)	Energy Use Reduction per unit (kWh/yr)	Capital Cost ($)	Installation Cost ($)	Total Cost ($)
3rd St Courthouse	7	LED Exit	5	Photoluminescent	0	0.01	44	$120.00	$10.00	$910.00

Direct Savings	
Total Energy Use Reduction (kWh/yr)	307
Total Demand Reduction (kW)	0.04
Energy Savings ($/yr)	$29.13
Demand Savings ($/yr)	$0.00
Total Direct Savings ($/yr)	$29.13

HVAC Interaction	
Cooling Load Reduction (kWh/yr)	25
Heat Load Reduction (therm/yr)	-9
Cooling Energy Savings ($/yr)	$2.38
Natural Gas Cost Increase ($/yr)	($9.09)
Net HVAC Savings ($/yr)	-$6.71

Economic Analysis	
Total Electricity Use Reduction (kWh/yr)	332
Natural Gas Use Savings (therm/yr)	-9
Net Savings ($/yr)	$22.42
Total Cost ($)	$910.00
Simple Payback (yrs)	40.6

L4: Occupancy Sensors (3rd St Courthouse)

Room Type	Number of Sensors	Load (W)	Predicted Savings (%)	Time On (hr/year)	Electricity Savings (kWh/yr)	Sensor Type	Capital Cost per Sensor ($)	Labor Cost Per Sensor ($)	Electricity Savings ($)	Total Cost ($)	Payback (Yrs)
Existing Restrooms	4	510	40%	2574	526	Ceiling IR	$80.00	$150.00	$44.67	$920.00	20.6
Existing Offices	54	22874	25%	2340	13,381	Wall Switch IR	$30.00	$20.00	$1,137.39	$2,700.00	2.4
Existing Mechanical Rooms	2	1019	35%	3640	1,298	Combination	$80.00	$150.00	$110.35	$460.00	4.2
Existing Storage Areas	4	1351	35%	1040	492	Wall Switch IR	$30.00	$20.00	$41.79	$200.00	4.8
Existing Large Common Areas	2	3557	35%	3640	4,531	Combination	$80.00	$150.00	$385.17	$460.00	1.2
Existing Common Rms	4	1297	35%	3640	1,652	Wall Switch IR	$30.00	$20.00	$140.41	$200.00	1.4
					0						
Proposed Restrooms	4	394	40%	2574	406	Ceiling IR	$80.00	$150.00	$34.50	$920.00	26.7
Proposed Offices	54	13657	25%	2340	7,989	Wall Switch IR	$30.00	$20.00	$679.07	$2,700.00	4.0
Proposed Mechanical Rooms	2	812	35%	3640	1,035	Combination	$80.00	$150.00	$87.98	$460.00	5.2
Proposed Storage Areas	4	620	35%	1040	226	Wall Switch IR	$30.00	$20.00	$19.17	$200.00	10.4
Proposed Large Common Area	2	1521	35%	3640	1,937	Combination	$80.00	$150.00	$164.67	$460.00	2.8
Proposed Misc Common Rms	4	829	35%	3640	1,057	Wall Switch IR	$30.00	$20.00	$89.82	$200.00	2.2

Option 1: Sensors on Existing Fixtures

Direct Savings Summary		
Electricity Savings	21,880	(kWh/yr)
Total Direct Savings	$2,078.57	($/yr)

HVAC Interaction Summary		
Cooling Load Reduction	1,788	(kWh/yr)
Heating Load Reduction	-658	(therm/yr)
Electricity Savings	$169.87	($/yr)
Natural Gas Savings	-$648.49	($/yr)
Net HVAC Savings	-$478.61	($/yr)

Economic Analysis		
Total Electricity Savings	23,668	(kWh/yr)
Total Natural Gas Savings	-658	(therm/yr)
Net Savings	$1,599.96	($/yr)
Total Cost	$4,940.00	($)
Combined Simple Payback	3.1	(yrs)

Option 2: Sensors on Proposed Fixtures

Direct Savings Summary		
Electricity Savings	12,650	(kWh/yr)
Total Direct Savings	$1,201.71	($/yr)

HVAC Interaction Summary		
Cooling Load Reduction	1,034	(kWh/yr)
Heating Load Reduction	-381	(therm/yr)
Electricity Savings	$98.21	($/yr)
Natural Gas Savings	-$374.92	($/yr)
Net HVAC Savings	-$276.71	($/yr)

Economic Analysis		
Total Electricity Savings	13,683	(kWh/yr)
Total Natural Gas Savings	-381	(therm/yr)
Net Savings	$925.00	($/yr)
Total Cost	$4,940.00	($)
Combined Simple Payback	5.3	(yrs)

Note: The following are energy savings predictions published by EPRI. The predictions fall in the range published by the U.S. EPA.

