6/26/2020

FLEXTECH STUDY

Erie County
95 Franklin Street
Buffalo, New York 14202

Jesse Nash Health Center – 608 William Street, Buffalo, NY
Erie County Holding Center – 40 Delaware Avenue, Buffalo, NY
Edward A. Rath Building – 95 Franklin Street, Buffalo, NY
Fire Training Academy – 3359 Broadway Street, Cheektowaga, NY
Youth Detention Center – 810 East Ferry Street, Buffalo, NY
Medical Examiner's Office – 501 Kensington Avenue, Buffalo, NY
Family Court – 1 Niagara Square, Buffalo, NY
Public Safety Campus – 45 Elm Street, Buffalo, NY
Correctional Facility – 11581 Walden Avenue, Alden, NY
Law Library – 77 West Eagle Street, Buffalo, NY
Aurora Highway – 119 Ellicott Road, West Falls, NY
Sheriff's Office – 10 Delaware Avenue, Buffalo, NY
Old County Hall – 92 Franklin Street, Buffalo, NY
Health Mall – 1500 Broadway – Buffalo, NY
Erie County Court Annex– 25 Delaware Avenue, Buffalo, NY
Chestnut Ridge Park – 6121 Chestnut Ridge Road, Orchard Park, NY
Harlem Highway – 1080 Harlem Road, Cheektowaga, NY
Concord Highway – 9125 Sibley Road, Concord, NY
Hamburg Highway – 50 West Avenue, Hamburg, NY
Angola Highway – 8752 Delameter Road, Angola, NY
Collins Highway – 14020 Jennings Road, Collins, NY
Clarence Highway – 5105 Salt Road, Clarence, NY
Holland Highway – 9988 South Protection Road, Holland, NY
Tonawanda Highway – 1870 Military Road, Tonawanda, NY
Board of Elections/Sheriff's – 134 West Eagle, Buffalo, NY
Mental Health – 120 West Eagle, Buffalo, NY

New York State Energy Research and Development Authority
17 Columbia Circle
Albany, New York 12203-6399

For questions regarding this report or other programs offered by NYSERDA, please contact

FlexTech@nyserda.ny.gov

We hope the findings of this report will assist you in making decisions about energy efficiency improvements in your facility. Thank you for your participation in this program.

State of New York
Andrew Cuomo, Governor

C.J. Brown Energy, P.C.

Energy Utilization & Commissioning Specialists

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NOTICE

The tables on the following pages summarize the energy savings and projected costs for each of the buildings.

PROJECT SUMMARY SHEET

Participant's Name and Address:

Erie County
Edward A. Rath County Office Building
95 Franklin Street
Buffalo, NY 14202

					Energy Savings						
Building	**FIM #**	**ECM Description**	**Measure Status**	**Fuel Type Saved**	**Elec (kWh/year)**	**Demand (kW/month)**	**Gas (mmBTU)**	**Total (mmBTU)**	**Annual Dollars Saved**	**Estimated Implementation Cost**	**Simple Payback Period**
Jesse Nash Health Center	1	Lighting Interior Retrofit	R	Elec	60,551	18.6	(35)	171.7	$ 5,340	$ 99,042	18.5
Jesse Nash Health Center	1	Lighting Interior Controls	RNE	Elec	7,471	0.0	0	25.5	$ 355	$ 12,220	34.4
Jesse Nash Health Center	2	Lighting Exterior Retrofit	R	Elec	4,133	0.0	0	14.1	$ 196	$ 2,093	10.7
Jesse Nash Health Center	30	Pipe Insulation	R	NGas	0	0.0	9	9.4	$ 50	$ 667	13.2
Jesse Nash Health Center	4	Replace Hvac System	RNE	NGas	83,155	0.6	486	769.4	$ 6,632	$ 1,671,119	252.0
Jesse Nash Health Center	36	Vending Machine Occupancy Controls	R	Elec	2,135	0.0	0	7.3	$ 101	$ 682	6.7
Jesse Nash Health Center	3	Weatherization	R	NGas	2,603	0.0	244	252.9	$ 1,432	$ 21,360	14.9
Sheriff's/BOE	1	120 West Eagle Interior Retrofit	R	Elec	21,163	6.3	0	72.2	$ 1,825	$ 25,564	14.0
Sheriff's/BOE	1	120 West Eagle Interior Contols	RNE	Elec	410	0.0	0	1.4	$ 21	$ 495	24.2
Sheriff's/BOE	1	134 West Eagle Interior Retrofit	R	Elec	115,225	26.1	0	393.1	$ 8,935	$ 100,478	11.2
Sheriff's/BOE	1	134 West Eagle Interior Controls	R	Elec	1,433	0.0	0	4.9	$ 72	$ 1,250	17.4
Sheriff's/BOE	5	134 W. Eagle Night Setback With Steam Valves	R	NGas	0	0.0	1,953	1952.9	$ 7,683	$ 75,028	9.8
Sheriff's/BOE	6	Install Exhaust Fan Controls 134 W Eagle	R	NGas	2,893	0.0	424	433.4	$ 1,811	$ 35,147	19.4
Sheriff's/BOE	7	Steam Traps	RS	NGas	0	0.0	1,077	1077.2	$ 4,238	$ 57,641	13.6
Sheriff's/BOE	8	Removable Insulation Blankets	RS	NGas	0	0.0	288	288.5	$ 1,135	$ 22,966	20.2
Holding Center	1	Holding Center Interior Retrofit	R	Elec	520,562	97.1	(202)	1574.5	$ 37,051	$ 427,059	11.5
Holding Center	1	Holding Center Interior Controls	R	Elec	1,748	0.0	0	6.0	$ 87	$ 1,434	16.4
Holding Center	33	Replace Chiller	RNE	Elec	78,432	22.7	0	267.6	$ 6,680	$ 384,680	57.6
Holding Center	34	Install Condensing Domestic Hot Water Heaters	RNE	NGas	25,013	0.0	1,482	1566.9	$ 7,080	$ 200,309	28.3
Holding Center	9	Cap Abandon Ahu Roof Penetration	R	NGas	0	0.0	1,139	1139.0	$ 4,481	$ 12,242	2.7
Holding Center	10	Insulate Steam Pipes	R	NGas	0	0.0	469	469.3	$ 1,847	$ 2,149	1.2
Holding Center	30	Pipe Insulation	RNE	NGas	0	0.0	32	31.5	$ 124	$ 4,658	37.5
Holding Center	39	Extend Ddc To Uncontrolled Equipment/Pneumatics	RNE	NGas	0	0.0	2,246	2246.3	$ 8,838	$ 1,453,591	164.5
Holding Center	43	Add Variable Speed Drive To Hot Water Pump	RNE	Elec	25,178	0.0	0	85.9	$ 1,259	$ 66,163	52.6
Holding Center	48	Add Variable Speed Drive To Chilled Water Pumps	RNE	Elec	21,977	0.0	0	75.0	$ 1,099	$ 34,005	30.9
Holding Center	36	Vending Machine Occupancy Controls	R	Elec	9,863	0.0	0	33.7	$ 493	$ 2,386	4.8
Holding Center	37	Open Balance Valve	R	Elec	3,723	0.0	0	12.7	$ 186	$ 2,823	15.2
Holding Center	7	Steam Traps	RS	NGas	0	0.0	1,223	1223.1	$ 4,812	$ 65,420	13.6
Holding Center	3	Holding Center Weatherization	RNE	NGas	1,066	0.0	120	123.6	$ 525	$ 17,472	33.3
Holding Center	42	Kitchen Hood Controls	R	NGas	57,590	0.0	574	770.2	$ 5,137	$ 49,371	9.6
Holding Center	44	Walk-In Refrigeration	RS	Elec	14,125	0.0	0	48.2	$ 706	$ 22,267	31.5
Sheriff's	1	10 Delaware Interior Retrofit	R	Elec	6,223	2.5	0	21.2	$ 610	$ 8,838	14.5
Sheriff's	1	10 Delaware Interior Controls	RNE	Elec	499	0.0	0	1.7	$ 25	$ 709	28.4
Sheriff's	2	10 Delware Exterior Retrofit	R	Elec	2,667	0.0	0	9.1	$ 133	$ 1,712	12.8
Sheriff's	7	Steam Traps	RS	NGas	0	0.0	84	83.9	$ 330	$ 4,463	13.5
Sheriff's	3	10 Delaware Weatherization	R	NGas	30	0.0	11	10.8	$ 44	$ 833	19.1
Holding Center	35	Add Heat Recovery	RNE	NGas	(67,527)	0.0	2,667	2436.2	$ 7,115	$ 143,108	20.1
Holding Center	46	Install Vfds On Supply/Return Fans	R	Elec	217,932	0.0	0	743.6	$ 10,896	$ 33,857	3.1
Holding Center	6	Install Exhaust Fan Controls Holding Center	R	NGas	2,850	0.0	491	500.3	$ 2,073	$ 13,191	6.4
Holding Center	11	Kitchen Booster Heater	R	NGas	0	0.0	404	404.2	$ 1,590	$ 24,161	15.2

Rath Building	12	Ah-10 Controls	R	NGas	93,176	0.0	956	1274.1	$ 9,040	$ 34,682	3.8
Rath Building	13	Snow Melt System Controls	R	NGas	69,190	0.0	990	1226.4	$ 8,009	$ 144,890	18.1
Rath Building	14	Optimal Start	R	NGas	62,596	0.0	1,361	1574.5	$ 9,397	$ 3,706	0.4
Rath Building	43	Add Variable Speed Drive To Hot Water Pump	R	Elec	214,380	0.0	0	731.5	$ 10,622	$ 82,150	7.7
Rath Building	15	Heating Season Chilled Water Pump Controls	R	Elec	155,593	0.0	0	530.9	$ 7,709	$ 43,722	5.7
Rath Building	46	Add Ac Unit Return Fan Vfds	R	Elec	93,488	0.0	0	319.0	$ 4,632	$ 81,430	17.6
Rath Building	16	Reducing Speed Of Ac-1 & Ac-2 Unit Fans	R	Elec	87,190	0.0	0	297.5	$ 4,320	$ 3,854	0.9
Rath Building	17	Add Controls To Vestibule Electric Heaters	R	Elec	46,842	0.0	0	159.8	$ 2,321	$ 15,303	6.6
Rath Building	41	Holiday Scheduling	R	NGas	0	0.0	64	64.1	$ 296	$ 3,706	12.5
Rath Building	40	Extend Ddc To Dhw Pumps	RNE	NGas	1,880	0.0	41	47.4	$ 283	$ 5,928	21.0
Rath Building	18	Add Vfd To Electric Vault Fan	RNE	Elec	8,613	0.0	0	29.4	$ 427	$ 16,456	38.6
Rath Building	36	Vending Machine Occupancy Controls	R	Elec	4,296	0.0	0	14.7	$ 213	$ 1,364	6.4
Rath Building	19	Chiller Plant Optimization	RS	Elec	473,286	0.0	0	1614.9	$ 23,450	$ 257,138	11.0
Rath Building	3	Weatherization	R	NGas	2,754	0.0	617	626.4	$ 2,991	$ 33,100	11.1
Rath Building	32	Install Premium Efficiency Motors	R	Elec	8,048	2.6	0	27.5	$ 714	$ 11,857	16.6
Rath Building	20	Install Ventilation Controls Ahu-11	R	NGas	55,429	0.0	1,743	1931.7	$ 10,808	$ 29,198	2.7
Fire Training Academy	1	Lighting Interior Retrofit	R	Elec	113,168	33.0	(62)	323.7	$ 9,117	$ 90,620	9.9
Fire Training Academy	1	Lighting Interior Controls	R	Elec	2,231	0.0	0	7.6	$ 114	$ 1,787	15.7
Fire Training Academy	2	Lighting Exterior Retrofit	R	Elec	24,734	0.0	0	84.4	$ 1,259	$ 17,580	14.0
Fire Training Academy	21	Replace Rooftop Units	RNE	Elec	19,803	16.5	0	67.6	$ 2,845	$ 103,109	36.2
Fire Training Academy	22	Install Condensing Unit Heaters	RNE	NGas	0	0.0	22	21.5	$ 106	$ 34,748	327.2
Fire Training Academy	23	Replace Air Rotation Unit	RNE	NGas	228	0.0	42	43.2	$ 221	$ 89,921	407.4
Fire Training Academy	36	Vending Machine Occupancy Controls	R	Elec	1,830	0.0	0	6.2	$ 93	$ 682	7.3
Fire Training Academy	6	Install Ventilation Controls	R	NGas	2,384	0.0	149	157.4	$ 857	$ 489	0.6
Fire Training Academy	45	Ventilate Based On Occupancy	RNE	NGas	0	0.0	96	95.6	$ 472	$ 16,233	34.4
Fire Training Academy	40	Extend Ddc To Dhw Pumps	R	NGas	1,636	0.0	56	62.0	$ 361	$ 4,224	11.7
Fire Training Academy	3	Weatherization	R	NGas	7,144	0.0	564	588.2	$ 3,144	$ 58,587	18.6
Hazmat Storage	38	Improve Temperature Control Hazmat	R	NGas	0	0.0	30	30.1	$ 148	$ 778	5.2
New Storage	38	Improve Temperature Control New Storage	R	NGas	0	0.0	27	27.1	$ 134	$ 1,835	13.7
Youth Detention	1	Lighting Interior Retrofit	R	Elec	169,840	36.5	(90)	489.5	$ 12,499	$ 120,702	9.7
Youth Detention	1	Lighting Interior Controls	R	Elec	11,489	0.0	0	39.2	$ 578	$ 8,165	14.1
Youth Detention	2	Lighting Exterior Retrofit	R	Elec	39,732	0.0	0	135.6	$ 1,999	$ 29,988	15.0
Youth Detention	31	Install More Efficient Boiler	RNE	NGas	0	0.0	365	365.2	$ 2,138	$ 132,987	62.2
Youth Detention	11	Kitchen Booster Heater	RNE	Elec	2,810	2.7	(11)	-1.3	$ 409	$ 25,981	63.5
Youth Detention	34	Install Condensing Domestic Hot Water Heater	RNE	NGas	0	0.0	10	9.8	$ 57	$ 13,136	228.6
Youth Detention	30	Pipe Insulation	R	NGas	0	0.0	30	30.4	$ 178	$ 1,260	7.1
Youth Detention	37	Open Isolation Valve	RNE	Elec	838	0.3	0	2.9	$ 74	$ 2,823	38.4
Youth Detention	45	Ventilate Based On Occupancy	R	NGas	0	0.0	180	179.8	$ 1,052	$ 10,078	9.6
Youth Detention	6	Install Ventilation Controls	R	NGas	3,436	0.0	319	330.5	$ 2,039	$ 11,412	5.6
Youth Detention	3	Weatherization	RNE	NGas	1,713	0.0	146	151.7	$ 940	$ 22,734	24.2
Youth Detention	42	Kitchen Hood Controls	R	NGas	40,126	0.0	399	535.9	$ 4,355	$ 51,928	11.9
Youth Detention	44	Walk-in Refrigeration	RS	Elec	7,749	0.0	0	26.4	$ 390	$ 11,102	28.5

Family Court	24	Replace Snow Melt Slab Sensors	RNE	NGas	1,371	0.0	518	522.2	$ 2,474	$ 144,890	58.6
Family Court	14	Optimal Start	R	NGas	70,763	0.0	429	670.6	$ 5,540	$ 3,113	0.6
Family Court	43	Add Variable Speed Drives To Hot Water Pumps	RNE	Elec	63,696	0.0	0	217.3	$ 3,191	$ 75,393	23.6
Family Court	41	Holiday Scheduling	RNE	NGas	0	0.0	29	29.2	$ 136	$ 3,113	22.9
Family Court	40	Extend Ddc To Dhw Pumps	RNE	NGas	927	0.0	31	33.9	$ 189	$ 4,517	23.9
Family Court	3	Weatherization	R	NGas	1,353	0.0	292	296.4	$ 1,424	$ 22,395	15.7
Family Court	34	Install Condensing Domestic Hot Water Heater	RNE	NGas	0	0.0	81	81.0	$ 376	$ 17,485	46.5
Family Court	30	Pipe Insulation	R	NGas	0	0.0	61	60.8	$ 282	$ 1,112	3.9
Family Court	37	Open Balance Valve	R	Elec	3,307	1.0	0	11.3	$ 288	$ 2,964	10.3
Family Court	25	Close Vav By Occupancy & Sp Reset	R	NGas	59,508	0.0	260	463.4	$ 4,192	$ 9,486	2.3
Public Safety Campus	1	Lighting Interior Retrofit	R	Elec	287,948	91.7	(152)	830.3	$ 24,805	$ 405,816	16.4
Public Safety Campus	2	Lighting Exterior Retrofit	R	Elec	24,646	0.0	0	84.1	$ 1,226	$ 9,705	7.9
Public Safety Campus	33	Replace Chiller	RNE	Elec	195,266	69.7	0	666.2	$ 18,185	$ 486,141	26.7
Public Safety Campus	36	Vending Machine Occupancy Controls	R	Elec	5,755	0.0	0	19.6	$ 286	$ 1,023	3.6
Public Safety Campus	3	Weatherization	R	NGas	1,760	0.0	209	214.9	$ 998	$ 13,754	13.8
Public Safety Campus	26	Replace Dx With Chilled Water	RNE	Elec	73,648	16.5	0	251.3	$ 5,662	$ 162,047	28.6
Correctional Facility	1	Lighting Interior Retrofit	R	Elec	642,676	104.2	(308)	1885.3	$ 37,153	$ 431,245	11.6
Correctional Facility	1	Lighting Interior Controls	R	Elec	55	0.0	0	0.2	$ 3	$ 37	13.9
Correctional Facility	2	Lighting Exterior Retrofit	R	Elec	98,469	0.0	0	336.0	$ 4,746	$ 57,810	12.2
Correctional Facility	32	Install Premium Efficiency Motors	RNE	Elec	2,525	0.8	0	8.6	$ 188	$ 4,235	22.5
Correctional Facility	37	Open Triple Duty Valve	R	Elec	8,327	2.4	0	28.4	$ 598	$ 2,964	5.0
Correctional Facility	43	Add Variable Speed Drive To Hot Water Pump	RNE	Elec	5,890	0.0	0	20.1	$ 284	$ 39,814	140.2
Correctional Facility	40	Extend Ddc To Dhw Pumps	R	NGas	3,498	0.0	82	94.4	$ 777	$ 8,744	11.3
Correctional Facility	45	Ventilate Based On Occupancy Ahu 7	R	NGas	0	0.0	312	311.7	$ 2,299	$ 35,147	15.3
Correctional Facility	25	Close Vav By Occupancy & Sp Reset Ahu 5&6	R	NGas	14,557	0.0	85	134.2	$ 1,325	$ 18,350	13.8
Correctional Facility	36	Vending Machine Occupancy Controls	R	Elec	3,177	0.0	0	10.8	$ 153	$ 1,023	6.7
Correctional Facility	3	Weatherization	R	NGas	2,382	0.0	344	351.9	$ 2,651	$ 13,754	5.2
Correctional Facility	42	Kitchen Hood Controls	R	NGas	47,631	0.0	798	960.4	$ 8,181	$ 40,835	5.0
Correctional Facility	44	Walk-In Refrigeration	RS	Elec	18,688	0.0	0	63.8	$ 901	$ 24,674	27.4
Correctional Facility	38	Improve Temp Control 2nd Floor Fin	R	NGas	0	0.0	143	142.8	$ 1,053	$ 18,230	17.3
Law Library	1	Lighting Interior Retrofit	R	Elec	58,779	15.3	(30)	170.6	$ 4,878	$ 66,320	13.6
Law Library	1	Lighting Interior Controls	RNE	Elec	212	0.0	0	0.7	$ 10	$ 239	23.3
Law Library	31	Install More Efficient Boiler	RNE	NGas	0	0.0	83	82.9	$ 441	$ 49,803	112.8
Law Library	21	Replace Rooftop Units	RNE	Elec	21,263	6.2	0	72.6	$ 1,917	$ 190,736	99.5
Law Library	45	Ventilate Based On Occupancy	RNE	NGas	0	0.0	162	162.0	$ 862	$ 21,173	24.6
Law Library	40	Extend Ddc To Dhw Pumps	RNE	NGas	1,191	0.0	19	22.9	$ 158	$ 4,023	25.4
Law Library	3	Weatherization	R	NGas	1,287	0.0	128	132.1	$ 742	$ 10,753	14.5
Aurora Barn	1	Lighting Interior Retrofit	R	Elec	73,817	23.7	(49)	202.4	$ 5,863	$ 51,348	8.8
Aurora Barn	1	Lighting Interior Controls	R	Elec	14,025	0.0	0	47.9	$ 753	$ 9,756	13.0
Aurora Barn	2	Lighting Exterior Retrofit	R	Elec	11,705	0.0	0	39.9	$ 628	$ 6,781	10.8
Aurora Barn	22	Install Condensing Unit Heaters	RNE	NGas	0	0.0	15	14.9	$ 77	$ 23,930	312.7
Aurora Barn	36	Vending Machine Occupancy Controls	R	Elec	1,393	0.0	0	4.8	$ 75	$ 682	9.1
Aurora Barn	38	Improve Temperature Control	R	NGas	0	0.0	348	347.9	$ 1,791	$ 8,670	4.8
Aurora Barn	6	Install Ventilation Controls	R	NGas	954	0.0	12	15.4	$ 114	$ 371	3.3
Aurora Barn	3	Weatherization	R	NGas	0	0.0	563	562.5	$ 2,896	$ 56,711	19.6

Old County Hall	1	Old County Hall Lighting Interior Retrofit	R	Elec	229,825	76.1	0	784.2	$ 21,138	$ 374,838	17.7
Old County Hall	1	Old County Hall Lighting Interior Controls	RNE	Elec	6,764	0.0	0	23.1	$ 350	$ 11,033	31.5
Old County Hall	27	Add Hw Heat Exchanger To Electric Dhw Heater	RNE	Elec	10,557	4.9	(41)	-5.2	$ 974	$ 24,026	24.7
Old County Hall	28	Install Gravity Relief Dampers	R	NGas	0	0.0	397	397.0	$ 1,562	$ 15,779	10.1
Health Mall	1	Lighting Interior Retrofit	R	Elec	35,755	13.0	0	122.0	$ 3,623	$ 56,695	15.6
Health Mall	30	Pipe Insulation	R	NGas	0	0.0	7	6.6	$ 34	$ 635	18.4
Health Mall	39	Extend Ddc To Uncontrolled Equipment	RNE	Elec	21,280	0.0	0	72.6	$ 1,052	$ 28,513	27.1
Health Mall	36	Vending Machine Occupancy Controls	R	Elec	2,148	0.0	0	7.3	$ 106	$ 682	6.4
Health Mall	3	Weatherization	RNE	Elec	6,095	0.0	0	20.8	$ 301	$ 8,310	27.6
Health Mall	40	Extend Ddc To Dhw Pumps	RNE	NGas	1,787	0.0	14	19.7	$ 160	$ 8,752	54.8
Erie County Court(Annex)	1	Erie County Court (Annex) Lighting Interior Retrofit	R	Elec	473,886	116.9	(377)	1240.2	$ 38,125	$ 619,393	16.2
Erie County Court(Annex)	1	Erie County Court (Annex) Lighting Interior Controls	RNE	Elec	29,062	0.0	0	99.2	$ 1,558	$ 37,985	24.4
Erie County Court(Annex)	31	Install More Efficient Boiler	RNE	NGas	0	0.0	1,858	1857.9	$ 7,310	$ 264,757	36.2
Erie County Court(Annex)	34	Install Condensing Domestic Hot Water Heater	RNE	NGas	0	0.0	122	121.9	$ 480	$ 47,476	98.9
Erie County Court(Annex)	30	Pipe Insulation	R	NGas	0	0.0	42	42.2	$ 166	$ 2,445	14.7
Erie County Court(Annex)	40	Extend Ddc To Dhw Pumps	R	NGas	3,872	0.0	145	158.1	$ 778	$ 6,077	7.8
Erie County Court(Annex)	36	Vending Machine Occupancy Controls	R	Elec	6,764	0.0	0	23.1	$ 363	$ 1,364	3.8
Erie County Court(Annex)	37	Open Triple Duty Valve	R	Elec	2,198	0.3	0	7.5	$ 157	$ 2,823	18.0
Erie County Court(Annex)	3	Weatherization	R	NGas	1,836	0.0	399	405.2	$ 1,668	$ 17,726	10.6
Erie County Court(Annex)	35	Add Heat Recovery To Ahu-Gb And Ahu-35N	RNE	NGas	(33,637)	-14.5	981	866.7	$ 291	$ 154,760	532.2
Casino	1	Lighting Interior Retrofit	R	Elec	16,802	6.0	(9)	48.7	$ 1,486	$ 19,996	13.5
Casino	2	Lighting Exterior Retrofit	R	Elec	24,230	0.0	0	82.7	$ 1,213	$ 17,564	14.5
Casino	30	Pipe Insulation	R	NGas	0	0.0	20	19.7	$ 110	$ 1,408	12.8
Casino	38	Improve Temperature Control	R	NGas	0	0.0	41	40.6	$ 226	$ 741	3.3
Casino	36	Vending Machine Occupancy Controls	R	Elec	2,500	0.0	0	8.5	$ 125	$ 341	2.7
Casino	3	Weatherization	RNE	NGas	0	0.0	219	219.3	$ 1,221	$ 57,565	47.1
Park Office	1	Lighting Interior Retrofit	RNE	Elec	10,915	3.8	(6)	30.9	$ 916	$ 20,940	22.9
Park Office	2	Lighting Exterior Retrofit	RNE	Elec	1,638	0.0	0	5.6	$ 77	$ 1,599	20.7
Park Office	31	Install More Efficient Boiler	RNE	NGas	0	0.0	147	146.7	$ 791	$ 29,615	37.4
Park Office	30	Pipe Insulation	R	NGas	0	0.0	24	23.7	$ 128	$ 1,260	9.9
Park Office	38	Improve Temperature Control	R	NGas	0	0.0	130	129.9	$ 700	$ 482	0.7
Radio Repair Building	1	Lighting Interior Retrofit	RNE	Elec	10,210	7.2	(6)	28.4	$ 1,284	$ 25,790	20.1
Radio Repair Building	31	Install More Efficient Boiler	RNE	NGas	0	0.0	132	132.1	$ 730	$ 26,206	35.9
Radio Repair Building	38	Improve Temperature Control	R	NGas	0	0.0	71	70.9	$ 392	$ 963	2.5
Truck Maint. Shop	1	Lighting Interior Retrofit	R	Elec	9,508	3.5	(6)	26.4	$ 670	$ 11,627	17.4
Truck Maint. Shop	38	Improve Temperature Control	R	NGas	0	0.0	88	87.8	$ 467	$ 482	1.0
Truck Maint. Shop	31	Install More Efficient Boiler	RNE	NGas	0	0.0	266	266.0	$ 1,416	$ 38,095	26.9
Sheriff's Bunker	1	Lighting Interior Retrofit	R	Elec	26,472	9.6	0	90.3	$ 1,961	$ 36,133	18.4
Sheriff's Bunker	2	Lighting Exterior Retrofit	R	Elec	6,216	0.0	0	21.2	$ 296	$ 3,251	11.0
Sheriff's Bunker	32	Replace Ah Supply Motor	R	Elec	2,809	0.3	0	9.6	$ 157	$ 3,122	19.9
Sheriff's Bunker	32	Replace Exhaust Fans B&C	RNE	Elec	2,234	0.6	0	7.6	$ 153	$ 5,799	37.9
Sheriff's Bunker	47	Add Controls To Exhaust Fans B&C	R	Elec	46,305	0.0	0	158.0	$ 2,208	$ 14,673	6.6
Sheriff's Bunker	32	Replace Fan D	R	Elec	1,260	0.3	0	4.3	$ 81	$ 1,175	14.5

Harlem District Hwy	1	Lighting Interior Retrofit	R	Elec	29,610	8.0	(20)	80.6	$ 2,333	$ 38,498	16.5
Harlem District Hwy	1	Lighting Interior Controls	RNE	Elec	6,358	0.0	0	21.7	$ 332	$ 8,266	24.9
Harlem District Hwy	2	Lighting Exterior Retrofit	R	Elec	2,671	0.0	0	9.1	$ 139	$ 1,557	11.2
Harlem District Hwy	22	Install Condensing Unit Heaters	RNE	NGas	0	0.0	244	244.2	$ 1,263	$ 125,928	99.7
Harlem District Hwy Buildings and Grounds	31	Install More Efficient Boiler	RNE	NGas	0	0.0	36	36.0	$ 186	$ 11,619	62.4
Harlem District Hwy Maintenance Shop	29	Install Condensing Furnaces	RNE	NGas	82	0.0	17	17.4	$ 93	$ 14,220	153.4
Harlem District Hwy Maintenance Shop	34	Install Condensing Domestic Hot Water Heater	RNE	NGas	0	0.0	2	1.8	$ 9	$ 4,148	446.5
Harlem District Hwy	30	Pipe Insulation	R	NGas	0	0.0	15	14.9	$ 77	$ 1,200	15.6
Harlem District Hwy	38	Improve Temperature Control	R	NGas	0	0.0	594	593.7	$ 3,070	$ 7,600	2.5
Harlem District Hwy	3	Weatherization	RNE	NGas	0	0.0	449	448.7	$ 2,320	$ 58,489	25.2
East Concord Hwy	1	Lighting Interior Retrofit	R	Elec	44,250	15.8	(32)	118.5	$ 4,062	$ 44,180	10.9
East Concord Hwy	1	Lighting Interior Controls	R	Elec	12,863	0.0	0	43.9	$ 719	$ 12,843	17.9
East Concord Hwy	2	Lighting Exterior Retrofit	R	Elec	12,877	0.0	0	43.9	$ 720	$ 6,501	9.0
East Concord Hwy	22	Install Condensing Unit Heaters	RNE	NGas	0	0.0	175	175.3	$ 900	$ 92,452	102.7
East Concord Hwy Maintenance Shop	31	Install More Efficient Boiler	RNE	NGas	0	0.0	22	21.8	$ 112	$ 11,788	105.3
East Concord Hwy	30	Pipe Insulation	RNE	NGas	0	0.0	16	16.0	$ 82	$ 2,117	25.8
East Concord Hwy Vehicle Storage	36	Vending Machine Occupancy Controls	R	Elec	2,545	0.0	0	8.7	$ 142	$ 682	4.8
East Concord Hwy Maintenance Shop	40	Install Aquastat To Control Dhw Recirc Pump	RNE	NGas	262	0.0	11	11.5	$ 69	$ 1,412	20.5
East Concord Hwy Vehicle Storage	6	Install Ventilation Controls	R	NGas	316	0.0	8	9.5	$ 61	$ 371	6.1
East Concord Hwy	3	Weatherization	RNE	NGas	0	0.0	236	235.8	$ 1,211	$ 45,870	37.9
East Concord Hwy Vehicle Storage	38	Improve Temperature Control Office/Storage Only	R	NGas	0	0.0	174	174.4	$ 895	$ 1,412	1.6
Hamburg Hwy	1	Lighting Interior Retrofit	R	Elec	39,155	11.2	(31)	102.3	$ 3,094	$ 24,855	8.0
Hamburg Hwy	1	Lighting Interior Controls	R	Elec	16,152	0.0	0	55.1	$ 825	$ 10,253	12.4
Hamburg Hwy	2	Lighting Exterior Retrofit	R	Elec	3,339	0.0	0	11.4	$ 170	$ 2,038	12.0
Hamburg Hwy	22	Install Condensing Unit Heaters	RNE	NGas	0	0.0	406	406.4	$ 2,082	$ 180,636	86.7
Hamburg Hwy Maintenance Shop	30	Pipe Insulation	RNE	NGas	0	0.0	4	3.8	$ 20	$ 706	36.1
Hamburg Hwy	38	Improve Temperature Control	R	NGas	0	0.0	707	706.5	$ 3,620	$ 5,780	1.6
Hamburg Hwy Maintenance Shop	36	Vending Machine Occupancy Controls	R	Elec	1,554	0.0	0	5.3	$ 79	$ 682	8.6
Hamburg Hwy	3	Weatherization	R	NGas	0	0.0	398	397.9	$ 2,039	$ 29,201	14.3
Angola Hwy	1	Lighting Interior Retrofit	R	Elec	4,213	5.2	(2)	12.0	$ 978	$ 18,323	18.7
Angola Hwy	2	Lighting Exterior Retrofit	R	Elec	5,166	0.0	0	17.6	$ 326	$ 3,605	11.1
Angola Hwy	38	Improve Temperature Control	R	NGas	0	0.0	579	579.3	$ 2,948	$ 5,299	1.8
Angola Hwy	3	Weatherization	RNE	NGas	0	0.0	304	304.1	$ 1,547	$ 35,540	23.0
Collins Hwy	1	Lighting Interior Retrofit	R	Elec	1,641	3.8	(3)	2.4	$ 593	$ 5,573	9.4
Collins Hwy	1	Lighting Interior Controls	RNE	Elec	3,902	0.0	0	13.3	$ 186	$ 13,253	71.1
Collins Hwy	2	Lighting Exterior Retrofit	RNE	Elec	1,471	0.0	0	5.0	$ 70	$ 3,584	51.0
Collins Hwy	22	Install Condensing Unit Heaters	RNE	NGas	0	0.0	140	140.3	$ 728	$ 57,348	78.8
Collins Hwy Maintenance Shop	31	Install More Efficient Boiler	RNE	NGas	0	0.0	20	19.9	$ 103	$ 11,956	115.6
Collins Hwy Maintenance Shop	30	Pipe Insulation	RNE	NGas	0	0.0	7	7.1	$ 37	$ 1,764	48.1
Collins Hwy	38	Improve Temperature Control	R	NGas	0	0.0	451	451.1	$ 2,340	$ 2,294	1.0
Collins Hwy	3	Weatherization	RNE	NGas	0	0.0	294	294.0	$ 1,525	$ 31,849	20.9
Clarence Hwy	1	Lighting Interior Retrofit	R	Elec	58,134	16.8	(38)	160.3	$ 4,376	$ 62,243	14.2
Clarence Hwy	1	Lighting Interior Controls	R	Elec	9,211	0.0	0	31.4	$ 517	$ 9,862	19.1
Clarence Hwy	2	Lighting Exterior Retrofit	R	Elec	5,515	0.0	0	18.8	$ 310	$ 4,074	13.2
Clarence Hwy	22	Install Condensing Unit Heaters	RNE	NGas	0	0.0	191	191.5	$ 987	$ 104,915	106.3
Clarence Hwy Maintenance Shop	29	Install Condensing Furnaces	RNE	NGas	36	0.0	7	6.8	$ 37	$ 8,536	233.5
Clarence Hwy Maintenance Shop	34	Install Condensing Domestic Hot Water Heater	RNE	NGas	0	0.0	2	2.2	$ 11	$ 17,181	1524.0
Clarence Hwy Maintenance Shop	30	Pipe Insulation	R	NGas	0	0.0	9	8.6	$ 45	$ 776	17.4
Clarence Hwy	38	Improve Temperature Control	R	NGas	0	0.0	323	323.2	$ 1,665	$ 4,764	2.9
Clarence Hwy Maintenance Shop	6	Install Ventilation Controls	R	NGas	46	0.0	12	12.6	$ 67	$ 371	5.5
Clarence Hwy	3	Weatherization	RNE	NGas	0	0.0	161	161.3	$ 831	$ 18,402	22.1
South Protection Hwy	1	Lighting Interior Retrofit	R	Elec	4,964	1.7	(3)	14.1	$ 522	$ 8,276	15.8
South Protection Hwy	2	Lighting Exterior Retrofit	R	Elec	3,083	0.0	0	10.5	$ 218	$ 3,380	15.5
South Protection Hwy	22	Install Condensing Unit Heaters	RNE	NGas	0	0.0	12	11.6	$ 61	$ 17,374	284.2
South Protection Hwy	38	Improve Temperature Control	R	NGas	0	0.0	250	250.1	$ 1,323	$ 2,470	1.9
South Protection Hwy	3	Weatherization	RNE	NGas	0	0.0	229	228.7	$ 1,210	$ 26,838	22.2
Tonawanda Hwy	1	Lighting Interior Retrofit	R	Elec	30,724	3.8	(24)	81.1	$ 1,889	$ 13,499	7.1
Tonawanda Hwy	1	Lighting Interior Controls	R	Elec	10,950	0.0	0	37.4	$ 529	$ 4,811	9.1
Tonawanda Hwy	2	Lighting Exterior Retrofit	RNE	Elec	2,457	0.0	0	8.4	$ 119	$ 2,942	24.8
Tonawanda Hwy	22	Install Condensing Unit Heaters	RNE	NGas	0	0.0	182	181.7	$ 938	$ 74,953	79.9
Tonawanda Hwy	38	Improve Temperature Control	R	NGas	0	0.0	789	789.5	$ 4,077	$ 3,882	1.0
Tonawanda Hwy	3	Weatherization	RNE	NGas	0	0.0	284	283.9	$ 1,466	$ 37,013	25.2
					5,632,211	**891.2**	**37,281**	**56,498**	**$ 558,980**	**$ 12,194,604**	**21.8**

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1. EXECUTIVE SUMMARY

Project Background

Twenty six of Erie County's buildings were surveyed to provide the them with possible energy conservation opportunities. This report presents the results of that field work and the analysis that was performed afterwards.

The buildings' heating / ventilating / air conditioning systems, and lighting contribute to these County building's most extensive energy use. Within these areas, measures were identified that, if implemented, will lower energy consumption and operating cost(s). The measures outlined in this report should be viewed not only for their energy cost reduction value but also for the improvement of occupant comfort.

Energy Use

Electricity and Natural Gas usage was analyzed for all of the buildings within the scope of work. The combined Energy Use Intensity (EUI) of the 26 buildings surveyed for Erie County was **125.2 kBtu/sq ft**.

Measures were identified to reduce energy use and improve the EUI at Erie County. Calculations were performed to quantify the energy savings that would be achieved by implementing the various Facility Improvement Measures (FIMs) identified during the site visits. If all the recommended FIMSs were implemented, the estimated EUI would be **96.4 kBtu/sq ft**.

Summary of ECM Findings

During the site visits and interaction with the building operators, it was established that Erie County has taken steps to be more energy efficient. However, some Facility Improvement Measures were identified that would have a positive impact on the buildings' energy usage. A full description of each energy conservation measure can be found in the "Projects Results / Recommendations" section of this report.

The top five energy conservation measures that will have the greatest impact on energy savings for the county are:

- **Interior Lighting Retrofit and Controls**: Most of the buildings currently have newer technology fluorescent lighting, however LED lighting is now at a price point that makes it advantageous to upgrade interior and exterior lighting fixtures with LED technology. Some areas of the buildings would also benefit with the addition of lighting controls, such as occupancy sensors. A large portion of the installation costs associated with this measure may be offset with SBC incentives if eligible lighting fixtures are installed.

- **Exterior Lighting Retrofit and Controls**: Throughout the county, a majority of exterior lighting fixtures are of a high intensity discharge type, which consume significantly more energy than LED lighting fixtures. In order to facilitate energy savings and have a consistent maintenance schedule, all of the exterior lighting that is currently not LED should be converted to LED. Additionally, the county could install photocell control and tie the exterior lights into the existing building management systems in order to reduce the amount of hours the lights are on.

- **Improve Temperature Control**: The ability to accurately control the temperature of a building is possibly the most important factor in reducing energy consumption, while maintaining a comfortable environment. Energy savings occurs when the temperature is set to a desired range while occupants are within an area, and “setback” when they are not. Erie county has a wide range of temperature control devices such as thermostats (manual and programmable), pneumatic control systems and direct digital control systems. There are also many pieces of HVAC equipment that are either uncontrolled or the controls are in a state of disrepair. Erie county should utilize temperature control measures such as programmable thermostats, extending control systems to uncontrolled equipment, and upgrading the existing control systems.

- **Weatherization**: One of the primary modes of heat transfer into or out a building is through the shell of the building, aka the envelope. Insulation helps reduce conductive heat transfer and sealing helps reduce convective heat transfer. The better insulated and sealed a building is, the better it can keep the desired conditions within it and reduce energy consumption. Erie county can greatly benefit from a comprehensive weatherization project that will improve occupant comfort and reduce energy use.

- **VFD on Pumps and Fan Motors** : HVAC equipment that has motor driven pumps and fans often run at full speed. In many instances the pumps and fans are moving a greater amount of fluid than the space or equipment demands. Variable frequency drives (VFDs) can adjust the speed of the motor based on feedback sensors (typically pressure or temperature) to the desired speed. The reduction in speed reduces energy consumption and wear on the equipment. Specific pumps and fans that should be controlled with variable frequency drives can be found in section 5 of this report.

A full list of ECMs discovered at Erie County are as follow:

FIM #	FIM Description
1	Lighting Interior / Controls
2	Lighting Exterior / Controls
3	Weatherization
4	Replace Hvac System
5	134 W. Eagle Night Setback With Steam Valves
6	Install Ventilation Controls
7	Steam Traps
8	Removable Insulation Blankets
9	Cap Abandon Ahu Roof Penetration
10	Insulate Steam Pipes
11	Kitchen Booster Heater
12	Ah-10 Controls
13	Snow Melt System Controls
14	Optimal Start
15	Heating Season Chilled Water Pump Controls
16	Reducing Speed Of Ac-1 & Ac-2 Unit Fans
17	Add Controls To Vestibule Electric Heaters
18	Add Vfd To Electric Vault Fan
19	Chiller Plant Optimization
20	Install Ventilation Controls Ahu-11
21	Replace Rooftop Units
22	Install Condensing Unit Heaters
23	Replace Air Rotation Unit
24	Replace Snow Melt Slab Sensors
25	Close Vav By Occupancy & Sp Reset
26	Replace Dx With Chilled Water
27	Add Hw Heat Exchanger To Electric Dhw Heater
28	Install Gravity Relief Dampers
29	Install Condensing Furnaces
30	Pipe Insulation
31	Install More Efficient Boiler
32	Install Premium Efficiency Motors
33	Replace Chiller
34	Install Condensing Domestic Hot Water Heater
35	Add Heat Recovery
36	Vending Machine Occupancy Controls
37	Open Triple Duty Valve
38	Improve Temperature Control
39	Extend Ddc To Uncontrolled Equipment
40	Extend Ddc To Dhw Pumps
41	Holiday Scheduling
42	Kitchen Hood Controls
43	Add Variable Speed Drive To Hot Water Pump
44	Walk-In Refrigeration
45	Ventilate Based on Occupancy
46	Install Vfds On Supply/Return Fans
47	Add Controls To Exhaust Fans B&C
48	Add Variable Speed Drive To Chilled Water Pumps

Energy Savings

All of the energy conservation measures listed in this report will have a positive impact on reducing energy consumption and Erie County's utility costs. In addition, many of the measures will yield non-energy benefits, such as reduced maintenance, longer equipment life and improved occupant comfort.

This FlexTech study was used for the purpose of identifying and evaluating opportunities and measures that would save energy. It does not include complete engineering design. The advisability of these measures will ultimately depend upon the specific scope of work developed during the design phase and contractor pricing for each specified scope of work.

The table on the following page summarize the energy savings and projected costs for each measure identified.

Erie County is considering entering into an energy performance contract. Based on this they have asked that all measures discovered during this study remain as "Recommended" in the savings summary regardless of the length of simple payback. All energy cost savings in this report are calculated based on the individual building utility rates.

If the recommended measures were implemented, the total annual energy savings are estimated to be **$558,980** with a total estimated investment of **$12,194,604**. If these measures were implemented collectively, the payback period would be **21.8** years.

BASELINE ENERGY SUMMARY

	Electric (kWh)	Natural Gas (therms)	#2 Oil (gallons)	#4 Oil (gallons)	#6 Oil (gallons)	Steam (lbs.)	Propane (gallons)	Coal (tons)	Other (MMBtu)	**Total Baseline Use (MMBtu)**
Baseline Energy Use	29,438,423	1,453,970								**245,840.9**
Average Utility Rate	$0.0515	$0.5213								**Total Annual Cost ($)**
Baseline Annual Cost	$2,184,059	$744,565								**$2,928,624**

ENERGY SAVINGS SUMMARY

Building	Measure Description	Measure Status [1]	Fuel Savings Type [2]	Electric		Fuel Savings (MMBtu)	Energy Savings to Total Baseline Use (%) [3]	Annual Cost Savings	Cost Savings to Total Annual Cost (%) [4]	Project Cost	Simple Payback (Years)
				Supply Savings (kWh)	Demand Savings (kW)						
Jesse Nash Health Center	Lighting Interior Retrofit	R	Elec	60,551	18.6	-35	0.1%	$5,340	0.2%	$99,042	18.5
Jesse Nash Health Center	Lighting Interior Controls	RNE	Elec	7,471	0.0	0	0.0%	$355	0.0%	$12,220	34.4
Jesse Nash Health Center	Lighting Exterior Retrofit	R	Elec	4,133	0.0	0	0.0%	$196	0.0%	$2,093	10.7
Jesse Nash Health Center	Pipe Insulation	R	NGas	0	0.0	9	0.0%	$50	0.0%	$667	13.2
Jesse Nash Health Center	Replace Hvac System	RNE	NGas	83,155	0.6	486	0.3%	$6,632	0.2%	$1,671,119	252.0
Jesse Nash Health Center	Vending Machine Occupancy Controls	R	Elec	2,135	0.0	0	0.0%	$101	0.0%	$682	6.7
Jesse Nash Health Center	Weatherization	R	NGas	2,603	0.0	244	0.1%	$1,432	0.0%	$21,360	14.9
Sheriff's/BOE	120 West Eagle Interior Retrofit	R	Elec	21,163	6.3	0	0.0%	$1,825	0.1%	$25,564	14.0
Sheriff's/BOE	120 West Eagle Interior Contols	RNE	Elec	410	0.0	0	0.0%	$21	0.0%	$495	24.2
Sheriff's/BOE	134 West Eagle Interior Retrofit	R	Elec	115,225	26.1	0	0.2%	$8,935	0.3%	$100,478	11.2
Sheriff's/BOE	134 West Eagle Interior Controls	R	Elec	1,433	0.0	0	0.0%	$72	0.0%	$1,250	17.4
Sheriff's/BOE	134 W. Eagle Night Setback With Steam Valves	R	NGas	0	0.0	1,953	0.8%	$7,683	0.3%	$75,028	9.8
Sheriff's/BOE	Install Exhaust Fan Controls 134 W Eagle	R	NGas	2,893	0.0	424	0.2%	$1,811	0.1%	$35,147	19.4
Sheriff's/BOE	Steam Traps	RS	NGas	0	0.0	1,077	0.4%	$4,238	0.1%	$57,641	13.6
Sheriff's/BOE	Removable Insulation Blankets	RS	NGas	0	0.0	288	0.1%	$1,135	0.0%	$22,966	20.2
Holding Center	Holding Center Interior Retrofit	R	Elec	520,562	97.1	-202	0.6%	$37,051	1.3%	$427,059	11.5
Holding Center	Holding Center Interior Controls	R	Elec	1,748	0.0	0	0.0%	$87	0.0%	$1,434	16.4
Holding Center	Replace Chiller	RNE	Elec	78,432	22.7	0	0.1%	$6,680	0.2%	$384,680	57.6
Holding Center	Install Condensing Domestic Hot Water Heaters	RNE	NGas	25,013	0.0	1,482	0.6%	$7,080	0.2%	$200,309	28.3
Holding Center	Cap Abandon Ahu Roof Penetration	R	NGas	0	0.0	1,139	0.5%	$4,481	0.2%	$12,242	2.7
Holding Center	Insulate Steam Pipes	R	NGas	0	0.0	469	0.2%	$1,847	0.1%	$2,149	1.2
Holding Center	Pipe Insulation	RNE	NGas	0	0.0	32	0.0%	$124	0.0%	$4,658	37.5
Holding Center	Extend Ddc To Uncontrolled Equipment/Pneumatics	RNE	NGas	0	0.0	2,246	0.9%	$8,838	0.3%	$1,453,591	164.5
Holding Center	Add Variable Speed Drive To Hot Water Pump	RNE	Elec	25,178	0.0	0	0.0%	$1,259	0.0%	$66,163	52.6
Holding Center	Add Variable Speed Drive To Chilled Water Pumps	RNE	Elec	21,977	0.0	0	0.0%	$1,099	0.0%	$34,005	30.9
Holding Center	Vending Machine Occupancy Controls	R	Elec	9,863	0.0	0	0.0%	$493	0.0%	$2,386	4.8
Holding Center	Open Balance Valve	R	Elec	3,723	0.0	0	0.0%	$186	0.0%	$2,823	15.2
Holding Center	Steam Traps	RS	NGas	0	0.0	1,223	0.5%	$4,812	0.2%	$65,420	13.6
Holding Center	Holding Center Weatherization	RNE	NGas	1,066	0.0	120	0.1%	$525	0.0%	$17,472	33.3
Holding Center	Kitchen Hood Controls	R	NGas	57,590	0.0	574	0.3%	$5,137	0.2%	$49,371	9.6
Holding Center	Walk-In Refrigeration	RS	Elec	14,125	0.0	0	0.0%	$706	0.0%	$22,267	31.5
Sheriff's	10 Delaware Interior Retrofit	R	Elec	6,223	2.5	0	0.0%	$610	0.0%	$8,838	14.5
Sheriff's	10 Delaware Interior Controls	RNE	Elec	499	0.0	0	0.0%	$25	0.0%	$709	28.4
Sheriff's	10 Delware Exterior Retrofit	R	Elec	2,667	0.0	0	0.0%	$133	0.0%	$1,712	12.8
Sheriff's	Steam Traps	RS	NGas	0	0.0	84	0.0%	$330	0.0%	$4,463	13.5
Sheriff's	10 Delaware Weatherization	R	NGas	30	0.0	11	0.0%	$44	0.0%	$833	19.1
Holding Center	Add Heat Recovery	RNE	NGas	-67,527	0.0	2,667	1.0%	$7,115	0.2%	$143,108	20.1
Holding Center	Install Vfds On Supply/Return Fans	R	Elec	217,932	0.0	0	0.3%	$10,896	0.4%	$33,857	3.1
Holding Center	Install Exhaust Fan Controls Holding Center	R	NGas	2,850	0.0	491	0.2%	$2,073	0.1%	$13,191	6.4
Holding Center	Kitchen Booster Heater	R	NGas	0	0.0	404	0.2%	$1,590	0.1%	$24,161	15.2
Rath Building	Ah-10 Controls	R	NGas	93,176	0.0	956	0.5%	$9,040	0.3%	$34,682	3.8
Rath Building	Snow Melt System Controls	R	NGas	69,190	0.0	990	0.5%	$8,009	0.3%	$144,890	18.1
Rath Building	Optimal Start	R	NGas	62,596	0.0	1,361	0.6%	$9,397	0.3%	$3,706	0.4
Rath Building	Add Variable Speed Drive To Hot Water Pump	R	Elec	214,380	0.0	0	0.3%	$10,622	0.4%	$82,150	7.7
Rath Building	Heating Season Chilled Water Pump Controls	R	Elec	155,593	0.0	0	0.2%	$7,709	0.3%	$43,722	5.7
Rath Building	Add Ac Unit Return Fan Vfds	R	Elec	93,488	0.0	0	0.1%	$4,632	0.2%	$81,430	17.6
Rath Building	Reducing Speed Of Ac-1 & Ac-2 Unit Fans	R	Elec	87,190	0.0	0	0.1%	$4,320	0.1%	$3,854	0.9
Rath Building	Add Controls To Vestibule Electric Heaters	R	Elec	46,842	0.0	0	0.1%	$2,321	0.1%	$15,303	6.6
Rath Building	Holiday Scheduling	R	NGas	0	0.0	64	0.0%	$296	0.0%	$3,706	12.5
Rath Building	Extend Ddc To Dhw Pumps	RNE	NGas	1,880	0.0	41	0.0%	$283	0.0%	$5,928	21.0
Rath Building	Add Vfd To Electric Vault Fan	RNE	Elec	8,613	0.0	0	0.0%	$427	0.0%	$16,456	38.6
Rath Building	Vending Machine Occupancy Controls	R	Elec	4,296	0.0	0	0.0%	$213	0.0%	$1,364	6.4
Rath Building	Chiller Plant Optimization	RS	Elec	473,286	0.0	0	0.7%	$23,450	0.8%	$257,138	11.0
Rath Building	Weatherization	R	NGas	2,754	0.0	617	0.3%	$2,991	0.1%	$33,100	11.1
Rath Building	Install Premium Efficiency Motors	R	Elec	8,048	2.6	0	0.0%	$714	0.0%	$11,857	16.6
Rath Building	Install Ventilation Controls Ahu-11	R	NGas	55,429	0.0	1,743	0.8%	$10,808	0.4%	$29,198	2.7
Fire Training Academy	Lighting Interior Retrofit	R	Elec	113,168	33.0	-62	0.1%	$9,117	0.3%	$90,620	9.9
Fire Training Academy	Lighting Interior Controls	R	Elec	2,231	0.0	0	0.0%	$114	0.0%	$1,787	15.7
Fire Training Academy	Lighting Exterior Retrofit	R	Elec	24,734	0.0	0	0.0%	$1,259	0.0%	$17,580	14.0
Fire Training Academy	Replace Rooftop Units	RNE	Elec	19,803	16.5	0	0.0%	$2,845	0.1%	$103,109	36.2
Fire Training Academy	Install Condensing Unit Heaters	RNE	NGas	0	0.0	22	0.0%	$106	0.0%	$34,748	327.2
Fire Training Academy	Replace Air Rotation Unit	RNE	NGas	228	0.0	42	0.0%	$221	0.0%	$89,921	407.4
Fire Training Academy	Vending Machine Occupancy Controls	R	Elec	1,830	0.0	0	0.0%	$93	0.0%	$682	7.3
Fire Training Academy	Install Ventilation Controls	R	NGas	2,384	0.0	149	0.1%	$857	0.0%	$489	0.6
Fire Training Academy	Ventilate Based On Occupancy	RNE	NGas	0	0.0	96	0.0%	$472	0.0%	$16,233	34.4
Fire Training Academy	Extend Ddc To Dhw Pumps	R	NGas	1,636	0.0	56	0.0%	$361	0.0%	$4,224	11.7
Fire Training Academy	Weatherization	R	NGas	7,144	0.0	564	0.2%	$3,144	0.1%	$58,587	18.6
Hazmat Storage	Improve Temperature Control Hazmat	R	NGas	0	0.0	30	0.0%	$148	0.0%	$778	5.2
New Storage	Improve Temperature Control New Storage	R	NGas	0	0.0	27	0.0%	$134	0.0%	$1,835	13.7
Youth Detention	Lighting Interior Retrofit	R	Elec	169,840	36.5	-90	0.2%	$12,499	0.4%	$120,702	9.7
Youth Detention	Lighting Interior Controls	R	Elec	11,489	0.0	0	0.0%	$578	0.0%	$8,165	14.1
Youth Detention	Lighting Exterior Retrofit	R	Elec	39,732	0.0	0	0.1%	$1,999	0.1%	$29,988	15.0
Youth Detention	Install More Efficient Boiler	RNE	NGas	0	0.0	365	0.1%	$2,138	0.1%	$132,987	62.2
Youth Detention	Kitchen Booster Heater	RNE	Elec	2,810	2.7	-11	0.0%	$409	0.0%	$25,981	63.5
Youth Detention	Install Condensing Domestic Hot Water Heater	RNE	NGas	0	0.0	10	0.0%	$57	0.0%	$13,136	228.6
Youth Detention	Pipe Insulation	R	NGas	0	0.0	30	0.0%	$178	0.0%	$1,260	7.1
Youth Detention	Open Isolation Valve	RNE	Elec	838	0.3	0	0.0%	$74	0.0%	$2,823	38.4
Youth Detention	Ventilate Based On Occupancy	R	NGas	0	0.0	180	0.1%	$1,052	0.0%	$10,078	9.6
Youth Detention	Install Ventilation Controls	R	NGas	3,436	0.0	319	0.1%	$2,039	0.1%	$11,412	5.6
Youth Detention	Weatherization	RNE	NGas	1,713	0.0	146	0.1%	$940	0.0%	$22,734	24.2
Youth Detention	Kitchen Hood Controls	R	NGas	40,126	0.0	399	0.2%	$4,355	0.1%	$51,928	11.9
Youth Detention	Walk-in Refrigeration	RS	Elec	7,749	0.0	0	0.0%	$390	0.0%	$11,102	28.5

Family Court	Replace Snow Melt Slab Sensors	RNE	NGas	1,371	0.0	518	0.2%	$2,474	0.1%	$144,890	58.6
Family Court	Optimal Start	R	NGas	70,763	0.0	429	0.3%	$5,540	0.2%	$3,113	0.6
Family Court	Add Variable Speed Drives To Hot Water Pumps	RNE	Elec	63,696	0.0	0	0.1%	$3,191	0.1%	$75,393	23.6
Family Court	Holiday Scheduling	RNE	NGas	0	0.0	29	0.0%	$136	0.0%	$3,113	22.9
Family Court	Extend Ddc To Dhw Pumps	RNE	NGas	927	0.0	31	0.0%	$189	0.0%	$4,517	23.9
Family Court	Weatherization	R	NGas	1,353	0.0	292	0.1%	$1,424	0.0%	$22,395	15.7
Family Court	Install Condensing Domestic Hot Water Heater	RNE	NGas	0	0.0	81	0.0%	$376	0.0%	$17,485	46.5
Family Court	Pipe Insulation	R	NGas	0	0.0	61	0.0%	$282	0.0%	$1,112	3.9
Family Court	Open Balance Valve	R	Elec	3,307	1.0	0	0.0%	$288	0.0%	$2,964	10.3
Family Court	Close Vav By Occupancy & Sp Reset	R	NGas	59,508	0.0	260	0.2%	$4,192	0.1%	$9,486	2.3
Public Safety Campus	Lighting Interior Retrofit	R	Elec	287,948	91.7	-152	0.3%	$24,805	0.8%	$405,816	16.4
Public Safety Campus	Lighting Exterior Retrofit	R	Elec	24,646	0.0	0	0.0%	$1,226	0.0%	$9,705	7.9
Public Safety Campus	Replace Chiller	RNE	Elec	195,266	69.7	0	0.3%	$18,185	0.6%	$486,141	26.7
Public Safety Campus	Vending Machine Occupancy Controls	R	Elec	5,755	0.0	0	0.0%	$286	0.0%	$1,023	3.6
Public Safety Campus	Weatherization	R	NGas	1,760	0.0	209	0.1%	$998	0.0%	$13,754	13.8
Public Safety Campus	Replace Dx With Chilled Water	RNE	Elec	73,648	16.5	0	0.1%	$5,662	0.2%	$162,047	28.6
Correctional Facility	Lighting Interior Retrofit	R	Elec	642,676	104.2	-308	0.8%	$37,153	1.3%	$431,245	11.6
Correctional Facility	Lighting Interior Controls	R	Elec	55	0.0	0	0.0%	$3	0.0%	$37	13.9
Correctional Facility	Lighting Exterior Retrofit	R	Elec	98,469	0.0	0	0.1%	$4,746	0.2%	$57,810	12.2
Correctional Facility	Install Premium Efficiency Motors	RNE	Elec	2,525	0.8	0	0.0%	$188	0.0%	$4,235	22.5
Correctional Facility	Open Triple Duty Valve	R	Elec	8,327	2.4	0	0.0%	$598	0.0%	$2,964	5.0
Correctional Facility	Add Variable Speed Drive To Hot Water Pump	RNE	Elec	5,890	0.0	0	0.0%	$284	0.0%	$39,814	140.2
Correctional Facility	Extend Ddc To Dhw Pumps	R	NGas	3,498	0.0	82	0.0%	$777	0.0%	$8,744	11.3
Correctional Facility	Ventilate Based On Occupancy Ahu 7	R	NGas	0	0.0	312	0.1%	$2,299	0.1%	$35,147	15.3
Correctional Facility	Close Vav By Occupancy & Sp Reset Ahu 5&6	R	NGas	14,557	0.0	85	0.1%	$1,325	0.0%	$18,350	13.8
Correctional Facility	Vending Machine Occupancy Controls	R	Elec	3,177	0.0	0	0.0%	$153	0.0%	$1,023	6.7
Correctional Facility	Weatherization	R	NGas	2,382	0.0	344	0.1%	$2,651	0.1%	$13,754	5.2
Correctional Facility	Kitchen Hood Controls	R	NGas	47,631	0.0	798	0.4%	$8,181	0.3%	$40,835	5.0
Correctional Facility	Walk-In Refrigeration	RS	Elec	18,688	0.0	0	0.0%	$901	0.0%	$24,674	27.4
Correctional Facility	Improve Temp Control 2nd Floor Fin	R	NGas	0	0.0	143	0.1%	$1,053	0.0%	$18,230	17.3
Law Library	Lighting Interior Retrofit	R	Elec	58,779	15.3	-30	0.1%	$4,878	0.2%	$66,320	13.6
Law Library	Lighting Interior Controls	RNE	Elec	212	0.0	0	0.0%	$10	0.0%	$239	23.3
Law Library	Install More Efficient Boiler	RNE	NGas	0	0.0	83	0.0%	$441	0.0%	$49,803	112.8
Law Library	Replace Rooftop Units	RNE	Elec	21,263	6.2	0	0.0%	$1,917	0.1%	$190,736	99.5
Law Library	Ventilate Based On Occupancy	RNE	NGas	0	0.0	162	0.1%	$862	0.0%	$21,173	24.6
Law Library	Extend Ddc To Dhw Pumps	RNE	NGas	1,191	0.0	19	0.0%	$158	0.0%	$4,023	25.4
Law Library	Weatherization	R	NGas	1,287	0.0	128	0.1%	$742	0.0%	$10,753	14.5
Aurora Barn	Lighting Interior Retrofit	R	Elec	73,817	23.7	-49	0.1%	$5,863	0.2%	$51,348	8.8
Aurora Barn	Lighting Interior Controls	R	Elec	14,025	0.0	0	0.0%	$753	0.0%	$9,756	13.0
Aurora Barn	Lighting Exterior Retrofit	R	Elec	11,705	0.0	0	0.0%	$628	0.0%	$6,781	10.8
Aurora Barn	Install Condensing Unit Heaters	RNE	NGas	0	0.0	15	0.0%	$77	0.0%	$23,930	312.7
Aurora Barn	Vending Machine Occupancy Controls	R	Elec	1,393	0.0	0	0.0%	$75	0.0%	$682	9.1
Aurora Barn	Improve Temperature Control	R	NGas	0	0.0	348	0.1%	$1,791	0.1%	$8,670	4.8
Aurora Barn	Install Ventilation Controls	R	NGas	954	0.0	12	0.0%	$114	0.0%	$371	3.3
Aurora Barn	Weatherization	R	NGas	0	0.0	563	0.2%	$2,896	0.1%	$56,711	19.6
Old County Hall	Old County Hall Lighting Interior Retrofit	R	Elec	229,825	76.1	0	0.3%	$21,138	0.7%	$374,838	17.7
Old County Hall	Old County Hall Lighting Interior Controls	RNE	Elec	6,764	0.0	0	0.0%	$350	0.0%	$11,033	31.5
Old County Hall	Add Hw Heat Exchanger To Electric Dhw Heater	RNE	Elec	10,557	4.9	-41	0.0%	$974	0.0%	$24,026	24.7
Old County Hall	Install Gravity Relief Dampers	R	NGas	0	0.0	397	0.2%	$1,562	0.1%	$15,779	10.1
Health Mall	Lighting Interior Retrofit	R	Elec	35,755	13.0	0	0.0%	$3,623	0.1%	$56,695	15.6
Health Mall	Pipe Insulation	R	NGas	0	0.0	7	0.0%	$34	0.0%	$635	18.4
Health Mall	Extend Ddc To Uncontrolled Equipment	RNE	Elec	21,280	0.0	0	0.0%	$1,052	0.0%	$28,513	27.1
Health Mall	Vending Machine Occupancy Controls	R	Elec	2,148	0.0	0	0.0%	$106	0.0%	$682	6.4
Health Mall	Weatherization	RNE	Elec	6,095	0.0	0	0.0%	$301	0.0%	$8,310	27.6
Health Mall	Extend Ddc To Dhw Pumps	RNE	NGas	1,787	0.0	14	0.0%	$160	0.0%	$8,752	54.8
Erie County Court(Annex)	Erie County Court (Annex) Lighting Interior Retrofit	R	Elec	473,886	116.9	-377	0.5%	$38,125	1.3%	$619,393	16.2
Erie County Court(Annex)	Erie County Court (Annex) Lighting Interior Controls	RNE	Elec	29,062	0.0	0	0.0%	$1,558	0.1%	$37,985	24.4
Erie County Court(Annex)	Install More Efficient Boiler	RNE	NGas	0	0.0	1,858	0.8%	$7,310	0.2%	$264,757	36.2
Erie County Court(Annex)	Install Condensing Domestic Hot Water Heater	RNE	NGas	0	0.0	122	0.0%	$480	0.0%	$47,476	98.9
Erie County Court(Annex)	Pipe Insulation	R	NGas	0	0.0	42	0.0%	$166	0.0%	$2,445	14.7
Erie County Court(Annex)	Extend Ddc To Dhw Pumps	R	NGas	3,872	0.0	145	0.1%	$778	0.0%	$6,077	7.8
Erie County Court(Annex)	Vending Machine Occupancy Controls	R	Elec	6,764	0.0	0	0.0%	$363	0.0%	$1,364	3.8
Erie County Court(Annex)	Open Triple Duty Valve	R	Elec	2,198	0.3	0	0.0%	$157	0.0%	$2,823	18.0
Erie County Court(Annex)	Weatherization	R	NGas	1,836	0.0	399	0.2%	$1,668	0.1%	$17,726	10.6
Erie County Court(Annex)	Add Heat Recovery To Ahu-Gb And Ahu-35N	RNE	NGas	-33,637	-14.5	981	0.4%	$291	0.0%	$154,760	532.2
Casino	Lighting Interior Retrofit	R	Elec	16,802	6.0	-9	0.0%	$1,486	0.1%	$19,996	13.5
Casino	Lighting Exterior Retrofit	R	Elec	24,230	0.0	0	0.0%	$1,213	0.0%	$17,564	14.5
Casino	Pipe Insulation	R	NGas	0	0.0	20	0.0%	$110	0.0%	$1,408	12.8
Casino	Improve Temperature Control	R	NGas	0	0.0	41	0.0%	$226	0.0%	$741	3.3
Casino	Vending Machine Occupancy Controls	R	Elec	2,500	0.0	0	0.0%	$125	0.0%	$341	2.7
Casino	Weatherization	RNE	NGas	0	0.0	219	0.1%	$1,221	0.0%	$57,565	47.1
Park Office	Lighting Interior Retrofit	RNE	Elec	10,915	3.8	-6	0.0%	$916	0.0%	$20,940	22.9
Park Office	Lighting Exterior Retrofit	RNE	Elec	1,638	0.0	0	0.0%	$77	0.0%	$1,599	20.7
Park Office	Install More Efficient Boiler	RNE	NGas	0	0.0	147	0.1%	$791	0.0%	$29,615	37.4
Park Office	Pipe Insulation	R	NGas	0	0.0	24	0.0%	$128	0.0%	$1,260	9.9
Park Office	Improve Temperature Control	R	NGas	0	0.0	130	0.1%	$700	0.0%	$482	0.7
Radio Repair Building	Lighting Interior Retrofit	RNE	Elec	10,210	7.2	-6	0.0%	$1,284	0.0%	$25,790	20.1
Radio Repair Building	Install More Efficient Boiler	RNE	NGas	0	0.0	132	0.1%	$730	0.0%	$26,206	35.9
Radio Repair Building	Improve Temperature Control	R	NGas	0	0.0	71	0.0%	$392	0.0%	$963	2.5
Truck Maint. Shop	Lighting Interior Retrofit	R	Elec	9,508	3.5	-6	0.0%	$670	0.0%	$11,627	17.4
Truck Maint. Shop	Improve Temperature Control	R	NGas	0	0.0	88	0.0%	$467	0.0%	$482	1.0
Truck Maint. Shop	Install More Efficient Boiler	RNE	NGas	0	0.0	266	0.1%	$1,416	0.0%	$38,095	26.9
Sheriff's Bunker	Lighting Interior Retrofit	R	Elec	26,472	9.6	0	0.0%	$1,961	0.1%	$36,133	18.4
Sheriff's Bunker	Lighting Exterior Retrofit	R	Elec	6,216	0.0	0	0.0%	$296	0.0%	$3,251	11.0
Sheriff's Bunker	Replace Ah Supply Motor	R	Elec	2,809	0.3	0	0.0%	$157	0.0%	$3,122	19.9
Sheriff's Bunker	Replace Exhaust Fans B&C	RNE	Elec	2,234	0.6	0	0.0%	$153	0.0%	$5,799	37.9
Sheriff's Bunker	Add Controls To Exhaust Fans B&C	R	Elec	46,305	0.0	0	0.1%	$2,208	0.1%	$14,673	6.6
Sheriff's Bunker	Replace Fan D	R	Elec	1,260	0.3	0	0.0%	$81	0.0%	$1,175	14.5

Harlem District Hwy	Lighting Interior Retrofit	R	Elec	29,610	8.0	-20	0.0%	$2,333	0.1%	$38,498	16.5
Harlem District Hwy	Lighting Interior Controls	RNE	Elec	6,358	0.0	0	0.0%	$332	0.0%	$8,266	24.9
Harlem District Hwy	Lighting Exterior Retrofit	R	Elec	2,671	0.0	0	0.0%	$139	0.0%	$1,557	11.2
Harlem District Hwy	Install Condensing Unit Heaters	RNE	NGas	0	0.0	244	0.1%	$1,263	0.0%	$125,928	99.7
Harlem District Hwy Buildings and Grounds	Install More Efficient Boiler	RNE	NGas	0	0.0	36	0.0%	$186	0.0%	$11,619	62.4
Harlem District Hwy Maintenance Shop	Install Condensing Furnaces	RNE	NGas	82	0.0	17	0.0%	$93	0.0%	$14,220	153.4
Harlem District Hwy Maintenance Shop	Install Condensing Domestic Hot Water Heater	RNE	NGas	0	0.0	2	0.0%	$9	0.0%	$4,148	446.5
Harlem District Hwy	Pipe Insulation	R	NGas	0	0.0	15	0.0%	$77	0.0%	$1,200	15.6
Harlem District Hwy	Improve Temperature Control	R	NGas	0	0.0	594	0.2%	$3,070	0.1%	$7,600	2.5
Harlem District Hwy	Weatherization	RNE	NGas	0	0.0	449	0.2%	$2,320	0.1%	$58,489	25.2
East Concord Hwy	Lighting Interior Retrofit	R	Elec	44,250	15.8	-32	0.0%	$4,062	0.1%	$44,180	10.9
East Concord Hwy	Lighting Interior Controls	R	Elec	12,863	0.0	0	0.0%	$719	0.0%	$12,843	17.9
East Concord Hwy	Lighting Exterior Retrofit	R	Elec	12,877	0.0	0	0.0%	$720	0.0%	$6,501	9.0
East Concord Hwy	Install Condensing Unit Heaters	RNE	NGas	0	0.0	175	0.1%	$900	0.0%	$92,452	102.7
East Concord Hwy Maintenance Shop	Install More Efficient Boiler	RNE	NGas	0	0.0	22	0.0%	$112	0.0%	$11,788	105.3
East Concord Hwy	Pipe Insulation	RNE	NGas	0	0.0	16	0.0%	$82	0.0%	$2,117	25.8
East Concord Hwy Vehicle Storage	Vending Machine Occupancy Controls	R	Elec	2,545	0.0	0	0.0%	$142	0.0%	$682	4.8
East Concord Hwy Maintenance Shop	Install Aquastat To Control Dhw Recirc Pump	RNE	NGas	262	0.0	11	0.0%	$69	0.0%	$1,412	20.5
East Concord Hwy Vehicle Storage	Install Ventilation Controls	R	NGas	316	0.0	8	0.0%	$61	0.0%	$371	6.1
East Concord Hwy	Weatherization	RNE	NGas	0	0.0	236	0.1%	$1,211	0.0%	$45,870	37.9
East Concord Hwy Vehicle Storage	Improve Temperature Control Office/Storage Only	R	NGas	0	0.0	174	0.1%	$895	0.0%	$1,412	1.6
Hamburg Hwy	Lighting Interior Retrofit	R	Elec	39,155	11.2	-31	0.0%	$3,094	0.1%	$24,855	8.0
Hamburg Hwy	Lighting Interior Controls	R	Elec	16,152	0.0	0	0.0%	$825	0.0%	$10,253	12.4
Hamburg Hwy	Lighting Exterior Retrofit	R	Elec	3,339	0.0	0	0.0%	$170	0.0%	$2,038	12.0
Hamburg Hwy	Install Condensing Unit Heaters	RNE	NGas	0	0.0	406	0.2%	$2,082	0.1%	$180,636	86.7
Hamburg Hwy Maintenance Shop	Pipe Insulation	RNE	NGas	0	0.0	4	0.0%	$20	0.0%	$706	36.1
Hamburg Hwy	Improve Temperature Control	R	NGas	0	0.0	707	0.3%	$3,620	0.1%	$5,780	1.6
Hamburg Hwy Maintenance Shop	Vending Machine Occupancy Controls	R	Elec	1,554	0.0	0	0.0%	$79	0.0%	$682	8.6
Hamburg Hwy	Weatherization	R	NGas	0	0.0	398	0.2%	$2,039	0.1%	$29,201	14.3
Angola Hwy	Lighting Interior Retrofit	R	Elec	4,213	5.2	-2	0.0%	$978	0.0%	$18,323	18.7
Angola Hwy	Lighting Exterior Retrofit	R	Elec	5,166	0.0	0	0.0%	$326	0.0%	$3,605	11.1
Angola Hwy	Improve Temperature Control	R	NGas	0	0.0	579	0.2%	$2,948	0.1%	$5,299	1.8
Angola Hwy	Weatherization	RNE	NGas	0	0.0	304	0.1%	$1,547	0.1%	$35,540	23.0
Collins Hwy	Lighting Interior Retrofit	R	Elec	1,641	3.8	-3	0.0%	$593	0.0%	$5,573	9.4
Collins Hwy	Lighting Interior Controls	RNE	Elec	3,902	0.0	0	0.0%	$186	0.0%	$13,253	71.1
Collins Hwy	Lighting Exterior Retrofit	RNE	Elec	1,471	0.0	0	0.0%	$70	0.0%	$3,584	51.0
Collins Hwy	Install Condensing Unit Heaters	RNE	NGas	0	0.0	140	0.1%	$728	0.0%	$57,348	78.8
Collins Hwy Maintenance Shop	Install More Efficient Boiler	RNE	NGas	0	0.0	20	0.0%	$103	0.0%	$11,956	115.6
Collins Hwy Maintenance Shop	Pipe Insulation	RNE	NGas	0	0.0	7	0.0%	$37	0.0%	$1,764	48.1
Collins Hwy	Improve Temperature Control	R	NGas	0	0.0	451	0.2%	$2,340	0.1%	$2,294	1.0
Collins Hwy	Weatherization	RNE	NGas	0	0.0	294	0.1%	$1,525	0.1%	$31,849	20.9
Clarence Hwy	Lighting Interior Retrofit	R	Elec	58,134	16.8	-38	0.1%	$4,376	0.1%	$62,243	14.2
Clarence Hwy	Lighting Interior Controls	R	Elec	9,211	0.0	0	0.0%	$517	0.0%	$9,862	19.1
Clarence Hwy	Lighting Exterior Retrofit	R	Elec	5,515	0.0	0	0.0%	$310	0.0%	$4,074	13.2
Clarence Hwy	Install Condensing Unit Heaters	RNE	NGas	0	0.0	191	0.1%	$987	0.0%	$104,915	106.3
Clarence Hwy Maintenance Shop	Install Condensing Furnaces	RNE	NGas	36	0.0	7	0.0%	$37	0.0%	$8,536	233.5
Clarence Hwy Maintenance Shop	Install Condensing Domestic Hot Water Heater	RNE	NGas	0	0.0	2	0.0%	$11	0.0%	$17,181	1524.0
Clarence Hwy Maintenance Shop	Pipe Insulation	R	NGas	0	0.0	9	0.0%	$45	0.0%	$776	17.4
Clarence Hwy	Improve Temperature Control	R	NGas	0	0.0	323	0.1%	$1,665	0.1%	$4,764	2.9
Clarence Hwy Maintenance Shop	Install Ventilation Controls	R	NGas	46	0.0	12	0.0%	$67	0.0%	$371	5.5
Clarence Hwy	Weatherization	RNE	NGas	0	0.0	161	0.1%	$831	0.0%	$18,402	22.1
South Protection Hwy	Lighting Interior Retrofit	R	Elec	4,964	1.7	-3	0.0%	$522	0.0%	$8,276	15.8
South Protection Hwy	Lighting Exterior Retrofit	R	Elec	3,083	0.0	0	0.0%	$218	0.0%	$3,380	15.5
South Protection Hwy	Install Condensing Unit Heaters	RNE	NGas	0	0.0	12	0.0%	$61	0.0%	$17,374	284.2
South Protection Hwy	Improve Temperature Control	R	NGas	0	0.0	250	0.1%	$1,323	0.0%	$2,470	1.9
South Protection Hwy	Weatherization	RNE	NGas	0	0.0	229	0.1%	$1,210	0.0%	$26,838	22.2
Tonawanda Hwy	Lighting Interior Retrofit	R	Elec	30,724	3.8	-24	0.0%	$1,889	0.1%	$13,499	7.1
Tonawanda Hwy	Lighting Interior Controls	R	Elec	10,950	0.0	0	0.0%	$529	0.0%	$4,811	9.1
Tonawanda Hwy	Lighting Exterior Retrofit	RNE	Elec	2,457	0.0	0	0.0%	$119	0.0%	$2,942	24.8
Tonawanda Hwy	Install Condensing Unit Heaters	RNE	NGas	0	0.0	182	0.1%	$938	0.0%	$74,953	79.9
Tonawanda Hwy	Improve Temperature Control	R	NGas	0	0.0	789	0.3%	$4,077	0.1%	$3,882	1.0
Tonawanda Hwy	Weatherization	RNE	NGas	0	0.0	284	0.1%	$1,466	0.1%	$37,013	25.2
			TOTAL (All):	6,146,058	891	39,953	24.8%	$594,943	20.3%	$12,660,274	21.3
			TOTAL (Recommended Only):	**5,632,211**	**891**	**37,281**	**23.0%**	**$558,980**	**19.1%**	**$12,194,604**	**21.8**

Measure Status[1]

I	Implemented
R	Recommended
RS	Further Study Recommended
NR	Not Recommended
RME	Recommeded Mutually Exclusive
ME	Mutually Exclusive to Recommended Option
RNE	Recommended Non-Energy

Fuel Saved

Elec	Electric
NGas	Natural Gas
Oil2	#2 Oil
Oil4	#4 Oil
Oil6	#6 Oil
Steam	District Steam
LPG	Propane
Coal	Coal
Other	Other

MMBtu Conversion Facto

Btu	1,000,000
kWh	0.003412
therms	0.1
#2 gallon	0.139
#4 gallon	0.1467
#6 gallon	0.15
Steam lbs.	0.0012
LPG gallon	0.0915
Coal tons	24

Notes:

[2] Fuel Savings Type: Indicate the reported MMBtu savings fuel type. Select the predominant fuel type if there are MMBtu savings from multiple fuel sources

[3] Energy Savings to Total Fuel Baseline Use is a comparison of the total electric & fuel savings to the total baseline energy use

[4] Cost Savings to Total Annual Cost is a comparison of the total annual cost savings to the total baseline annual energy cost

Instructions:

* Fill in the light blue cells, as appropriate. White cells will auto-calculate.
* Energy savings must be presented as savings at the customer's utility meter(s), not at the individual building or tenant space
* Update the baseline energy use conversion factors in the 'References' tab, as necessary
* Unhide rows to enter more measures, as necessary

2. FINANCIAL ANALYSIS

CASH FLOW ANALYSIS

This financial analysis is provided to demonstrate how the energy cost savings resulting from the implementation of energy conservation measures can actually pay for the cost of the installation. The financial analysis projects the energy cost savings each year as a result of the implemented conservation measures.