Private Offices: 25%
Conference Rooms: 35%
Restrooms: 40%

Line	Room	Space Type	Present Lighting			Total Existing Watts per Area	Proposed Lighting			Total New Watts per Area
			Qty	Fixture	Watts		Qty	Fixture	Watts	
92	360 Copy	C	4	4-foot 2-lamp 32W U-bend T8	64	256	4	2-foot 2-lamp 17W T8	34	136
5	Break Room	C	3	4-foot 2-lamp Std 32W T8	64	192	3	Relamp w/ high lumen 28W T8	56	168
97	Jury Lounge	C	8	4-foot 2-lamp 32W U-bend T8	64	512	8	2-foot 2-lamp 17W T8	34	272
29	Maint. Shop	C	1	4-foot 1-lamp Std 34W T12	37	37	1	4-foot 1-lamp HP T8	28	28
51	Maint. Shop	C	4	4-foot 2-lamp 34W T12	75	299	4	4-foot 2-lamp HP T8	56	225
60	241	C	18	4-foot 4-lamp 34W T12	150	2693	18	4-foot 2-lamp HP T8 w/ Refl	56	1014
74	Record Storage	C	18	4-foot 1-lamp 40W T12	48	864	18	4-foot 1-lamp HP T8	28	507
46	Chem Store	CF	2	4-foot 2-lamp 34W T12	75	150	2	4-foot 2-lamp HP T8	56	113
53	Storage	CF	1	4-foot 2-lamp 34W T12	75	75	1	4-foot 2-lamp HP T8	56	56
72	Storage	CF	4	4-foot 4-lamp 34W T12	150	598	4	4-foot 2-lamp HP T8 w/ Refl	56	225
76	Storage	CF	4	8-foot 2-lamp 60W T12	132	528	4	4-foot 2-lamp HP T8 w/ Refl	56	225
4	Boiler House	M	13	4-foot 2-lamp Std 32W T8	64	832	13	Relamp w/ high lumen 28W T8	56	728
30	Old Chiller Room	M	1	4-foot 1-lamp Std 34W T12	37	37	1	4-foot 1-lamp HP T8	28	28
71	Old Chiller Room	M	1	4-foot 4-lamp 34W T12	150	150	1	4-foot 2-lamp HP T8 w/ Refl	56	56
1	060	O	6	4-foot 2-lamp Std 32W T8	64	384	6	Relamp w/ high lumen 28W T8	56	336
31	112	O	6	4-foot 2-lamp 34W T12	75	449	6	4-foot 2-lamp HP T8	56	338
77	111	O	1	4-foot 2-lamp 32W U-bend T8	64	64	1	2-foot 2-lamp 17W T8	34	34
14	111	O	4	4-foot 3-lamp Std 32W T8	96	384	4	Relamp w/ high lumen 28W T8	84	336
80	121	O	1	4-foot 2-lamp 32W U-bend T8	64	64	1	2-foot 2-lamp 17W T8	34	34
15	121	O	4	4-foot 3-lamp Std 32W T8	96	384	4	Relamp w/ high lumen 28W T8	84	336
54	122	O	6	4-foot 4-lamp 34W T12	150	898	6	4-foot 2-lamp HP T8 w/ Refl	56	338
55	141	O	8	4-foot 4-lamp 34W T12	150	1197	8	4-foot 2-lamp HP T8 w/ Refl	56	451
82	142	O	2	4-foot 2-lamp 32W U-bend T8	64	128	2	2-foot 2-lamp 17W T8	34	68
56	142	O	4	4-foot 4-lamp 34W T12	150	598	4	4-foot 2-lamp HP T8 w/ Refl	56	225
83	153	O	2	4-foot 2-lamp 32W U-bend T8	64	128	2	2-foot 2-lamp 17W T8	34	68
57	153	O	6	4-foot 4-lamp 34W T12	150	898	6	4-foot 2-lamp HP T8 w/ Refl	56	338
16	154	O	6	4-foot 3-lamp Std 32W T8	96	576	6	Relamp w/ high lumen 28W T8	84	504
33	211	O	8	4-foot 2-lamp 34W T12	75	598	8	4-foot 2-lamp HP T8	56	451
34	212	O	5	4-foot 2-lamp 34W T12	75	374	5	4-foot 2-lamp HP T8	56	282
99	212	O	1	4-foot 2-lamp 34W U-bend T12	82	82	1	2-foot 2-lamp 17W T8	34	34
35	213	O	8	4-foot 2-lamp 34W T12	75	598	8	4-foot 2-lamp HP T8	56	451
100	221	O	2	4-foot 2-lamp 34W U-bend T12	82	163	2	2-foot 2-lamp 17W T8	34	68
59	221	O	4	4-foot 4-lamp 34W T12	150	598	4	4-foot 2-lamp HP T8 w/ Refl	56	225
87	242	O	2	4-foot 2-lamp 32W U-bend T8	64	128	2	2-foot 2-lamp 17W T8	34	68
61	242	O	4	4-foot 4-lamp 34W T12	150	598	4	4-foot 2-lamp HP T8 w/ Refl	56	225
89	251	O	6	4-foot 2-lamp 32W U-bend T8	64	384	6	2-foot 2-lamp 17W T8	34	204
73	253	O	2	4-foot 4-lamp 40W T12	192	384	2	4-foot 2-lamp HP T8 w/ Refl	56	113
62	254	O	8	4-foot 4-lamp 34W T12	150	1197	8	4-foot 2-lamp HP T8 w/ Refl	56	451

64	261	O	2	4-foot 4-lamp 34W T12	150	299	2	4-foot 2-lamp HP T8 w/ Refl	56	113
65	262	O	1	4-foot 4-lamp 34W T12	150	150	1	4-foot 2-lamp HP T8 w/ Refl	56	56
38	263	O	1	4-foot 2-lamp 34W T12	75	75	1	4-foot 2-lamp HP T8	56	56
17	311	O	4	4-foot 3-lamp Std 32W T8	96	384	4	Relamp w/ high lumen 28W T8	84	336
26	312	O	3	4-foot 4-lamp 32W T8-M	141	422	3	4-foot 2-lamp HP T8 w/ Refl	56	169
7	315	O	2	4-foot 2-lamp 32W T8-M	70	141	2	4-foot 2-lamp HP T8	56	113
19	321	O	4	4-foot 3-lamp Std 32W T8	96	384	4	Relamp w/ high lumen 28W T8	84	336
27	325	O	5	4-foot 4-lamp 32W T8-M	141	704	5	4-foot 2-lamp HP T8 w/ Refl	56	282
9	330 A	O	2	4-foot 2-lamp 32W T8-M	70	141	2	4-foot 2-lamp HP T8	56	113
10	330 B	O	2	4-foot 2-lamp 32W T8-M	70	141	2	4-foot 2-lamp HP T8	56	113
93	341	O	4	4-foot 2-lamp 32W U-bend T8	64	256	4	2-foot 2-lamp 17W T8	34	136
95	342	O	4	4-foot 2-lamp 32W U-bend T8	64	256	4	2-foot 2-lamp 17W T8	34	136
11	351	O	4	4-foot 2-lamp 32W T8-M	70	282	4	4-foot 2-lamp HP T8	56	225
39	353	O	2	4-foot 2-lamp 34W T12	75	150	2	4-foot 2-lamp HP T8	56	113
40	354	O	2	4-foot 2-lamp 34W T12	75	150	2	4-foot 2-lamp HP T8	56	113
91	360 A	O	4	4-foot 2-lamp 32W U-bend T8	64	256	4	2-foot 2-lamp 17W T8	34	136
28	361	O	4	4-foot 4-lamp 32W T8-M	141	563	4	4-foot 2-lamp HP T8 w/ Refl	56	225
41	363	O	1	4-foot 2-lamp 34W T12	75	75	1	4-foot 2-lamp HP T8	56	56
67	431	O	5	4-foot 4-lamp 34W T12	150	748	5	4-foot 2-lamp HP T8 w/ Refl	56	282
21	432	O	4	4-foot 3-lamp Std 32W T8	96	384	4	Relamp w/ high lumen 28W T8	84	336
43	448	O	6	4-foot 2-lamp 34W T12	75	449	6	4-foot 2-lamp HP T8	56	338
44	453	O	14	4-foot 2-lamp 34W T12	75	1047	14	4-foot 2-lamp HP T8	56	788
69	453	O	5	4-foot 4-lamp 34W T12	150	748	5	4-foot 2-lamp HP T8 w/ Refl	56	282
22	461	O	10	4-foot 3-lamp Std 32W T8	96	960	10	Relamp w/ high lumen 28W T8	84	840
2	461	O	4	4-foot 2-lamp Std 32W T8	64	256	4	Relamp w/ high lumen 28W T8	56	224
23	462	O	2	4-foot 3-lamp Std 32W T8	96	192	2	Relamp w/ high lumen 28W T8	84	168
70	462	O	2	4-foot 4-lamp 34W T12	150	299	2	4-foot 2-lamp HP T8 w/ Refl	56	113
3	464	O	6	4-foot 2-lamp Std 32W T8	64	384	6	Relamp w/ high lumen 28W T8	56	336
45	Cave	O	1	4-foot 2-lamp 34W T12	75	75	1	4-foot 2-lamp HP T8	56	56
25	tes Attornet(420-423?)	O	13	4-foot 3-lamp Std 32W T8	96	1248	13	Relamp w/ high lumen 28W T8	84	1092
49	Ladies Restroom	RR	2	4-foot 2-lamp 34W T12	75	150	2	4-foot 2-lamp HP T8	56	113
12	Restroom 3rd	RR	1	4-foot 2-lamp 32W T8-M	70	70	1	4-foot 2-lamp HP T8	56	56
13	Restroom 4th	RR	2	4-foot 2-lamp 32W T8-M	70	141	2	4-foot 2-lamp HP T8	56	113
52	Restrooms 4th	RR	2	4-foot 2-lamp 34W T12	75	150	2	4-foot 2-lamp HP T8	56	113

L5: Exterior Lighting Retrofit (3rd St Courthouse)

Option	Location	Present Lighting			Proposed Lighting			Time On (hrs/yr)	Demand Reduction (kW)	Electricity Savings (kWh/yr)	Capital Cost ($)	Labor Cost ($)	Line Cost ($)
		Qty	Fixture	Watts	Qty	Fixture	Watts						
1	Front of Building	24	200W MV	234	24	100 W Pulse Start MH Retrofit	128	4745	2.54	12,071	$150.00	$30.00	$4,320.00
1	West Parking Lot	12	100W MV	125	12	70 W Pulse Start MH Retrofit	95	4745	0.36	1,708	$100.00	$30.00	$1,560.00
1	West Parking Lot	9	60W MV	82	9	50 W Pulse Start MH Retrofit	72	4745	0.09	427	$100.00	$30.00	$1,170.00
2	Front of Building	24	200W MV	234	24	96W LED Shoebox Fixture	96	4745	3.31	15,715	$1,000.00	$150.00	$27,600.00
2	West Parking Lot	12	100W MV	125	12	56W LED	56	4745	0.83	3,929	$750.00	$150.00	$10,800.00
2	West Parking Lot	9	60W MV	82	9	20W LED Luminaire	20	4745	0.56	2,648	$550.00	$150.00	$6,300.00
3	Front of Building	24	200W MV	234	24	120W Induction Shoebox Fixture	120	4745	2.74	12,982	$550.00	$150.00	$16,800.00
3	West Parking Lot	12	100W MV	125	12	80W Induction	80	4745	0.54	2,562	$350.00	$150.00	$6,000.00
3	West Parking Lot	9	60W MV	82	9	40W Induction Luminaire	40	4745	0.38	1,794	$250.00	$150.00	$3,600.00