The financed amount is projected annually over a ten-year term. The annual finance costs are calculated based on the amount financed, the interest rate and the term of the financing. The net cash flow is the difference between the energy savings and the finance payments for each year. The cumulative cash flow is the sum of the annual net cash flows; this sum is equal to the value of the project. A project with energy savings in excess of the finance costs is said to have a positive cash flow. Such a project will result in lower overall costs for the owner than if no actions were taken.

The value of the project represents the net savings that a project will yield after implementation and finance costs are considered.

Interest Rates and Terms

Terms of finance are projected assuming a 10 year finance term and a 4.0% interest rate. Annual cash in-flow or savings is the initial projected savings plus an estimated energy escalation of 3.0% per year.

Summary

Over a ten year period, the project has a negative cash flow. This means energy savings alone are not enough to cover the costs of all discovered measures. Additional cost savings from utility incentives and reduction in maintenance costs can help close the gap between energy savings and costs.

ENERGY CONSERVATION PROJECT FINANCIAL ANALYSIS

Client:	**Erie County**	CAPITAL COSTS	**$12,194,604**	FINANCE TERM	**10**	Years
Address:	**95 Franklin Street**	INCENTIVES	**$0**	INTEREST RATE	**4.00%**	
	Buffalo, NY 14202	FINANCED AMOUNT	**$12,194,604**	UTILITY COST	**3.0%**	Escalation

SAVINGS ANALYSIS	**TOTALS**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year 10**
UTILITY SAVINGS	**$6,408,079**	**$558,980**	$575,749	$593,022	$610,813	$629,137	$648,011	$667,451	$687,475	$708,099	$729,342
OTHER SAVINGS	**$0**	**$0**	$0	$0	$0	$0	$0	$0	$0	$0	$0
TOTAL PROJECT SAVINGS	**$6,408,079**	$558,980	$575,749	$593,022	$610,813	$629,137	$648,011	$667,451	$687,475	$708,099	$729,342
EXPENDITURES AT 4% INTEREST RATE											
AMOUNT NOT FINANCED	**$0**	$0									
FINANCE PAYMENTS @ 4%	**$14,815,732**	$1,481,573	$1,481,573	$1,481,573	$1,481,573	$1,481,573	$1,481,573	$1,481,573	$1,481,573	$1,481,573	$1,481,573
CASH FLOWS AT 4% INTEREST RATE											
PROJECT COSTS	**$14,815,732**	$1,481,573	$1,481,573	$1,481,573	$1,481,573	$1,481,573	$1,481,573	$1,481,573	$1,481,573	$1,481,573	$1,481,573
PROJECT SAVINGS	**$6,408,079**	$558,980	$575,749	$593,022	$610,813	$629,137	$648,011	$667,451	$687,475	$708,099	$729,342
NET CASH FLOW	**($8,407,653)**	**($922,593)**	**($905,824)**	**($888,551)**	**($870,761)**	**($852,436)**	**($833,562)**	**($814,122)**	**($794,098)**	**($773,474)**	**($752,231)**
CUMULATIVE CASH FLOW	**($8,407,653)**	**($922,593)**	**($1,828,417)**	**($2,716,968)**	**($3,587,729)**	**($4,440,165)**	**($5,273,728)**	**($6,087,850)**	**($6,881,948)**	**($7,655,422)**	**($8,407,653)**

3. DESCRIPTION OF FACILITIES

JESSE NASH HEALTH CENTER

General

The Jesse Nash Health Center houses a STD clinic, tuberculosis clinic, and family planning clinic. Each clinic has office, examination, and conference rooms. The STD clinic provides free testing and support to patients. The tuberculosis clinic performs testing to improve control of the disease. The family planning clinic offers support and counseling to patients.

Construction

- Jesse Nash Health Center – 37,500 square feet, built in 1970
    - Two floors with a basement
    - The center is 37,500 square feet with two floors and a basement; built in 1970
    - Insulated concrete block walls
    - Windows are inoperable double pane aluminum frame
    - Several window seals have failed as condensation is visible inside the glazing
    - Flat roof with roll down membrane
    - Vestibules have doors with weather stripping missing or damaged. Some doors don't close all of the way.

Occupancy

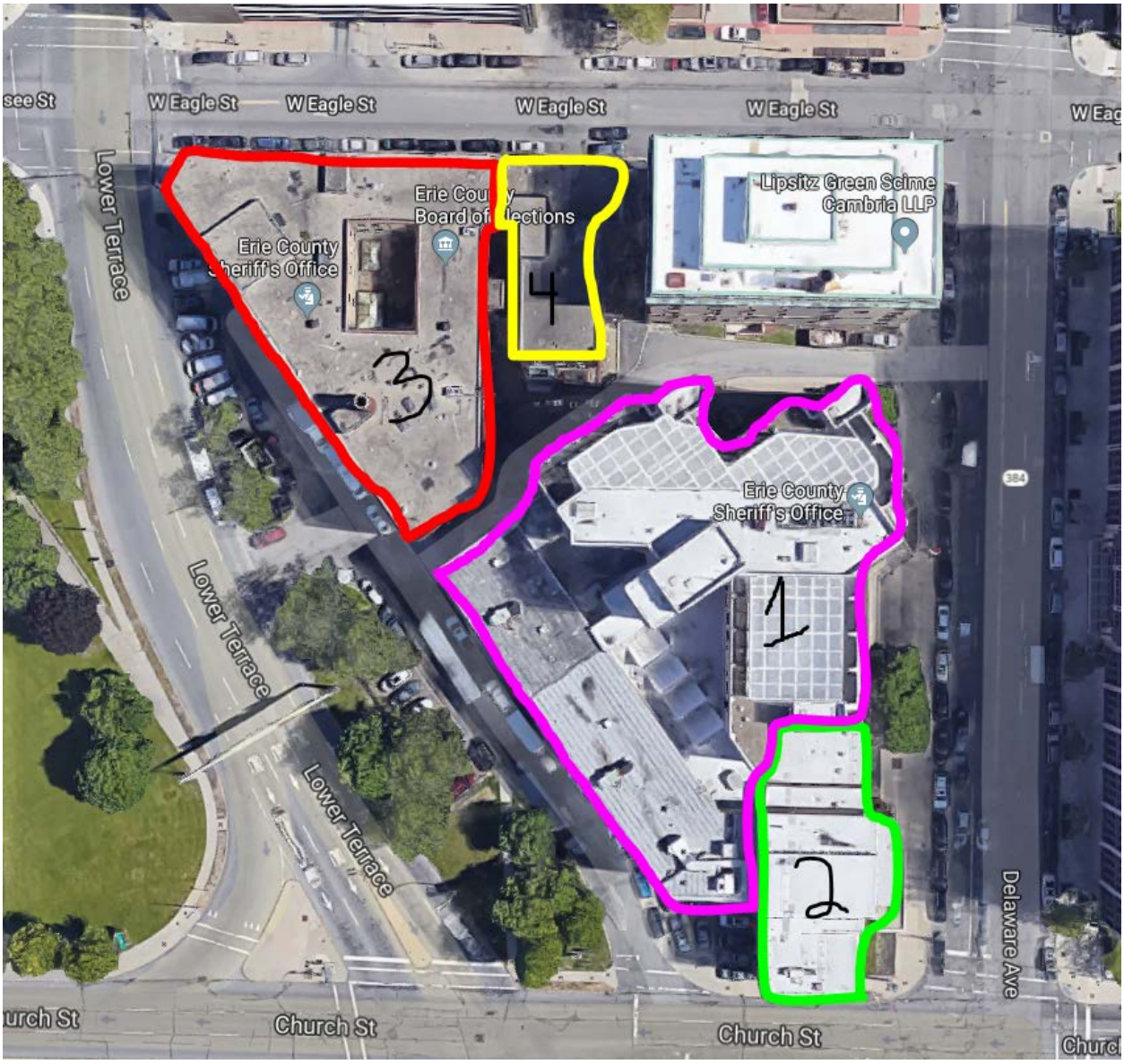
The center is open from 8:30 am to 4:00 pm Monday through Friday. There are approximately 50 patient visits per day and a staff of 40. The old UB Dental wing is currently vacant but staff have indicated that they are working on bringing in a new tenant. There are no night or weekend occupants.

ERIE COUNTY HOLDING CENTER / SHERIFF'S OFFICE / 120/134 DELAWARE

General

The Erie County complex that is bounded by Delaware Ave, Church St, Lower Terrace and West Eagle in Buffalo, NY consists of the holding center, sheriff's office, board of elections and mental health facilities. There are four physical addresses but essentially two double-adjoined buildings. The holding center and sheriff's office will be considered as one facility and 120/134 West Eagle another facility. The purpose of considering all four locations as one complex is because there is overlapping structural, electrical and mechanical systems and can more easily be grouped rather than treated as individual spaces. From this point forward, the four buildings together will be referred to as ECHC complex.

A map of the locations and a brief description of each is shown below:



1 – Erie County Holding Center, 40 Delaware
2 – Sheriff's Office, 10 Delaware
3 – Erie County Board of Elections/Sheriff, 134 West Eagle
4 – Erie County Department of Mental Health, 120 West Eagle

Construction

- 40 Delaware – 126,800 square feet, built in 1986
  - Two towers: Ground floor to 5th floor tower, Ground floor to 6th floor and penthouse tower
  - Precast concrete exterior walls
  - Flat concrete deck roof with built up membrane
  - Steel construction
  - Mix of operable and in-operable single and double pane windows
  - Physically attached to 10 Delaware (share ground through 4th floors)

- 10 Delaware – 90,824 square feet, built in 1936
  - Originally Erie County Jail

    - 4 stories plus basement
    - Stone block construction with steel interior
    - Flat built up membrane roofing
    - Mix of operable and in-operable single and double pane windows
    - Physically attached to 40 Delaware (share ground through 4th floors)

- 134 West Eagle – 91,042 square feet, built 1924
    - 5 stories plus basement
    - There is a lower and upper parking garage which is even with the two-story boiler room
    - Brick on clay tile walls with interior plaster
    - Roof is flat concrete deck with built up membrane (to be replaced in 2019)
    - Windows are aluminum single pane with lots of infiltration
    - Triangular shape with courtyard in middle
    - Physically attached to 120 West Eagle (share floors 1-4)

- 120 West Eagle – 21,445 square feet
    - 4 stories plus basement
    - Brick on clay tile walls with interior plaster
    - Roof is flat concrete deck with built up membrane (to be replaced in 2019)
    - Windows are aluminum single pane with lots of infiltration
    - Rectangular shape
    - Physically attached to 134 West Eagle (share floors 1-4)

Occupancy

The holding center is a 24/7 facility with a maximum capacity of 680 inmates plus guards and support staff. Currently the holding center has on average between 450-500 inmates. Staff have indicated that certain pod areas such as Foxtrot East and Golf south have limited or no occupants.

The sheriff's office spaces have the majority of occupants during normal working hours of 7 am to 5 pm Monday through Friday. Law enforcement officials do use the office spaces during nights and weekends when necessary.

134 West Eagle is home to an auxiliary sheriff's office space and the Erie County Board of Elections which is occupied from 7 am to 5 pm. 120 West Eagle houses the Erie County Department of Mental Health. This facility is also occupied from 7 am to 5 pm. 120 West Eagle has limited occupancy on two floors and the other two are unoccupied.

EDWARD A. RATH BUILDING

General

The Edward A. Rath County Office Building is a 16-story high-rise office building located in downtown Buffalo, NY. The building contains the Erie County Executive's office, Department of Motor Vehicles, Department of Public Works, Social Services, GIS and a number of other county departments. There are two additional levels below the main floor which have a basement and a parking garage. Typical spaces include offices, conference areas, mechanical spaces and break rooms.

Construction

- Edward Rath Building – 513,924 square feet, built in 1969
    - Sixteen floors plus a basement, lower level parking garage and roof penthouse
    - Steel construction
    - Exterior walls are concrete panel with spray foam insulation
    - Interior is steel clad dry board
    - Roof structure is concrete with high density foam insulation
    - Flat roof with rubberized membrane surface
    - Windows are aluminum frame double glazed original to building construction
    - Fully poured basement and concrete foundation

Occupancy

The majority of occupancy in the building occurs Monday through Friday, 7:00 am to 5:00 pm. Social Services activities operate from 7:00 am through 6:00 pm, Monday through Friday. Nights and weekend are usually un-occupied. On any given day it is estimated there are between 1,500 - 2,000 people in the building.

FIRE TRAINING ACADEMY

General

The Fire Training Academy complex consists of training classrooms, emergency situation simulation areas, fire fighter training facilities and emergency equipment storage facilities. The main building houses the classrooms, emergency personnel offices and a four-story drill hall. Other buildings on the property serve as live fire training facilities and storage of emergency equipment. An addition was added for Emergency Medical Services (EMS) and Emergency Operations.

Construction

Fire Training Academy – 22,700 square feet, built in 1976 with addition in 2003

- Exterior walls are concrete block with rigid foam insulation and masonry interior
- Steel roof structure with corrugated metal decking
- Flat roof with EPDM membrane and gravel in good condition, rigid foam insulation
- Ceilings are generally drywall with suspended ceiling grids in admin areas
- Operable aluminum double pane windows
- Four-story Drill hall has glass block windows and several window penetrations covered with plywood

Hazmat Building – 6,000 square feet, built in 2003

- Steel barn construction with metal siding
- Fiberglass insulation with plastic interior sheathing finish
- Metal roof with fiberglass insulation and plastic sheathing
- Several large garage doors that are well sealed
- Two small operable aluminum frame double pane windows in good condition
- Slab on grade concrete foundation

New Storage – 6,500 square feet, built in 2011

- Steel barn construction with metal siding
- Fiberglass insulation with plastic interior sheathing finish
- Metal roof with fiberglass insulation and plastic sheathing

- Several large garage doors that are well sealed
- Slab on grade concrete foundation

Occupancy

The building is typically occupied Monday through Friday from 6AM until 6PM. About a dozen staff members are stationed in the building during the occupied periods. When training is held as many as sixty people could be in the building. The weekday trainings typically occur in the evening around 6:30PM. On Saturdays the building is used from 8AM - PM. Storage outbuildings are very rarely occupied.

YOUTH DETENTION CENTER

General

The Erie County Youth Service Center (Secure Detention) is a facility that was built to house approximately 100 Juvenile Delinquents and Offenders. This facility offers health, mental health, educational and intervention programs to help Juveniles prevent breaking laws. Detention is a temporary facility for youths awaiting the outcome of their Court proceedings.

The building is one story with two central courtyards and detention housing units aka pods. Other areas include administrative offices, mental health offices, juvenile intake, kitchen, dining, gym and mechanical spaces.

Construction

Youth Detention Center – 62,555 square feet, built in 2002

- Insulated concrete block and metal stud wall construction
- Steel roof structure with corrugated metal decking
- Flat roof with EPDM membrane in good condition, rigid foam insulation
- Drywall interior and ceilings, some areas have drop tile ceilings
- Aluminum frame double pane windows
- Corridor areas have many skylights above and large windows to view the courtyard

Occupancy

The Youth Service Center is occupied 24 hours per day 365 days per year. Administrative and support areas are typically only occupied from 7 am to 5 pm Monday through Friday. The facility was designed to house 100 Juveniles and all supporting staff. At the time of the walkthrough, two of the four pods were un-occupied, equating to approximately 50 detainees and supporting staff. Several areas have limited daily occupancy including the kitchen, dining, gym, educational and mechanical spaces.

FAMILY COURT

General

The Erie County Family Court is an eight-story triangular shaped building that houses the Department of Probation, multiple court rooms, judicial chambers and other administrative offices. There are also large lobby/waiting areas for the general public's use as they wait

outside of courtroom/deliberation chambers. Mechanical rooms include a penthouse and a room on each of the eight floors.

Construction

- Family Court – 170,000 square feet, built in 2000
    - Eight floors and a roof penthouse
    - Steel construction
    - Precast concrete panel exterior
    - Rigidized metal roof deck structure with high density foam insulation
    - Flat rubber membrane roof
    - Inoperable aluminum frame double glaze windows
    - Drywall interior partitions

Occupancy

Occupancy is generally 8:30 am to 5:00 pm Mon-Fri for the general public, with some admin staff coming in earlier or leaving later during the week. There is no weekend occupancy.

PUBLIC SAFETY CAMPUS

General

- Location: City of Buffalo
- Square Footage: 114,000
- Tenants: Central Police Services
- EC Department of Homeland Security and Emergency Services
- Buffalo Police Department
- Erie County Sheriffs
- FBI
- Building is operated 24 /7, built in 2007-2008
- Houses call centers hub including the E-911 line
- Aside from call centers the building is made up mostly of administrative offices and conference style rooms along with labs and data server rooms.
- Labs include DNA and Forensic Evidence labs

Erie County's Public Safety Campus (PSC) is a five-story office building that houses the consolidated forensics, emergency call center, and disaster control services for Erie County sheriff, medical services and central police. The building has a substantial amount of glazing and also has a mechanical penthouse located on the roof.

Construction

- Public Safety Campus – 114,000 square feet, built in 2006
    - Five floors plus a mechanical penthouse
    - Steel frame construction
    - Poured-in-place concrete walls
    - Ribbed metal panels
    - Polycarbonate translucent glazing and aluminum sunscreens
    - Flat rubber membrane roof
    - Rigidized metal roof decking with high density foam insulation

Occupancy

Occupancy is generally 7 am to 5 pm Mon-Fri however some detectives and other personnel have night and weekend hours. The emergency call center is occupied 24/7. The ratio of occupants compared to the size of the facility is quite low.

CORRECTIONAL FACILITY

General

The Erie County Correctional Facility is a jail that houses non-arraigned, non-sentenced, sentenced and federal inmates. Male, female, and adolescent inmates are housed on the premises. The facility consists of inmate pods, cellblocks, administrative, recreational, processing, food service, educational, visitation, medical, library, chapel and mechanical areas.

The ECCF is considered a “New Generation Jail” because it was designed with pods and open bay construction. The primary housing areas consist of four, two-story X-shaped buildings that are connected to the main building by one of two corridors. An addition with large open “dorms” provides additional inmate housing.

Construction

Erie County Correctional Facility – 208,240 square feet, built in 1984 with addition in 1998

- Two stories with slab on grade foundation
- Walls are concrete block and brick
- Roof construction is corrugated steel deck on structural steel
- Flat roof with insulated single ply membrane
- Ceilings are generally drywall with suspended ceiling grids in admin areas
- Inoperable double pane aluminum windows

Occupancy

The building is occupied year-round 24 hours per day and seven days per week. Most of the inmate areas are occupied year-round but there are lower occupied areas such as the library, recreational, educational, and chapel. The facility has a maximum capacity of 884 inmates but is averaging less than 500. It was discovered that there are pods and dorms that had no occupants. Administrative areas are standard hours of 7 am to 5 pm Mon-Fri. The second floor of the central areas is generally unoccupied and used primarily as storage.

LAW LIBRARY

General

The Law Library is a low use library and storage space which served as a Supreme Court Library for many years. This facility was once a very busy place for lawyers and judges. With law information being so accessible on the internet now, the use of this building has been greatly diminished. Many areas of the building have been repurposed, by removing the book shelves and creating offices, IT storage areas, and a child day care. The front portion of the third floor and about half of the first floor are the only area that remain as a traditional library.

Construction

Law Library – 29, 338 square feet, built 1949

- Three stories with partially submerged full footprint basement
- Concrete foundation
- Concrete block and brick with exterior granite accents
- Flat multi-level roof with synthetic rubber roofing membrane in fair condition
- Steel truss roof structure with foam insulation above metal decking
- Interior has 2'x2' drop ceiling tiles
- Inoperable double pane aluminum frame windows

Occupancy

This building has fairly low occupancy most of the time; with about 2-4 security guards, a few people using the library at any given time, and a small state operated IT department. The most occupied portion of the building is the basement where a child day care is operated. This county building is mostly occupied during normal business hours (Mon-Fri 7am-6pm).

AURORA HIGHWAY

General

Aurora Highway department center is a multi-building complex which includes a Maintenance center (main building) and two salt barns.

The site is operated by the Erie County Department of Public Works division. The facility serves as a storage and maintenance center for vehicles and equipment related to snow plowing, salting, tree care and other general road maintenance activities.

Construction

Maintenance center - 43,463 square feet, built 1983

- Insulated precast concrete walls
- Slab on grade foundation
- Metal doors have some weather-stripping missing
- Garage doors have some weather-stripping missing
- Operable double pane aluminum windows
- Steel beam truss roof structure
- Flat roof with roll down membrane
- Metal deck roof with rigid insulation

Two salt barns - (2) at 2,400 square feet each, one was built in 1987 and the other 1995

- Wooden pole barn construction
- Metal roof with ridge ventilation

Occupancy

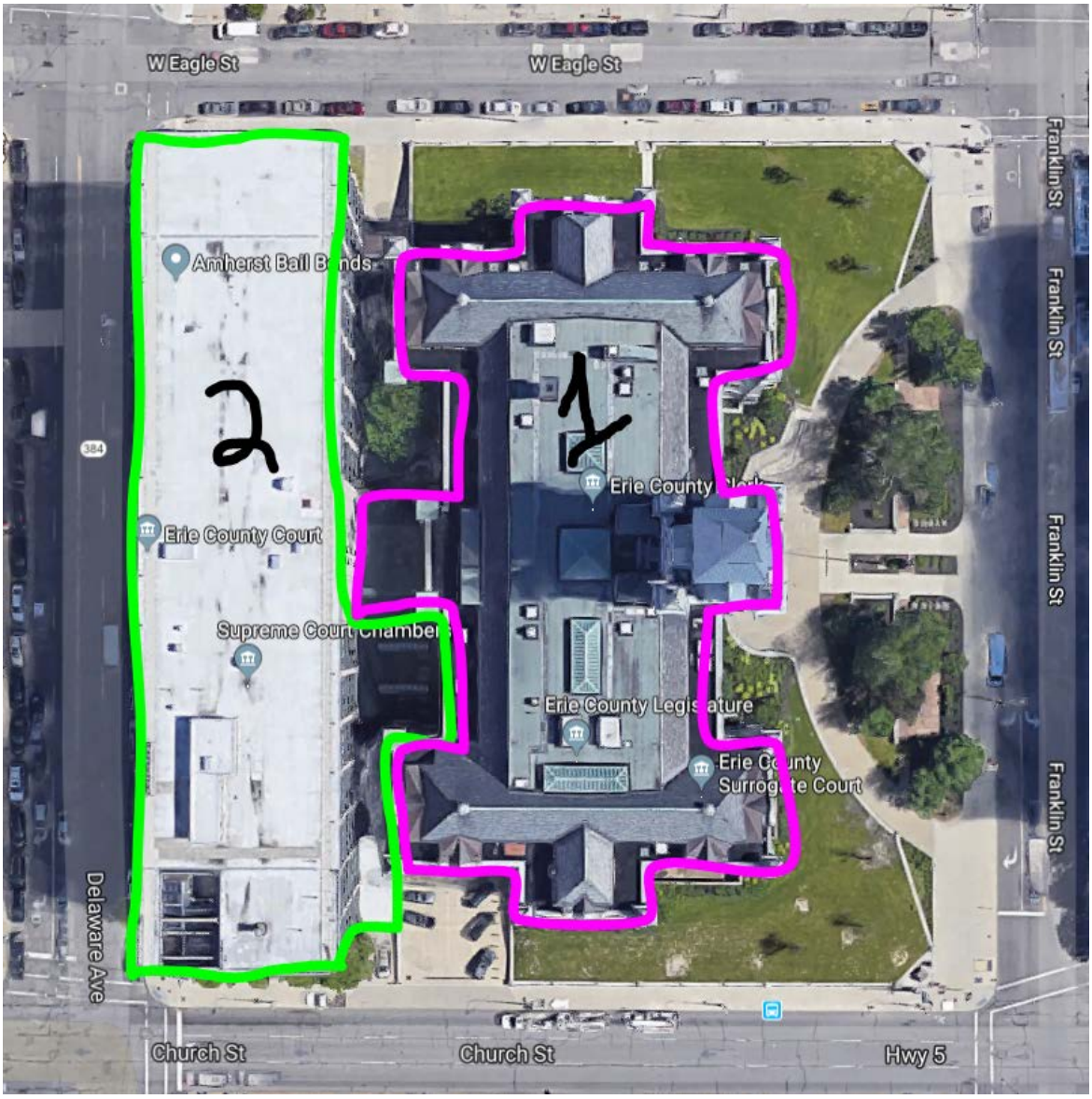
The facility employs 32 employees and is open year-round. Winter hours are Mon-Fri 7am-8pm with many of the occupants leaving by 3pm. Summer hours are 7am-3pm. Staff have indicated that at least one person is on the premises at all times, year-round for emergencies.

OLD COUNTY HALL / ERIE COUNTY COURT ANNEX

General

The Old County Hall and Erie County Court Annex complex that is bounded by Delaware Ave, Church St, Franklin and West Eagle in Buffalo, NY consists of two adjoined building with shared structural, mechanical and electrical systems. The Old County Hall spaces include Legislature, Clerk, records, court rooms, concession area and other County administrative offices. The Erie County Court Annex spaces include Supreme Court, various other court rooms, records, libraries, the District Attorney's Office and other administrative offices.

A map of the locations and a brief description of each is shown below:



1 – Old County Hall, 92 Franklin
2 – Erie County Court Annex, 10 Delaware

Construction

- Old County Hall – 185,000 square feet, built in 1875
    - Four stories plus basement
    - Stone block and brick construction
    - Steel interior and roof structure
    - Drop ceilings in office areas
    - Large open corridors and court rooms
    - Mix of operable and in-operable double pane windows which suffer from excessive infiltration
    - 200-foot-tall clock/bell tower
    - Pitched roof with slate roofing material in good shape
    - Attic space with batt roof insulation
    - Physically attached to Annex (share ground and 2nd floors)

- Erie County Court Annex – 325,000 square feet, built in 1964
    - Originally Erie County Jail
    - 9 stories plus basement
    - Precast concrete and tile exterior
    - Top floor houses mechanical and electrical equipment
    - Aluminum inoperable double pane windows
    - Flat built up membrane roofing with rigid foam insulation
    - Mix of operable and in-operable single and double pane windows
    - Physically attached to Old County Hall (share ground and 2nd floors)

Occupancy

The majority of occupancy generally occurs from 9am to 5pm Monday through Friday. Some people with offices will work on the weekend and weekday evenings. The court rooms and deed areas have varying occupancy. These spaces are rarely fully occupied and rarely occupied all day. Several records storage areas have very little occupancy as well. The District Attorney's office is staffed 24 hours per day but the majority of occupants fall into the standard work schedule outlined above.

HEALTH MALL

General

Erie County Health Mall is a two-story health care facility that houses Erie County and private company health service organizations. Groups at the Health Mall provide medical, behavioral health and education services for the surrounding community. The facility primarily consists of patient exam rooms, educational rooms, doctor offices and administrative offices.

Construction

The building consists of two floors and a basement. Exterior walls are concrete block with precast concrete decorative exterior panels. Windows are thermal glazed

- Health Mall – 24,638 square feet, built in 1970
    - Two floors and a basement

    - Steel frame construction
    - Concrete block and precast concrete decorative exterior panels
    - Flat membrane roof
    - Metal roof decking with high density foam insulation
    - Aluminum frame double pane windows

Occupancy

The Health Mall is occupied year-round from 7:00 am to 7:00 pm Monday through Friday.

CHESTNUT RIDGE PARK

General

Chestnut Ridge Park is a 1,200-acre park operated by the Department of Parks, Recreation and Forestry. The park has hiking trails, a sledding hill, disc golf course, tennis courts, rental shelters and space for other outdoor activities. There are multiple facilities on the property which include a park office, truck maintenance shop, Sheriff's bunker, Casino and Radio Tower Building.

Construction

- Park Office – 7,000 square feet, built in 1970s
    - Block and brick exterior walls
    - Flat rubber membrane roof
    - Metal frame single pane windows
    - Concrete roof structure
    - Several large garage doors
- Truck Maintenance Shop – 8,000 square feet, built in 1970s
    - Concrete block construction
    - Concrete slab on grade foundation
    - Pitched metal roof
    - Nine large garage doors
    - Metal frame single pane windows
    - Barn storage area
- Sheriff's Bunker – 10,000 square feet, built in 1960s
    - Built below ground level
    - Earthen roof with grass covering
    - Concrete foundation and walls
    - No windows
- Casino – 13,000 square feet, built in 1940s
    - Stone walls
    - Pitched slate roof
    - Wooden beam cathedral ceilings
    - Partial basement
    - Concrete slab foundation
    - Windows are metal frame single glazed
    - Two stone fireplaces
- Radio Tower Building – 3,500 square feet, built in 1960s
    - Concrete block construction
    - Flat rubber membrane roof
    - Three large garage doors
    - Glass block windows

- o Concrete slab on grade foundation

Occupancy

Occupancy for the park office, truck maintenance, Radio Tower, and Bunker is typically Mon-Fri 7am to 5 pm. Typically, there are approximately 2-3 persons in each of these facilities during occupied hours. Occupancy in the Casino varies by season and can be open from dawn till dusk during the summer months.

HARLEM HIGHWAY

General

Harlem Highway department center is a multi-building complex which includes a maintenance shop, vehicle storage building, building and grounds shop, sign shop, and one salt barn.

The site is operated by the Erie County Department of Public Works division. The facility serves as a storage and maintenance center for vehicles and equipment related to snow plowing, salting, tree care and other general road maintenance activities. The facility also serves as the main location for Erie County building maintenance services.

Construction

Maintenance Shop – 7,778 square feet, built 1960s

- Block Walls
- Slab on grade foundation
- Operable single pane glass aluminum windows in maintenance area
- Glass block windows in office room
- Steel beam truss roof structure
- Pitched metal roof
- Ceiling is wood planks
- Large uninsulated garage doors
- Metal doors

Vehicle Storage Building – 10,800 square feet, built 1963

- Block Walls
- Slab on grade foundation
- Operable aluminum single pane windows
- Some window glass panes replaced with plywood or street sign
- Flat EPDM roof
- Large uninsulated garage doors
- Metal doors

Buildings and Grounds Shop– 5,000 square feet, built 2002

- Block walls with metal siding
- Walls insulated inside with drywall in office space of building
- Some block walls insulated in the maintenance area
- Storage area newer with uninsulated steel wall construction
- Pitched metal roof with insulation
- Large uninsulated metal garage doors
- Metal doors

- Vinyl single pane windows

Sign Shop– 5,000 square feet, built 2002
- Block walls
- Slab on grade foundation
- Operable single pane glass aluminum windows in maintenance area
- Pitched metal roof
- Pitched metal roof
- Ceiling is wood planks
- Metal doors

Salt barn – 2,400 square feet, built in 1987
- Wooden pole barn construction
- Asphalt shingle roof

Occupancy

The Main building occupancy is from 7:30 am to 3:30 pm, Monday through Friday during Spring/Summer /Fall seasons. Occupancy during the winter season is two shifts, seven days per week, 7:30am to 8:00pm and 12:00am to 7:30am making the facility open 24/7.

CONCORD HIGHWAY

General

Concord Highway department center is a multi-building complex which includes a Maintenance center, office/vehicle storage building, a sign shop and two salt barns.

The site is operated by the Erie County Department of Public Works division. The facility serves as a storage and maintenance center for vehicles and equipment related to snow plowing, salting, tree care and other general road maintenance activities.

Construction

Maintenance center – 13,683 square feet, built 1928
- Block walls
- Slab on grade foundation
- Metal doors have some weather-stripping missing
- Garage doors have some weather-stripping missing
- Operable double pane aluminum windows
- Glass block windows
- Steel beam truss roof structure
- Pitched roof with architectural shingles
- Garage ceiling is covered in a plastic wrap
- Roof insulation is poor due to large icicles

Office / storage – 10,800 square feet, built 2010
- Wooden pole barn construction
- Slab on grade foundation
- Metal siding
- Pitched roof with metal roofing
- Metal finished ceiling with fiberglass insulation above

- Pitched roof with metal roofing
- Garage doors have some weather-stripping missing
- Metal doors
- Offices have operable double pane vinyl windows

Sign Shop – 3,200 square feet, built 2008

- Wooden pole barn construction
- Slab on grade foundation
- Metal siding
- Pitched roof with metal roofing
- Metal finished ceiling with fiberglass insulation above
- Pitched roof with metal roofing
- Garage door
- Metal doors
- Operable double pane vinyl windows

Salt barn and mix barns – 4,000 square feet each, built 1986 and 1995

- Wooden pole barn construction
- Metal roof

Occupancy

The facility employs 30 employees and is open year-round. Winter hours 24 hours per day 7 days per week running two shifts. The majority of employees occupy the maintenance and office buildings from 7am-3pm. Summer hours are Mon-Fri 7am-3pm. The sign shop building generally has no occupancy during the winter and one person during the summer.

HAMBURG HIGHWAY

General

Hamburg Highway department center is a multi-building complex which includes a maintenance garage, light truck/sign storage, heavy truck storage, general storage and salt storage buildings.

The site is operated by the Erie County Department of Public Works division. The facility serves as a storage and maintenance center for vehicles and equipment related to snow plowing, salting, tree care and other general road maintenance activities.

Construction

Maintenance Garage – 14,642 square feet, built 1932

- Brick exterior walls
- Slab on grade foundation
- Single pane glass windows in shop areas
- Operable double pane vinyl windows in the office area
- Pitched architectural shingled roof
- Steel structure
- Wooden plank ceiling above steel truss roof
- Garage doors have some weather-stripping missing
- Metal doors have some weather-stripping missing

Light Truck / Sign Storage – 7,594 square feet built 1960s

- Block and brick exterior walls
- Slab on grade foundation
- Glass block windows
- Pitched metal roof
- Steel truss roof structure
- Ceiling has wrap insulation
- Garage doors have some weather-stripping missing
- Metal doors have some weather-stripping missing

Heavy Truck Storage - 10,800 square feet, built 1963

- Block exterior walls
- Single pane glass windows
- Slab on grade foundation
- Flat membrane roofing
- Steel truss with metal deck roof structure
- Garage doors have some weather-stripping missing
- Metal doors have some weather-stripping missing
- One of the garage doors has plywood repair to wall which is not sealed

Salt Storage Buildings - 4,000 square feet each, built 1995

- Wooden pole barn construction
- Slab on grade foundation
- Wooden siding
- Metal roof

Salt Delivery Building – 10,000 square feet, built 2018

- Steel shell with wrap
- Slab on grade foundation

Storage Building – 3,200 square feet, built 2008

- Wooden pole barn construction
- Slab on grade foundation
- Metal roofing and siding

Occupancy

The facility employs 30 employees and is open year-round. Winter hours are 24 hours per day 7 days per week running two shifts. The majority of employees occupy the maintenance center building from 7am-7pm. Summer hours are Mon-Fri 7am-3pm. The heavy truck has occasional occupancy 24/7 during the winter hours. The light truck / sign storage building has limited occupancy year-round. The additional salt and storage buildings are utilized for salt operations during the winter months.

ANGOLA HIGHWAY

General

Angola Highway department center is a multi-building complex which includes a maintenance center, vehicle storage building and a salt barn.

The site is operated by the Erie County Department of Public Works division. The facility serves as a storage and maintenance center for vehicles and equipment related to paving, street cleaning, mowing, tree care, and other general road maintenance activities. It also houses vehicles such as boats and snow mobiles for the county sheriffs.

Construction

Maintenance center – 6,868 square feet, built in 1960s

- Block Walls
- Slab on grade foundation
- Operable single pane glass aluminum windows in maintenance area
- One double pane vinyl replacement window in office room
- Steel beam truss roof structure
- Pitched metal roof
- Ceiling is wood planks
- Large uninsulated garage doors
- Metal doors
- 2 exhaust fan dampers on front wall are not shut fully
- Building heated unnecessarily high for vehicles used during spring and summer months.

Vehicle storage building - 10,920 square feet, built in 1996

- Block Walls
- Slab on grade foundation
- Some metal siding/walls uninsulated
- Pitched metal roof with insulation
- Large metal garage doors (2) need weather stripping
- Metal doors need weather stripping
- Operable aluminum single pane windows
- 2 exhausts on roof for vehicles that were shut

Salt barn – 2,400 square feet, built in 1987

- Wooden pole barn construction
- Asphalt shingle roof

Occupancy

This facility is not regularly occupied and is primarily used for storage. Most of the vehicles that are in storage are for summer usage such as boats, lawn care and various specialty trucks. Winter occupancy is extremely rare. Occupancy in the summer is estimated at 2-3 occupants from 7 am-3 pm.

COLLINS HIGHWAY

General

Collins Highway department center is a multi-building complex which includes a maintenance center, vehicle storage building and a salt barn.

The site is operated by the Erie County Department of Public Works division. The facility serves as a storage and maintenance center for vehicles and equipment related to snow plowing, salting, tree care and other general road maintenance activities.

Construction

Maintenance center – 7,050 square feet, built 1945

- Block walls
- Slab on grade foundation
- Metal doors have some weather-stripping missing
- Garage doors
- Single pane inoperable windows
- Steel beam truss roof structure
- Flat roof with roll down roofing
- Ceiling is wood planks

Vehicle storage – 10,800 square feet, built 1963

- Block walls
- Slab on grade foundation
- Flat roof with membrane roofing
- Steel beam truss roof structure
- Garage doors have some weather-stripping missing
- Metal doors have some weather-stripping missing
- Single pane swing-out windows

Salt barn – 4,000 square feet, built 1987

- Wooden pole barn construction
- Metal roof
- Metal siding

Occupancy

The facility mainly serves as storage and has no occupancy except for very seldom occasions. Staff have indicated that employees usually fill-up on gas and do not generally use the office area. The vehicle storage houses multiple different types of road maintenance equipment and has more usage during the summer months but is still very sparsely occupied.

CLARENCE HIGHWAY

General

Clarence Highway department center is a multi-building complex which includes a maintenance center, vehicle storage building, extra wood framed garages, and a salt barn.

The site is operated by the Erie County Department of Public Works division. The facility serves as a storage and maintenance center for vehicles and equipment related to snow plowing, salting, tree care and other general road maintenance activities.

Construction

Maintenance center – 21,982 square feet, built 1960s

- Block walls
- Slab on grade foundation
- Metal doors have some weather-stripping missing
- Garage doors
- Single pane inoperable windows
- Steel beam truss roof structure
- Pitched metal roof
- Ceiling is insulated

Vehicle storage – 13,500 square feet, built 1963

- Block walls
- Slab on grade foundation
- Flat roof with membrane roofing
- Steel beam truss roof structure
- Garage doors have some weather-stripping missing
- Metal doors have some weather-stripping missing
- Single pane swing-out windows

Salt barn – 4,000 square feet, built 1990

- Metal frame barn
- Stretched building skin of durable fabric

Extra Garages – 4,366 square feet, built 1987

- Wood frame garages
- Asphalt shingle/metal roof
- Uninsulated

Occupancy

The facility employs approximately 20 employees and is open year-round. Winter hours are 24 hours per day 7 days per week running two shifts. The majority of employees occupy the maintenance center building from 7am-7pm. Summer hours are Mon-Fri 7am-3pm. The additional salt and storage buildings are utilized for salt operations during the winter months.

HOLLAND HIGHWAY (SOUTH PROTECTION HIGHWAY)

General

Holland Highway department center is a multi-building complex which includes a maintenance center, storage shed, and a salt barn.

The site is operated by the Erie County Department of Public Works division. The facility serves as a storage and maintenance center for vehicles and equipment related to paving, street cleaning, mowing, tree care, and other general road maintenance activities.

Construction

Maintenance center – 6,917 square feet, built in 1960s

- Block Walls

- Slab on grade foundation
- Operable single pane glass aluminum windows
- Steel beam truss roof structure
- Pitched metal roof
- Ceiling is wood planks
- Large uninsulated garage doors, (2) need weather-stripping
- Metal doors
- Building temperature could be setback for vehicle storage

Storage Shed
- Wood construction
- Asphalt shingle roof

Salt barn – 2,400 square feet, built in 1987
- Wooden pole barn construction
- Asphalt shingle roof

Occupancy

This facility is not regularly occupied and is primarily used for storage. Most of the vehicles that are in storage are for summer usage such as lawn care and paving equipment. Winter occupancy is extremely rare. Occupancy in the summer is estimated at 2-3 occupants from 7 am-3 pm.

TONAWANDA HIGHWAY

General

Tonawanda Highway department center is a multi-building complex which includes a maintenance center, vehicle storage building and a salt barn.

The site is operated by the Erie County Department of Public Works division. The facility serves as a storage and maintenance center for vehicles and equipment related to snow plowing, salting, tree care and other general road maintenance activities.

Construction

Maintenance center – 6,738 square feet, built 1960s
- Block walls
- Slab on grade foundation
- Metal doors have some weather-stripping missing
- Garage doors
- Single pane inoperable windows
- Steel beam truss roof structure
- Flat roof with roll down roofing
- Ceiling is wood planks

Vehicle storage – 10,800 square feet, built 1963
- Block walls
- Slab on grade foundation

- Flat roof with membrane roofing
- Steel beam truss roof structure
- Garage doors have some weather-stripping missing
- Metal doors have some weather-stripping missing
- Single pane swing-out windows

Salt barn – 5,000 square feet, built 1987

- Metal frame barn
- Stretched building skin of durable fabric

Occupancy

This facility is not regularly occupied and is primarily used for storage. Winter occupancy is occasional but increases when plowing activities commence. Summer occupancy is very limited.

4. DESCRIPTION OF ENERGY USING EQUIPMENT

JESSE NASH HEALTH CENTER

Interior Lighting

Lighting at the Jesse Nash Health Center is provided primarily by T8 linear fluorescent ceiling mounted fixtures. Additional interior lighting consists of compact fluorescent and incandescent fixtures. The lights are controlled with manual switches and are typically found off when occupants leave the spaces.

Exterior Lighting

The perimeter of the building is lit with HID wallpack lights which are on a timer. It is estimated the timer no longer functions and is in need of replacement.

Heating and Cooling Equipment

Heating at the Center is provided by a 1,000 MBH standard efficiency hot water boiler. This unit has four modules connected together and two of the modules are constantly lit throughout the heating season. The other two modules are staged-on as necessary. Hot water is sent to a central reheat coils and unit heaters by a 1.5 HP constant volume pump. The boiler is original to the construction of the facility and is beyond its service life.

The main AHU is also original to the construction of the facility and provides conditioned air throughout the facility. There is no hot water coil located within the AHU, but rather in the individual reheat coils out in the spaces. The facility uses outside air to help provide “free cooling” when available to the building. Two roof-mounted air-cooled condensing units reject heat from the DX cooling coil in the AHU when required.

One packaged RTU serves the dining room area and is a DX cooling only unit.

Ventilation Equipment

There are 5 total exhaust fans at the facility. The exhaust fans run continuously in the tuberculosis testing labs. Other exhausts are commonly operated when testing is being performed in their specific areas or during all occupied hours.

The central air handling unit mixes outside air with return air for the rooms in the facility to provide 50°F air to the heating coils.

Domestic Hot Water System

Domestic hot water is used for faucets in restrooms and break rooms. DHW is heated with a 200 MBH gallon standard efficiency gas fired hot water heater. One fractional HP recirculation pump runs based on an aquastat so hot water is available at all times.

HVAC Controls

JNHC is controlled with a pneumatic control system and computer workstation. Based on observations and from interviews with staff, several of the pneumatic controllers have failed and are in need of replacement. The system utilizes a ¾ HP air compressor to pressurize the

system but there are many air leaks present. Equipment on the HVAC controls system include the AHU, RTU, reheat coils, boiler, HW pump and exhaust fans.

ERIE COUNTY HOLDING CENTER

Interior Lighting

The primary lighting throughout the facility is ceiling mounted linear fluorescent fixtures. Due to the nature of the facility, the lights are typically on 24/7 in common areas. Areas where inmates are housed can be manually turned off during nighttime hours. Additional lighting consists of compact fluorescent and incandescent lamps.

Exterior Lighting

Exterior lighting consists of HID wallpack and area lighting fixtures. The fixtures operate based on photocell controls.

Heating Equipment

The main source of space heating at the Holding Center/Sheriff's/120/134 West Eagle Complex is two 500 HP natural gas fired Cleaver-Brooks steam boilers which maintain between 5-6 lbs. of steam. Steam piping extends from the boiler room located at the ground floor of 134 West Eagle to the various buildings. Staff have indicated that on the coldest day of the winter heating season, only one boiler fires at approximately 30%. Both boilers recently had burner control upgrades and are in good condition.

Holding Center/Sheriff's

In the Holding Center/Sheriff's buildings, steam heating serves four steam-to-hot water heat exchangers, and cast-iron steam radiators located around the perimeter of the inmate tower areas. Two of the heat exchangers transfer heat from steam-to-hot water, and two transfer heat from steam to a glycol/water heating solution. The hot water is used for fin radiation, cab heaters and possibly VAV reheat coils. The glycol/water is used exclusively for heating air handler coils. VAV boxes are located throughout the facility and serve as the terminal temperature control units as part of the AHU system. The BMS computer screen showed that there may be VAV reheat coils but the schedule of VAV boxes showed there were no reheat coils in the building.

Steam Boilers
- → HW HX #1 → Ground through 3rd floors hot water fin, cab heaters
- → GHW HX #1 → AHU 1-5, 8, 8a, 9
- → HW HX #2 → 4th through 6th floors hot water fin, cab heaters
- → GHW HX #2 → AHU 6,7
- → Steam cast-iron radiators

A list of heat exchangers with associated pumps and air handlers is shown below:

Tag	Type	Location	Serves	Pumps	Motor Eff.	VFD?	TDV % open
HW #1	Hot Water	Room 211	Ground - 3rd floors	(2) 5 HP	81.6%	no	70 / 40
GHW #1	Glycol Heat	Room 211	AHU 1-5, 8, 8A, 9	(2) 15 HP	93.0%	yes	20 / 30
HW #2	Hot Water	Room 701	4th - 6th floors	(2) 5 HP	81.6%	no	10 / 10
GHW #2	Glycol Heat	Room 701	AHU 6, 7	(2) 5 HP	81.6%	no	50 / 50

Tag	Location	Serves	Supply [cfm]	Min OA [cfm]	Heating Capacity [MBH]	Cooling Capacity [tons]	Supply Fan [HP]	Return Fan [HP]	VFDs on fans?
AHU 1	Room 213	1st & 2nd Floors; Admin, inmate visiting, central areas	20,600	2,400	1,916	69	40	15	yes, supply & return
AHU 2	Room 211	Ground, 1st & 2nd Floors; inmate receiving & long block east	26,900	8,600	1,788	106	50	15	yes, supply & return
AHU 3	Room 238	2nd & 3rd Floors; inmate recreation & medical records	4,000	700	281	12	7.5	2	VFDs for supply and return in bypass; both run 100% speed
AHU 4	Room 386	3rd Floor; Delta north/east/central & Sheriff's	11,000	1,850	750	29	25	7.5	yes, supply & return
AHU 5	Room 238	1st Floor of Sheriff's	5,000	750	351	12	7.5	2	yes, supply & return
AHU 6	Room 705	4th, 5th & 6th Floors; Echo south;Foxtrot south, Golf south/east	20,800	4,020	1,408	61	40	15	yes, supply & return
AHU 7	Room 704	4th, 5th & 6th Floors; Echo north/east;Foxtrot north/east, Golf north	20,800	4,020	1,487	61	40	15	VFDs for supply and return in bypass; both run 100% speed
AHU 8	Grd Floor Mech Room	Ground Floor; kitchen north	6,270	6,270	517	0	5	0	no
AHU 8a	Grd Floor Mech Room	Ground Floor; kitchen hood supply	2,900	2,900	192	0	1/3	0	no
AHU 9	Grd Floor Mech Room	Ground Floor; kitchen south	4,800	4,800	396	0	5	0	no

There are two abandoned steam heating air handling units located on the long block roof of the older holding center tower. It was found that the steam piping was capped from the coils but still had steam in the lines.

120/134 West Eagle

Primary heating is accomplished with steam radiators throughout the facility. Steam is supplied by the 500 HP boilers located in the ground floor boiler room of 134 West Eagle. There are four abandoned-in-place air handlers with steam heating coils which haven't been used for several years. It was discovered that many areas had uninsulated steam piping and the building was very warm to many of the occupants.

Cooling Equipment

Holding Center/Sheriff's

Cooling in the Holding Center/Sheriff's is accomplished with two chillers, two RTUs, and one DX ac unit.

One water cooled 250-ton chiller located in the ground floor of 120 West Eagle serves glycol solution cooling coils in AHUs 1-5 of the Holding Center/Sheriff's building. One 10 HP chilled water pump provides the chilled water to the AHUs. Heat is rejected to a cooling tower located on the lower roof of the 120 West Eagle building. The cooling tower fans have VFD controls and are tied into the BMS.

One 150-ton roof mounted (above holding center) air-cooled chiller serves glycol solution cooling coils in AHUs 6 and 7. The chiller is estimated to be from 1995 and is beyond its

service life. Two lead/lag 7.5 HP chilled water pumps provide the chilled water to the AHUs. It was noticed during the walkthrough that the triple duty valves are only 10% open.

There are two 8 ton cooling only RTUs located on the roof of the sheriff's building. Both units have DX cooling and have the supply fans running 24/7. AC-1 serves the trustee dorms and AC-2 serves the constant observation area. The economizer on AC-1 was found to be inoperable because the compressors were on during a winter heating day.

The Erie County Sheriff's Office has its own standalone split DX cooling unit.

120/134 West Eagle

Cooling at 120/134 West Eagle is accomplished with three split DX units. Two of the condenser units (15 and 7.5 ton) are located on the roof and one 5-ton unit is located in the courtyard.

Window air conditioners provide cooling for areas not served by the three split units.

Ventilation Equipment

Holding Center/Sheriff's

There are approximately 25 one-speed and two-speed general exhaust fans that serve various areas throughout the Holding Center/Sheriff's buildings. Most of the fans have two speed capability and are all fractional HP motors. The kitchen hood is served by EF-11 which has a 5 HP motor.

AHUs 1-7 have return fans that draw return air back to the units to be mixed with outside air when the command calls for mixed air. Any return air that does not get mixed is exhausted out of the building.

An additional 12 propeller type fans operate as either intake or exhaust air for mechanical rooms and transformer rooms. These fans all have fractional HP motors with the exception of four 1.5 HP fans for the transformer rooms.

120/134 West Eagle

Air exchanges in the 120/134 W Eagle buildings is a combination of gravity relief dampers, exhaust fans, window leakage and open windows. An abandoned RTU also has some air leakage out of the building. Additional ventilation used to be supplied by the four air handling units but have been abandoned for several years.

Domestic Hot Water System

The main source of domestic hot water heating at the complex is provided by the steam boilers located in the boiler room of 134 West Eagle. Steam piping extends to two tank storage areas, one located in the ground floor of the Holding Center/Sheriff building and another in the ground floor of 134 West Eagle.

During the summer months, steam is provided by a 69 HP (2,898 MBH input) natural gas steam boiler. The two 500 HP boilers are turned off during the non-heating months. Steam from the summer boiler keeps the steam distribution system hot in order to provide summer domestic hot water heating.

Domestic hot water is used in restrooms, kitchens and showers.

Holding Center/Sheriff's

There are two 102 gallon and two 443-gallon shell and tube heat exchanger tanks that heat domestic water in the ground floor storage tank area of the Holding Center/Sheriff building. Staff have indicated that at least one of the tanks has leaking issues.

Domestic hot water for the kitchen area is heated with a 500 MBH 85% efficient natural gas fired boiler with a 115-gallon external storage tank.

A four 5 HP domestic water booster sled located in the ground floor mechanical space provides extra pressure so the domestic water is available at the highest floor and the furthest from the sled.

120/134 West Eagle

The same steam distribution system that heats the domestic water in the holding center also heats the domestic water in both the 120/134 West Eagle buildings. A shell and tube heat exchanger with a 750-gallon domestic hot water storage tank supplies all of the hot water needs of 120/134 West Eagle and the Echo dorm of the holding center. Two fractional HP recirculation pumps circulate water 24/7 (snap switch, enabled on) to ensure hot water is available at every faucet.

HVAC Controls

The complex has a partial pneumatic and partial electronically controlled building management system. Items that are on the BMS are AHUs, AC units, exhaust fans, boilers, heat exchangers with associated pumps, chillers and cooling tower with associated pumps.

Holding Center/Sheriff's

The holding center has two air compressors that serve the pneumatic control system. The compressor located in the ground floor mechanical space is a 3 HP motor unit but the compressor has been turned off. Staff were unsure of the spaces originally served by this compressor. The compressor located in room 213 is a 7.5 HP unit and had an almost constant duty cycle.

Steam radiators located in the sheriff's offices and the inmate perimeter areas have failed pneumatic controls. During the walkthrough it was noticed that many were either on full or completely off. In the inmate blocks many windows were found wide open to help keep the space from overheating, but the spaces were around 80 deg F on a day when it was 20 deg F outside. Temperature sensors in these spaces are located around the perimeter with many on the inside of an exterior wall. The sheriff's office has a wall-mounted thermostat which controls the DX air conditioning unit.

VFDs were found on supply and return fans for AHUs 1-7 (AHU 3 and AHU 7 VFDs were not operational and stuck on 100% speed). VFDs were also found on the cooling tower fans that serve the water-cooled chiller and the glycol hot water pumps that serve AHU 1-5, 8, 8a and 9.

Temperature sensors control each VAV box served by the AHUs and determine how much volume of air should be distributed to each space. Controls on the AHUs themselves include glycol heating valves, air dampers, chilled water valves, as well as temperature and humidity feedback.

Most of the general exhaust fans are controlled with the BMS, however the 12 intake/exhaust propeller type fans had manual switch controls. Many of the two speed exhaust fans were discovered in high-speed mode with no indication why they needed to run at high speed.

120/134 West Eagle

The steam radiators are controlled with manually set thermostatic valves located on each individual unit. In general, the building is overheated and the occupants leave many windows open to help control the temperature. Several lower occupancy areas were overheating with the valves either set too high or had failed.

The three split DX units are controlled with individual programmable thermostats, and were running based on an occupied/unoccupied schedule. Due to the building overheating, the DX units were found on, during a heating day.

EDWARD A. RATH BUILDING

Interior Lighting

The interior lighting in this facility has been upgraded in recent years by the county. Most of the fixtures were kept in place and just retrofitted to LED lamps. The existing Siemens control system has scheduling setup for the lighting zones throughout the facility.

Exterior Lighting

The perimeter of the Rath is lit with LED wallpacks which are controlled by a schedule in the building management system.

Heating Equipment

The heating system originally consisted of super-heated water supplied from the District Heat plant and supplemented by two electric hot water boilers. Within the last several years these systems where abandoned/removed and new boilers were installed.

The main source of space heating at the Rath Building is now three PK Sonic SC4000 (4000 MBH) and one PK Sonic SC2000 (2000 MBH) condensing boilers. The boilers supply 180°F (max.) water to AHU heating coils, AC unit reheat coils, fin radiation, cab heaters, unit heaters. The hot water is distributed to this equipment with a 100 HP constant volume pump. This pump operates only during the heating season.

Heating is only provided to the perimeter 15 feet of the building. This perimeter area is served by an induction system that consists of 2,158 induction units and 2 primary air handling systems, AC #1 and AC #2. There is a cooling coil in each of the induction units. Air is supplied to the induction units at between 74°F and 100°F and then cooled as required by the respective induction cooling coil. There is generally one thermostat for each 2 or 3 induction units. One unit serves as the master with a pneumatic thermostat in the return air stream so that it reads a representative space temperature. The thermostat modulates the pneumatic master valve of the unit to which it is attached and the slave valves of the adjacent units.
The SAT to the induction units (74°F to 100°F) is reset by the DDC system. On some very cold days it is sometimes necessary to set the SAT above 100°F.
During the heating season, the induction system fans operate 24 hours per day. They are seldom shut down at night because experience has been that there is a very slow recovery from setting back temperatures at night. The slow recovery from night setback results in operating and comfort problems in the building. As a result, on very cool days, night setback is not implemented and the air handling units that serve the perimeter spaces run continuously during these times.

Cooling Equipment

The perimeter spaces, from the 2nd through 16th floors, are cooled through the cooling coils in the induction units. The chilled water in the induction units is a separate circulation loop from the loop that serves the rest of the building. The induction unit chilled water is maintained at a supply temperature of approximately of 55°F.
The induction system operates at 100% outdoor air until it is approximately 40°F outdoors. The purpose of this is to use the low temperature outdoor air to cool the chilled water in the chilled water coils. The chilled water thus produced is then used to provide cooling in the induction units and in the core units.
The first-floor perimeter is cooled through a dual coil constant volume system.
The interior zones are cooled through a VAV distribution system. The AC unit fans have inlet guide vanes which were controlled to maintain a set static pressure in the supply ductwork. Many of the pneumatic controlled inlet guide vanes no longer work.
On summer nights when the outdoor air temperature is cooler than the building interior, the outdoor air dampers are opened fully to precool the building for the next day.
When the Outdoor Air Temperature is greater than the Mixed Air Temperature, then the DDC system reduces the % Outdoor Air to “minimum”, which is approximately 20%.
The SAT from the Air Handling Units that serve the interior spaces is 60°F in the winter and 55°F in the summer.

There are two recently installed York MaxE Centrifugal chillers. Each chiller is rated at 900 tons, 732 kW. At full load this is 0.81 kW/Ton. Each chiller is designed with 1873 lbs. of the R-134A refrigerant.

One chiller is generally turned on whenever the outdoor air temperature exceeds between 60°F and 65°F. One chiller can handle the entire building, even when it is 95°F outdoors. The primary chilled water loop serves the chilled water coils in the air handling units. Each of these chilled water coils have a three-way control valve. The primary chilled water pump has a 150 HP motor with a VFD.
There is a secondary chilled water distribution loop for the induction units. The loop on each floor is split to two zones, a North zone and a South zone. The induction unit control valves are all two position valves, except for the two three-way valves at the end of the zone loops at each floor. These three-way valves at the end of each zone loop (two total per floor) maintain a constant minimum flow of chilled water in the zone loop. The secondary chilled water loop has a 100 HP motor.

Snow Melt System

There is approximately 23,000 square feet of sidewalk area that is tempered during the winter for snow melting purposes. This system is served by the building space heating boilers through a hot water to glycol heat exchanger and 3-way mixing valve. A constant flow 60HP pump circulates the glycol throughout the many in-slab zones.

The slab was designed to be maintained at approximately 40°F utilizing an entering glycol temperature between 110°F and 120°F.

Some of the glycol used for snow melting is pumped through the coil in AHU-11 and was originally intended to recover waste heat from the building toilet exhaust air. However, the air passing over this coil is approximately 72°F and the temperature of the return glycol is approximately 90°F to 100°F. This is actually cooling the return glycol, not recovering heat.

This system is at the end of its service life. The in-slab moisture sensor has failed and many of the loop coils have begun to leak and have been valve off. Recently a new Tekmar controller was added along with two aerial snow deception sensors to try to gain back some level of control of this system.

Domestic Hot Water System

The domestic hot water system for the Rath building relatively new. There is two gas fired 285 MBH Lochinvar Armor condensing water heaters. The DHW is stored in two insulated tanks at about 135°F. DHW is used in the building for bathrooms and kitchenette faucets. Two recirculation pumps ensure hot water is available at all times and are controlled with aquastats.

HVAC Controls

The facility has a DDC controlled building management system with most end devices pneumatic and some electronically controlled. Items that are on the BMS include AH units, AC units, exhaust fans, boilers, lighting, heat exchangers with associated pumps, chillers and cooling tower with associated pumps. There is some equipment in the building that is not currently controlled by the Siemens controls.

This building has two Quincy reciprocating type air compressors that serve the pneumatic control system end devices. The compressors are located in the fifth-floor mechanical space and each have a 20 HP motor.

FIRE TRAINING ACADEMY

Interior Lighting

Academy
The majority of the interior lighting consists of 2 ft and 4 ft linear fluorescent T-8 fixtures. The fire drill hall has high bay metal halide fixtures to supplement the natural light from glass block windows. All interior lighting at the fire training building are manually controlled. There are an additional 8 3’x3’ skylights in the EMS addition area.

Hazmat
Lit with 4 ft linear fluorescent T-8 fixtures. Some have occupancy sensors. There are high bay metal halide lights that also do not have occupancy sensors.

New Storage
Primarily 4 ft linear fluorescent T-8 fixtures. Two of the fixtures have occupancy sensors.

Exterior Lighting

Exterior lighting at the Fire Training Academy includes HID parking lot and wallpack light fixtures as well as compact fluorescent fixtures. The parking lot lighting is controlled with photocells and the wall packs are controlled with timers.

Heating and Cooling Equipment

The drill hall of the main building is heated by an 840 MBH gas-fired air rotation unit. There are six gas-fired RTUs with DX cooling, that serve the fire training classrooms and offices. There are two 10-ton gas fired RTUs with DX cooling, for the EMS part of the main building and the

auditorium. One of the 10-ton RTUs is ducted to VAV boxes which control the amount of air into each office space. Staff have indicated that the OA economizers are not functioning.

The hazmat building is heated by four standard efficiency gas-fired infrared heaters. One PTAC unit is installed in the wall of the only office in the building, but was found off during the site visit.

The new storage building is heated by three standard efficiency gas-fired infrared heaters. One PTAC unit is installed in the wall of a storage room. Four gas fired unit heaters heat the loft and entry way areas.

There are three electric cabinet heaters located in vestibules of the new addition but were found off. Three Nesbitt electric cabinet heaters serve two vestibules and a hallway of the older portion of the building. The two that serve the vestibules set to the warmest setting with fan on low and had no thermostat control. The other one located in the hallway was not functioning.

Ventilation Equipment

The Fire Training building is mainly ventilated through the packaged RTUs. Additional ventilation comes from three bathroom exhaust fans that are either manually controlled or on a broken timer. The drill hall relieves air through a damper controlled roof mounted gravity relief vent.

The Hazmat storage building and New Storage building have two vehicle exhaust fans each, that are on manual switches. These are only used if a vehicle is running inside the building, which happens very rarely.

Domestic Hot Water System

Domestic hot water for the Fire Training building is provided by a 60-gallon high-efficiency gas fired condensing DHW heater. DHW is used for bathroom and kitchenette faucets. One recirculation pump ensures hot water is available at all times and is controlled with an aquastat.

Both the Hazmat and New Storage buildings have standard efficiency 50-gallon gas fired DHW heaters with low usage. One recirculation pump is located in the Hazmat building to serve two bathroom faucets and is controlled with an aquastat.

HVAC Controls

All buildings at the Fire Training campus are on an Andover control system which can be accessed offsite. The system uses the control points from the local controls and relays them to the main control system.

Main Building
The new addition RTU-1 and corresponding 7 VAV boxes, has 7 zones of control all linked with remote sensors to one central control panel. Each zone has its own temperature setpoint and can be adjusted at the control panel. The control panel doesn't have scheduling capability. Heating setpoints range from 65 to 71 deg F and cooling setpoints range from 69 to 77 deg F. RTU-2 serves the new classroom only and has its own thermostat in the room. Demand control ventilation is in place for RTU-2, as there is a CO2 sensor located in the room, which controls the outside air damper.

The older portion of the building that is served by the 6 Trane RTUs have remote temperature sensors that feed back to 6 programmable thermostats located in an electrical room. The thermostats were split between manual mode and programmed mode. Heating setpoints from

65 to 70 deg F and cooling setpoints of 72 to 74 deg F. The units that are programmed have an occupancy schedule of 6AM to 6PM.

The air rotation unit setpoint is based on a return air sensor set at 72 deg F. Note this unit is not controlled by the Andover system.

Hazmat Building
Control of the infrared heaters is accomplished with one temperature sensor that relays back to the Andover control system. The setpoint for all infrareds is 66 deg F.

New Storage
Control of the infrared heaters is accomplished with individual thermostats set at 55, 55 and 45 deg F. The unit heaters are controlled with individual battery powered programmable thermostats which have no battery power left.

YOUTH DETENTION CENTER

Interior Lighting

The interior lighting in this facility is provided by linear fluorescent fixtures throughout. The main corridors are well lit due to large amounts of courtyard glazing and skylights. Lighting in the corridors consists of sconce type compact fluorescent fixtures.

Exterior Lighting

The exterior lighting at this facility is provided by HID wall pack fixtures with photocell controls.

Heating Equipment

The facility is primarily heated with gas-fired RTUs that are original to the 2002 construction. Most of the RTUs have cooling economizers and heat recovery wheels installed. Facilities staff have indicated that there some of the cooling economizers and heat recovery wheels are not-functioning. Approximately half of the RTUs are constant volume units and the other half are variable air volume units with reheat terminal units. One kitchen make-up air unit replaces the air that is exhausted by the kitchen hood. A list of RTUs is shown below:

Tag	Area Served	CAV/VAV	Supply CFM	Min. OA CFM	Suppy Fan HP	Gas Section Input (MBH)	Cooling (tons)	Cooling economizer	Heat Recovery wheel
RTU-1	Intake/Visiting	VAV	4,500	1,860	5	180	14	yes	yes
RTU-2	Admin/Mech/Warehouse	VAV	8,460	3,800	7.5	540	30	yes	yes
RTU-3	Bedrooms/Dayrooms	CAV	4,900	600	5	180	13	yes	yes
RTU-4	Bedrooms/Dayrooms	CAV	4,900	600	5	180	13	yes	yes
RTU-5	Kitchen/Dining	VAV	4,915	1,850	5	180	17	yes	no
RTU-6	Education	VAV	20,500	4,500	15	780	62	yes	yes
RTU-7	Bedrooms/Dayrooms	CAV	4,900	600	5	180	13	yes	yes
RTU-8	Bedrooms/Dayrooms	CAV	4,900	600	5	180	13	yes	yes
RTU-9	Gymnasium	CAV	6,000	1,800	5	390	18	yes	yes
MUA-1	Kitchen Hood	CAV	4,500	4,500	3	400	n/a	n/a	n/a

RTUs 2 and 5 that serve the admin and gym areas respectively, also have a solar wall pre-heating system ducted into the supply ductwork. The solar walls are intended to pre-heat the outside air before it passes by the heating coil. During the walkthrough it was discovered that the solar wall fans are not running and staff indicated that they have not run in quite some time. It is believed that the solar wall heating system may still be operational, but is not utilized.

Additional heat is supplied by two gas-fired 3,000 MBH standard efficiency hot water boilers. Hot water is sent by a set of 3HP lead/lag HW pumps to the VAV reheat coils, unit heaters, and cabinet unit heaters.

Cooling Equipment

Cooling is accomplished through the packaged RTUs utilizing DX cooling technology. There are two mini-split cooling systems that serve two computer and server rooms.

Ventilation Equipment

Fresh air is brought into the building through the outside air dampers of the packaged RTUs and kitchen MUA unit. Air is exhausted out of the building via the relief fans and dampers of the packaged RTUs, kitchen hood fan, and several exhaust fans. The kitchen hood fan operates only a few hours per day during cooking activity. The exhaust fans serve restrooms, office areas, and general open areas.

Domestic Hot Water System

Domestic hot water is used throughout the facility at restroom faucets, showers and kitchen washing. There are three condensing gas-fired DHW heaters (200 MBH, 400 MBH and 200MBH) and one non-condensing gas-fired DHW heater. The non-condensing unit is rated for 199 MBH and serves the kitchen area. Two fractional HP DHW recirculation pumps ensure DHW is readily available at all times.

HVAC Controls

The HVAC equipment at the Youth Detention Facility is controlled with an electronic Siemens control system. Equipment that is under control includes the boilers, hot water pumps, RTUs, MUA unit, exhaust fans, VAV boxes, and the DHW system.

VFDs at this facility are found on the hot water pumps and on the supply fans of the RTUs.

The solar wall preheating functionality is also on the control system but has been turned-off manually at the electrical panels.

FAMILY COURT

Interior Lighting

The interior lighting in this facility is primarily provided by linear LED fixtures with some hanging fixtures utilizing LED lamps. Lighting is controlled by the building management system occupancy schedule.

Exterior Lighting

The perimeter of Family Court is lit with LED wallpacks which are controlled by a schedule in the building management system.

Heating Equipment

Family Court is heated by two gas-fired condensing boilers of 2,000 and 4,000 MBH capacity. A fully redundant 12,247 MBH scotch marine gas-fired non-condensing boiler acts as a backup for the two condensing boilers. Hot water from the primary loop circulates through all three boilers

during the heating season. Heating hot water is sent from various hot water and glycol pumps to AHU heating coils, VAV reheat coils and perimeter fin radiation.

The hot water and glycol system is as follows:

Two 10 HP lead/lag constant volume (CV) primary hot water loop pumps circulate water through boilers and primary loop

- Two 7.5 HP lead/lag CV hot water pumps serve fin radiation
- Two 3 HP lead/lag CV hot water pumps serve VAV reheat coils
- Two 7.5 HP lead/lag CV hot water pumps pull hot water from the primary loop to send water to a plate and frame heat exchanger. The heat exchanger transfers heat to a glycol solution used in the AHU coils
    - Two 20 HP lead/lag CV glycol solution pumps serve the AHU coils
- Two 1 HP lead/lag CV hot water pumps pull water from the primary loop to send water to a shell and tube heat exchanger. This heat exchanger transfers heat to a glycol solution used in the snow melt system
    - Two 7.5 HP lead/lag CV glycol solution pumps serve the snow melt system. The snow melt system serves four zones around the front entrances of the building.

A list of AHUs at Family Court is shown below:

Tag	Serves	Supply [cfm]	Min OA [cfm]	Heating Capacity [MBH]	Cooling Capacity [tons]	Supply Fan [HP]	Return Fan [HP]	VFDs on fans?
AHU GR	Ground Floor	22,000	4,205	1,511	58	30	25	y
AHU 1	1st Floor	22,000	4,112	1,511	62	30	25	y
AHU 2	2nd Floor	22,000	4,187	1,511	63	30	25	y
AHU 3	3rd Floor	22,000	4,088	1,511	67	30	15	y
AHU 4	4th Floor	22,000	4,038	1,511	65	30	25	y
AHU 5	5th Floor	22,000	4,347	1,511	68	30	25	y
AHU 6	6th Floor	22,000	4,988	1,511	74	30	25	y
AHU 7	7th Floor	22,000	4,990	1,511	75	30	25	y

Cooling Equipment

Chilled water is provided by two 450-ton water cooled chillers. A set of 25 HP lead/lag CV condenser water pumps send condenser water to a roof mounted cooling tower. The cooling tower has two 30 HP fans.

Three 20 HP CV primary loop chilled water pumps circulate chilled water through the evaporators of the two chillers. One pump is for chiller one, the second is for chiller two, and the third could be used as a backup for chiller one or two. Two 25 HP lead/lag secondary chilled water pumps pull from the primary chilled water loop and sends chilled water to the AHU cooling coils. All cooling at Family Court is accomplished through the AHU cooling coils

Ventilation Equipment

Air is brought in and exhausted out through the air handling units outside air dampers and relief dampers. The return air fans of the air handlers push air to a common relief out of the building. One 10 HP exhaust fan serves all of the toilets throughout the building. Additional fractional HP fans serve mechanical and janitorial spaces.

Domestic Hot Water System

The DHW needs of the Family Court are for restroom and break room faucets. One 200 MBH non-condensing gas-fired heater provides the DHW heating. A storage tank located adjacent the DHW heater stores DHW for use throughout the day. One fractional HP recirculation pump provides DHW available at the faucets at all times. Several feet of DHW copper piping was found uninsulated.

HVAC Controls

Family Court HVAC equipment is controlled with a Siemens DDC building management system. Equipment that is under control includes boilers, hot water pumps, snow melt system, chillers, cooling towers, chilled water pumps, condenser water pumps, AHUs, VAV reheats, fin radiation, exhaust fans, and the domestic hot water system.

Variable frequency drives are found on the air handler supply and return fans, cooling tower fans and secondary chilled water pumps.

PUBLIC SAFETY CAMPUS

Interior Lighting

The interior lighting in this facility is provided by linear and compact fluorescent fixtures. The lighting is controlled with scheduling programmed into the building management system. Some areas have limited lighting usage because the number of occupants in the building is quite low compared to the square footage.

Exterior Lighting

The exterior lighting at this facility is provided by metal halide wallpack and spot lights which are controlled by the schedule of the building management system.

Heating Equipment

The Public Safety Campus is heated with three gas-fired 4,763 MBH hot water boilers. Two of the boilers are standard efficiency non-condensing boilers and one is a high efficiency condensing boiler. Due to an issue with the victaulic pipe fittings, the hot water loop has to be maintained at 180 deg or above so the seals do not leak. Hot water is sent to AHU heating coils, VAV reheat coils and perimeter fin radiation via two 25 HP lead/lag hot water pumps. Two 15 HP lead/lag pumps serve the glycol snow melt loop which transfers heat with the main hot water loop via a plate and frame heat exchanger.

One 2,396 MBH gas-fired standard efficiency steam boiler provides humidification for the air handling units.

Several of the VAVs have electric reheat coils.

A list of air handling units that serve the Public Safety Campus are as follows:

Tag	Area Served	Supply Air [cfm]	Min OA [cfm]	Heating [MBH]	Cooling [tons]	Supply Fan [HP]
AHU-1	Central Command	18075	2850	405	49	40
AHU-2	Central Command	18075	2850	405	49	40
AHU-3	Laboratories	23000	23000	1621	118	40
AHU-4	Laboratories	23000	23000	1621	118	40
AHU-5	Offices	44700	10800	987	98	75
AHU-6	Offices	43425	10800	987	98	75

Cooling Equipment

Chilled water is provided by two fully redundant 361-ton packaged air cooled chillers which is sent to all AHUs except AHU 3 and AHU 4. AHU 3 and AHU 4 are cooled with two 50-ton DX cooling units.

Pumping for the chilled water system includes two 20 HP lead/lag constant volume chilled water process pumps and two 25 HP lead/lag chilled water distribution pumps.

Additional cooling for equipment rooms includes five 5-ton dry coolers and a mini-split cooling system.

Ventilation Equipment

Fresh air is brought into the building through the outdoor air dampers of the air handling units. Air is exhausted through the relief dampers of the air handling units as well as laboratory fume hoods and general exhaust fans. Laboratory fume hoods generally run 24/7 because biological evidence and chemical compounds are stored within the laboratory areas. Only one of the two 50 HP lab exhaust fan runs at a time. A run-around heat recovery system is currently installed to recovery heat from the two lab exhaust fans. A list of exhaust fans at Public Safety is shown below:

Tag	Area Served	CFM	HP	VFD
RF-1	AHU-1	15,425	10	y
RF-2	AHU-2	15,425	10	y
RF-5	AHU-5	33,900	20	y
RF-6	AHU-6	32,625	20	y
EF-1	Bio Safety	1,200	1 1/2	n
EF-2	Bio Safety	1,200	1 1/2	n
EF-3	Bio Safety	850	1 1/2	n
EF-4	Toilets	7,800	2	n
EF-5	Laboratories	24,600	50	n
EF-6	Laboratories	24,600	50	n
EF-7	Trash	675	1/3	n
EF-8	Communication Room	500	1/2	n
EF-9	Penthouse Elec Room	500	1/2	n
EF-10	Bio Safety	1,200	1 1/2	n
EF-11	Firing Range	7,925	10	y

Domestic Hot Water System

Hot water for restroom, laboratories, and janitorial use is produced by two (2) natural gas fired water heaters located in the penthouse. The heaters are manufactured by Laars and have an input of 200 MBH. A storage tank, also located in the penthouse, is maintained at 122°F.

HVAC Controls

The building was constructed with a Siemens Apogee direct digital control system.

The Apogee system is used to perform typical equipment operations as well as economizer operations and VFD control.

The Apogee system has the ability to schedule the operation of all the HVAC equipment and VAV boxes based on an occupied/unoccupied schedule. Equipment under the control system include the boilers, AHUs, chillers, exhaust fans, heat exchangers, heat recovery, snow melt, hot water pumps, chilled water pumps, domestic hot water and lighting.

VFDs are found on the AHU supply and return fans, hot water pumps, chilled water pumps, and the snow melt glycol pumps.

CORRECTIONAL FACILITY

Interior Lighting

The interior lighting in this facility is provided by linear fluorescent fixtures throughout. The facility is occupied 24/7, so the majority of the lighting is also on 24/7. Areas that are manually turned off at night include administrative and inmate housing areas.

Exterior Lighting

The exterior lighting at this facility is provided by HID wall pack fixtures with photocell controls.

Heating Equipment

Heating at the ECCF is accomplished with (5) gas-fired 4,000 MBH condensing hot water boilers. The boilers are recently new and supply 180°F water to AHU heating coils, fin radiation, cab heaters, unit heaters and heat exchangers for kitchen DHW and building DHW.

One set of 60 HP hot water pumps serve the main building and a second set of 5 HP hot water pumps serves the annex. The annex hot water piping is taken off from the main hot water loop.