Direct Savings Summary				
	Opt 1	Opt 2	Opt 3	
Electricity Savings	14,207	22,292	17,338	(kWh/yr)
Demand Reduction	2.99	4.70	3.65	(kW)
Direct Electricity Savings	$1,349.62	$2,117.74	$1,647.13	($/yr)
Demand Savings	$0.00	$0.00	$0.00	($/yr)
Total Direct Savings	$1,349.62	$2,117.74	$1,647.13	($/yr)

HVAC Interaction Summary				
	Opt 1	Opt 2	Opt 3	
Cooling Load Reduction	0	0	0	(kWh/yr)
Heating Load Reduction	0	0	0	(therm/yr)
Electricity Savings	$0.00	$0.00	$0.00	($/yr)
Natural Gas Savings	$0.00	$0.00	$0.00	($/yr)
Net HVAC Savings	$0.00	$0.00	$0.00	($/yr)

Economic Analysis				
	Opt 1	Opt 2	Opt 3	
Total Electricity Savings	14,207	22,292	17,338	(kWh/yr)
Total Natural Gas Savings	0	0	0	(therm/yr)
Net Savings	$1,349.62	$2,117.74	$1,647.13	($/yr)
Total Cost	$7,050.00	$44,700.00	$26,400.00	($)
Simple Payback	5.2	21.1	16.0	(yrs)

Pricing for LED fixtures from LEDtronics
Pricing for Induction lighting from FSG

L6: Photocells on Exterior Fixtures (3rd St. Courthouse)

Option	Location	Nominal Fixture Wattage	Load (W)	Current Annual Hours	Annual Hours on Sensors	Electricity Savings (kWh/yr)	Number of Sensors	Capital Cost per Sensor ($)	Labor Cost Per Sensor ($)	Total Cost ($)
1	Existing Exterior Parking Lot	200	5,616	4745	4380	2,050	1	$100.00	$240.00	$340.00
1	Existing Exterior Wall Packs	100	1,500	4745	4380	548	1	$100.00	$240.00	$340.00
1	Existing Exterior Wall Packs	60	738	4745	4380	269	1	$100.00	$240.00	$340.00
2	Pulse Start MH Exterior Parking Lot	190	3,072	4745	4380	1,121	1	$100.00	$240.00	$340.00
2	Pulse Start MH Exterior Wall Packs	95	1,140	4745	4380	416	1	$100.00	$240.00	$340.00
2	Pulse Start MH Exterior Wall Packs		648	4745	4380	237	1	$100.00	$240.00	$340.00
3	LED Exterior Parking Lot	96	2,304	4745	4380	841	1	$100.00	$240.00	$340.00
3	LED Exterior Wall Packs	56	672	4745	4380	245	1	$100.00	$240.00	$340.00
3	LED Exterior Wall Packs	20	180	4745	4380	66	1	$100.00	$240.00	$340.00
4	Induction Exterior Parking Lot	120	2,880	4745	4380	1,051	1	$100.00	$240.00	$340.00
4	Induction Exterior Wall Packs	80	960	4745	4380	350	1	$100.00	$240.00	$340.00
4	Induction Exterior Wall Packs	40	360	4745	4380	131	1	$100.00	$240.00	$340.00

Direct Savings Summary

	Opt 1	Opt 2	Opt 3	Opt 4	
Electricity Savings	2,867	1,774	1,152	1,533	(kWh/yr)
Total Direct Savings	$243.67	$150.78	$97.91	$130.31	($/yr)

HVAC Interaction Summary

	Opt 1	Opt 2	Opt 3	Opt 4	
Cooling Load Reduction	0	0	0	0	(kWh/yr)
Heating Load Reduction	0	0	0	0	(therm/yr)
Electricity Savings	$0.00	$0.00	$0.00	$0.00	($/yr)
Natural Gas Savings	$0.00	$0.00	$0.00	$0.00	($/yr)
Net HVAC Savings	$0.00	$0.00	$0.00	$0.00	($/yr)

Economic Analysis

	Opt 1	Opt 2	Opt 3	Opt 4	
Total Electricity Savings	2,867	1,774	1,152	1,533	(kWh/yr)
Total Natural Gas Savings	0	0	0	0	(therm/yr)
Net Savings	$243.67	$150.78	$97.91	$130.31	($/yr)
Total Cost	$1,020.00	$1,020.00	$1,020.00	$1,020.00	($)
Combined Simple Payback	4.2	6.8	10.4	7.8	(yrs)