VAV boxes are located throughout the facility and serve as the terminal temperature control units as part of the AHU system. The main building has hydronic re-heat coils in the VAV boxes and the air handler that serves the Sierra area of the annex has electric resistance re-heats. The rest of the AHUs in the annex do not have VAV boxes. A list of AHUs is shown below:

Tag	Location	Serves	Supply [cfm]	Return [cfm]	Min OA [cfm]	Heating Capacity [MBH]	Cooling Capacity [tons]	Supply Fan [HP]	Return Fan [HP]	VFDs on fans?
AHU 1	Main	Charlie/Delta	15,700	13,200	2,500	436	52	15	5	y
AHU 2	Main	Gill/Hotel	15,700	13,200	2,500	436	52	15	5	y
AHU 3	Main	Alpha/Bravo	15,700	13,200	2,500	436	52	15	5	y
AHU 4	Main	Echo/Foxtrot	15,700	13,200	2,500	436	52	15	5	y
AHU 5	Main	Voc. Educ./Gym/Chapel	9,450	8,300	1,150	277	31	10	5	y
AHU 6	Main	Admin/Lobby/Visiting	14,650	11,875	2,775	418	53	15	7.5	y
AHU 7	Main	Library/Line-up	16,250	14,300	1,950	432	53	20	7.5	y
AHU 8	Main	Medical/Offices	9,525	8,650	875	323	30	7.5	3	y
AHU 9	Main	Kitchen/Bakery	14,850	9,200	5,650	749	61	15	5	y
AHU 1	Annex	Nova	5,800	4,930	870			5		n
AHU 2	Annex	Lima	5,825	4,951	874			5		n
AHU 3	Annex	Oscar	5,975	5,079	896			5		n
AHU 4	Annex	Papa	5,975	5,079	896			5		n
AHU 5	Annex	Romeo	5,725	4,866	859			5		n
AHU 6	Annex	Sierra	1,900	1,615	285			2		n

Cooling Equipment

Two 285-ton water cooled centrifugal chillers provide chilled water to the AHU cooling coils in the main portion of the building. Only one chiller runs at a time and the facility engineers rotate them for even use. One of the chillers was installed in 2015 and the other was installed in 2016. Heat is rejected with a cooling tower located outside of the first-floor mechanical room.

Two lead/lag 50 HP condenser pumps circulate water between the chiller and the cooling tower.

Chilled water to the AHU coils is provided by two lead/lag 30 HP chilled water pumps. Two additional led/lag 15 HP pumps circulates chilled water through the chillers.

The annex portion of the building has DX cooling that runs between outside condensing units and coils within the AHUs.

Ventilation Equipment

Building ventilation is primarily provided by the outside air plenums/dampers and relief air through the AHUs. Additional ventilation is from roof-mounted general exhaust fans that run 24 hours per day seven days per week.

Domestic Hot Water System

The five condensing hot water boilers feed hot water to two DHW heat exchangers. One heat exchanger provides DHW for the kitchen area loop and another heat exchanger provides DHW for the rest of the facility loop. Kitchen DHW is used for cooking, cleaning and dish washing. An electric kitchen booster heater increases the temperature of the dishwashing DHW. The main DHW loop is used at bathroom faucets and inmate showers.

HVAC Controls

The ECCF HVAC equipment is controlled with a partial pneumatic and partial electronic control system integrated into one BMS. The original construction building has pneumatic controls with powered by an air compressor located in the main mechanical space. Staff have indicated that the pneumatic system has leaks but generally operates as intended. Electronic controls are found in the Annex portion of the building and are in good condition.

Equipment currently on the BMS includes boilers, chillers, cooling tower, air handlers, pumps, VAV dampers and reheat valves.

The second-floor storage area was found to be warmer than is required because the fin radiation and air handlers that serve that space have setpoints from when the space was occupied.

LAW LIBRARY

Interior Lighting

The interior lighting in this facility is provided by linear and compact fluorescent fixtures. Facility staff have indicated that the lights are typically manually turned off at the end of the work day.

Exterior Lighting

Exterior lighting at the Law Library is HID wall pack fixtures with photocell controls.

Heating / Cooling Equipment

The facility is heated and cooled by four Trane, gas-fired, packaged roof top units. The RTUs were all installed during the 2002 renovation project. All four RTU's are controlled by the BMS. The units appear to have been maintained well over the years; however, they are at the end of their service life and have recently needed costly parts and repairs. Below is a list of the RTUs.

Tag	Area Served	DX Capacity (tons)	Supply CFM	Min. OA CFM	Gas Section Input (MBH)	Suppy Fan HP
RTU-1	Day Care	15	6025	1500	350	5
RTU-2	1st Floor	15	6000	1500	350	5
RTU-3	2nd/3rd Floor	25	9600	2400	400	7.5
RTU-4	3rd Floor Main Law Library	10	4000	1000	205	3

In addition to the RTUs, a few areas of the building also have hot water radiation, such as perimeter radiation for the 3rd floor main law library and CUHs in the stair wells. Hot water is produced from a single gas fired, 999.9 MBH LAARS Pennant boiler, located in the basement. Hot water is distributed to the areas served by two 3HP Bell and Gossett pumps. The boiler seems to be oversized for the areas it serves. Both the pumps and boiler are controlled by the BMS.

Ventilation Equipment

Fresh air is brought into the building through the four RTUs. The air is then relieved from the building with three exhaust fans. EF-2, 3 appear to be controlled with schedules from the BMS. EF-1 is manually controlled with a snap switch when the kitchen cooking equipment is being used.

Tag	Area Served	Exhaust CFM	Fan HP
EF-1	Kitchen Hood	1000	3/4
EF-2	Toilet Rooms	900	1/4
EF-3	Elec. Rooms	700	1/3

Domestic Hot Water System

All the buildings domestic hot water needs are met with one 75-gallon standard efficiency gas fired hot water heater. This 75 MBH Rheem was installed in January 2018. This system has one 1/6 HP recirculation pump that runs based on an aqua stat.

HVAC Controls

An Andover control system was installed during the 2002 renovation project. Equipment that is controlled by the system includes the boiler, hot water pumps, and RTUs.

AURORA HIGHWAY

Interior Lighting

Interior lighting at this facility is primarily T-12 fluorescent light fixtures in various lengths and configurations. The garage area is lit with high bay high pressure sodium fixtures in a grid pattern. Supplemental lighting between the high bay fixtures comes from 12 large skylights. All interior lighting is manually controlled and most was found on even when there were no occupants in the rooms.

Exterior Lighting

The outside perimeter of the building is lit with HID wallpacks which are on photocell controls. Some of the photocells have failed as the lights were discovered on during daylight hours. The parking lot lighting consists of LED area lights on photocell control.

Heating Equipment

Heating at this facility is accomplished with infrared heaters, unit heaters, electric baseboard and gas-fired RTUs. The garage and repair shop are heated with a total of 22 standard efficiency gas fired infrared heaters. During the walkthrough it appeared that four of the infrared heaters were much newer than the rest of the units.

Three standard efficiency 25 MBH gas-fired unit heaters serve the paint room, parts storage and small office areas. The parts storage unit heater had a crack in the heat exchanger and the paint room unit heater was mounted up near the ceiling.

The offices and break rooms are heated with two new 130 MBH standard efficiency gas-fired RTUs. Electric baseboard provides supplemental heat for the engineer and crew chief offices.

Cooling Equipment

The offices and break room are cooled by the RTUs with packaged DX cooling. Each RTU is capable of 5 tons of cooling. These were installed in 2017 and include economizer to provide “free” non-DX cooling when temperatures allow. The rest of the facility has no cooling.

Ventilation Equipment

There are two bathroom exhaust fans in the office restrooms. One serves the combined men and women’s break room area and the other is for the private office restroom. Both exhaust fans are manually controlled and the combined men’s/women’s bathroom was found left on with no occupants.

The garage has 9 vehicle exhaust fans which are controlled with a manual switch and a timer. Staff have indicated the fans operable very seldom and only if a vehicle is running inside or in oppressive summer heat.

The repair shop and paint shop have a total of 3 general exhaust fans on a switch and one vehicle exhaust fan on a manual switch.

Domestic Hot Water System

Domestic hot water is provided with one 40-gallon 80% efficient gas fired hot water heater with a 40 MBH capacity. Hot water is used in the bathroom faucets and for washing in the shop areas. One 1/6 HP recirculation pump circulates domestic hot water to all the fixtures based and is controlled with an aquastat.

HVAC Controls

The two RTUs are controlled with individual programmable thermostats being held in the manual mode. Break room setpoint is 73 deg F and the offices are set at 70 deg F during the heating months. Both are set at 72 deg F during the cooling months. Electric baseboard heating is controlled with a dial type controller on each individual unit. Currently there is no communication interface between the RTU and electric baseboard controls, so there may be times when the electric baseboard is heating and the RTUs are cooling. All infrared heaters and unit heaters were on wall mounted dial type non-programmable thermostats with setpoints ranging from 55 deg F to 70 deg F.

OLD COUNTY HALL / ERIE COUNTY COURT ANNEX

Interior Lighting

The interior lighting in this facility is provided by linear and compact fluorescent fixtures throughout. The majority of the lights are controlled manually but there are several areas with occupancy sensors.

Exterior Lighting

Exterior lighting for both buildings consists of HID wallpacks and spot lighting. The exterior lighting is controlled with both photocell controls and through the BMS scheduling.

Heating Equipment

The main source of space heating at Old County Hall and the Erie County Court Annex is two 250 HP natural gas fired Farrar & Trefts hot water boilers, located in the 8th floor mechanical space of the Annex building. Hot water piping serves AHU coils, VAV reheat coils and perimeter fin radiation in both buildings. Both boilers appear to have been well maintained and are in good condition.

One set of 20 HP lead/lag hot water pumps serves the air handler coils and VAV reheats while another set of 20 HP lead/lag hot water pumps serves the perimeter fin radiation.

In 2002 a major renovation occurred which installed new mixed-air AHUs, VAV boxes, perimeter fin, exhaust fans and associated applicable ductwork and mechanical piping.

All AHUs that serve the Annex are located in the 8th floor mechanical space whereas the AHUs that serve Old County Hall are located in various mechanical spaces of that building. A majority of the AHUs at Old County Hall are found in the attic and mezzanine mechanical spaces.

A list of AHUs is shown below:

Building	Tag
EC Court Annex	AHU-GB
EC Court Annex	AHU-35N
EC Court Annex	AHU-12N
EC Court Annex	AHU-24S
EC Court Annex	AHU-6
EC Court Annex	AHU-15S
EC Court Annex	AHU-7
EC Court Annex	AHU-TEMP
EC Court Annex	AHU-8
EC Court Annex	INFILL
Old County Hall	1st West
Old County Hall	2nd West
Old County Hall	1st East
Old County Hall	2nd East
Old County Hall	Ground S
Old County Hall	3rd SE
Old County Hall	3rd SW
Old County Hall	3rd NW
Old County Hall	4th SW
Old County Hall	Ground N
Old County Hall	3rd NE
Old County Hall	4th SE
Old County Hall	4th NE
Old County Hall	4th NW

A snow melt system located in the basement of Old County Hall heats the main entrances of both buildings. This system exchanges heat from the fin radiation hot water loop through a plate-and-frame heat exchanger to a glycol snow melt solution.

Cooling Equipment

Both buildings are cooled with a central chiller plant (installed 2002) located on the 8th floor of the Annex building. Two 640-ton water cooled centrifugal chillers provide chilled water to the AHU cooling coils in both buildings. Only one chiller runs at a time and the facility engineers rotate them for even use. Heat is rejected with two roof mounted cooling towers. Typically, only one cooling tower is used when one of the chillers is operating but in recent years the engineers have blended them to prevent bacteria issues.

Three 30 HP condenser pumps circulate water between the chiller and the cooling tower. One of the pumps is a backup and the other two work in a lead/lag configuration.

Chilled water to the AHU coils is provided by three 50 HP chilled water pumps. One of the pumps is a backup and the other two work in a lead/lag configuration.

Ventilation Equipment

Building ventilation is primarily provided by the outside air plenums/dampers and relief air through the AHUs in both buildings. Supplemental ventilation in the Annex building is from two large roof-mounted general exhaust fans. The attic space of the Old County Hall has four natural vent turbines that allow heat to escape out of the roof. Three of the four vents had operational spinning mechanisms.

Domestic Hot Water System

Domestic hot water in both buildings is used at bathroom and small kitchenette faucets. The Annex DHW is heated with a standard-efficiency 315 MBH atmospheric boiler which feeds a storage tank. Several feet of distribution piping was found uninsulated. Two fractional HP recirculation pumps ensure hot water is readily available at faucets around the facility and are on aqua stat controls.

The Old County Hall DHW system consists of an 85-gallon electric resistance heater tank. A large amount of DHW distribution piping was found uninsulated. One fractional HP recirculation pump circulates the water with aqua stat controls.

HVAC Controls

An electronic Andover controls system monitors and controls the buildings' boilers, air handling units, exhaust fans, hot water pumps, chillers, cooling towers, condenser pumps, chilled water pumps and domestic hot water systems. Occupancy scheduling is also programmed by the facility manager to adjust temperature setpoints and equipment operation during unoccupied periods.

VFDs are found on the Annex hot water pumps, chilled water pumps, and AHU supply and return fans in both the Annex and Old County Hall.

HEALTH MALL

Interior Lighting

Interior lighting at the Health Mall is accomplished with linear and compact fluorescent fixtures throughout. The lights are controlled with manual wall switches and are generally turned-off after occupants leave the spaces. The old UB Dental area that is currently unused has the lights off until another tenant can be found.

Exterior Lighting

The exterior lighting at this facility is provided by LED wallpacks on photocell controls. The photocell controls were found to be not working since the lights were on during the daylight hours.

Heating and Cooling Equipment

The Health Mall is heated and cooled with an electric Variable Refrigerant Flow (VRF) system. This system acts as a network of heat pumps which can move heat from one area to another or exchange heat with the outside through outdoor heat pump units. The interior portion consists of cassette heat pumps that distribute the heated or cooled air. At the Health Mall there are 42 individual cassettes and 8 (6-ton) outside heat pump units.

Electric resistance heaters provide additional heating for the vestibules and stairwells.

Ventilation Equipment

Fresh air is brought in by six energy recovery ventilators (ERVs). Inside the ERVs there exists compressors to move refrigerant through the system, supply and exhaust fans, and a heat recovery wheel. The fresh air being brought in by the supply fan passes through a heat wheel which exchanges heat with the air being exhausted out of the building. All of the building ventilation goes through the ERVs.

Domestic Hot Water System

Domestic hot water for faucets is provided by two 200 MBH condensing DHW heaters. The heaters were installed in 2013. Several feet of uninsulated copper piping was found in the mechanical space where the DHW heaters are located. Two DHW recirculation pumps are snap switch enabled and currently run 24/7 to ensure hot water is available at the faucets.

HVAC Controls

The Health Mall HVAC equipment is controlled with an electronic Siemens control system. The VRF system has a main controller which is picked up by the main controls system. Access to the BMS can be either on site through the VRF control panel or remotely with a computer, wither on site or off site.

Electric resistance heaters are controlled with manual switches located on or adjacent to the units.

CHESTNUT RIDGE PARK

Interior Lighting

- Park Office – linear fluorescent and incandescent fixtures, manual switches
- Truck Maintenance Shop – linear fluorescent and incandescent fixtures, manual switches
- Sheriff's Bunker – linear and compact fluorescent fixtures, manual switches
- Casino – linear fluorescent, metal halide, incandescent, manual switches
- Radio Tower Building – linear fluorescent and incandescent fixtures, manual switches

Exterior Lighting

- Park Office – HID wallpacks on photocells
- Truck Maintenance Shop – HID wallpacks on photocells
- Sheriff's Bunker – high pressure sodium wall packs on timer
- Casino – high pressure sodium wallpacks, quartz spot lights, metal halide flag lights, incandescent entry lighting; all exterior lighting on timers
- Radio Tower Building – high pressure sodium wallpacks on photocells

Heating Equipment

- Park Office – one 600 MBH gas fired standard efficiency boiler serves heating hot water to fin radiation and unit heaters. There are four zones of hot water heating served by four fractional HP pumps.
- Truck Maintenance Shop – one 776 MBH gas fired standard efficiency boiler serves heating hot water to unit heaters. The boiler was originally designed for oil but has been converted to burn gas. This unit is original to the 1960s and is operating very poorly.
- Sheriff's Bunker – heat is supplied by two electric boilers. Hot water is sent via two lead/lag 1.5 HP hot water pumps to a multizone hot deck/cold deck air handling unit. There are 11 individual zones that the air handler has heating and cooling coils for. The AHU is from the 1960s construction and has some blow-by issues with the sheet metal and seams.
- Casino – three 210 MBH gas fired condensing hot water boilers (installed in 2010) provide heating hot water to unit heaters throughout the building. The boilers were operating with a hot water reset schedule to take advantage of the condensing technology.
- Radio Tower Building – one 500 MBH gas fired standard efficiency boiler serves heating hot water to perimeter fin radiation and unit heaters. There are two fractional HP hot water pumps that serve the two zones hot water heating.

Cooling Equipment

- Park Office – no cooling
- Truck Maintenance Shop– no cooling
- Sheriff's Bunker – the Bunker is cooled with a 50-ton chiller. Chilled water is sent from 1.5 HP lead/lag chilled water pumps to the multizone air handler cold deck coils. Heat is rejected by two 3 HP lead/lag condenser water pumps to a heat rejection coil and fan system. The coil and two fans act as a cooling tower by passing outdoor air across the heat rejection coil. Two fans (B&C) are 10 HP each and currently operate 24/7 together.
- Casino– no cooling
- Radio Tower Building – one mini-split system cools the server room

Ventilation Equipment

- Park Office – one restroom exhaust fan on a manual switch
- Truck Maintenance Shop – one vehicle exhaust fan on a manual switch
- Sheriff's Bunker – Fresh air is brought in by Fan D (7.5 HP). This fan draws air from the tunnel and into the multizone air handler. The air handler has its own 10 HP supply fan. Fan E is a 3 HP fan that exhausts air from the building. If the building begins to over pressurize there is a building relief damper that can open in the equipment room.
- Casino – there are two open fireplaces which, through stack effect exhaust air from the building. During the heating season it is estimated that heated air is escaping from the fireplace chimneys. Air infiltration is the only means of fresh air into the facility. The kitchen has a general exhaust fan and is used only seldomly during cooking operations.
- Radio Tower Building – one fractional HP restroom exhaust fan with very little usage

Domestic Hot Water System

- Park Office – one gas fired 40 MBH standard efficiency DHW heater for faucet use; there is several feet of uninsulated copper DHW piping located in the boiler room
- Truck Maintenance Shop – no DHW heater was found at this facility
- Sheriff's Bunker – one storage type electric water heater provides DHW for faucets

- Casino – one gas fired 200 MBH standard efficiency DHW heater for faucets; there is several feet of uninsulated copper DHW piping located in the basement
- Radio Tower Building – one gas fired 37 MBH standard efficiency DHW heater for faucets; there is several feet of uninsulated copper DHW piping; the unit was installed in the early 1990s.

HVAC Controls

- Park Office – the four zones of hot water heating are controlled with four non-programmable thermostats. The t-stats control the operation of the hot water pumps.
- Truck Maintenance Shop – one thermostat controls a hot water pump which sends hot water to the unit heaters. The unit heater fans are manually controlled with wall switches.
- Sheriff's Bunker – Siemens pneumatic control system. Equipment on the controls system includes electric boilers, hot water pumps, multizone air handler, chiller, chilled water pumps, condenser water pumps, intake fan, exhaust fan, heat rejection fans, generator and domestic hot water heater. The system is antiquated but is still functioning. Individual zone thermostats control the hot deck/cold deck dampers of the multizone AHU. Two ¾ HP compressors provide the pressurized air for the controls system.
- Casino – programmable thermostats control the unit heaters throughout the building; the t-stats were found held in manual mode and is overriding the programmable features
- Radio Tower Building – there are two non-programmable thermostats that control the hot water pump operation in the boiler room

HARLEM HIGHWAY

Interior Lighting

Interior lighting at the buildings and grounds shop is primarily T-8 and T-12 fluorescent light fixtures in various sizes and configurations. In the newest storage addition, the lighting is provided by LED fixtures. Lighting was found on in unoccupied areas and are controlled with manual switches.

T-8 and T-12 fluorescent lighting was also found in the maintenance shop and sign shop. The fixtures in these areas ranged from 2-6 lamps at various sizes. Lighting was left on in unoccupied spaces.

Vehicle storage has many 300- and 400-watt metal halide fixtures on in the garage even when the area is unoccupied.

Exterior Lighting

The outside perimeter lighting of the buildings is provided by HID wallpacks which are on photocell controls. Only 1-2 photocells have failed and their lights are on during the day.

Heating Equipment

Heating in the Buildings and Grounds shop is provided by heated slab, unit heaters, infrared standard efficiency heaters, and some baseboards in the office areas. Heated slab is provided by a non-condensing gas-fired Peerless hot water boiler with an input rating of 145 MBH. (7) total 80MBH infrared heaters heat the garage areas of the building. In the storage bay, there is (1) 30MBH gas-fired unit heater used to heat a back room in the bay.

The maintenance shop is heated by (2) furnaces and (4) unit heaters. In the office area, there is a 35 MBH wall furnace responsible for heating the office space for the crew chief. The second furnace is a 100MBH unit that heats the break room as well as a second office area. (2) 150 MBH and (2) 105 MBH gas-fired unit heaters are spread out through the garage areas. There is a 30MBH gas fired unit heater in the bathroom as well. They all are mounted near the ceiling.

The sign shop is heated by (1) Dayton gas-fired 125 MBH unit heater and (1) Markel Electric 1500W electric wall heater in the bathroom.

Vehicle storage is heated by (4) Reznor gas-fired unit heaters of 300 MBH capacity.

Cooling Equipment

Only the Buildings and Grounds shop and the Maintenance shop have cooling capabilities. The Buildings and Grounds facility has a 1.5 and 2 ton split system air conditioners for cooling. They are responsible for cooling the computer room and offices. The maintenance building has a DX cooling setup on the furnace in the breakroom area.

Ventilation Equipment

There are two exhaust fans present in the buildings and grounds for the men's and women's restrooms. There are also two 12" exhaust fans in the storage bay, both with dampers. The bathroom fans are controlled by operating occupancy sensors, while the storage bay fans are manually controlled.

The sign shop has an exhaust fan in the bathroom that is connected to the light switch. If the light is on, the exhaust is running.

Domestic Hot Water System

Domestic Hot Water in the Buildings and Grounds is provided by an Amtrol indirect water heater which exchanges heat from the boiler loop to the city water. DHW is used at restroom and kitchen faucets.

One 40 gal 36 MBH gas-fired domestic hot water heater serves the sign shop faucets.

One 40 gal 34 MBH gas-fired domestic hot water heater serves the maintenance shop faucets.

HVAC Controls

The heated slab of buildings and grounds is controlled by thermostats in manual control modes for the offices, bathroom, parts rooms, and breakroom. The office setpoints are 68 deg F and the breakroom is set to 70 deg F during the heating season. In addition to the slab heat, one office has baseboard hot water radiation heating controlled from the same thermostat. In the garage bay, infrared heaters are controlled by a manual thermostat set at 70 deg F. In the parts area near the offices, infrared heaters are set to 50 deg F. The new storage bay addition has infrared heaters on a manually controlled thermostat at 62 deg F. There is also a unit heater with a programmable thermostat set at 62 deg during the day. The thermostat is programmed to currently heat at 62 deg F during the day and 70 deg F overnight.

In the maintenance shop there is a non-programmable thermostat in the bathroom to control the unit heater but it was not functioning. In the breakroom, there is a programmable thermostat in manual mode set at 72 deg F to control the furnace. In the garage bays, two unit heaters are

controlled by a non-programmable thermostat and programmable thermostat with setpoints of 68 and 50 deg F.

In the sign shop there is a non-programmable thermostat set to 62 deg F controlling a unit heater in the building. In the bathroom, there is an electric heater with “low, med, high” setting for the heater.

The four unit heaters of the Vehicle Storage building are controlled by non-programmable thermostats with setpoints ranging from 50-75 deg F.

CONCORD HIGHWAY

Interior Lighting

The interior lighting in this facility is primarily provided by T-8 and T-12 linear fluorescent with supplemental lighting from LED T-8, and low/high bay HID fixtures. All of the interior light fixtures are on manual wall switch controls. During the walkthrough the unoccupied areas of the vehicle storage and sign shop buildings had the lights on.

The salt barn has three HID area light fixtures which are burned out due to the wall switch being left on at all times. The mix barn has three LED area fixtures on wall switch control and is left on at all times.

Exterior Lighting

Exterior lighting on the perimeter of the maintenance building are high pressure sodium wallpacks with a single manual switch control. The exterior lights are left on at all times.

The exterior of the vehicle storage and sign shop buildings is lit with HID and CFL wallpacks with working photocell controls.

Heating Equipment

The maintenance building is primarily heated with standard efficiency gas-fired infrared heaters in a large grid pattern. There are a total of three “sections” which are made-up of several burner units. Additional heating is provided by two 75 MBH standard efficiency gas-fired unit heaters, electric fin baseboard and a standard efficiency gas-fired 112.5 MBH hot water boiler with cast iron hot water radiators. The boiler was installed in 1987 and is beyond its service life. Hot water radiation serves the old office area and bathrooms exclusively.

Heating in the vehicle storage/office building is accomplished with four 400 MBH standard efficiency gas-fired unit heaters for the garage area and a high efficiency 44 MBH gas-fired furnace for the offices. The break room and engineers office use supplemental electric heaters when the outside air temperature is below freezing.

The sign shop is heated with one 400 MBH standard efficiency gas-fired unit heater.

Cooling Equipment

The facility has limited cooling equipment which includes a 2-ton AC coil in the furnace serving the offices, and one window air conditioning unit in the maintenance building break room and one unit serving the desk area of the sign shop.

Ventilation Equipment

The maintenance building is ventilated with four gravity relief vents which have been converted to four vehicle exhaust relief vents. Each vent has a motor driven vehicle exhaust fan on manual controls. The vehicle exhaust fans run only when equipment is running inside the building.

Ventilation in the vehicle storage building includes two vehicle exhaust fans that seldom run and two office bathroom exhaust fans which are tied into the wall mounted light switch. Staff have indicated that the lights and fans in the bathrooms are often left on even after occupants leave the area. The men's bathroom lights and exhaust fan were discovered on with no occupants during the walkthrough.

Domestic Hot Water System

Domestic hot water in the maintenance building is served by a 40-gallon 40MBH gas fired unit with one recirculation pump. The office / storage building is served by a 40 gallon 40 MBH gas fired unit and is connected to uninsulated piping.

HVAC Controls

The vehicle storage building has 3 non-programmable thermostats controlling the infrared heaters with setpoints ranging from 70 to 90 deg F. There is 1 non-programmable thermostat controlling the fin tube radiation set at 70 deg F.

The office/storage building furnace in the office is controlled with a single programmable thermostat at 70 deg F. The unit heaters located in the garage area are on individual dial-type thermostats set between 60 and 65 deg F.

HAMBURG HIGHWAY

Interior Lighting

In the Maintenance Garage there is 4 ft fixture T-8s in office areas. The Garage/Shop areas have low-bay metal halides and a variety of T-12 fixtures. The light truck and sign storage buildings have a variety of fluorescent T-8 and T-12 lighting. Heavy Truck storage has low bay metal halide and a variety of T-8 and T-12 fluorescent lighting. The salt storage barns have HID area lights on manual switches but they were burned out from 24/7 use. The salt delivery barn has LED high bay lighting on timers. The additional storage building has low bay metal halide lighting that was burned out.

Exterior Lighting

The Maintenance Garage has high pressure sodium area lights with photocell control, but one has failed and was found on during the day. The Light Truck / Sign Storage has LED spot lights. The Heavy Truck Storage has HID/CFL/LED wallpacks on photocells. The Salt Storage

Buildings also has HID area lights with photocells. The Salt Delivery Building has LED area lights on timer. The Storage Building has HID wallpacks on switches that were found off.

Heating Equipment

In the Maintenance Garage offices are heated with electric baseboard heating. The office bathroom is heated with a direct fired wall heater. The garage area has eight linear and two u-shape infrared heaters 120 MBH each. The garage area also has two 400 MBH Modine unit heaters. The tool shop and parts storage are heated with 75 MBH Reznor unit heaters. The lunch room has a 75 MBH Dayton unit heater.

The Light Truck /Sign Storage building has three newer 400 MBH Reznor unit heaters and one old 300 MBH unit heater. The Heavy Truck Storage building has four Reznor unit heaters; three newer models 400 MBH and one older 300MBH unit heater.

Cooling Equipment

The Maintenance Garage's office area is served by a Sanyo ducted mini-split system and the lunch room has a window air conditioner.

Ventilation Equipment

In the Maintenance Garage, two commonly used exhaust fans on wall switch which are used whenever vehicles are running inside. The damper blades were not fully closed on one. There are also 6 destratification fans with wall mounted speed control switches. In the Light Truck /Sign Storage non powered ridge vents which were found closed and inoperable. The Heavy Truck Storage has a vehicle exhaust fan mounted up at ceiling level, but is used sparingly only when plow is running inside

Domestic Hot Water System

The Maintenance Garage has a 40-gallon 40 MBH standard efficiency unit with uninsulated piping.

HVAC Controls

The Maintenance Garage office electric baseboard and bathroom gas fired wall heater are controlled by dial type thermostats. The office mini split cooling system is controlled by a manual thermostat set at 75. The garage area has manual dial type thermostats; 5 t-stats for infrareds set at 62 to 80 deg F and 2 for unit heaters at 50 and 72 deg F. The lunch room unit heater has manual t-stat at 70. The tool room and parts storage unit heaters have programmable t-stats but in manual mode set at 79 and 80 deg F. They are set higher to account for high amount of heat loss in the building. The Light Truck /Sign Storage unit heaters are on manual thermostats set from 63 to 65 deg F. Heavy Truck Storage has unit heaters with manual thermostats; three at 60 and one at 75 deg F.

ANGOLA HIGHWAY

Interior Lighting

The lighting throughout the maintenance building is primarily T-12 fluorescent lamp fixtures with electronic ballasts and on manual switches. Inside the vehicle storage building there are T-8 fluorescent fixtures that are also on manual switches. Several of the interior lights in the vehicle storage building were found on when no occupants were there. The salt barn has 2 HID lights on manual switches with burned-out lamps.

Exterior Lighting

Exterior lighting on all buildings consists of HID wallpack and area lights. The maintenance building and vehicle storage building exterior lights are on timers while the salt barn exterior lights are on photocell control.

Heating Equipment

The maintenance and vehicle storage buildings are heated with a total of 17 gas-fired high-bay infrared heaters. A small office located in the maintenance center is heated with a standard efficiency 35 MBH direct vent wall furnace.

Cooling Equipment

There is no cooling equipment at this facility.

Ventilation Equipment

The maintenance building has 2 exhaust fans on the front of the building for when vehicles are running and are controlled with manual on/off switches.

The vehicle storage building has 2 exhaust fans on the roof for when vehicles are running inside and are controlled with an electrical breaker panel.

All fans were found off while the buildings were unoccupied.

Domestic Hot Water System

Both the maintenance and vehicle storage buildings have a standard efficiency gas-fired 40-gallon DHW heater each, to serve bathroom faucets. The DHW heater located in the maintenance shop was valved and powered off and is assumed to be out of commission.

HVAC Controls

The maintenance building infrared heaters are controlled with 4 non-programmable thermostats set between 60 and 68 deg F. Another non-programmable thermostat set at 50 deg F controls the office furnace.

Infrared heaters in the vehicle storage building are controlled with a total of 6 thermostats located around the perimeter of the building. One programmable thermostat is located near the Sheriff's office within the building set at 62 deg F in manual mode. There are 5 other non-programmable thermostats in the facility and range from 62 to 80 deg F.

COLLINS HIGHWAY

Interior Lighting

The interior lighting at this facility is primarily T-12 and T-8 fluorescent linear light fixtures. All interior lighting fixtures are controlled with manual wall switches. Several lights in the

maintenance building were found on with no occupants and all of the interior lights in the vehicle storage building were left on with no occupants. The inside of the salt barn is lit with high output LED area fixtures and were also found on with manual controls.

Exterior Lighting

Exterior lighting consists of HID area lights and wallpacks, and LED area lights on the salt barn. The maintenance building and salt barn exterior lights are controlled with photocells and the vehicles storage exterior lights are controlled with a timer.

Heating Equipment

The maintenance building is heated with six 20' long gas-fired GordonRay Infrared heaters located in the garage bay areas. One standard efficiency gas-fired 150 MBH hot water boiler serves the office and lunch break areas of the maintenance building. Hot water circulates through fin radiation and to one unit heater in the lunch room.

The vehicle storage building is heated with four 300MBH gas-fired standard efficiency unit heaters.

Cooling Equipment

There is no cooling equipment at this location.

Ventilation Equipment

Two exhaust fans on manual switches provide ventilation in the vehicle storage building. The fans run very seldom and only if a piece of equipment is running inside.

Domestic Hot Water System

Domestic hot water for the maintenance building is provided by a standard efficiency gas fired 40 gallon 40 MBH storage type DHW heater. It was discovered that none of the copper distribution piping was insulated and is located in a drafty bathroom with single pane windows. The DHW heater serves bathroom sinks and the garage area for washing.

HVAC Controls

The infrared heaters in the maintenance building are controlled with three dial type manual thermostats. One thermostat serves two heaters in the first bay set at 54 deg F, another serves three heaters in the second bay set at 58 deg F and the third serves a tool room. The tool room infrared heater was turned completely off at the electrical panel. The lunch room unit heater has dial type thermostat set at 50 deg F. Each zone of fin radiation has a zone valve with a corresponding thermostat. The setpoints for the three zones 72, 50, and 62 deg F.

In the vehicle storage building the unit heaters are controlled with individual dial type thermostat. Three were set at 50 deg F and the fourth was set at 60 deg F.

CLARENCE HIGHWAY

Interior Lighting

The interior lighting at this facility is primarily T-12 and low bay HID light fixtures. All interior lighting fixtures are controlled with manual wall switches. Several lights in the maintenance building were found on with no occupants and all of the interior lights in the vehicle storage building were left on with no occupants. The inside of the salt barn is lit with high output LED area fixtures and were also found on with manual controls.

Exterior Lighting

Exterior lighting consists of HID area lights and wallpacks, and HID area lights on the salt barn. The maintenance building and salt barn exterior lights are controlled with photocells and the vehicles storage exterior lights are controlled with a timer.

Heating Equipment

The maintenance building has fourteen gas-fired standard efficiency infrared heaters located in half of the garage bay areas. Currently, these units do not operate. The office is heated with a 30 MBH gas-fired unit heater and the chainsaw room is heated with a 30 MBH unit. There are also two larger 300 MBH unit heater units heating the opposite side of the garage area. There also is a standard efficiency 75 MBH gas-fired furnace located outside the office area. In a parts area there is an electric heater with an unknown capacity.

The vehicle storage building is heated with four 300 MBH gas-fired standard efficiency unit heaters.

Cooling Equipment

There is no cooling equipment at this location.

Ventilation Equipment

Two exhaust fans on manual switches provide ventilation in the vehicle storage building. The fans run very seldom and only if a piece of equipment is running inside.

There also are two exhaust fans located in the bathrooms that operate when the room is occupied.

Domestic Hot Water System

Domestic hot water for the maintenance building is provided by a standard efficiency gas fired 40 gallon 40 MBH storage type DHW heater. It was discovered that some of the copper distribution piping was uninsulated.

HVAC Controls

The infrared heaters in the maintenance building were controlled with two non-programmable thermostats while they were operating. Two 300 MBH unit heaters in the maintenance building are controlled by two non-programmable thermostats set at 73 and 72 deg F. A 30 MBH unit heater is controlled a digital non-programmable thermostat at 67 deg F in the chainsaw room. The main office has fin tube radiation heating controlled with a dial type manual thermostat set at 70 deg F. The condensing furnace is controlled by an analog thermostat set to 65 deg F.

In the vehicle storage building the four unit heaters are controlled by manual thermostats set at 70, 65, 65, and 70 deg F.

HOLLAND HIGHWAY (SOUTH PROTECTION HIGHWAY)

Interior Lighting

Interior lighting at this facility is provided by T-8 fluorescent 4' long fixtures. All of the light fixtures are on manual switches. The building was unoccupied during the walkthrough and all interior lights were left on.

Inside the salt barn there are two HID area light fixtures which are burned out from the wall switch being left on at all times.

Exterior Lighting

The exterior lighting at this facility is provided by high pressure sodium lights. All lights were off during the walk through but it is unknown if they are controlled manually or by photocell. The salt barn had an exterior HID light that was also burned out.

Heating Equipment

Heating at this facility is provided by six infrared heaters and two unit heaters. The six 80MBH infrared heaters are in the garage bay area. There are two infrared heaters for each third of the building. Two 30MBH gas-fired unit heaters serve both the breakroom area and the bathroom.

Cooling Equipment

No cooling is present at this facility.

Ventilation Equipment

No ventilation equipment is present at the facility.

Domestic Hot Water System

Domestic hot water for faucet use is provided by a gas-fired 40 gal 40 MBH storage type water heater.

HVAC Controls

There are a total of five non-programmable thermostats present in the facility. Three thermostats are dedicated to controlling the infrared heaters in the three different zones. Their settings ranged from 50-62 deg F. The unit heater in the breakroom was set at 70 deg F. The unit heater in the bathroom was set to 63 deg F.

TONAWANDA HIGHWAY

Interior Lighting

The interior lighting at this facility is primarily T-12 and low bay HID light fixtures. All interior lighting fixtures are controlled with manual wall switches. Several lights in the maintenance building were found on with no occupants and all of the interior lights in the vehicle storage building were left on with no occupants. The inside of the salt barn is lit with high output LED area fixtures and were also found on with manual controls.

Exterior Lighting

Exterior lighting consists of HID area lights and wallpacks, and LED area lights on the salt barn. The maintenance building and salt barn exterior lights are controlled with photocells and the vehicles storage exterior lights are controlled with a timer.

Heating Equipment

The maintenance building is heated with eight gas-fired standard efficiency infrared heaters located in the garage bay areas. The break room is heated with a 50 MBH gas-fired unit heater and the bathroom is heated with a 30 MBH unit.

The vehicle storage building is heated with four 300 MBH gas-fired standard efficiency unit heaters.

Cooling Equipment

There is no cooling equipment at this location.

Ventilation Equipment

Two exhaust fans on manual switches provide ventilation in the vehicle storage building. The fans run very seldom and only if a piece of equipment is running inside.

Domestic Hot Water System

Domestic hot water for the maintenance building is provided by a standard efficiency gas fired 40 gallon 40 MBH storage type DHW heater. It was discovered that none of the copper distribution piping within the bathroom area was insulated.

HVAC Controls

The infrared heaters in the maintenance building are controlled with three dial type manual thermostats. The setpoints for the three zones 70, 65, and 70 deg F. Similarly, the two unit heaters are controlled with manual thermostats set at 70 deg F for the break room and 75 deg F for the bathroom.

In the vehicle storage building the unit heaters are controlled with individual dial type thermostat. Temperature setpoints were found to be 68, 72, 65, and 55 deg F.

5. ENERGY CONSERVATION RECOMMMENDATIONS, CALCULATIONS AND IMPLEMENTATION COSTS

FIM# 1 INTERIOR LIGHTING RETROFIT AND CONTROLS

Concept:

The light-emitting diode (LED) is one of today's most energy-efficient and rapidly-developing lighting technologies. Quality LED light bulbs last longer, are more durable, and offer comparable or better light quality than other types of lighting. LED is a highly energy efficient lighting technology and has the potential to fundamentally change the future of lighting in the United States. LEDs also emit very little heat. In comparison, incandescent bulbs release 90% of their energy as heat and CFLs release about 80% of their energy as heat. LEDs are now made in almost every configuration to replace or retrofit incandescent, fluorescent or HID lamps and fixtures.

Interior lighting controls in the form of occupancy sensors can limit lighting usage based on if the space is occupied or not. Areas that can benefit from occupancy controls are partially or infrequently occupied spaces, during a typical day. Wall mounted occupancy sensors are good applications for smaller rooms that can sense movement from 1-3 people. Remote ceiling mounted occupancy sensors are good applications for larger, more open rooms where occupancy can be sensed in a broader pattern.

Application:

Replace interior incandescent, fluorescent and compact fluorescent lamps with LED lamps.

Wall-mounted occupancy sensors are recommended for these specific areas: bathrooms, storage areas, and various other partially occupied areas. Refer to the appendix calculations for specified LED replacements and photocell control locations.