Pricing for sensor from Grainger

Period of Record = 1967 to 1996

Breakpoint from graph 63 °F
Fan on from 06 to 18

COST

Chiller	0.92	kW/ton	0.095 $/kWh
Heat	0.78	%	0.985 $/therm

BTU/1000 cfm
Assumes 55°F SAT

Temperature Range (oF)	Annual Totals Hour Group LST 01 to "08	09 to 16	17 to 00	Total Obs	MCWB (oF)		HOURS ON 01 to 08	09 to 16	17 to 00	SUM	Tons	Heat Required	Cooling kWh required	Therms Required
100/104	0	1	0	1	78.9	102	0	0.714286	0	0.714286	36257.14	3.021429	2.779714	
95/99	0	10	1	11	76.8	97	0	7.142857	0.178571	7.321429	332100	27.675	25.461	
90/94	0	50	11	62	74.8	92	0	35.71429	1.964286	37.67857	1505636	125.4696	115.4321	
85/89	2	121	40	163	72.3	87	0.357143	86.42857	7.142857	93.92857	3246171	270.5143	248.8731	
80/84	22	219	99	340	69.6	82	3.928571	156.4286	17.67857	178.0357	5191521	432.6268	398.0166	
75/79	90	269	181	540	67	77	16.07143	192.1429	32.32143	240.5357	5715129	476.2607	438.1599	
70/74	201	244	244	689	64.4	72	35.89286	174.2857	43.57143	253.75	4658850	388.2375	357.1785	
65/69	254	199	244	696	60.5	67	45.35714	142.1429	43.57143	231.0714	2994686	249.5571	229.5926	
60/64	259	203	237	699	56.3	62	46.25	145	42.32143	233.5714	1765800	58.86	1358308	54.1512	13.58308
55/59	234	181	210	626	51.7	57	41.78571	129.2857	37.5	208.5714	450514.3		577582.4		5.775824
50/54	222	181	203	605	47.1	52	39.64286	129.2857	36.25	205.1786	664778.6		852280.2		8.522802
45/49	215	172	202	589	42.7	47	38.39286	122.8571	36.07143	197.3214	1704857		2185714		21.85714
40/44	216	195	216	627	38.4	42	38.57143	139.2857	38.57143	216.4286	3038657		3895714		38.95714
35/39	275	239	266	780	34.1	37	49.10714	170.7143	47.5	267.3214	5196729		6662473		66.62473
30/34	295	216	267	778	29.8	32	52.67857	154.2857	47.67857	254.6429	6325329		8109396		81.09396
25/29	201	146	172	519	24.9	27	35.89286	104.2857	30.71429	170.8929	5167800		6625385		66.25385
20/24	139	96	116	351	20.2	22	24.82143	68.57143	20.71429	114.1071	4066779		5213819		52.13819
15/19	99	64	73	236	15.5	17	17.67857	45.71429	13.03571	76.42857	3136629		4021319		40.21319
10/14	62	43	57	162	10.6	12	11.07143	30.71429	10.17857	51.96429	2413221		3093874		30.93874
05/09	52	30	40	123	5.8	7	9.285714	21.42857	7.142857	37.85714	1962514		2516044		25.16044
00/04	42	18	25	85	1.2	2	7.5	12.85714	4.464286	24.82143	1420779		1821511		18.21511
-5/-1	18	6	11	35	-3.2	-3	3.214286	4.285714	1.964286	9.464286	592842.9		760054.9		7.600549
-10/-6	13	5	6	24	-7.5	-8	2.321429	3.571429	1.071429	6.964286	473850		607500		6.075
-15/-11	6	2	4	12	-12.1	-13	1.071429	1.428571	0.714286	3.214286	236057.1		302637.4		3.026374
-20/-16	2	1	1	4	-17	-18	0.357143	0.714286	0.178571	1.25	98550		126346.2		1.263462
-25/-21	1	0	0	2	-22.1	-23	0.178571	0	0	0.178571	15042.86		19285.71		0.192857
-30/-26	0	0	0	0	-25.4	-28	0	0	0	0	0		0		0
	2920	2911	2926	8759						3123.214			1869.645	487.4924	TOTAL
			8757									$$	177.6162	480.18	$657.80

Cost for 1,000 cfm of outside air in the 3rd Street Courthouse is $657.80

Period of Record = 1967 to 1996

Breakpoint from graph 63 °F
Fan on from 06 to 18

COST

Chiller	0.92	kW/ton	0.095 $/kWh
Heat	0.78	%	0.985 $/therm

BTU/1000 cfm
Assumes 55°F SAT

Annual Totals Hour Group LST 01 to "08	09 to 16	17 to 00	Total Obs	MCWB (oF)		HOURS ON 01 to 08	09 to 16	17 to 00	SUM	Tons	Heat Required	Cooling kWh required	Therms Required
0	1	0	1	78.9	102	0	0.625	0	0.625	31725	2.64375	2.43225	
0	10	1	11	76.8	97	0	6.25	0.089286	6.339286	287550	23.9625	22.0455	
0	50	11	62	74.8	92	0	31.25	0.982143	32.23214	1287996	107.333	98.74639	
2	121	40	163	72.3	87	0.178571	75.625	3.571429	79.375	2743200	228.6	210.312	
22	219	99	340	69.6	82	1.964286	136.875	8.839286	147.6786	4306307	358.8589	330.1502	
90	269	181	540	67	77	8.035714	168.125	16.16071	192.3214	4569557	380.7964	350.3327	
201	244	244	689	64.4	72	17.94643	152.5	21.78571	192.2321	3529382	294.1152	270.586	
254	199	244	696	60.5	67	22.67857	124.375	21.78571	168.8393	2188157	182.3464	167.7587	
259	203	237	699	56.3	62	23.125	126.875	21.16071	171.1607	1293975	43.1325	995365.4	39.6819	9.953654
234	181	210	626	51.7	57	20.89286	113.125	18.75	152.7679	329978.6		423049.5		4.230495
222	181	203	605	47.1	52	19.82143	113.125	18.125	151.0714	489471.4		627527.5		6.275275
215	172	202	589	42.7	47	19.19643	107.5	18.03571	144.7321	1250486		1603187		16.03187
216	195	216	627	38.4	42	19.28571	121.875	19.28571	160.4464	2252668		2888036		28.88036
275	239	266	780	34.1	37	24.55357	149.375	23.75	197.6786	3842871		4926758		49.26758
295	216	267	778	29.8	32	26.33929	135	23.83929	185.1786	4599836		5897225		58.97225
201	146	172	519	24.9	27	17.94643	91.25	15.35714	124.5536	3766500		4828846		48.28846
139	96	116	351	20.2	22	12.41071	60	10.35714	82.76786	2949846		3781854		37.81854
99	64	73	236	15.5	17	8.839286	40	6.517857	55.35714	2271857		2912637		29.12637
62	43	57	162	10.6	12	5.535714	26.875	5.089286	37.5	1741500		2232692		22.32692
52	30	40	123	5.8	7	4.642857	18.75	3.571429	26.96429	1397829		1792088		17.92088
42	18	25	85	1.2	2	3.75	11.25	2.232143	17.23214	986367.9		1264574		12.64574
18	6	11	35	-3.2	-3	1.607143	3.75	0.982143	6.339286	397092.9		509093.4		5.090934
13	5	6	24	-7.5	-8	1.160714	3.125	0.535714	4.821429	328050		420576.9		4.205769
6	2	4	12	-12.1	-13	0.535714	1.25	0.357143	2.142857	157371.4		201758.2		2.017582
2	1	1	4	-17	-18	0.178571	0.625	0.089286	0.892857	70392.86		90247.25		0.902473
1	0	0	2	-22.1	-23	0.089286	0	0	0.089286	7521.429		9642.857		0.096429
0	0	0	0	-25.4	-28	0	0	0	0	0		0		0
2920	2911	2926	8759						2341.339			1492.046	354.0516	TOTAL
		8757									$$	141.7443	348.7408	$490.49