The sensors should be located so they can accurately sense the presence of occupants. For most locations, the sensors should be set as vacancy sensors so that they will not turn the lights on automatically, but they will turn the lights off automatically. The time delay should be set based on the type of space and how people use the space. This will avoid unnecessary cycling and reduce the chance of lights turning off when the space is occupied.

FIM# 2 EXTERIOR LIGHTING RETROFIT

Concept:

The light-emitting diode (LED) is one of today's most energy-efficient and rapidly-developing lighting technologies. Quality LED light bulbs last longer, are more durable, and offer comparable or better light quality than other types of lighting. LED is a highly energy efficient lighting technology and has the potential to fundamentally change the future of lighting in the United States. LEDs also emit very little heat. In comparison, incandescent bulbs release 90% of their energy as heat and CFLs release about 80% of their energy as heat. LEDs are now made in almost every configuration to replace or retrofit incandescent, fluorescent or HID lamps and fixtures.

Application:

Replace exterior lighting fixtures and lamps with equivalent lumen-rated LED fixtures and lamps. Parking lot lighting and wall packs are excellent candidates for new LED fixtures. Refer to the appendix calculations for specified LED replacements.

FIM# 3 WEATHERIZATION

Concept:

Reducing air infiltration is vital to creating a more energy efficient building. The purpose of air sealing is to create an effective air tight seal on the building envelope. This will reduce the amount of air flow and heat loss from conditioned to un-conditioned space. Factors that cause high air flow rates include the size and number of openings that connect the conditioned and unconditioned spaces and pressure differences between the interior and exterior of the building. The differences in pressures are typically caused by stack effect, wind, and temperature differences between the inside and outside of the building.

An air sealing contractor will use special diagnostic tools to pinpoint and seal hidden air leaks, typically hidden under the attic insulation.

Sealing the largest openings at the highest and lowest levels first is the most effective way to reduce unwanted air flow. These types of openings may include attic access doors, large mechanical chases that house ductwork and vent flues, and wall bypasses. Wall bypasses are holes created by irregular framing and can be found in interior and exterior wall systems. Smaller openings from wire holes, plumbing lines, and gaps around windows, doors and chimney flues are equally as important. Materials that should be considered for different applications are caulks, expanding foam, non-expanding foam, weather-stripping, and rigid insulation board.

Application:

Install weather-stripping, sealants, foams, gaskets and other sealing materials to reduce the amount of air infiltration at each of the buildings listed below. Weatherization should take place around doors, roof top ventilators, bulkheads, pipe penetrations, and roof/wall joints. Specific counts and types of weatherization can be found in the appendix calculations.

Note: The calculations indicate that 100% of the building is cooled. It is understood that there are certain areas within the buildings such as stairwells that are unconditioned. The calculations are based on the fact that the areas identified where the weatherization measures will be taking place are 100% cooled.

FIM# 4 REPLACE HVAC SYSTEM

Concept:

When HVAC systems are no longer operating the way they were designed, occupant comfort and energy costs can suffer. HVAC equipment that is passed its service life, when new, was

less efficient than new modern equipment. Most HVAC systems can also benefit from new DDC controls and tighter control strategies and sequencing.

Application:

The current HVAC system is past its service life and in very poor condition.

It is proposed to design and replace the entire HVAC system. This would include:

- Demo the existing AHU and Installing five gas fired, DX cooled, packaged rooftop units.
- Installing new duct systems for each of the RTUs with VAV box terminal units with hot water reheat coils.
- Replacing the boilers with new condensing boilers sized to serve the VAV reheats and add a set of hot water pumps with VFDs.
- Add a condensing furnace to serve the basement areas of the building.
- Install new control system.

FIM# 5 120/134 W. EAGLE SETBACK WITH STEAM VALVE

Concept:

Buildings that heat with steam radiator valves often control the temperature with thermostatic radiator valves (TRV)s. A TRV is mounted directly onto the steam radiator and are typically set to one temperature during all hours. Occupants generally do not lower the setpoint after they leave for the day, and thus the building heats more than necessary during the unoccupied hours. If terminal unit controls are installed in a building, control valves can replace the TRVs to implement proper temperature setpoints and an occupancy schedule.

Another option to control the steam radiators is with a global control valve installed in the main supply of steam to the building.

Application:

Install global control valves onto the main steam lines the serve 120/134 W. Eagle. The control valves should be installed in the boiler room right after the 120/134 W Eagle steam lines branch off from the main Holding Center Complex steam line. Use the control valves to modulate the amount of steam that goes through the 120/134 W Eagle supply lines in order to satisfy the unoccupied temperature setpoint. Several averaging temperature sensors throughout the spaces would need to be installed to provide the feedback to control the steam valves.

FIM# 6 INSTALL VENTILATION CONTROLS

Concept:

Exhaust systems remove air from a building. This air must be replaced with outside air that requires conditioning (heating and/or cooling). Some spaces are required by code to have exhaust fans, which generally operate when the building is occupied.

The energy impact of building exhaust can be minimized by limiting the operation of exhaust fans to those times when it is required. Reducing exhaust fan operation results in some motor savings, but the primary value is in the reduced heating and cooling load.

Control of an exhaust fan can be provided with a building management system (BMS) or an occupancy sensor. A building management system can turn the fans on or off based on an occupancy schedule. An occupancy sensor that controls light fixtures, can control exhaust fan operation. Heating and motor energy can be reduced by scheduling exhaust fans to operate only when the areas they serve are occupied.

Application:

- 134 W Eagle (Sheriff's/BOE) – integrate four roof mounted exhaust fans into the existing BMS; the fans currently run 24/7; schedule fans to run only during occupied hours
- Holding Center – integrate four mechanical room fans into the existing BMS; the fans currently run 24/7; schedule fans to run only during occupied hours
- Fire Training Academy – install wall mounted occupancy sensors to control two bathroom exhaust fans; the fans currently run 24/7; wire the lighting and exhaust fan operation together
- Youth Detention – integrate EF-1 and EF-2 (administrative areas) into BMS and schedule to run during occupied hours only; these fans currently run 24/7 similar to the inmate areas, however these areas are not occupied 24/7.
- Aurora Barn – install wall mounted occupancy sensors to control two bathroom exhaust fans; the fans currently run 24/7; wire the lighting and exhaust fan operation together
- Concord Hwy – install a wall mounted occupancy sensor to control one bathroom exhaust fan; the fan currently runs 24/7; wire the lighting and exhaust fan operation together
- Clarence Hwy – install wall mounted occupancy sensors to control two bathroom exhaust fans; the fans currently run 24/7; wire the lighting and exhaust fan operation together

FIM# 7 REPAIR/REPLACE STEAM TRAPS

Concept:

Mechanical traps are prone to failure as they age, resulting in large steam losses and requiring substantial maintenance. Steam traps separate the steam system from the condensate system. Traditional steam traps can fail in the open or closed position. When a steam trap fails in the open or leaking-by position, some or all of the energy that was added at the boiler is lost into the condensate return system. The energy contained in steam is only utilized when it condenses in a heat exchanger (radiator, convector, hot water heater, AHU coil, etc.) and releases its latent heat to the process. It is at this point the steam trap should allow this condensate into the condensate return system to return to the boiler. As mentioned above, a leaking trap still allows steam to flow through the heat exchange device it serves and will typically not affect its heating capacity. For this reason, leaking traps are rarely discovered without performing specific tests on the trap. Conversely, a steam trap that fails in the closed position does not allow the condensate to enter the condensate return system. As a result, condensate backs up into the heat exchange device it serves, thereby first reducing, then eliminating, its heating capacity. Plugged traps are often identified through "cold calls" and repaired. Replacing or repairing failed traps will improve the efficiency of the steam distribution system and save energy.

Application:

At the Holding Center Complex (Holding Center, Sheriff's and 120/134 W Eagle) there are a significant number of steam traps that have failed. 3 mechanical traps will be replaced with new traps. 50 mechanical traps for which replacement is not feasible (due to size or configuration) will be retrofit with a new insert and gasket; the existing cover will be reused. 388 thermostatic traps will be retrofit with new insert and cap. See the appendix calculations for specific locations.

FIM# 8 REMOVABLE INSULATION BLANKETS

Concept:

Valves and fittings are commonly overlooked components through which valuable heat can be lost. While the pipes in the distribution piping may be well insulated, valves and fittings commonly provide a weak spot for heat to escape via the conductive metal surface area. Due to the high temperatures of steam systems, typically 200-220°F, a significant amount of heat loss may occur at these locations. Removable jackets can provide a similar insulating value as the straight pipe insulation, with the added functionality of access to the valves and fittings.

Application:

Install removable insulation blankets on the uninsulated steam valves and fittings in the boiler room areas of 134 W. Eagle (Sheriff's/BOE). The full scope of fittings to be insulated can be found in the appendix calculations.

FIM# 9 CAP ABANDONED RTU ROOF PENETRATIONS

Concept:

Abandoned HVAC equipment that is no longer used may have openings that allow conditioned air to escape the building. Sometimes when HVAC equipment is abandoned in place, the air dampers are not properly sealed off which would allow air to escape. Thermal losses are significant when the abandoned equipment is roof-mounted because it can create a stack effect, thus furthering the thermal losses. In order to avoid unwanted energy waste, all abandoned HVAC equipment should be sealed off to the outside air.

Application:

Remove the two abandoned roof mounted air handling units located on the long block of the Holding Center. Properly cap and seal the penetrations to the roof. Coordinate this work with the slated roof replacement to avoid any rework issues.

FIM# 10 INSULATE STEAM PIPING

Concept:

Steam heating distribution piping is typically in the 200-220°F range. The surrounding airspaces are on average between 68-72°F. If steam distribution piping is left uninsulated there can be significant thermal losses. Due to the large amount of temperature difference between the steam distribution piping and the surrounding air it is important that all steam piping is fully insulated. When piping is missing insulation, some of the heat that was generated by the boiler is lost before the steam arrives at the terminal heating units. The heat does not get directed to where it was intended and oftentimes areas with uninsulated steam piping become overheated.

Energy savings can be most significant on piping that is larger diameter and closer to the boiler plant. Areas that are out of plain sight are also opportunities where uninsulated piping can be found.

Application:

Insulate steam distribution piping at the Holding Center Complex. Major areas of concern include the boiler room of 134 W Eagle, third floor above the ceiling of 134 W Eagle and basement/mechanical spaces of 120 W Eagle. Steam piping in these areas was found uninsulated and is generating significant energy losses to those spaces. Refer to the appendix calculations for specific sizes and locations.

FIM# 11 KITCHEN BOOSTER HEATER

Concept:

In the Buffalo area, the cost of heating with electricity is high. This cost can be decreased by replacing electrical equipment such as heating systems and domestic hot water heaters with units using fossil fuel such as natural gas. The new systems will require the installation of natural gas piping and there must be an exhaust system for these units. A separate chimney or flue is necessary to vent combustion gasses. Therefore, the unit must be located within the facility in an area with outside access. All state and local regulations must be adhered to for the safe and proper installation of these units.

Application:

Electricity is used to boost the temperature of domestic hot water in the kitchen for use in the dishwasher. The present electric booster heaters in the Holding Center, Youth Detention, and Correctional Facility are external to the dishwasher. Replace the electric booster heaters with natural gas booster water heaters. A natural gas fired water heater must be vented and as a result may have to be installed in another location nearby.

FIM# 12 RATH AH-10 CONTROLS

Concept:

Any equipment that is in operation when not needed consumes energy and increases operational costs.

Exhaust systems which operate unnecessarily waste energy by exhausting previously heated air. An energy efficient exhaust system will operate only when required and will have the appropriate control sequence to insure efficient operation. Exhaust hoods, process exhaust, and restroom facilities are examples of exhaust systems that should operate only when required.

Application:

AH-10 (in the 5th floor mechanical room) was originally designed to exhaust air from the south half of the first and second floor of the building. This unit has a hydronic coil used to recover /reject heat from the induction loop. At some point the duct work from the unit to the first and second floor was disconnected and connected directly to the outside. Currently, outside air is brought in through a louver on the south side of the building and ducted to the unit. This unconditioned air is blown over the heat recovery /rejection coil to maintain the induction loop temperature setpoint.

The antiquated pneumatic controls no longer have the ability to start/stop the unit based on day/night schedules, and this unit was never added to the newer Siemens BAS. Because, the BAS does not have control of this unit, it operates 24/7 and during the heating season cold outdoor air is rejecting unnecessary heat from the induction loop. During the cooling season warm outdoor air is being blown over the coil and adding heat to the chilled water loop.

This unit should be added to the existing Siemens BAS with a schedule that only enables the unit to operate when the building is occupied. Sensors and logic will be added to only run the unit during times when Induction loop heat rejection is needed. Excess induction loop heat should be rejected first to the cooling coil of the AC-1 and AC-2 to preheat the incoming outdoor air. AH-10 should only run when heat needs to be rejected from the induction loop and pre heating of the AC unit's outdoor air is not needed. This should result in AH-10 operating very few hours each year.

FIM# 13 RATH SNOW MELT SYSTEM CONTROLS

Concept:

Snow melt systems are installed in cold weather climates to melt snow and ice in pedestrian walkways, parking areas, handicapped ramp and even residential driveways for safety

purposes. These systems can be designed many different ways, however the goal of each of them is the same. Add enough heat to the area to melt the snow and ice. The shortfalls of many of these systems are the way they are controlled. This can include anything from manual on/off control to very sophisticated sensor technology and control strategies.

Application:

The existing Rath Building snow melt system is designed the treat about 23,000 sqft of outdoor surfaces, with in-slab tubing. This system is near the end of its service life. The in-slab tubing is beginning to fail and causing the system to leak. When this happens, that zone needs to be valved off, which puts additional pumping pressure on the remaining operational zones.

The distribution pump is a 60 HP, ~1200 gpm, constant volume pump which flows 110°F glycol solution to all zones during the winter months. The existing in-slab sensors have failed over the years leaving next to no controllability for the facility operators other than, tuning the system on in late fall and off in the early spring. A new Tekmar controller with one aerial type snow/ice sensor was added within the past year. This addition most defiantly improved the annual energy consumed by the snow melt system. The shortcoming is that the system is still an “all or nothing” scenario. The heated glycol is distributed to all zones regardless of how much snow and ice is present in the individual zones. Snow and ice quantities can differ greatly zone to zone and by building exposures.

It is proposed to update the controls portion of the snow melt system by: adding a VFD to the 60 HP pump controlled by a system pressure sensor, create six snow melt zones by adding control valves to each of the branch circuits of the distribution system, and add aerial type snow/ice detection sensors near the 5th floor overhang to monitor each of the six zones. These additions would allow for further reduction of annual energy consumed by only allowing the heated glycol to flow through the zones the require snow and ice melting.

The county is planning to replace the distribution portion of the snow melt system in the near future. All the added controls proposed under this measure would remain after the distribution system replacement and associated energy saving would continue to be realized.

FIM# 14 OPTIMAL START

Concept:

HVAC system controls are often scheduled to begin operation in advance of building occupancy to ensure that space temperature setpoints will be achieved by the time occupants arrive, even on the coldest day. This results in extended hours of ventilation and exhaust fan operation during time the building is not occupied. It also starts heating the building sooner than necessary on most days.

As a result, both fan energy and heating/cooling energy are higher than necessary.

Application:

Institute an optimal start control sequence that correlates outdoor air temperature and the building's historic performance to optimize the onset of HVAC system operation each day. This control sequence will adjust the time that heating or cooling equipment starts based on the current outdoor air temperature, the space temperature setpoint and the current indoor air temperature. HVAC units will be operated on 100% return air during warm-up mode, avoiding the ventilation load imposed by outside air.

Implement Optimal Start at the following locations:

- Rath Building – supply and return fans of AC1-6, supply fans of AH-1,3,5,6,7,8
- Family Court – supply and return fans of AHU GR,1,2,3,4,5,6,7

FIM# 15 RATH HEATING SEASON CHW PUMP CONTROLS

Concept:

Equipment that runs when it is not necessary, produces a significant amount of energy waste. It is important that all equipment runs only when there is a demand for it. An overlap in seasons can be a time when heating and cooling equipment runs more than it should. Another instance can be if a system has been changed or reconfigured and is now functioning differently than designed or intended. To correct equipment that runs when it shouldn't, may require an adjustment to the controls system and the sequence of operations.

Application:

Reprogram the heating season sequence of operation for the 150 HP chilled water pump at the Rath building. Currently, the CHW pump runs at full speed during the heating season because it was believed that the induction loop was supposed to reject heat via the CHW loop and also to prevent possible coil freezing in the AC units. The building has AHUs (AC units) that serve the core of the building and perimeter of the building. Additionally, there is a heating induction loop around the perimeter of the building. For many years it was believed that during the heating season, the induction loop could move heat between the perimeter and core AHUs. It was also believed that excess heat in the induction loop could be rejected through AH-10 heat rejection unit.

Based on data logging and site observations it was proven that there is almost no heat that needs to be rejected or is being moved between the core and perimeter units. In fact, during a majority of the time heat was actually being added to the induction loop. It is estimated the CHW pump needs to run very seldom if at all during the heating season

The new heating season sequence of operation should turn the pump on only if:

- Heat does need to be rejected from the loop (during the heating season should happen very seldom, if at all)
- There is a threat of a coil freeze-up for any of the AC units. Safeties and sensors should be added to each units' cooling coil to monitor and protect the coils

During the cooling season the pump shall operate as it currently does which is vary the speed based on the cooling demand.

FIM# 16 RATH REDUCE SPEED OF AC-1 AND AC-2

Concept:

Supply fans that are on at a constant speed may be pulling more air than is required, thus wasting electrical energy at the fan motor. Variable frequency drives (VFDs) may are used to control the fan motor speed based on the demand of the system. There are different strategies for controlling the VFD speed. Sensors may include pressure, air flow or relays for when equipment is operating.

Application:

AC-1 and AC-2 serve as the air supply to the building's perimeter induction units. Each of these units currently have VFDs installed on the supply fans. The VFDs act as a balancing devise to meet the original design air flows and velocities at the perimeter induction units. Currently the controls set the speed of the fans to about 80% of the max speed.

It is proposed to allow the VFDs to reduce flow further during times when the temperature of perimeter of the building is satisfied. The supply fan could operate at the same speed they are set to currently during such times as: morning warm-up and near design conditions for both heating and cooling. All other times the fans speed could be lowered and still maintain comfort throughout the building.

FIM# 17 ADD CONTROLS TO VESTIBULE ELECTRIC HEATERS

Concept:

Vestibules and stairwells that are heated oftentimes lack proper temperature control for the heating units. Typical equipment in these spaces include air curtain heaters, cabinet unit heaters and electric resistance heaters. Because the units are usually on throughout the entire heating season, there exists an energy conservation opportunity by limiting the run hours of these heaters.

Installation of a thermostat in the vestibule or stairwell can allow the heaters to turn off, when the desired temperature is met. During the heating season the vestibules need only be approximately 55F during occupied and 50F during unoccupied times. This space helps create a thermal buffer between the inside and outside.

Application:

Install thermostats in each of the Franklin Street and DMV vestibules at the Rath building to control the operation of the electric cabinet unit heaters. The current operation is 24/7 during the heating season. Energy savings occurs when the temperature setpoints are reached and the heaters turn off until a call for heating triggers them back on. Integrate the thermostats and electric heaters into the BMS for monitoring and scheduling purposes.

FIM# 18 RATH ADD VFD TO ELECTRIC VAULT FAN

Concept:

Fans that are on at a constant speed may be moving more air than is required, thus wasting electrical energy at the fan motor. Variable frequency drives (VFDs) may be added to fans to control the fan motor speed based on the demand of the system and an appropriate feedback sensor. There are different strategies for controlling the VFD speed. Sensors may include pressure, temperature, air flow or relays for when equipment is operating.

Application:

Replace the motor and install a variable frequency drive on the 5 HP electric vault fan located in the Rath building. This fan was designed to keep air flowing in the electric vault to prevent the equipment from overheating. Currently the fan runs at full speed all the hours when the outside air is above freezing. Install a temperature sensor inside the electric vault and modulate the fan speed based on the room temperature.

FIM# 19 CHILLER PLANT OPTIMIZATION

Concept:

Installing a high efficiency chiller is a good way for a building owner to keep operating costs lower during the cooling season; however, the chiller is only one piece of the equipment that is needed to air-condition a building. Operating chilled water pumps, condenser pumps, cooling towers, and often other chillers (of differing capacities and efficiencies), can complicate the control strategy of the chilled water plant. It is important that all this equipment operates properly together to maximize the overall chilled water plant efficiency.

Application:

It is proposed to implement Siemens' Demand Flow chiller plant optimization control package, which includes variable chilled and condenser water pumping for the chilled water plant. This will effectively be establishing a variable primary pumping system. The pumps will operate along the system efficiency curves utilizing Siemens Variable Pressure Curve Logic (VPCL). The VFD's will be controlled with a new Demand Flow programming in the Siemens Demand Flow Control Panel.

FIM# 20 RATH INSTALL VENTILATION CONTROLS AH-11

Concept:

Exhaust / Ventilation fans are provided to remove stale air or excess heat from buildings. Some fans are intended for continuous operation, while others are intended to be operated thermostatically or on an as-needed basis. Exhaust fans generally need to operate only during periods when the building or area they serve is occupied. Electricity and heating fuel costs may be reduced by scheduling exhaust fans to operate only when needed.

Application:

Ventilating equipment and exhaust fan operation is ordinarily not required when the building or area served is unoccupied. Heating and motor energy can be reduced by scheduling the H&V units to operate only during times when the building is occupied.

AH-11 (in the 5th floor mechanical room) is the bathroom ventilation fan for the entire building. The antiquated pneumatic controls no longer have the ability to start/stop the unit based on day/night schedules, and this unit was never added to the newer Siemens BAS. Because, the BAS does not have control of this unit, it operates 24/7.

This unit should be added to the existing Siemens BAS with a schedule that matches the actual occupancy of the building.

FIM# 21 REPLACE ROOFTOP UNITS

Concept:

Air conditioning units that are over 10 years old are not very energy efficient. Rooftop units are rated with an Energy Efficiency Ratio, commonly called EER. The higher the EER, the more efficient the unit. SEER is the Seasonal Energy Efficiency Ratio, which indicates the average EER over the course of a cooling season. The SEER will be higher than the EER for a given piece of equipment, so be sure to compare products using the same measurements.

The energy savings of a new air conditioning system is often not enough to warrant the purchase of a new unit. However, if the air conditioner requires repair or needs replacement for another reason, the highest EER rated equipment should be purchased.

Application:

The existing roof top units are less efficient at cooling than current high efficiency models. Although they operate as intended, they are in fair condition and are beyond their useful life.

Replace the RTUs at the Fire Training Academy and Law Library with new high efficiency RTUs. The new RTUs must have air side economizer controls in order to achieve the energy savings calculated in this report. The EER and SEER ratings that must be met or exceeded are shown in the appendix calculations.

- Fire Training Academy – replace (5) 3-ton, (1) 6-ton, and (2) 10 ton
- Law Library – replace (1) 10-ton, (2) 15-ton, and (1) 25-ton

FIM# 22 INSTALL CONDENSING UNIT HEATERS

Concept:

Replacing existing gas fired unit heaters with high efficiency unit heaters will reduce heating costs by improving combustion efficiency. Whereas non-condensing gas-fired unit heaters are limited to combustion efficiencies of 80% to 85%, condensing gas fired unit heaters are capable of combustion efficiencies of 90% to 95%. These types of units achieve higher efficiencies through the use of a secondary heat exchanger that cools the combustion gases to the point where the water vapor in the gas condenses. This allows the combustion gases to be vented through inexpensive plastic pipe. Since the chimney is not used for the heater, additional savings are realized by the reduction of off-cycle energy losses due to the stack effect.

Application:

Replace existing standard unit heaters with high efficiency condensing units. The new unit heaters may use the existing roof/wall penetrations to exhaust the flue gases.

- Fire Training – replace (4) 30 MBH; all four in new storage building
- Aurora Barn – replace (2) 25 MBH; one in paint bay; one in office
- Harlem Hwy – replace (1) 30 MBH in HVAC building; replace (1) 125 MBH in sign shop; replace (4) 300 MBH in vehicle storage building; replace (2) 150 MBH, (2) 105 MBH and (1) 30 MBH in the maintenance building
- Concord Hwy – replace (2) 75 MBH in the maintenance building; replace (4) 300 MBH in the office/storage building; replace (1) 400 in the sign shop
- Hamburg Hwy – replace (2) 400 MBH and (3) 75 MBH in the maintenance building; replace (2) 400 MBH and (1) 300 MBH in the light truck/sign building; replace (3) 400 MBH and (1) 300 MBH in the heavy truck building
- Collins Hwy – replace (4) 300 MBH in the vehicle storage building
- Clarence Hwy – replace (2) 300 MBH and (2) 30 MBH in the maintenance shop; replace (4) 300 MBH in the vehicle storage building
- South Protection Hwy – replace (2) 30 MBH in the maintenance building
- Tonawanda Hwy – replace (1) 50 MBH and (1) 30 MBH in the maintenance shop; replace (4) 300 MBH in the vehicle storage building

FIM# 23 REPLACE AIR ROTATION UNIT

Concept:

Replacing gas fired air rotation units with high efficiency gas fired air rotation units can reduce your heating costs by improving the air rotation unit combustion efficiency. Whereas non-condensing gas-fired air rotation units are limited to combustion efficiencies of 80% to 85%,

condensing gas fired air rotation units are capable of combustion efficiencies of 90% to 95%. These air rotation units achieve higher efficiencies through the use of a secondary heat exchanger that cools the combustion gases to the point where the water vapor in the gas condenses.

Application:

Replace the existing 840 MBH non-condensing air rotation unit at the Fire Training Academy with a high efficiency condensing air rotation unit.

FIM# 24 REPLACE SNOW MELT SENSORS

Concept:

A snow melt system is used to eliminate snow from the surrounding entrance areas to a building. Many snow melt systems send heat to walkways based on outdoor air temperature. This method has the walkways heating regardless of snow presence. There are many hours during the winter months that ice and snow are not present and therefore the snow melt system does not need to operate. The installation of a snow melt sensor will allow the snow melt system to cycle on only when ice and/or snow is sensed.

Application:

The Family Court building has four zones of in-slab radiant heat snow melt systems located on the front stairs and surrounding sidewalk. Hot water from the heating loop transfers through a shell and tube heat exchanger to a glycol solution. The glycol solution is sent to the four zones via a 7.5 HP pump. Three of the existing slab sensors have failed and are reporting inaccurate temperature data to the control system the controls the pump and temperature output.

Replace the three failed slab sensors with new sensors and integrate into the existing BMS.

FIM# 25 VAV OCCUPANCY CONTROL AND STATIC PRESSURE RESET

Concept:

Variable Air Volume (VAV) systems vary the airflow at a constant temperature. The air flow rate must vary to meet the rising and falling heat gains or losses within the individual zones served. A VAV box has a damper which controls the amount of air that is sent to each space. The VAV boxes are generally balanced to have a minimum amount of air flow to meet ventilation standards. The damper does not go below the minimum position, whether the space is occupied or not. If a space does go unoccupied, there exists a potential to close the VAV box damper and produce energy savings. If the supply and return fan of the AHU serving the VAV boxes have variable frequency drives, both fan electrical savings and building thermal savings can be realized.

When a VAV box closes, the static pressure in the system increases. This provides the necessary feedback to the variable frequency drive to reduce the fan speeds. A reduction in fan speed also means a reduction in outside air that needs to be conditioned.

An additional form of control in this system includes a static pressure reset strategy. In a pressure reset strategy, the pressure setpoint is adjusted at regular intervals to only be as high as needed to satisfy the zone of highest airflow demand. As VAV boxes close, the total system pressure can be reduced and thus reduce the fan speed.

Application:

Implement the following VAV system occupancy strategies:

- Family Court – install occupancy sensors and implement static pressure reset for the VAV systems on AHUs GR,1,2,3,4,5,6,7; there are many areas including courtrooms and counsel rooms that are unoccupied at various times throughout the day
- Public Safety Campus – install occupancy sensors for the VAV systems on AHUs 5,6; AHU 5 and 6 serve general offices and is often partially or fully unoccupied; static pressure reset is not recommended at this facility due to the presence of fume hoods
- Correctional Facility – install occupancy sensors and implement static pressure reset for the VAV systems on AHUs 5,6; AHU 5 serves the education room, gym and chapel which are often unoccupied; AHU 6 serves the lobby, admin, and visiting room which has part time occupancy
- Old County Hall – install occupancy sensors and implement static pressure reset for the VAV systems on AHUs 1E, 1W, 2E, 2W, 3NE, 3NW, 3SE, 3SW, 4NE, 4NW, 4SE, 4SW, Ground N and Ground S; there are many areas including court rooms and counsel rooms that are unoccupied at various times throughout the day
- Erie County Court (Annex) – install occupancy sensors and implement static pressure reset for the VAV systems on AHUs GB, 15S, 12N, 24S, 35N, 6 and 7; there are many areas including court rooms and counsel rooms that are unoccupied at various times throughout the day

FIM# 26 CHILLER REPLACEMENT / REPLACE DX WITH CHILLED WATER

Concept:

Advances in chiller technology have resulted in designs that are more efficient at producing chilled water with less electrical energy input. Heat exchanger design coupled with variable speed and flow capabilities can improve overall chiller performance. Selecting a chiller with the higher IPLV (Integrated Part Load Value) rating means that the unit is more effective at producing chilled water. High efficiency air-cooled chillers are good options when a separate cooling tower is not required or wanted. A mag-lev water-cooled chiller is suggested as a replacement for chillers located inside a facility with a separate cooling tower.

Application:

The PSC building currently has two 360-ton air cooled chillers on the roof that are original to the building and operate with R22 refrigerant. Each unit is redundant, as only one chiller is needed to serve the building's cooling load.

AHU-1 and AHU-2 serve the 911 command center. These units are also redundant, as only one is needed to serve the space. Each unit has a dedicated R22 DX coil with remote condensers on the roof.

It is being proposed to replace one of the air-cooled chillers at the PSC building (360-ton) with a high efficiency air cooled chiller. The new chiller would become the lead and remaining chiller should become the backup to the new chiller.

Replace the DX coil in AHU-1 or AHU-2 with an equivalent capacity chilled water cooling coil. This unit should operate as the lead AHU during the cooling season to take advantage of the new high efficiency chiller and to reduce the R22 equipment at this facility. To ensure each AHU operates during the year the AHU with the remaining DX coil should become the lead unit during the heating season and operate off the generator during a power outage.

FIM# 27 ADD HW HEAT EXCHANGER TO ELECTRIC DHW HEATER

Concept:

In the Buffalo area, the cost of heating with electricity is high. Costs can be decreased by utilizing equipment that burns natural gas to provide heating instead of electricity. When hot water is located nearby a piece of equipment with electric resistance heating, an opportunity exists to use the hot water to heat instead of electricity.

Application:

Install a heating hot water to domestic hot water heat exchanger to allow the heating loop fed by the boilers to heat the domestic hot water in Old County Hall. During the winter heating season, the domestic hot water heating at Old County Hall would be provided by the boilers instead of by the electric resistance DHW tank. During the non-heating season, the DHW heating at Old County Hall will revert back to the electric tank heater. There is an existing hot water loop already in the lower level mechanical room where the electric tank heater is located.

FIM# 28 INSTALL GRAVITY RELIEF DAMPERS

Concept:

Stack effect is the movement of air into and out of buildings, chimneys, flue gas stacks, or other passage ways through the roof, resulting from air buoyancy. Buoyancy occurs due to a difference in indoor-to-outdoor air density resulting from temperature and moisture differences. The greater the thermal difference and the height of the structure, the greater the buoyancy force, and thus the stack effect.

Gravity relief vents provide natural ventilation at all times. If there are no dampers to close the vents then there can be significant thermal losses during the heating season. Conditioned air will leave through the vents which will have to be replaced and conditioned. Gravity vents should have controllable dampers installed to allow for ventilation control. There are several strategies for controlling the ventilation including occupancy schedules, temperature setpoints or building pressure.

Application:

Install (4) DDC gravity relief vent dampers on the existing vents located in the attic space of Old County Hall. Integrate the open/close dampers into the BMS to allow them to open when the temperature in the attic begins to climb too high. During the heating season and shoulder months it is estimated the dampers will remain in the closed position and reduce thermal losses out of the building. Four temperature sensors will need to be installed in the attic space to control the dampers.

FIM# 29 INSTALL CONDENSING FURNACES

Concept:

Replacing gas fired furnaces with a high efficiency gas fired furnace can reduce your heating costs by improving the furnace combustion efficiency. Whereas non-condensing gas-fired furnaces are limited to combustion efficiencies of 80% to 85%, condensing gas fired furnaces are capable of combustion efficiencies of 90% to 95%. These furnaces achieve higher efficiencies through the use of a secondary heat exchanger that cools the combustion gases to the point where the water vapor in the gas condenses.

Application:

Replace the existing non-condensing furnaces with high efficiency condensing furnaces at the following locations:

- Harlem Hwy – (1) 35 MBH and (1) 100 MBH at the maintenance building; the 100 MBH unit has a cooling coil that may need to be replaced at the time of replacing the furnace
- Clarence Hwy – (1) 75 MBH at the maintenance building

FIM# 30 PIPE INSULATION

Concept:

Heat is distributed through the building by pipes containing hot water. Heating distribution system pipes lose heat to the surrounding space. If the heat is lost to an area that does not require heating, the reduction in system efficiency can be significant. Un-insulated pipes in conditioned space may also overheat the space, wasting energy and causing comfort problems. All heating distribution system pipes located in unconditioned space should be insulated.

Domestic hot water (DHW) is water that is heated for hand washing, showering, dish washing, laundry, etc., as contrasted with hot water that is circulated through radiators and used to heat the building.

Domestic hot water pipes lose heat to the surrounding space. This loss is significant in facilities with recirculating hot water systems, or in facilities that use hot water for a large portion of the

day. In a recirculating system, all domestic hot water pipes should be insulated. In a non-recirculating system, domestic hot water pipes within eight feet of the water heater should be insulated.

Application:

Insulate all exposed heating and domestic hot water pipes in the following buildings: Holding Center, Youth Detention, Family Court, Health Mall, Erie County Court (Annex), Chestnut Ridge Park Casino, Chestnut Ridge Park Office, Harlem, East Concord, Hamburg, Collins and Clarence. See the appendix calculations for sizes and lengths to be insulated.

Insulation thickness should be per the New York State Energy Conservation Construction Code, and should be pre-formed fiberglass pipe insulation with protective jacketing.

FIM# 31 CONDENSING HOT WATER BOILERS

Concept:

Boiler efficiency is determined by a number of factors which vary with each boiler design. The efficiency of the boiler heat exchanger, jacket heat loss, flue losses, and boiler sizing relative to the heating load combine to determine how efficiently a boiler will operate in a given application. Combustion efficiency, as part of the overall efficiency, is determined by the amount of heat going up the exhaust stack and the amount of oxygen and carbon dioxide in the flue gas. Excess heat can be lost up the flue when too much air is allowed for combustion. If insufficient air is used, the fuel may be partially burned and carbon monoxide is produced. Atmospheric burners tend to experience greater flue heat losses than power burners during off cycles when the burner is not firing.

Advances in hot water boiler technology has brought many benefits to hydronic heating systems. Condensing boilers remove heat from the flue gases in the form of an acidic condensate. Instead of losing the heat out to the atmosphere, condensing boilers are able to utilize most of the latent heat leaving the flue pipe, which increases the efficiency. Gas-fired condensing boilers can achieve up to 96% efficiency if the appropriate return water temperature conditions are satisfied. Generally condensing boilers will average around 90% year-round in most facility heating applications. Additionally, a new condensing boiler is typically smaller, more reliable and include better internal controls compared to antiquated hot water boilers.

Application:

Install condensing HW boilers at the locations below. Perform complete load sizing calculations for the building, prior to selecting replacement equipment, using standard methods. Size new equipment according to the load calculations and not according to the size of the equipment scheduled for removal. The new boilers will have higher heat transfer efficiency and experience lower jacket and flue losses. Operating efficiency will improve at part-load conditions by avoiding the short cycling of the burner.

- Law Library – replace existing 1,000 MBH with smaller condensing HW boiler approx. 300 MBH; the existing boiler is well oversized for the area it serves.
- Erie County Court (Annex) – add a condensing boiler next to the two 250 HP existing in the boiler room. Size of new HW boiler approx. 4,000 MBH.

- CRP Park Office – replace existing 600 MBH with condensing HW boiler similar size
- CRP Radio Repair Building – replace existing 500 MBH with condensing HW boiler similar size
- CRP Truck Maint. Shop – replace existing 776 MBH with condensing HW boiler similar size
- Harlem – replace existing 145 MBH with condensing HW boiler similar size
- East Concord – replace existing 112.5 MBH with condensing HW boiler similar size
- Collins – replace existing 150 MBH with condensing HW boiler similar size

FIM# 32 INSTALL PREMIUM EFFICIENCY MOTORS

Concept:

In 2006, the total annual energy consumption due to motor-driven equipment in the U.S. industrial, commercial, residential, and transportation sectors was approximately 38% of the total electrical energy usage across the U.S.

Electrical energy usage can be reduced by replacing standard efficiency motors with premium efficiency motors. Premium efficiency motors experience lower losses than standard or high efficiency motors through the use of higher quality materials and larger conductors. Larger motors with long operating hours will have the highest potential for energy savings.

In addition, premium motors are more reliable, typically have longer warranties and produce less waste heat compared to standard or high efficiency motors.

Application:

Replace standard and high efficiency motors with premium efficiency motors as shown below:

- Rath Building – replace one 20 HP air compressor motor; supply fan motors: AH-16 5HP, AH-15 7.5 HP, AH-12 7.5 HP, AH-11 10HP, AH-9 5HP, AH-1, 5HP
- Correctional Facility – replace two 15 HP lead/lag CHW pump motors, and two 3 HP lead/lag compressor motors
- CRP Sheriff's Bunker – replace the three fan motors for exhaust fans B (10 HP), C (10 HP) & D (7.5 HP) and the multizone AHU supply fan motor (10 HP)

Refer to the calculations in the Appendix for run hours.

FIM# 33 REPLACE CHILLER

Concept:

Advances in chiller technology have resulted in designs that are more efficient at producing chilled water with less electrical energy input. Heat exchanger design coupled with variable speed and flow capabilities can improve overall chiller performance. Selecting a chiller with the higher IPLV (Integrated Part Load Value) rating means that the unit is more effective at producing chilled water. High efficiency air-cooled chillers are good options when a separate

cooling tower is not required or wanted. A mag-lev water-cooled chiller is suggested as a replacement for chillers located inside a facility with a separate cooling tower.

Application:

Replace the air-cooled chiller at the Holding Center (150-ton) with a high efficiency air cooled chiller.

FIM# 34 CONDENSING DOMESTIC HOT WATER HEATERS

Concept:

Domestic hot water heater efficiency is determined by a number of factors which vary depending on each design. The efficiency of the heat exchanger, jacket heat losses, flue losses, and hot water heater sizing relative to the domestic hot water load combine to determine how efficiently a hot water heater will operate in a given application. Replacing your existing water heater with a condensing gas-fired domestic hot water heater will reduce your water heating costs by improving the overall system efficiency.

Whereas non-condensing gas-fired domestic hot water heaters are limited to combustion efficiencies of 80% to 85%, condensing gas fired domestic hot water heaters are capable of combustion efficiencies of 90% to 96%. These hot water heaters achieve higher efficiencies through the use of a secondary heat exchanger that cools the combustion gases to the point where the water vapor in the gas condenses. This allows the combustion gases to be vented through inexpensive plastic pipe. Condensing water heaters experience lower off-cycle energy losses because of increased insulation levels in the jacket, and drastically lower flue losses.