Revised
Cost for 1,000 cfm of outside air in the 3rd Street Courthouse is $490.49

Savings per courtroom unit =	$138.03	
16 Courtroom Set-ups	$2,208.51	
	377.5991	133.4408
	kWh	4984.307 Therms 1761.419

Insulation

Heating Season Length	251	hours below 45	3738.00		
Cooling Season Length	114	Hours above 65	2502.00		
AFUE	78	htg factor	0.78		
SEER	13	kW/ton	0.92		
Present R	2.02 U		0.50	Delta U	
Added R	30 U		0.03	0.46	
				Average	
HDD	6455	heating season temp		50.00	39.28287
CDD	740	cooling season temp		71.49	
Ceiling Area	14,900	heating savings		7253.18	therms
Inside Temperature Heating	72	cooling savings		1974.46	kwh
Inside Temperature Cooling	70				
electric costs $/kWh	0.095	heating savings		7144.39	
heating costs $/therm	0.985	cooling savings		187.57	
		Total Savings		7331.96	
per square foot material	$0.70				
per square foot labor	$1.00				
contingency 30%	$0.51	Total Cost		Payback	
Total	$2.21	$32,929.00		4.5	

PATRICK ENGINEERING INC.

Project No	20903.047			
Project	Kane County Bldg. A			
Calculated by	DEK	Date	2/24/10	
Checked by	CJB	Date	2/26/10	
Title ECRM L-4 Occupancy Sensors		Sheet	1	of 1

PROBLEM STATEMENT: Determine the potential savings of replacing on-off wall switches in the 1 or 2 person offices with infrared and/or ultrasonic motion sensor wall switches by reducing electric energy consumption.

GIVEN:

1. Using occupancy sensor switches reduces power consumption by 10% to 25% based on ASHRAE, EPRI and AEE studies. EPRI number of 25% for offices will be used.
2. Electricity costs about $0.079/kWh.
3. Gas costs are $0.88/therm.
4. 42 offices will have switches replaced with an average of 3 fixtures per office.
5. Current operating time is estimated at 9 hr/day and 260 day/yr giving a total operating time of 2,340 hr/yr. (based on building occupancy)
6. Each occupancy sensor costs $51.75. (Means 2009)

ASSUMPTIONS:

1. All lighting fixtures will have been converted to T-8 fixtures using 58 watts.
2. The heating season length of Chicago is 251 days. (Technical Assistance Program Manual).
3. Cooling ranges from a SEER 8.5 to 12. Average SEER of 10.0 BTU/W used for interaction effect.
4. The heating system efficiency is estimated at 0.70. That will be used for calculations.

CALCULATION:

Annual Energy Reduction

The occupancy sensor switches reduce power consumption by 25%, the operating time of the lights in will be reduced by 585 hr/yr (0.25 * 2340).

kWh savings = (585 hr/yr)*(3 fixtures/office)*(58 watts/fixture)*(42 offices)/(1000W/kW) = 4,275 kWh/yr

HVAC Interaction

Heat Load Addition = (4,275 kWh/yr) (251/365) (3413 BTU/kWh) / [(0.70) (100,000 Btu/thm)]

= 143.3 therm/yr

Natural Gas Cost Increase = (143.3 therm/yr) ($0.88/therm) = $126/yr

Cooling Load Reduction = (4,275 kWh/yr)*(114/365)*(3413BTU/kWh) / ((10.0 BTU/W)* (1000W/kW)

= 456 kWh/yr

Energy Savings = (456 kWh/yr) ($0.079/kWh) = $36/yr

Economic Analysis

Total Energy Usage Reduction = (4,275 kWh/yr) + (456 kWh/yr) = 4,731 kWh/yr

Total Energy Savings = (4,731 kWh/yr) ($0.079/kWh) = $374/yr

Net Savings = Total Energy Savings – Natural Gas Cost Increase

= $374/yr – $126/yr = $248/yr

Installed Cost = ($51.75/sensor) (42 sensors) = $2,173.50

Simple Payback = ($2,173.50) / ($248/yr) = 8.8 years

RN-1-JJC: SOLAR PHOTOVOLTAIC ARRAY

Economics

Annual Cost savings = $10,000 - $13,200

Installed cost = $500,000 - $600,000

Simple Payback = 43.7 – 50 years

Annual Energy Production = 117,700 – 156,200 kWh

Summary

Install a 100 kW solar photovoltaic (PV) array at the Juvenile Justice Center.