Application:

Replace non-condensing hot water heaters with condensing hot water heaters as described below.

- Holding Center Complex - has two existing DHW storage tank areas that would be converted to condensing DHW systems. Instead of being fed from steam-to-hot water heat exchangers, each area will have its own condensing DHW heater, appropriately sized for the load they serve. The steam “pony” boiler will be abandoned in place and the steam lines from the main steam system will be valved-off. The steam piping and steam-to-hot water heat exchangers will remain but will only be used if the condensing DHW heaters fail. Install one 285 MBH condensing boiler in 134 W Eagle boiler room. Install one 300 MBH and one 500 MBH condensing boilers in the DHW tank room of the holding center.
- Youth Detention – replace 199 MBH that serves kitchen area with condensing DHW heater of similar capacity
- Erie County Court (Annex) – replace 315 MBH with condensing DHW heater of similar capacity

- Harlem Hwy – replace 34 MBH that serves kitchen area with condensing DHW heater of similar capacity
- Clarence Hwy – replace 40 MBH that serves kitchen area with condensing DHW heater of similar capacity

FIM# 35 ADD HEAT RECOVERY

Concept:

Air handlers that have outdoor air going to supply air, and return air going to the exhaust can take advantage of the heat that is already in the return air stream. By passing the return air that is heading for exhaust across a coil, heat can be extracted and used to pre-heat the incoming outdoor air. This measure can reduce the amount of heating by the main heating coil and is seen as gas savings at the boiler plant.

Application:

Install a run around heat recovery system for the air handling units listed below. Two coils will need to be installed as well as piping between them for this system to work. One coil be placed in the exhaust air stream to collect as much heat as possible and transfer that heat to the main air handling unit supply air.

- Holding Center – install heat recovery coils between AHU-2 outside air and relief air; AHU-6 outside air and relief air; AHU-7 outside air and relief air
- Erie County Court (Annex) – install heat recovery coils between EF-1 and AHU-GB; install heat recovery coils between EF-2 and AHU-35N; add a face/bypass damper to the exhaust ductwork

FIM# 36 VENDING MACHINE OCCUPANCY CONTROLS

Concept:

Electricity use by vending machines may be reduced by installing controls that sense building occupancy and reduce energy use accordingly. The interior fluorescent lights will be turned off if the occupancy sensor has not detected activity for a certain period of time. This would allow the lights to be turned off for as many as 75% of all hours for many facilities. Similarly, refrigeration compressors in vending machines run more than they should. Generally, these compressors are not controlled by thermostats. Instead they are usually controlled to operate 1/3 of the time. Intelligent electronic power controls will operate the compressor less frequently, approximately 1/8 of the time, during periods sensed as unoccupied to reduce refrigeration compressor energy use.

Application:

Install occupancy sensing vending machine controls on the vending machines in accordance with the appendix calculations. Where a group of vending machines are located together, one controller may be used to control as many as three refrigerated or non-refrigerated vending machines. The occupancy sensing controls should not be used on vending machines that contain perishable food items.

FIM# 37 OPEN TRIPLE DUTY/BALANCE/ISOLATION VALVE

Concept:

Pumps that are on variable frequency drive controllers are self-balancing and modulate speed based on feedback from the system. If a VFD was installed on a system that was balanced with valves and the valves are not in the fully open position, the system is fighting itself from a performance and energy standpoint. Often when the VFD is installed, the valves were not opened fully to allow the VFD to do the balancing of the system. When a balancing valve is partially closed, it creates a pressure increase that the VFD driven pump must work against.

Application:

Open the valves to 100% open for pumps that are on VFDs at the Holding Center, Youth Detention, Family Court, Correctional Facility and Erie County Court (Annex). A water balancer will be required to set the VFD as the new balancing device.

- Holding Center – open triple duty valves on the 2nd floor mechanical room two lead/lag 15 HP glycol/hot water pumps
- Youth Detention – open isolation valve on one 5 HP hot water pump located in the boiler room
- Family Court – open triple duty valve on two 25 HP lead/lag chilled water pumps in the penthouse mechanical room
- Correctional Facility – open triple duty valve on two lead/lag 50 HP condenser water pumps located in the main mechanical room
- Erie County Court (Annex) – open triple duty valve on two lead/lag 20 HP hot water pumps located in the penthouse mechanical room

FIM# 38 IMPROVE TEMPERATURE CONTROL

Concept:

Proper temperature control is important in order to minimize energy costs. Maintaining space temperatures within a reasonable range during occupied periods and reliably reducing the amount of heating and cooling energy during unoccupied periods should be the goal for your temperature control system. Temperature control can be accomplished with a pneumatic or DDC building management system, programmable thermostats or manual temperature control. Pneumatic and DDC control systems are usually for medium to large commercial buildings due to the complexity and scale of equipment requiring temperature control. Programmable thermostats are good temperature control options for smaller offices that do not have the infrastructure or budget for a complete pneumatic or DDC system.

Application:

Improve the temperature control at the following locations:

- Fire Training Academy – integrate temperature control for eight RTUs into the BMS; install a new temp sensor for air rotation unit and integrate into BMS; install one programmable thermostat to control 4 infrared heaters in the Hazmat storage building; install four programmable thermostats to control 4 unit heaters in the new storage building
- Correctional Facility – integrate 2nd floor hot water fin radiation into BMS. Currently, the 2nd floor in the main portion of the building is predominately used as storage and was found to be overheating
- Aurora Barn – install 15 programmable thermostats to control 22 infrared heaters and 3 unit heaters; reprogram 2 programmable thermostats that serve the RTUs
- Chestnut Ridge Park
    - Casino – reprogram existing programmable thermostats that are currently in manual mode
    - Park Office – install four programmable thermostats to control the 4 hot water pumps that distribute heat to fin radiation and unit heaters
    - Radio Repair Building – install two programmable thermostats to control 2 hot water pumps that distribute heat to the fin radiation
    - Truck Maint. Shop – install one programmable thermostat to control the pump that sends hot water to the unit heaters
- Harlem Hwy – in the HVAC shop install four programmable thermostats that control fin radiation and infrared heaters and reprogram five t-stats that serve a unit heater and fin radiation; in the sign shop install one programmable t-stat to control a unit heater; in the vehicle storage install four programmable t-stats to control 4 unit heaters; in the maintenance shop install seven programmable thermostats to control 5 unit heaters and two zones of infrared heaters and reprogram two programmable thermostats that serve 2 furnaces
- Concord Hwy – in the Maintenance building, install eight thermostats to control 1 zone of hot water radiation, 3 zones of infrared heaters, 2 unit heaters, and 5 electric fin radiation; in the office/storage building install four programmable thermostats to control 4 unit heaters and reprogram the office furnace thermostat; in the sign shop install one programmable thermostat to control 1 unit heater
- Hamburg Hwy – in the Maintenance building install eleven programmable thermostats to control 6 zones of infrared heating, and 5 unit heaters; in the light truck install three programmable thermostats to control 3 unit heaters; in the heavy truck install four programmable thermostats to control 4 unit heaters;
- Angola Hwy – install eleven programmable thermostats to control 11 zones of unit heaters and infrared heaters
- Collins Hwy – in the Maintenance building install six programmable thermostats to control 3 zones of hot water heating and 3 zones of infrared heating; in the storage building install four programmable thermostats to control 4 unit heaters
- Clarence Hwy – in the vehicle storage install four programmable t-stats to control 4 unit heaters; in the maintenance shop install seven programmable t-stats to control 4 unit heaters, 1 furnace and 2 zones of infrared heaters
- S. Protection Hwy – install five programmable thermostats to control unit heaters and infrared heaters
- Tonawanda Hwy – in the maintenance shop install five programmable t-stats to control 2 unit heaters and 3 zones of infrared heaters; in the vehicle storage install four programmable t-stats to control 4 unit heaters

FIM# 39 EXTEND DDC TO UNCONTROLLED EQUIPMENT/PNEUMATICS

Concept:

Proper temperature control is important in order to minimize energy costs. Maintaining space temperatures within a reasonable range during occupied periods and reliably reducing the amount of heating and cooling energy during unoccupied periods should be the goal for your temperature control system. For buildings that already have a DDC system in place, adding temperature control points to the system is a viable option to controlling equipment that is currently not on the system. Typical equipment includes fin radiation, unit heaters, cabinet unit heaters and other secondary heating or cooling equipment.

Application:

Tie the following equipment into the DDC system at the following locations:

- Holding Center – long block and short block steam radiators have failed pneumatic control valves; install new DDC control valves and control to temperature sensors; these areas overheat and the existing solution for temperature control is to leave windows open
- Health Mall – vestibule and stairwell electric heaters have manual unit-mounted controls; integrate these units into the BMS; control to temperature sensors and occupancy schedule

FIM# 40 DOMESTIC HOT WATER RECIRCULATION CONTROL

Concept:

Domestic hot water systems in commercial and industrial facilities often have recirculation pumps to ensure hot water is available at all times when personnel need it. Usage and distribution losses causes the recirculation pump to turn on if a certain setpoint is not achieved. Facilities that have recirculation pumps that are on snap switch control are pumping hot water around the building even if it is not occupied. By installing an aquastat or extending the DDC system, the recirculation pumps can be controlled to not run at all times. With a DDC system, an occupancy schedule can be set to turn the recirculation pumps off during unoccupied times.

Application:

Install DHW recirculation pump controls on the following equipment:

- Rath Building – extend DDC to two fractional HP DHW pumps (two separate recirc loops)
- Fire Training Academy – extend DDC to two fractional HP DHW pumps (one in Academy building and one in New Storage building)
- Family Court – extend DDC to one fractional HP DHW pump

- Correctional Facility – extend DDC to two fractional HP DHW pumps (two separate recirc loops)
- Law Library – extend DDC to one fractional HP DHW pump
- Health Mall – extend DDC to two fractional HP DHW pumps (two separate recirc loops)
- Erie County Court (Annex) – extend DDC to two fractional HP DHW pumps (one in tool cage area, one near DHW heater)
- Concord Hwy – install aqua stat on fractional HP DHW pump

FIM# 41 HOLIDAY SCHEDULING

Concept:

The practice of maintaining comfort temperatures during times when holidays or school breaks are in effect, uses more energy than is necessary. If a building has a DDC system, the days that the building will be unoccupied may be scheduled to allow the heating and cooling equipment to perform a proper temperature setback and save energy.

Application:

Add holiday scheduling into the existing DDC systems at the Rath Building and Family Court to reduce gas and electricity consumption by heating and cooling equipment.

FIM# 42 KITCHEN HOOD CONTROL

Concept:

Kitchen Exhaust Hoods are required to vent hot and sometimes grease-laden air from cooking equipment. It is not unusual for these hoods to begin operation at the start of the day and run continuously until the end of the day, without regard to actual cooking activities.

Variable speed motor controls can vary the speed of both the exhaust fan and the make-up air unit fan based on the presence of heat and smoke. This will result in fan power savings and a reduction of make-up air to be heated and cooled.

Application:

Install variable speed kitchen hood controls for the ranges at the Holding Center, Youth Detention and Correctional Facility.

FIM# 43 ADD VFD TO HW PUMPS

Concept:

Pump systems are designed to meet peak conditions that usually occur for only a small number of hours per year. During periods when loads are less than the peak condition, it is often possible to reduce pump speed to save energy. Closed systems (hot water and chilled water, for example) are good candidates for variable speed pump control because a large portion of the design head is required to meet piping friction losses, which decrease as the pump flow decreases.

Application:

Install variable frequency drives to control the hot water pumps at the locations below:

- Holding Center – (2) 5 HP lead/lag AHU glycol loop pumps located in the penthouse mechanical room, replace with inverter rated motors; (2) 5 HP lead/lag hot water loop pumps located in the penthouse mechanical room replace with inverter rated motors; (2) 5 HP lead/lag hot water loop pumps located in the AHU2 mechanical room, replace with inverter rated motors
- Rath Building – (1) 100 HP hot water pump located in fifth floor mechanical room, convert 3-way AHU/reheat hot water coils to 2-way valves, install a static pressure sensor in supply and return to control the pump speed
- Family Court – (2) 3 HP lead/lag VAV hot water pumps (6A/B); (2) 7.5 HP lead/lag fin radiation hot water pumps (7A/B); (2) 20 HP lead/lag AHU glycol pumps (4A/B)
- Correctional Facility – (2) 5 HP lead/lag Annex hot water pumps located in the mechanical room, replace with inverter rated motors

FIM# 44 WALK-IN COOLER / FREEZER CONTROLS

Concept:

Walk-in coolers and freezers use a fair amount of energy due to their size and the fact that they most often run continuously. Some ways to reduce the energy include: installing more efficient condensing units, cycling the evaporator fans, cycling the condensers (and condenser fans), staging the door heater element and replacing the standard evaporator fans motors with electronically commutated motors (ECM).

Control packages can be installed to cycle the condensers, evaporators and door heater element in order to reduce energy by not allowing the equipment to run continuously.

Application:

Install walk-in cooler / freezer control packages and upgrade the evaporator fans with ECM motors at the Holding Center, Youth Detention and Correctional Facility.

FIM# 45 VENTILATE BASED ON OCCUPANCY

Concept:

Large open spaces that are partially occupied may be heating, cooling or ventilating more than is required. An example includes a room that is designed to hold 100 people maximum. The heating, cooling, and ventilation equipment is sized to serve the maximum number of people. If the space is occupied by only a small amount of people and only some of the occupied hours of the rest of the facility, energy savings can be had.

Gas energy savings will be had if CO2 sensors are installed to reduce the excess outside air that needs to be conditioned by the heating equipment. This applies to both variable and constant volume systems.

Application:

Install CO2 sensors to implement demand control ventilation at the following locations:

- Fire Training – control (3) RTU OA dampers; the RTUs are located in the northwest corner of the building and serve two classrooms and a lobby; these areas are rarely fully occupied
- Youth Detention – control the OA damper on RTU 9 that serves the Gym
- Correctional Facility – control the OA damper on AHU7 which serves the library; the library is either partially or fully unoccupied most of the time
- Law Library – control (4) RTU OA dampers; the RTUs are constant volume

FIM# 46 VFD ON SUPPLY / RETURN FANS

Concept:

Air handler supply and return fans that are on at a constant speed may be moving more air than is required, thus wasting electrical energy at the fan motor. Variable frequency drives (VFDs) may be added to supply and return fans to control the fan motor speed based on the demand of the system and an appropriate feedback sensor. There are different strategies for controlling the VFD speed. Sensors may include pressure, air flow or relays for when equipment is operating.

Application:

Install a variable frequency drive on the supply and return fans for AHU 3 (7.5 HP supply, 2 HP return) and AHU 7 (40 HP supply and 15 HP return) at the Holding Center. Both units have failed supply and return VFDs and therefore are running at full speed. The existing pressure sensors may be reused as the control feedback to the VFD.

Install a variable frequency drive on the return fans RF 3 (20HP), RF 4 (20HP), RF 5 (10HP), RF 6 (15HP) at the Rath building. These fans currently operate at full speed and have vortex dampers, which may or may not be functioning. The motors will need to be replaced with inverter rated motors in order to accept variable frequency drive control. The vortex dampers should either be locked in the full open position or removed.

FIM# 47 ADD CONTROLS TO FANS SHERIFF'S BUNKER

Concept:

Fans that are uncontrolled, run 24/7 whether the need to move air is present or not. This can apply to any type of fan which may include supply, return and exhaust fans. Electrical and thermal energy can be saved if fans that pull air into or out of a building run only when required. Control can be accomplished via timers, thermostats or integration into a BMS.

Application:

Integrate Fans B and C into the existing BMS at the Sheriff's Bunker. Fans B & C (10HP each) are heat rejection fans for the chiller and generator but were observed running during the heating season. Program these fans to run only when a call for heat rejection from the chiller or generator is present

FIM# 48 ADD VFD TO CHILLED WATER PUMPS

Concept:

Pump systems are designed to meet peak conditions that usually occur for only a small number of hours per year. During periods when loads are less than the peak condition, it is often possible to reduce pump speed to save energy. Closed systems (hot water and chilled water, for example) are good candidates for variable speed pump control because a large portion of the design head is required to meet piping friction losses, which decrease as the pump flow decreases.

Condenser water pumps serving open cooling towers and other open systems are usually less attractive candidates for VSD control since there is a minimum lift which must be accomplished regardless of flow. This limits the range of pump speed modulation that is possible.

Application:

Install a variable frequency drive on the 10 HP chilled water pump in the chiller mechanical room of 120 W Eagle (part of Holding Center Complex). This pump serves chilled water to AHUs 1-5 of the Holding Center. Install a static pressure sensor on the supply and return of the chilled water piping and use the drive to control speed based on cooling demand.
Install variable frequency drives on the (2) 7.5 HP lead/lag chilled water pump in penthouse mechanical room of the Holding Center. This pump serves chilled water to AHUs 6-7 of the Holding Center. Install a static pressure sensor on the supply and return of the chilled water piping and use the drive to control speed based on cooling demand.

6. ADDITIONAL COMMENTS

Study Objectives

The objective of this study was to determine possible energy savings from energy conservation measures for this facility and calculate their implementation cost and future benefits. Information regarding the building envelope, mechanical systems and lighting was collected during the field survey's and interviews with the owner between January – April 2019.

Potential energy savings for proposed energy conservation measures were calculated based on how much the annual energy consumption in the building could be lowered by replacing the existing systems or parts of them with newer technology. Energy savings were valued based on the most recent utility bills, which were provided by the building owner. An analysis of the energy use and cost is included below.

Implementation Costs

The energy conservation measures proposed for the owners' consideration were recommended after their cost and benefit calculations were performed. In this process the initial cost of implementation of each measure was taken into consideration and the simple payback period was calculated based on the annual energy savings. The implementation costs of each measure were estimated in good faith based on the most current prices; however, these are subject to market fluctuation and should be taken as orientation figures only. The actual implementation cost figures must be obtained by the owner from contractors who desire to perform the work. C. J. Brown Energy, PC, does not perform the installation of energy conservation measures, nor does it represent or solicit work for other companies that provide installation work.

Interaction of Energy Conservation Measures

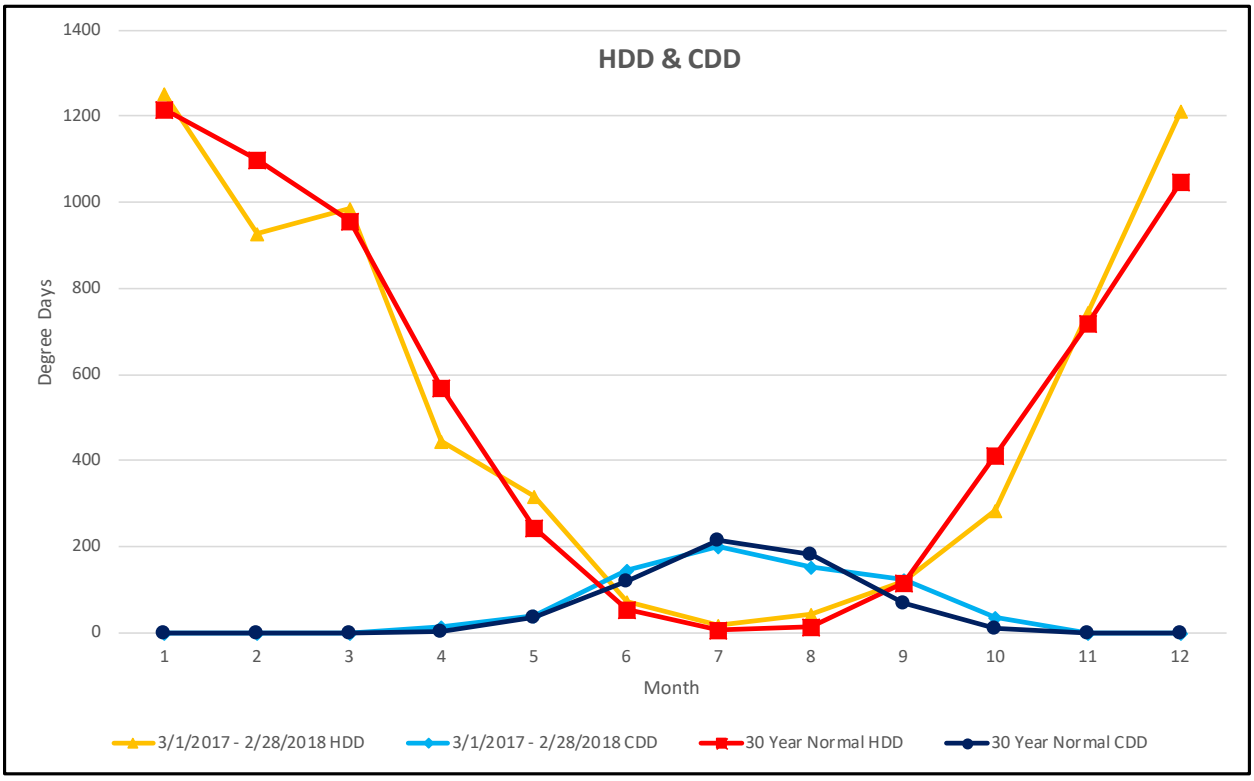
The Energy Conservation Measures recommended in this report are presented as stand-alone measures. The interactions between them may affect the savings if they are implemented together and savings will be different depending on the order of implementation. Assuming any order of implementation would be speculative in this report. It is up to the owner and his judgment to make a decision based on his priorities.

Measures Considered but not Recommended

Erie County is considering entering into an energy performance contract. Based on this they have asked that all measures discovered during this study remain as "Recommended" in the savings summary regardless of the length of simple payback.

7. EXISTING UTILITY BILLS, COST AND USAGE ANALYSIS

The time period selected for the utility study is 3/1/2017 – 2/28/2018. This time period was selected because it most closely matches the current 10-year and 30-year heating degree day (HDD) and cooling degree day (CDD) averages for the Buffalo area. It also encompasses one entire winter season. A correlation chart of the HDD and CDD is shown below:



Electricity is supplied by either National Grid or NYSEG, depending on the service territory that the building is located in. Erie County utilizes approximately 29,438,423 kWh annually at a cost of approximately $2,184,059. The individual; breakout per location is listed below:

Erie County Utilities

Location	Name	Electric Utility	Rate	Account #'s	Total kWh	Peak Demand kW	Elec Cost	$/kWh	$/kW
1	**Jesse Nash Health Center**	N Grid	SC2D	2765127108	368,480	90	$28,753	$0.0475	$11.89
2	**Holding Center**	N Grid	SC3	7120026107	3,661,675	777	$258,776	$0.0500	$10.14
3	**Rath Building**	N Grid	SC3	8612662109	7,423,390	1,596	$542,055	$0.0495	$10.30
4	**Fire Training**	NYSEG	SC2	N01000000387498 N01000003753076	359,318	104	$27,629	$0.0509	$9.26
5	**Youth Detention**	N Grid	SC3	6563023009	1,031,856	256	$78,937	$0.0503	$10.23
7	**Family Court**	N Grid	SC3	1923156004	1,953,445	506	$155,759	$0.0501	$10.59
8	**Public Safety Campus**	N Grid	SC3	64145008	3,953,867	902	$284,117	$0.0497	$10.12
9	**Correctional Facility**	NYSEG	SC7	N01000000210229	3,827,762	780	$243,429	$0.0482	$6.75
10	**Law Library**	N Grid	SC2D	5220013100	277,120	115	$27,194	$0.0485	$11.89
11	**Aurora Barn**	NYSEG	SC2 SC1 Outdoor Lighting	N01000000234401 N01000007530116	205,124	77	$16,246	$0.0537	$7.59
12	**Sheriff's**	N Grid	SC3	5140031102	included in Holding Center Complex				
13	**Old County Hall**	N Grid	SC3	7140026103	1,296,141	289	$104,218	$0.0518	$10.12
14	**Health Mall**	N Grid	SC2D	7915112110	501,520	154	$39,477	$0.0494	$11.88
15	**Erie County Court(Annex)**	N Grid	SC3	7100026101	3,349,649	979	$278,259	$0.0536	$10.12
16	**Chestnut Ridge Casino**	NYSEG	SC2: Commercial: 5 kW Min	N01000000206078 N01000007733066	62,083	34	$5,863	$0.0501	$9.55
16	**Chestnut Ridge Bunker**	NYSEG	SC3: Primary: 25 kW Min	N01000000270603	362,640	86	$23,543	$0.0477	$6.05
16	**Chestnut Ridge Radio Tower**	NYSEG	SC2: Commercial: 5 kW Min	N01000060485406	26,686	12	$2,523	$0.0486	$9.55
16	**Chestnut Ridge Office**	NYSEG	SC2: Commercial: 5 kW Min	N01000006076731	25,158	10	$2,454	$0.0471	$9.55
16	**Chestnut Ridge Truck Shop**	NYSEG	SC2: Commercial: 5 kW Min	N01000000238261	53,400	12	$4,633	$0.0470	$6.05
17	**Harlem District hwy**	NYSEG	SC2	N01000001838580 N01000002263895 N01000008881138	139,986	40	$11,897	$0.0522	$9.32
18	**East Concord**	NYSEG	SC2 SC2 SC2 SC1 Outdoor Lighting	N01000059743179 N01000059458281 N01000000189878 N01000003290657	132,707	43	$12,178	$0.0559	$9.26
19	**Hamburg hwy**	NYSEG	SC2	N01000059310441	122,520	36	$9,548	$0.0511	$9.32
20	**Angola hwy**	N Grid	SC2	9828699108 6248700107	23,797	6	$2,942	$0.0631	$11.53
21	**Collins hwy**	N Grid	SC2D	9182431106	19,935	7	$2,097	$0.0478	$11.52
22	**Clarence hwy**	NYSEG	SC2 SC1 Outdoor Lighting	N01000000294462 N01000059361428	173,343	80	$14,251	$0.0561	$6.51
23	**South Protection Hwy**	NYSEG	SC2	N01000007076789	16,054	3	$1,479	$0.0708	$9.32
24	**Tonawanda Hwy**	N Grid	SC2D	208714103	70,767	17	$5,803	$0.0483	$11.53
25	**120 West Eagle**	N Grid	SC3	7120026107 5140031102	included in Holding Center Complex				
26	**134 West Eagle**	N Grid	SC3	7120026107 5140031102	included in Holding Center Complex				

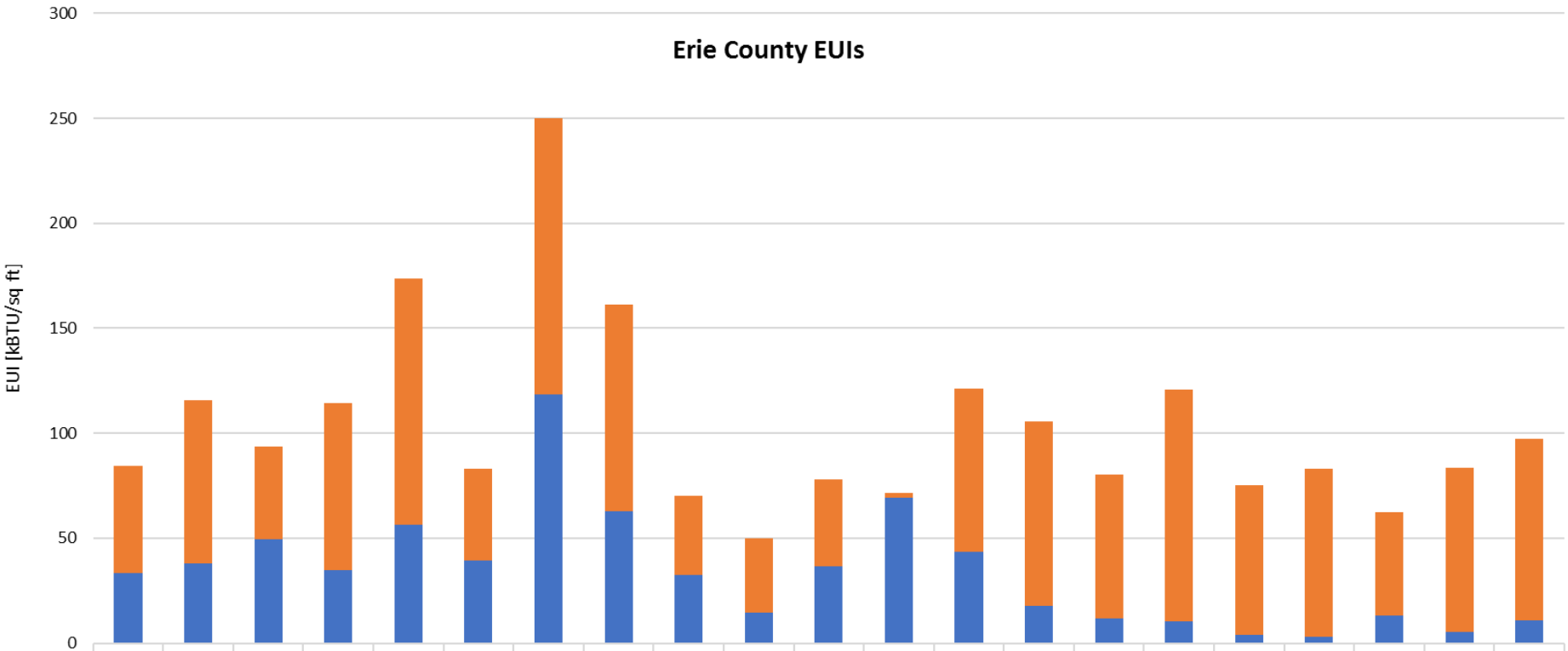
Natural gas is supplied by National Fuel Gas for all locations listed below. These locations utilize a total of approximately 141,162 mcf of natural gas annually at a cost of approximately $744,565. The individual; breakout per location is listed below:

Erie County Utilities

Location	Name	Gas Utility	Rate	Account #'s	Total MCF	Gas Cost	$/MCF
1	**Jesse Nash Health Center**	N Fuel	TC 1.0 COMM: < 5 MMCF	315406904	1,854	$10,462	$5.520
2	**Holding Center**	N Fuel	TC 2.0 COMM: 25-55 MMCF	359644310	42,521	$180,821	$4.052
3	**Rath Building**	N Fuel	TC 1.1 COMM: 5-25 MMCF	716559702	22,057	$108,990	$4.765
4	**Fire Training**	N Fuel	TC 1.0 COMM: < 5 MMCF	407115807 583918207 703787406	2,715	$15,252	$5.079
5	**Youth Detention**	N Fuel	TC 1.1 COMM: 5-25 MMCF TC 1.0 COMM: < 5 MMCF	568554708 577235803	7,138	$35,869	$6.030
7	**Family Court**	N Fuel	TC 1.0 COMM: < 5 MMCF	534540703	7,256	$34,968	$4.788
8	**Public Safety Campus**	N Fuel	TC 1.1 COMM: 5-25 MMCF	593162706	14,581	$69,308	$4.487
9	**Correctional Facility**	N Fuel	unknown	Reserve Gas # 8947 & 8948	19,944	$161,289	$7.597
10	**Law Library**	N Fuel	TC 1.0 COMM: < 5 MMCF	397043305	1,083	$6,164	$5.482
11	**Aurora Barn**	N Fuel	TC 1.0 COMM: < 5 MMCF	360522702	1,663	$9,041	$5.302
12	**Sheriff's**	N Fuel	TC 2.0 COMM: 25-55 MMCF	Fed from Holding Center Complex			
13	**Old County Hall**	N Fuel	TC 2.0 COMM: 25-55 MMCF	Fed from Holding Center Complex			
14	**Health Mall**	N Fuel	TC 1.0 COMM: < 5 MMCF	366923709	52	$507	$5.381
15	**Erie County Court(Annex)**	N Fuel	TC 2.0 COMM: 25-55 MMCF	Fed from Holding Center Complex			
16	**Chestnut Ridge Casino**	N Fuel	TC 1.0 COMM: < 5 MMCF	353472709 383864808	893	$5,404	$5.736
16	**Chestnut Ridge Bunker**	n/a	n/a	n/a	0	$0	$0.000
16	**Chestnut Ridge Radio Tower**	N Fuel	TC 1.0 COMM: < 5 MMCF	353472306	477	$2,939	$5.690
16	**Chestnut Ridge Office**	N Fuel	TC 1.0 COMM: < 5 MMCF	353472611	729	$4,275	$5.554
16	**Chestnut Ridge Truck Shop**	N Fuel	TC 1.0 COMM: < 5 MMCF	353472404	1,032	$5,847	$5.484
17	**Harlem District hwy**	N Fuel	TC 1.0 COMM: < 5 MMCF	319842301	2,298	$12,464	$5.326
18	**East Concord**	N Fuel	TC 1.0 COMM: < 5 MMCF	469909804	2,591	$13,927	$5.288
19	**Hamburg hwy**	N Fuel	TC 1.0 COMM: < 5 MMCF	316638805	4,405	$23,478	$5.278
20	**Angola hwy**	N Fuel	TC 1.0 COMM: < 5 MMCF	327365608 485211607	1,388	$8,056	$5.241
21	**Collins hwy**	N Fuel	TC 1.0 COMM: < 5 MMCF	349936605	1,654	$9,064	$5.344
22	**Clarence hwy**	N Fuel	TC 1.0 COMM: < 5 MMCF	367764705	2,185	$11,821	$5.308
23	**South Protection Hwy**	N Fuel	TC 1.0 COMM: < 5 MMCF	338441806	752	$4,308	$5.449
24	**Tonawanda Hwy**	N Fuel	TC 1.0 COMM: < 5 MMCF	339600101	1,896	$10,310	$5.319
25	**120 West Eagle**	N Fuel	TC 2.0 COMM: 25-55 MMCF	Fed from Holding Center Complex			
26	**134 West Eagle**	N Fuel	TC 2.0 COMM: 25-55 MMCF	Fed from Holding Center Complex			

Energy Use Intensity

A common metric of a building's energy performance is an Energy Use Intensity or EUI number. It is calculated by dividing the total energy consumed by the building in one year, by the total gross floor area of the building. The higher the EUI, the higher the energy consumption per area. Presented below are the Erie County EUIs (in kBTU/sq ft) for the utility timeframe chosen:



	Jesse Nash Health Center	Holding Center Complex	Rath Building	Fire Training	Youth Detention	Family Court	Public Saftey Campus	Correctional Facility	Law Libray	Aurora Barn	Court Complex	Health Mall	Chestnut Ridge Park	Harlem District hwy	East Concord	Hamburg hwy	Angola hwy	Collins hwy	Clarence hwy	South Protection Hwy	Tonawanda Hwy
Gas EUI	51	78	44	79	118	44	132	99	38	35	42	2	78	88	69	111	71	80	50	78	87
Elec EUI	34	38	49	35	56	39	118	63	32	15	36	69	44	18	12	10	4	3	13	6	11

Electricity Consumption Data

The electricity consumption and cost data show the monthly use and cost information for the period from March 2017 through February 2018. This information was used to determine the value of each unit of electric energy.

The following page contains the electricity analysis for each electric account in table and graphic forms.

ELECTRICITY CONSUMPTION AND COST ANALYSIS

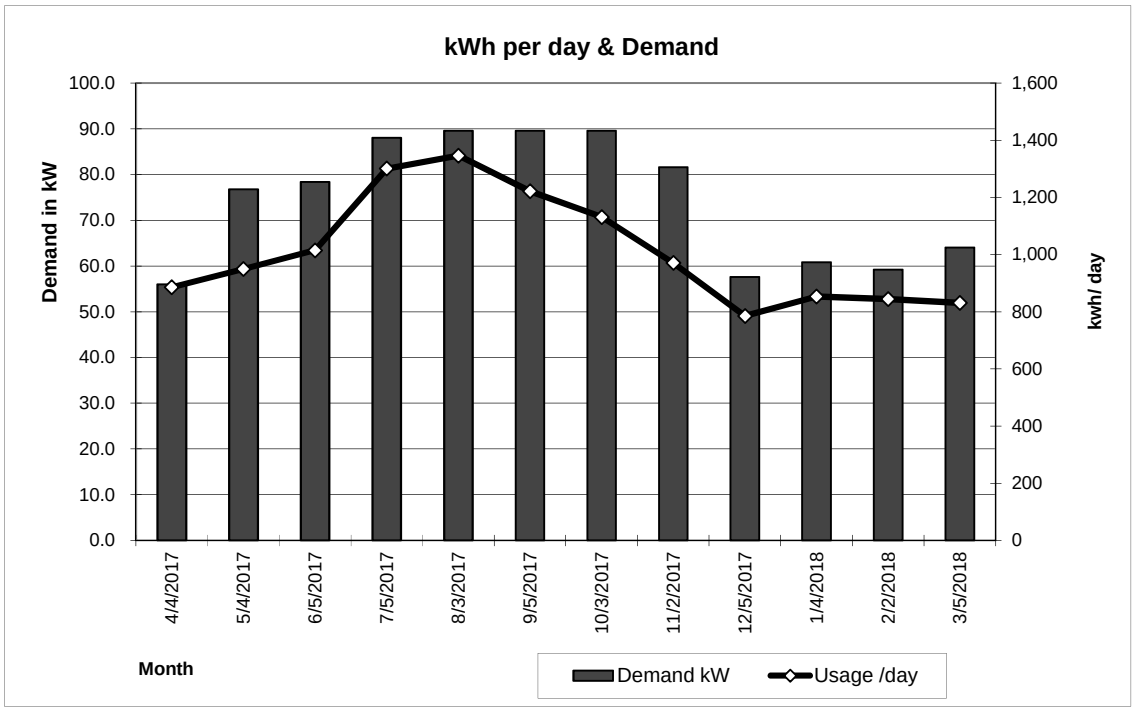
Client: Jesse Nash Health Center
Address: 608 William
Gross Area: 37,500 s.f.
33,527 Btu/s.f./Yr
$ 0.77 /s.f.
2.4 watts/s.f.