Backgound

The Juvenile Justice Center has a significant continuous baseload and summer peaks of electrical consumption that could be offset by on-site generation of electricity. There is sufficient space (min. 100,000 ft^2 or 2.3 acres for a fixed tilt array) available at the complex for such an installation. The photovoltaic panels can be installed on ground or roof mounted racks, or as canopies over parking areas.

The 100 kW sizing was chosen to reflect the approximate baseload of the Juvenile Justice Center (estimated to be about 133 kW), so all the electricity produced is used on-site and a grid connection would not be required. The chart below summarizes the payback calculations for three different array types with the annual production calculated from local solar resource data.

Array Type	System cost ($/kW)	Total System Cost	Annual Production (kWh)	Electricity Cost Savings	Simple Payback (years)	Adjusted Payback (with Maximum $50K State Grant)
Fixed Tilt	$5,000	$500,000	117,699	$10,004	50.0	45.0
Single Axis Tracking	$5,500	$550,000	148,156	$12,593	43.7	39.7
Dual-Axis Tracking	$6,000	$600,000	156,210	$13,278	45.2	41.4

The Juvenile Justice Center and the Judicial Center complex has a combined baseload of over 500 kW, so the PV array could be significantly up-sized and remain off-grid. A larger array would likely result in a slightly lower $/kW installed cost and slightly better payback.

Implementation

The County could own the array, but another possibility would be to lease space to a third-party, who would own and install the array, and enter into a power purchase agreement for the electricity. This approach would have the advantage of avoiding the initial investment, and may result in a lower delivered cost of electricity, since a private investor could benefit from Federal tax credits.

Kane County Heat Pump Analysis **Juvenile Justice Center**

	# units	Size (tons)	Equipment & installation costs /unit[1]	Total equipment	Well field installation[2]	
	1	60	65,600	65600	240000	
	2	20	22,500	45000	160000	
	3	17.5	21,400	64200	210000	
	2	15	20,300	40600	120000	
	2	10	10,100	20200	80000	
Total	**10**	**202.5**		**235600**	**810000**	
						1045600

1. From Rsmeans, Mechanical Cost Data, 2009
2. Estimated at $4000/ton including drilling, plumbing, manifolds, and pumps

	Juvenile Justice Center					
before	Heating Consumption	47281 Therms @	75% AFUE	Load	35461 Therms	
	Cooling Consumption	342,904 kWh	9.5 SEER	Load	3257588000 BTU	
after	Heating Consumption	259,824 kWh @	4 COP		8865 therms	
	Cooling Consumption	162,879 kWh @	20 SEER			
	Heating Savings	38416 Therms				
	Cooling Savings	180,025 kWh				
	Heating Savings	$22,903			Gas Rate	0.957 Therm
	Cooling Savings	$15,482			Elec Rate	0.086 kWh
	Total	$38,385				
	Simple Payback	27.2				
		-79,799				

RN-3- JJC: GROUND SOURCE HEAT PUMP

Economics

Annual Cost savings = $38,385

Installed cost = $1,045,600

Simple Payback = 27.2 years

Annual Energy Savings = 47281 therms, (-79,800 kWh)

Summary

Replace rooftop units at the Juvenile Justice Center with a ground source heat pump system.

Background

The existing rooftop units have an estimated cooling efficiency of 9.5 SEER and an estimated AFUE for heating of 75%. Ground source heat pumps (GSHPs) take advantage of consistent temperatures below ground to achieve efficiencies not attainable with conventional air-source A/C units. A GSHP can achieve SEER rating of 20 and above, and provide heating at a COP of 4.0 and better.

Though significant savings are seen in both heating and cooling, the switch of the bulk of the heating load from gas to electricity will increase the annual kWh consumption.

Implementation

The Juvenile Justice Center's ten rooftop HVAC units would be exchanged for water-source heat pump units that would be tied to a geothermal well field. The well field would be sized to meet the estimated 200 ton cooling load of the Center and be equipped with gas-fired backup for the heating season.

Purchase and installation of the new rooftop units are estimated to cost $235,600

The well field would require approximately 210 wells, 250-300 ft deep, and cover an area of approximately 3 acres. Well drilling, plumbing of well loops and manifolds, and pumps are estimated to cost $810,000.

PATRICK ENGINEERING INC.

Project No	20903.047			
Project	Kane County			
Calculated by	CJB	Date	3/16/2010	
Checked by	DEK	Date	4/22/2010	
		Sheet	1 of	2

Title ECRM RN-4 Solar Thermal to Heat Domestic Hot Water

PROBLEM STATEMENT: Determine the potential and feasibility of a solar thermal system for heating domestic hot water for the Juvenile Justice Center

GIVEN: Estimated total water usage = 6,000 gallons per day
Natural gas used in summer = 22 therms per day which is used for cooking, laundry and hot water.
Of the 22 therms per day, estimate 15 therms per day is used to heat water.

Water Temperature set-points = 120 degrees for shower, 140 degrees for laundry and 160 degrees for dishwasher.
Incoming Water Temperature = 55 degrees.
Present water heating system efficiency = 85%

CALCULATIONS: 15 therms/day * 100,000 BTU/therm = 1,500,000 BTU/day
Volume of water being heated = 1,500,000 BTU/Day * 1 gallon/8.34 pounds * (pound-°F)/1 BTU * 1/(130–55 °F) 0.85 = 2,038 gallons/day at present
This is 2,038 gallons/day/6,000 gallons/day = 34% of water used is heated. Appears reasonable.

Solar Availability; Maximum, 1743 BTU/(square foot-day) in June per ENR reference
Maximum, 5.92 kWh/(square meter-day) in July per PV Watts
This converts to 5.92 kWh/(square meter-day) * 3,413 BTU/kWh * 0.0929 square meters/square foot = 1,877 BTU/(square foot-day) – (similar to ENR)

Size to meet peak summer water heating load assuming solar thermal system is 70% efficient:
15 therms/day = 1,500,000 BTU/day
Size = 1,500,000 BTU/day/(1,743 BTU/(square foot-day) * 0.70) = 1,229 square feet of solar panel needed
Use 1,230 square feet as panel area; cost per square foot of panel ranged from $26 to $40
Equals $31,980 to $49,200, use $35,000 for panel costs

Annual Solar Water Heating Quantity

Month	Solar Radiation BTU/Ft^2-day	Solar Collection Efficiency %	Output BTU/Day	Energy Saved Therms/Month
January	964	70	829,906	303
February	1,199	70	1,031,922	340
March	1,376	70	1,184,800	432
April	1,620	70	1,395,006	492
May	1,801	70	1,550,613	566
June	1,795	70	1,545.153	545
July	1,877	70	1,616,132	589
August	1,655	70	1,425,035	520
September	1,566	70	1,348,597	476
October	1,351	70	1,162,960	424
November	897	70	772,577	273
December	720	70	619,699	226
TOTAL				**5,186**

Table above uses values for solar radiation from PV Watts for Chicago Illinois.

PATRICK ENGINEERING INC.

Project No	20903.047			
Project	Kane County			
Calculated by	CJB	Date	3/16/2010	
Checked by	DEK	Date	4/22/2010	
		Sheet	2	of 2

Title ECRM RN-4 Solar Thermal to Heat Domestic Hot Water

System Costs:

Panels	$35,000
System Components	$30,000
Tank 2,000 gallon	$15,000
Installation	$30,000
TOTAL	$110,000

Cost Savings:

Savings = 5,186 therms/year * $0.957/therm = $4,963/year

Payback = Cost/Savings = $110,000/$4,963/year = 22.2 years

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ENGINEERING INC.

Project No	20903.047			
Project	Kane County			
Calculated by	CJB	Date	3/16/2010	
Checked by	DEK	Date	4/22/2010	
	Sheet	3	of	2

Title ECRM RN-4 Solar Thermal to Heat Domestic Hot Water

	kWh/m2-day	BTU/ft2-day	BTU/day	therm/mo
1230	3.04	964	829,906	303
0.7	3.78	1,199	1,031,922	340
0.85	4.34	1,376	1,184,800	432
100000	5.11	1,620	1,395,006	492
3413	5.68	1,801	1,550,613	566
0.0929	5.66	1,795	1,545,153	545
	5.92	1,877	1,616,132	589
	5.22	1,655	1,425,035	520
	4.94	1,566	1,348,597	476
	4.26	1,351	1,162,960	424
	2.83	897	772,577	273
	2.27	720	619,699	226
Total				5,186

EXHIBIT 6

ABBREVIATIONS

Abbreviations

AC – Air conditioning

ACH – Air changes per hour

AFUE – Annual fuel utilization efficiency

ASHRAE – American Society of Heating, Refrigeration and Air-Conditioning Engineers

BAS – Building automation system

BTU – British thermal unit

CBECS – Commercial Buildings Energy Consumption Survey

CFM – Cubic feet per minute

COP – Coefficient of performance

CRI – Color rendering index

DCEO – Department of Commerce and Economic Opportunity

DSIRE – Database of State Incentives for Renewables and Efficiency

DWH – Domestic water heater

ECRM – Energy cost reduction measure

EEPS – Energy Efficient Portfolio Standard

EER – Energy efficiency ratio

ERV – Energy recovery ventilator

F – Fahrenheit

ft – Foot or feet

ft^2 – Square feet

fc – Foot candle

GHP – Geothermal heat pump

HP – Horsepower

HRV – Heat recovery ventilator

HSPF – Heating seasonal performance factor

HVAC – Heating, ventilating, and air conditioning

IRR – Internal rate of return

kW – Kilowatt, one thousand watts, a unit of power, or energy per unit time

kWh – Kilowatt-hours, one thousand watt-hours, a unit of energy

lm/W – Lumens per watt

LPD – Lighting power density

NPV – Net present value

OA – Outside air

PKG – Package

PSEEP – Public Sector Electric Efficiency Program

RPS – Renewable Portfolio Standard

RTU – Roof top unit

R-Value – A measure of the resistance of building materials to heat transfer

SEDAC – Smart Energy Design Assistance Center

SEER – Seasonal energy efficiency ratio

SHGC – Solar heat gain coefficient

T5 – A tubular fluorescent lamp 5/8 inch in diameter

T8 – A tubular fluorescent lamp 1 inch in diameter

T12 – A tubular fluorescent lamp 1½ inch in diameter

Therm – A unit of measure for natural gas equal to 100,000 BTUs or 100 Cubic Feet.

U-Factor – A factor expressing the ability of a material to transfer heat.

V– Volts

VFD – Variable frequency drive

W – Watts

yr – Year(s)