Utility: National Grid
Account # ending in 27108
Rate: SC2D
Meter Charge: $ 52.52 / month
Demand Charge: $ 11.89 / kW
Supplier: Fluent Energy
Supplier Acct. # 0
Taxes: 0.00000%

Month Ending	Days	Usage Energy kWh	Usage Demand kW	Electricity Charges Utility Cost	Electricity Charges Supply Costs	Total Electricity Cost	Demand Cost	Energy $/kWh	Load Factor	Usage /day
4/4/2017	30	26,560	56.0	$ 973	$ 806	$ 1,779	$ 666	$ 0.040	0.66	885
5/4/2017	30	28,480	76.8	$ 1,112	$ 881	$ 1,993	$ 913	$ 0.036	0.52	949
6/5/2017	32	32,480	78.4	$ 1,197	$ 1,343	$ 2,540	$ 932	$ 0.048	0.54	1,015
7/5/2017	30	39,040	88.0	$ 1,344	$ 1,684	$ 3,028	$ 1,047	$ 0.049	0.62	1,301
8/3/2017	29	39,040	89.6	$ 1,344	$ 2,080	$ 3,425	$ 1,066	$ 0.059	0.63	1,346
9/5/2017	33	40,320	89.6	$ 1,381	$ 1,504	$ 2,885	$ 1,066	$ 0.044	0.57	1,222
10/3/2017	28	31,680	89.6	$ 1,297	$ 1,267	$ 2,563	$ 1,066	$ 0.046	0.53	1,131
11/2/2017	30	29,120	81.6	$ 1,198	$ 995	$ 2,193	$ 971	$ 0.040	0.50	971
12/5/2017	33	25,920	57.6	$ 914	$ 830	$ 1,744	$ 685	$ 0.039	0.57	785
1/4/2018	30	25,600	60.8	$ 966	$ 1,426	$ 2,392	$ 723	$ 0.063	0.58	853
2/2/2018	29	24,480	59.2	$ 880	$ 1,558	$ 2,438	$ 704	$ 0.069	0.59	844
3/5/2018	31	25,760	64.0	$ 975	$ 798	$ 1,773	$ 761	$ 0.037	0.54	831
	365	**368,480**	**891.2**	**$ 13,582**	**$ 15,170**	**$ 28,753**	**$ 10,600**	**$ 0.048**	**0.57**	**1,010**

Annual Energy: **368,480 kWh / year** **$ 28,753 /year**
Peak Demand: **90 kW Peak**
Average Demand: **74 kW**

Unit Costs
Demand **$ 11.894 $/kW**
Energy **$ 0.048 $/kWh Incremental**
Blended **$ 0.078 $/kWh Blended**



Note:

ELECTRICITY CONSUMPTION AND COST ANALYSIS

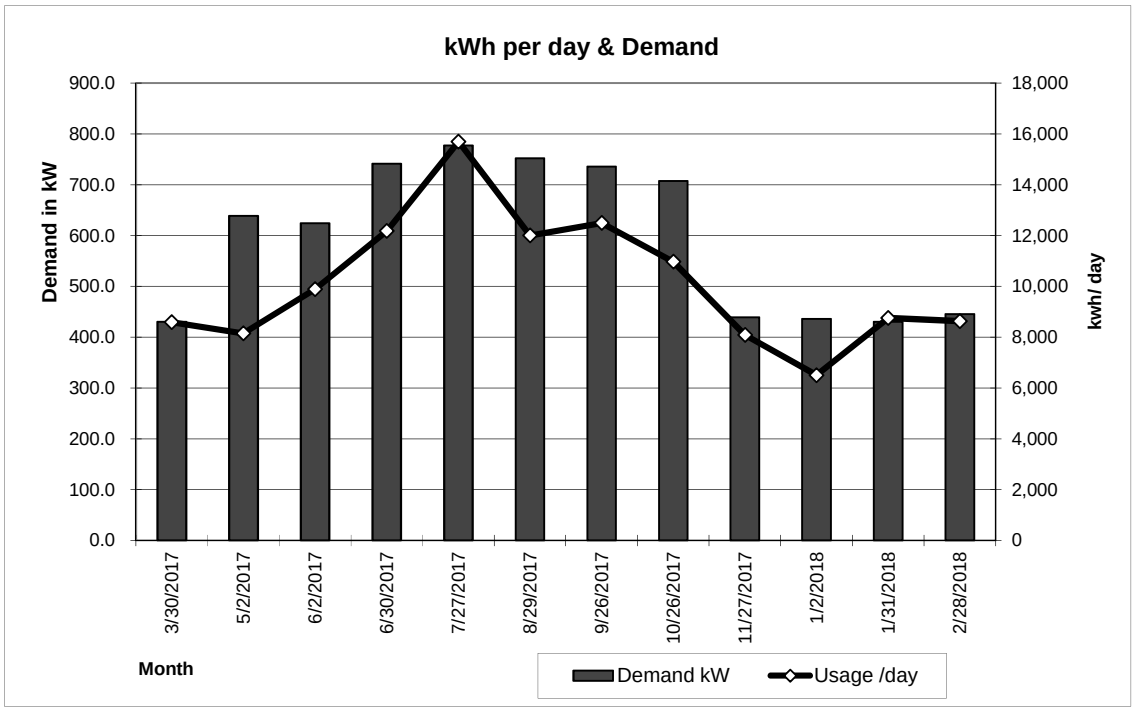
Client: Erie County
Address: Holding Center
Gross Area: 330,111 s.f.
37,847 Btu/s.f./Yr
$ 0.78 /s.f.
2.4 watts/s.f.

Utility: National Fuel
Account # ending in 4310
Rate: TC 2.0 COMM: 25-55 MMCF & othe
Meter Charge: $ 1,012.50 / month
Demand Charge: $ 6.66 / kW
Supplier: Fluent Energy
Supplier Acct. # 0
Taxes: 0.00000%

Month Ending	Days	Usage Energy kWh	Usage Demand kW	Electricity Charges Utility Cost	Electricity Charges Supply Costs	Total Electricity Cost	Demand Cost	Energy $/kWh	Load Factor	Usage /day
3/30/2017	30	257,918	429.9	$ 7,435	$ 7,435	$ 14,870	$ 2,865	$ 0.043	0.83	8,597
5/2/2017	33	268,977	638.9	$ 9,709	$ 8,233	$ 17,942	$ 4,258	$ 0.047	0.53	8,151
6/2/2017	31	306,488	624.2	$ 9,767	$ 12,892	$ 22,659	$ 4,160	$ 0.057	0.66	9,887
6/30/2017	28	341,081	741.4	$ 11,158	$ 13,145	$ 24,303	$ 4,941	$ 0.054	0.68	12,181
7/27/2017	27	423,694	776.9	$ 12,119	$ 20,925	$ 33,044	$ 5,178	$ 0.063	0.84	15,692
8/29/2017	33	396,095	751.9	$ 11,831	$ 15,611	$ 27,442	$ 5,011	$ 0.054	0.67	12,003
9/26/2017	28	349,822	735.4	$ 11,273	$ 13,328	$ 24,601	$ 4,901	$ 0.053	0.71	12,494
10/26/2017	30	329,275	707.1	$ 10,810	$ 11,040	$ 21,849	$ 4,713	$ 0.049	0.65	10,976
11/27/2017	32	258,860	439.0	$ 7,205	$ 8,348	$ 15,553	$ 2,926	$ 0.045	0.77	8,089
1/2/2018	36	234,149	436.0	$ 6,984	$ 8,871	$ 15,855	$ 2,906	$ 0.051	0.62	6,504
1/31/2018	29	253,740	430.0	$ 6,608	$ 19,258	$ 25,866	$ 2,866	$ 0.087	0.85	8,750
2/28/2018	28	241,576	445.0	$ 6,578	$ 8,213	$ 14,791	$ 2,966	$ 0.045	0.81	8,628
	365	**3,661,675**	**7,155.7**	**$ 111,477**	**$ 147,299**	**$ 258,776**	**$ 47,690**	**$ 0.054**	**0.71**	**10,032**

Annual Energy: **3,661,675 kWh / year** **$ 258,776 /year**
Peak Demand: **777 kW Peak**
Average Demand: **596 kW**

Unit Costs
Demand **$ 6.665 $/kW**
Energy **$ 0.054 $/kWh Incremental**
Blended **$ 0.071 $/kWh Blended**



Note:

ELECTRICITY CONSUMPTION AND COST ANALYSIS

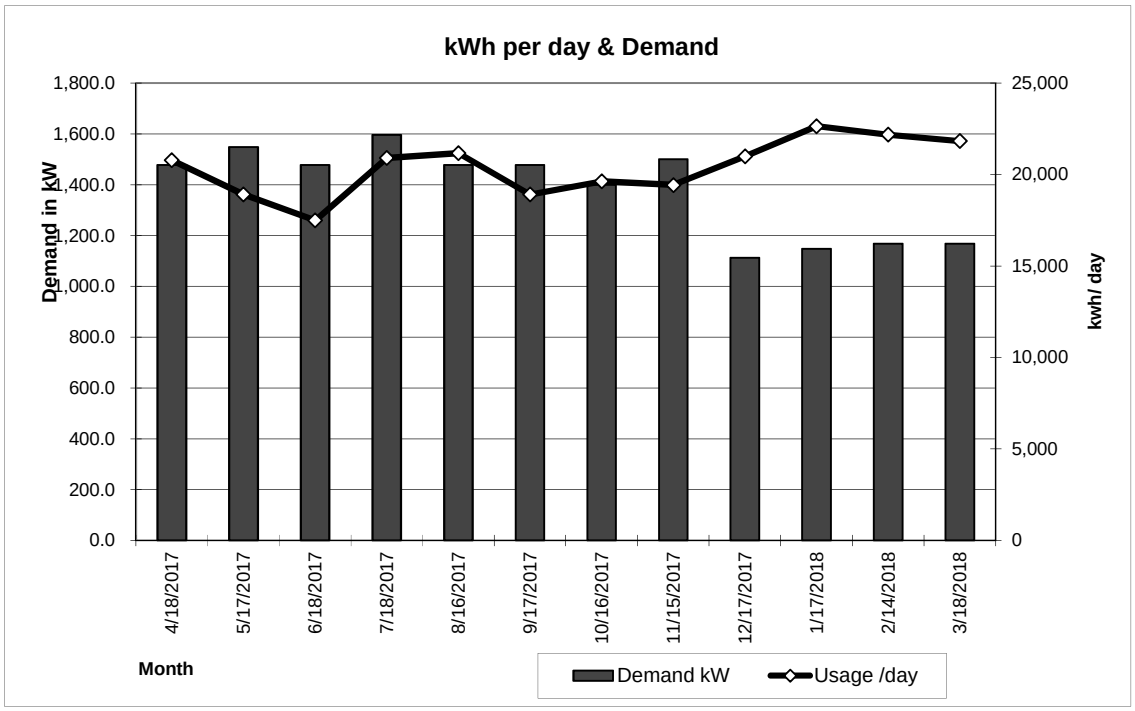
Client: Rath Building
Address: 95 Franklin Street
Gross Area: 513,924 s.f.
49,285 Btu/s.f./Yr
$ 1.05 /s.f.
3.1 watts/s.f.

Utility: National Grid
Account # ending in 2109
Rate: SC3
Meter Charge: $ 303.61 / month
Demand Charge: $ 10.30 / kW
Supplier: Fluent Energy
Supplier Acct. # 0
Taxes: 0.00000%

Month Ending	Days	Usage Energy kWh	Usage Demand kW	Electricity Charges Utility Cost	Electricity Charges Supply Costs	Total Electricity Cost	Demand Cost	Energy $/kWh	Load Factor	Usage /day
4/18/2017	30	623,292	1,478.0	$ 21,708	$ 19,362	$ 41,070	$ 15,224	$ 0.041	0.59	20,776
5/17/2017	29	548,532	1,548.0	$ 21,492	$ 20,795	$ 42,287	$ 15,945	$ 0.047	0.51	18,915
6/18/2017	32	559,640	1,478.0	$ 20,618	$ 24,243	$ 44,861	$ 15,224	$ 0.052	0.49	17,489
7/18/2017	30	626,990	1,596.0	$ 22,033	$ 28,744	$ 50,778	$ 16,439	$ 0.054	0.55	20,900
8/16/2017	29	613,815	1,478.0	$ 20,494	$ 28,551	$ 49,044	$ 15,224	$ 0.055	0.60	21,166
9/17/2017	32	605,078	1,478.0	$ 20,941	$ 21,562	$ 42,503	$ 15,224	$ 0.045	0.53	18,909
10/16/2017	29	569,242	1,400.0	$ 19,543	$ 23,381	$ 42,924	$ 14,420	$ 0.050	0.58	19,629
11/15/2017	30	582,830	1,500.0	$ 20,923	$ 19,792	$ 40,715	$ 15,450	$ 0.043	0.54	19,428
12/17/2017	32	671,928	1,112.0	$ 16,784	$ 22,179	$ 38,963	$ 11,454	$ 0.040	0.79	20,998
1/17/2018	31	701,839	1,148.0	$ 17,735	$ 54,098	$ 71,833	$ 11,825	$ 0.085	0.82	22,640
2/14/2018	28	621,336	1,168.0	$ 15,590	$ 24,511	$ 40,101	$ 12,031	$ 0.045	0.79	22,191
3/18/2018	32	698,868	1,168.0	$ 16,734	$ 20,242	$ 36,976	$ 12,031	$ 0.035	0.78	21,840
	364	**7,423,390**	**16,552.0**	**$ 234,596**	**$ 307,459**	**$ 542,055**	**$ 170,490**	**$ 0.050**	**0.62**	**20,394**

Annual Energy: **7,423,390 kWh / year** **$ 542,055 /year**
Peak Demand: **1,596 kW Peak**
Average Demand: **1,379 kW**

Unit Costs
Demand **$ 10.300 $/kW**
Energy **$ 0.050 $/kWh Incremental**
Blended **$ 0.073 $/kWh Blended**



Note:

ELECTRICITY CONSUMPTION AND COST ANALYSIS

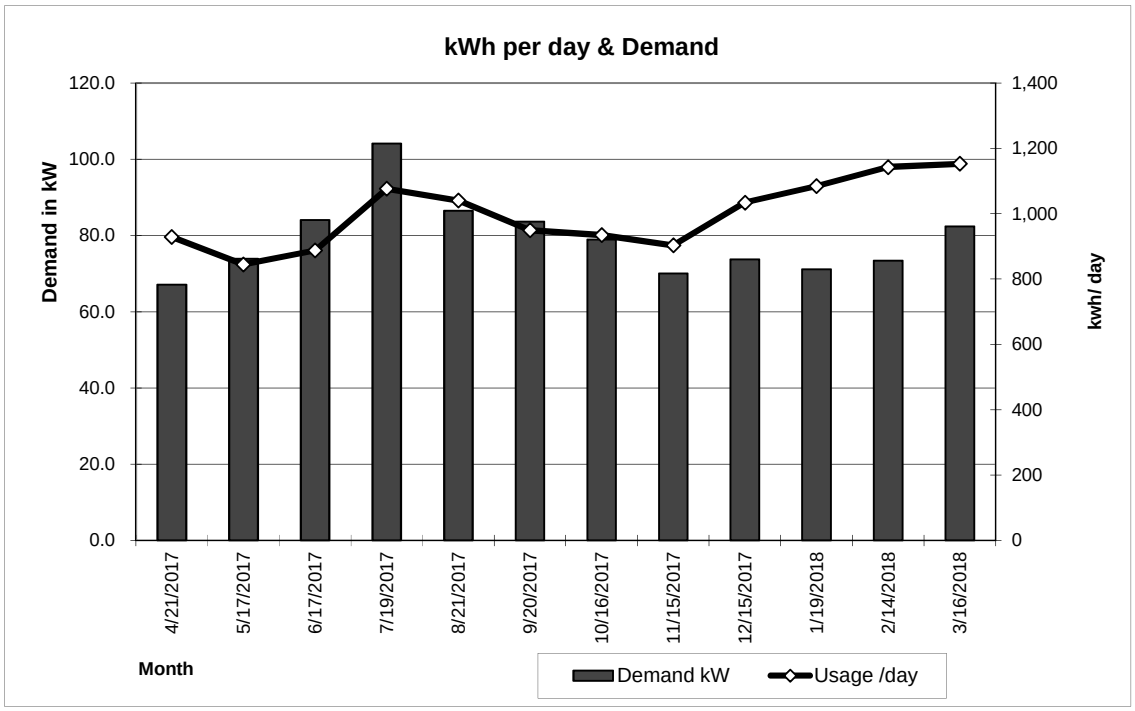
Client: Fire Training
Address: 3359 Broadway St.
Gross Area: 35,200 s.f.
34,829 Btu/s.f./Yr
$ 0.79 /s.f.
3.0 watts/s.f.

Utility: NYSEG
Account # ending in 87498
Rate: SC2 & others
Meter Charge: $ 46.30 / month
Demand Charge: $ 9.26 / kW
Supplier: Fluent Energy
Supplier Acct. # 0
Taxes: 0.00000%

Month Ending	Days	Usage Energy kWh	Usage Demand kW	Electricity Charges Utility Cost	Electricity Charges Supply Costs	Total Electricity Cost	Demand Cost	Energy $/kWh	Load Factor	Usage /day
4/21/2017	30	27,866	67.1	$ 992	$ 828	$ 1,820	$ 621	$ 0.041	0.58	929
5/17/2017	26	21,962	73.9	$ 989	$ 862	$ 1,851	$ 684	$ 0.051	0.48	845
6/17/2017	31	27,522	84.1	$ 1,152	$ 1,151	$ 2,303	$ 779	$ 0.054	0.44	888
7/19/2017	32	34,469	104.1	$ 1,462	$ 1,671	$ 3,133	$ 964	$ 0.062	0.43	1,077
8/21/2017	33	34,334	86.5	$ 1,235	$ 1,598	$ 2,833	$ 801	$ 0.058	0.50	1,040
9/20/2017	30	28,470	83.6	$ 1,093	$ 1,000	$ 2,093	$ 774	$ 0.045	0.47	949
10/16/2017	26	24,301	78.9	$ 995	$ 969	$ 1,964	$ 730	$ 0.049	0.49	935
11/15/2017	30	27,113	70.0	$ 928	$ 913	$ 1,841	$ 648	$ 0.042	0.54	904
12/15/2017	30	31,022	73.7	$ 974	$ 1,001	$ 1,975	$ 682	$ 0.040	0.58	1,034
1/19/2018	35	37,955	71.1	$ 1,002	$ 2,759	$ 3,761	$ 658	$ 0.081	0.64	1,084
2/14/2018	26	29,714	73.4	$ 888	$ 1,131	$ 2,019	$ 679	$ 0.044	0.65	1,143
3/16/2018	30	34,590	82.4	$ 1,048	$ 991	$ 2,039	$ 763	$ 0.036	0.58	1,153
	359	**359,318**	**948.8**	**$ 12,758**	**$ 14,874**	**$ 27,632**	**$ 8,783**	**$ 0.051**	**0.53**	**1,001**

Annual Energy: **359,318 kWh / year** **$ 27,632 /year**
Peak Demand: **104 kW Peak**
Average Demand: **79 kW**

Unit Costs
Demand **$ 9.257 $/kW**
Energy **$ 0.051 $/kWh Incremental**
Blended **$ 0.077 $/kWh Blended**



Note:

ELECTRICITY CONSUMPTION AND COST ANALYSIS

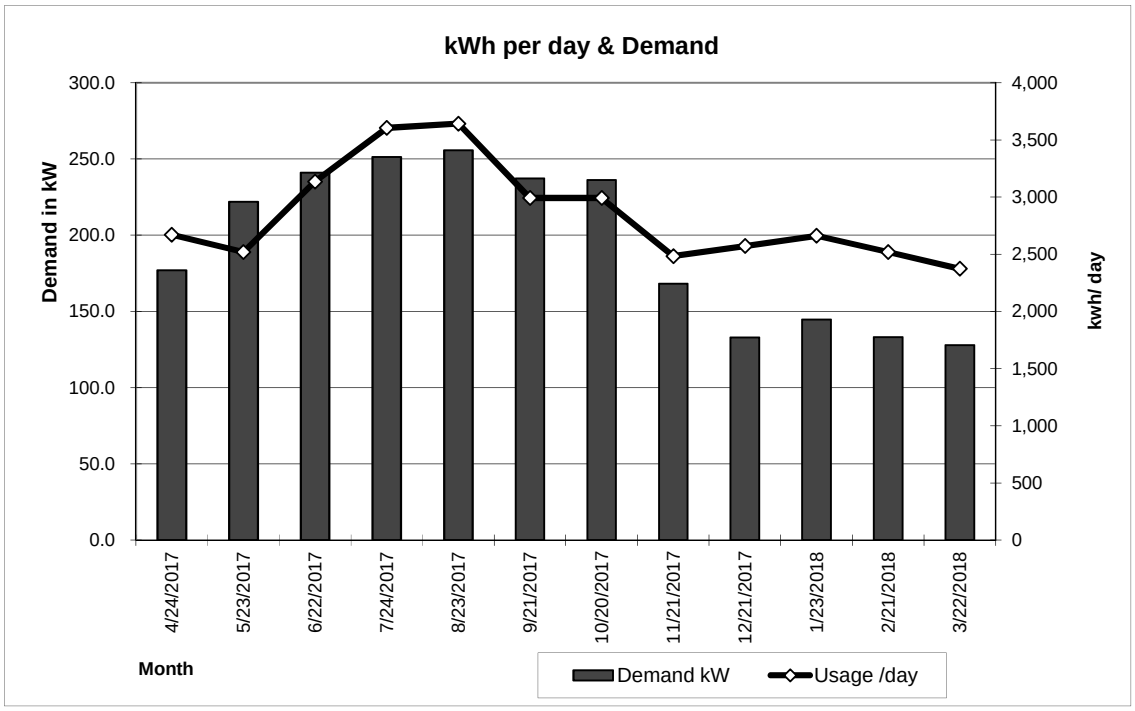
Client: Youth Detention
Address: 810 East Ferry Street
Gross Area: 62,555 s.f.
56,282 Btu/s.f./Yr
$ 1.26 /s.f.
4.1 watts/s.f.

Utility: National Grid
Account # ending in 23009
Rate: SC3
Meter Charge: $ 260.15 / month
Demand Charge: $ 10.23 / kW
Supplier: Fluent Energy
Supplier Acct. # 0
Taxes: 0.00000%

Month Ending	Days	Usage Energy kWh	Usage Demand kW	Electricity Charges Utility Cost	Electricity Charges Supply Costs	Total Electricity Cost	Demand Cost	Energy $/kWh	Load Factor	Usage /day
4/24/2017	30	80,095	177.0	$ 2,893	$ 2,460	$ 5,353	$ 1,811	$ 0.041	0.63	2,670
5/23/2017	29	73,035	221.8	$ 3,264	$ 3,110	$ 6,374	$ 2,269	$ 0.053	0.47	2,518
6/22/2017	30	94,092	241.1	$ 3,603	$ 3,852	$ 7,455	$ 2,466	$ 0.050	0.54	3,136
7/24/2017	32	115,391	251.2	$ 3,808	$ 5,809	$ 9,616	$ 2,570	$ 0.059	0.60	3,606
8/23/2017	30	109,297	255.7	$ 3,782	$ 4,758	$ 8,540	$ 2,616	$ 0.052	0.59	3,643
9/21/2017	29	86,788	237.2	$ 3,498	$ 3,023	$ 6,520	$ 2,426	$ 0.044	0.53	2,993
10/20/2017	29	86,795	236.1	$ 3,440	$ 3,425	$ 6,865	$ 2,415	$ 0.048	0.53	2,993
11/21/2017	32	79,503	168.1	$ 2,692	$ 2,675	$ 5,366	$ 1,720	$ 0.043	0.62	2,484
12/21/2017	30	77,209	132.9	$ 2,211	$ 2,618	$ 4,829	$ 1,359	$ 0.042	0.81	2,574
1/23/2018	33	87,812	144.6	$ 2,453	$ 6,752	$ 9,205	$ 1,479	$ 0.085	0.77	2,661
2/21/2018	29	73,030	133.1	$ 2,012	$ 2,653	$ 4,664	$ 1,362	$ 0.042	0.79	2,518
3/22/2018	29	68,809	127.9	$ 2,006	$ 2,141	$ 4,147	$ 1,308	$ 0.037	0.77	2,373
	362	**1,031,856**	**2,326.7**	**$ 35,662**	**$ 43,274**	**$ 78,937**	**$ 23,801**	**$ 0.050**	**0.62**	**2,850**

Annual Energy: **1,031,856 kWh / year** **$ 78,937 /year**
Peak Demand: **256 kW Peak**
Average Demand: **194 kW**

Unit Costs
Demand **$ 10.229 $/kW**
Energy **$ 0.050 $/kWh Incremental**
Blended **$ 0.076 $/kWh Blended**



Note:

ELECTRICITY CONSUMPTION AND COST ANALYSIS

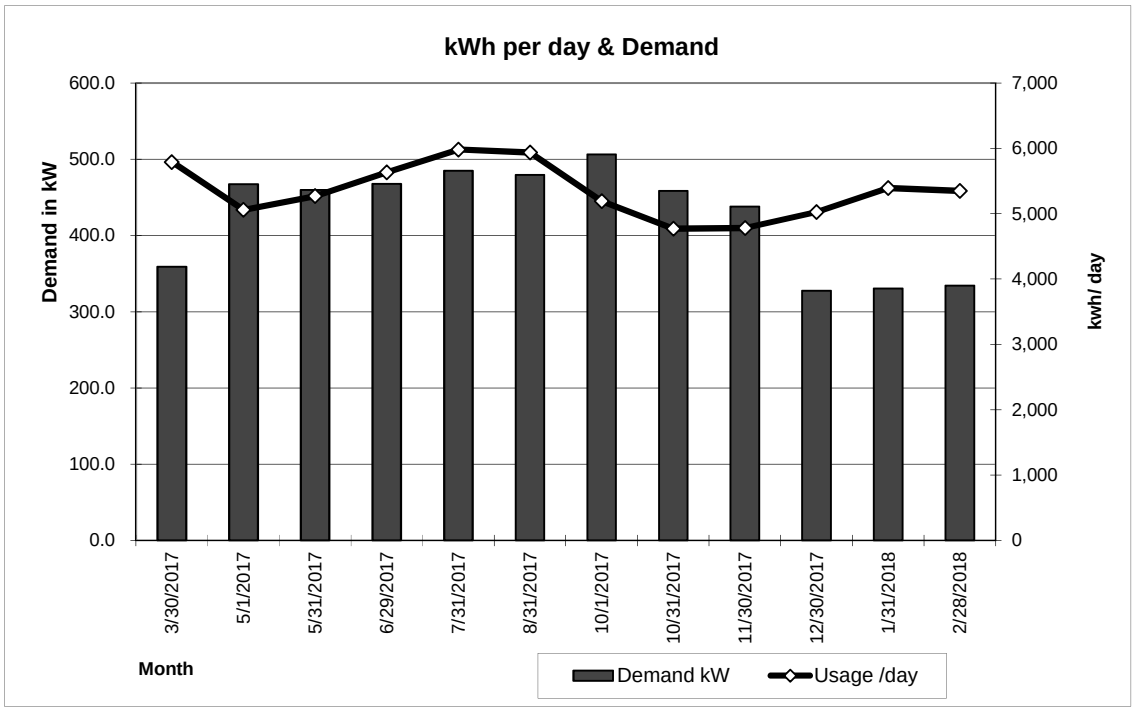
Client: Family Court
Address: 1 Niagara Square
Gross Area: 170,000 s.f.
39,207 Btu/s.f./Yr
$ 0.92 /s.f.
3.0 watts/s.f.

Utility: National Grid
Account # ending in 56004
Rate: SC3
Meter Charge: $ 303.61 / month
Demand Charge: $ 10.59 / kW
Supplier: Fluent Energy
Supplier Acct. # 0
Taxes: 0.00000%

Month Ending	Days	Usage Energy kWh	Usage Demand kW	Electricity Charges Utility Cost	Electricity Charges Supply Costs	Total Electricity Cost	Demand Cost	Energy $/kWh	Load Factor	Usage /day
3/30/2017	30	173,779	358.9	$ 5,658	$ 5,123	$ 10,781	$ 3,800	$ 0.038	0.67	5,793
5/1/2017	32	161,969	467.3	$ 6,619	$ 5,084	$ 11,703	$ 4,947	$ 0.040	0.45	5,062
5/31/2017	30	158,161	459.7	$ 6,498	$ 7,332	$ 13,830	$ 4,867	$ 0.055	0.48	5,272
6/29/2017	29	163,408	467.6	$ 6,565	$ 7,046	$ 13,611	$ 4,950	$ 0.051	0.50	5,635
7/31/2017	32	191,433	484.9	$ 6,862	$ 10,175	$ 17,037	$ 5,133	$ 0.061	0.51	5,982
8/31/2017	31	183,992	479.5	$ 6,883	$ 7,782	$ 14,666	$ 5,076	$ 0.050	0.52	5,935
10/1/2017	31	160,948	506.2	$ 6,926	$ 6,910	$ 13,836	$ 5,359	$ 0.051	0.43	5,192
10/31/2017	30	143,157	458.6	$ 6,318	$ 5,216	$ 11,534	$ 4,855	$ 0.045	0.43	4,772
11/30/2017	30	143,457	437.8	$ 5,984	$ 4,731	$ 10,715	$ 4,635	$ 0.040	0.46	4,782
12/30/2017	30	150,822	327.6	$ 4,947	$ 6,324	$ 11,272	$ 3,468	$ 0.050	0.64	5,027
1/31/2018	32	172,594	330.5	$ 4,612	$ 12,532	$ 17,144	$ 3,499	$ 0.077	0.68	5,394
2/28/2018	28	149,725	334.4	$ 4,658	$ 4,971	$ 9,630	$ 3,540	$ 0.039	0.67	5,347
	365	**1,953,445**	**5,113.0**	**$ 72,531**	**$ 83,227**	**$ 155,759**	**$ 54,129**	**$ 0.050**	**0.53**	**5,352**

Annual Energy: **1,953,445 kWh / year** **$ 155,759 /year**
Peak Demand: **506 kW Peak**
Average Demand: **426 kW**

Unit Costs
Demand **$ 10.587 $/kW**
Energy **$ 0.050 $/kWh Incremental**
Blended **$ 0.080 $/kWh Blended**



Note:

ELECTRICITY CONSUMPTION AND COST ANALYSIS

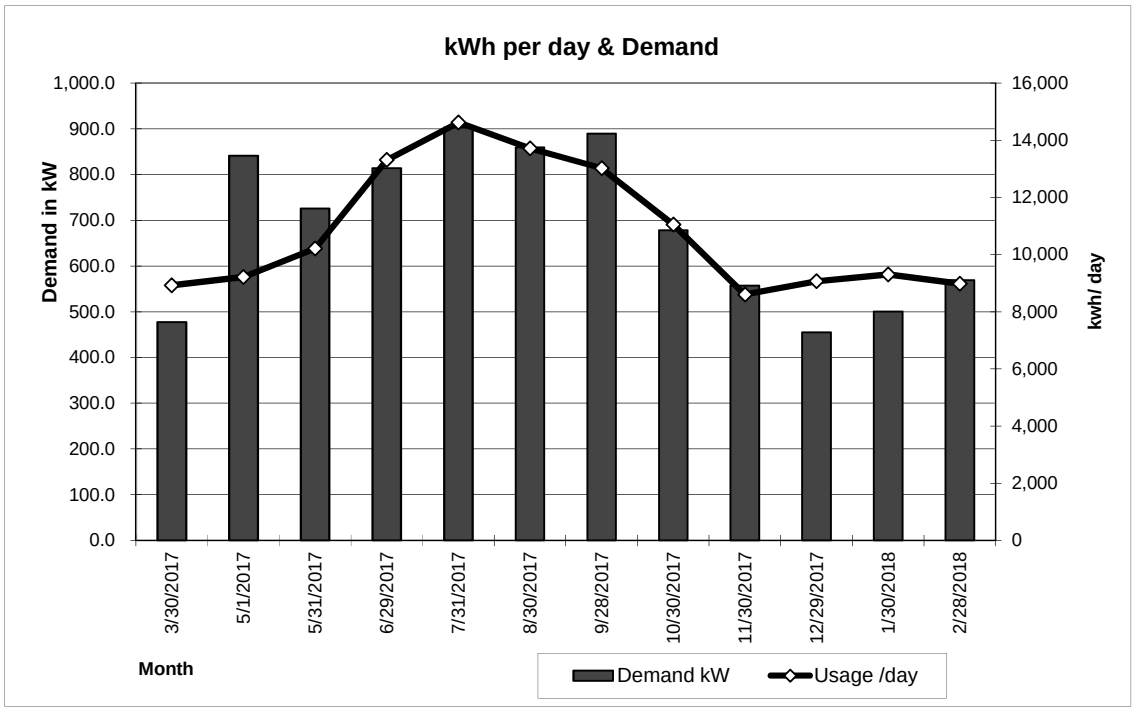
Client: Public Safety Campus
Address: 45 Elm Street
Gross Area: 114,000 s.f.
118,339 Btu/s.f./Yr
$ 2.49 /s.f.
7.9 watts/s.f.

Utility: National Grid
Account # ending in 45008
Rate: SC3
Meter Charge: $ 303.61 / month
Demand Charge: $ 10.12 / kW
Supplier: Fluent Energy
Supplier Acct. # 0
Taxes: 0.00000%

Month Ending	Days	Usage Energy kWh	Usage Demand kW	Electricity Charges Utility Cost	Electricity Charges Supply Costs	Total Electricity Cost	Demand Cost	Energy $/kWh	Load Factor	Usage /day
3/30/2017	30	267,602	477.6	$ 7,781	$ 7,788	$ 15,568	$ 4,836	$ 0.039	0.78	8,920
5/1/2017	32	294,955	841.2	$ 11,694	$ 9,002	$ 20,696	$ 8,517	$ 0.040	0.46	9,217
5/31/2017	30	306,508	726.0	$ 10,535	$ 13,696	$ 24,232	$ 7,351	$ 0.054	0.59	10,217
6/29/2017	29	386,165	813.6	$ 11,967	$ 15,327	$ 27,294	$ 8,237	$ 0.049	0.68	13,316
7/31/2017	32	467,863	902.4	$ 13,333	$ 23,330	$ 36,663	$ 9,137	$ 0.058	0.68	14,621
8/30/2017	30	411,445	859.2	$ 12,756	$ 16,704	$ 29,461	$ 8,699	$ 0.050	0.67	13,715
9/28/2017	29	377,761	889.2	$ 12,653	$ 15,100	$ 27,753	$ 9,003	$ 0.049	0.61	13,026
10/30/2017	32	353,573	678.0	$ 10,313	$ 12,136	$ 22,449	$ 6,865	$ 0.043	0.68	11,049
11/30/2017	31	266,702	556.8	$ 8,101	$ 8,497	$ 16,598	$ 5,637	$ 0.040	0.64	8,603
12/29/2017	29	262,915	454.8	$ 7,168	$ 10,406	$ 17,575	$ 4,605	$ 0.048	0.83	9,066
1/30/2018	32	297,833	500.4	$ 7,021	$ 22,298	$ 29,319	$ 5,066	$ 0.080	0.77	9,307
2/28/2018	29	260,545	568.8	$ 7,732	$ 8,778	$ 16,510	$ 5,759	$ 0.040	0.66	8,984
	365	**3,953,867**	**8,268.0**	**$ 121,054**	**$ 163,062**	**$ 284,117**	**$ 83,711**	**$ 0.050**	**0.66**	**10,833**

Annual Energy: **3,953,867 kWh / year** **$ 284,117 /year**
Peak Demand: **902 kW Peak**
Average Demand: **689 kW**

Unit Costs
Demand **$ 10.125 $/kW**
Energy **$ 0.050 $/kWh Incremental**
Blended **$ 0.072 $/kWh Blended**



Note:

ELECTRICITY CONSUMPTION AND COST ANALYSIS

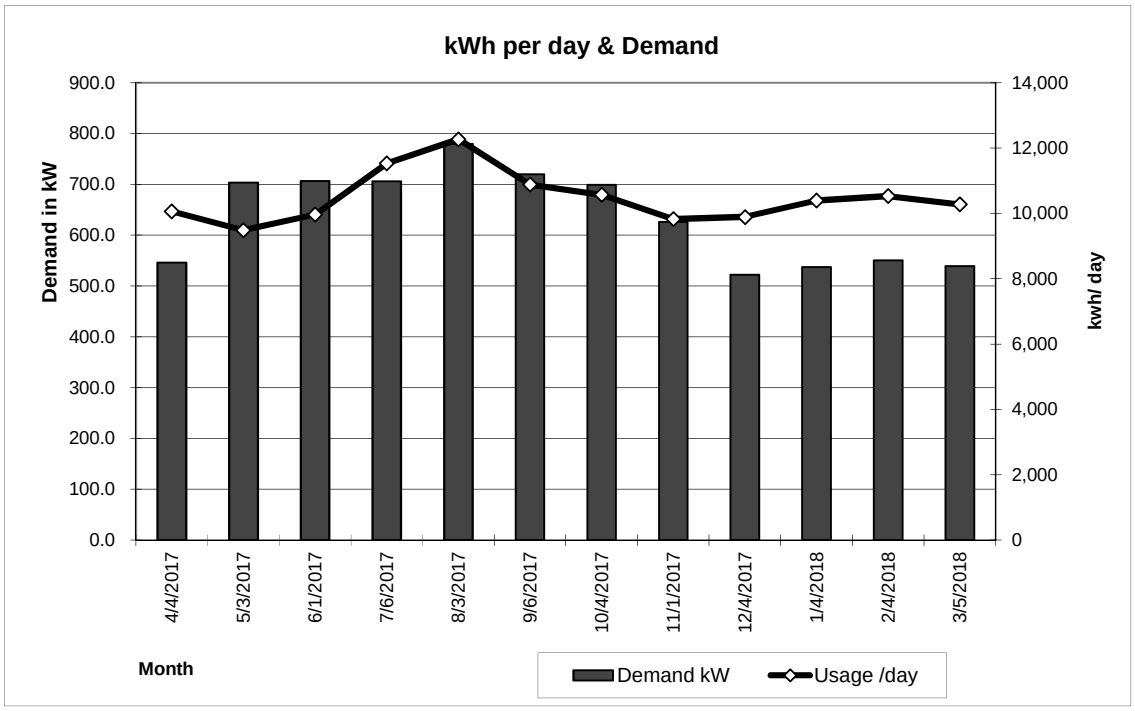
Client: Correctional Facility
Address: 11581 Walden Ave.
Gross Area: 208,280 s.f.
62,706 Btu/s.f./Yr
$ 1.17 /s.f.
3.7 watts/s.f.

Utility: NYSEG
Account # ending in 10229
Rate: SC7
Meter Charge: $ 615.57 / month
Demand Charge: $ 6.75 / kW
Supplier: Fluent Energy
Supplier Acct. # 0
Taxes: 0.00000%

Month Ending	Days	Usage Energy kWh	Usage Demand kW	Electricity Charges Utility Cost	Electricity Charges Supply Costs	Total Electricity Cost	Demand Cost	Energy $/kWh	Load Factor	Usage /day
4/4/2017	30	301,804	545.9	$ 6,266	$ 8,983	$ 15,249	$ 3,685	$ 0.036	0.77	10,060
5/3/2017	29	275,069	703.4	$ 9,360	$ 8,132	$ 17,492	$ 4,748	$ 0.044	0.56	9,485
6/1/2017	29	289,062	706.6	$ 8,274	$ 12,094	$ 20,368	$ 4,769	$ 0.052	0.59	9,968
7/6/2017	35	403,697	705.9	$ 10,132	$ 16,015	$ 26,147	$ 4,765	$ 0.051	0.68	11,534
8/3/2017	28	343,573	779.5	$ 9,988	$ 17,362	$ 27,349	$ 5,262	$ 0.062	0.66	12,270
9/6/2017	34	370,068	720.0	$ 8,677	$ 13,429	$ 22,106	$ 4,860	$ 0.045	0.63	10,884
10/4/2017	28	296,009	698.9	$ 7,544	$ 11,635	$ 19,178	$ 4,718	$ 0.047	0.63	10,572
11/1/2017	28	275,226	625.9	$ 6,848	$ 9,235	$ 16,083	$ 4,225	$ 0.041	0.65	9,830
12/4/2017	33	326,382	522.2	$ 6,298	$ 10,009	$ 16,307	$ 3,525	$ 0.037	0.79	9,890
1/4/2018	31	322,222	537.0	$ 6,128	$ 16,957	$ 23,085	$ 3,625	$ 0.058	0.81	10,394
2/4/2018	31	326,575	550.4	$ 6,309	$ 19,771	$ 26,080	$ 3,715	$ 0.067	0.80	10,535
3/5/2018	29	298,075	538.9	$ 5,106	$ 8,879	$ 13,984	$ 3,638	$ 0.033	0.79	10,278
	365	**3,827,762**	**7,634.6**	**$ 90,928**	**$ 152,501**	**$ 243,429**	**$ 51,536**	**$ 0.048**	**0.70**	**10,487**

Annual Energy: **3,827,762 kWh / year** **$ 243,429 /year**
Peak Demand: **780 kW Peak**
Average Demand: **636 kW**

Unit Costs
Demand **$ 6.750 $/kW**
Energy **$ 0.048 $/kWh Incremental**
Blended **$ 0.064 $/kWh Blended**



Note:

ELECTRICITY CONSUMPTION AND COST ANALYSIS

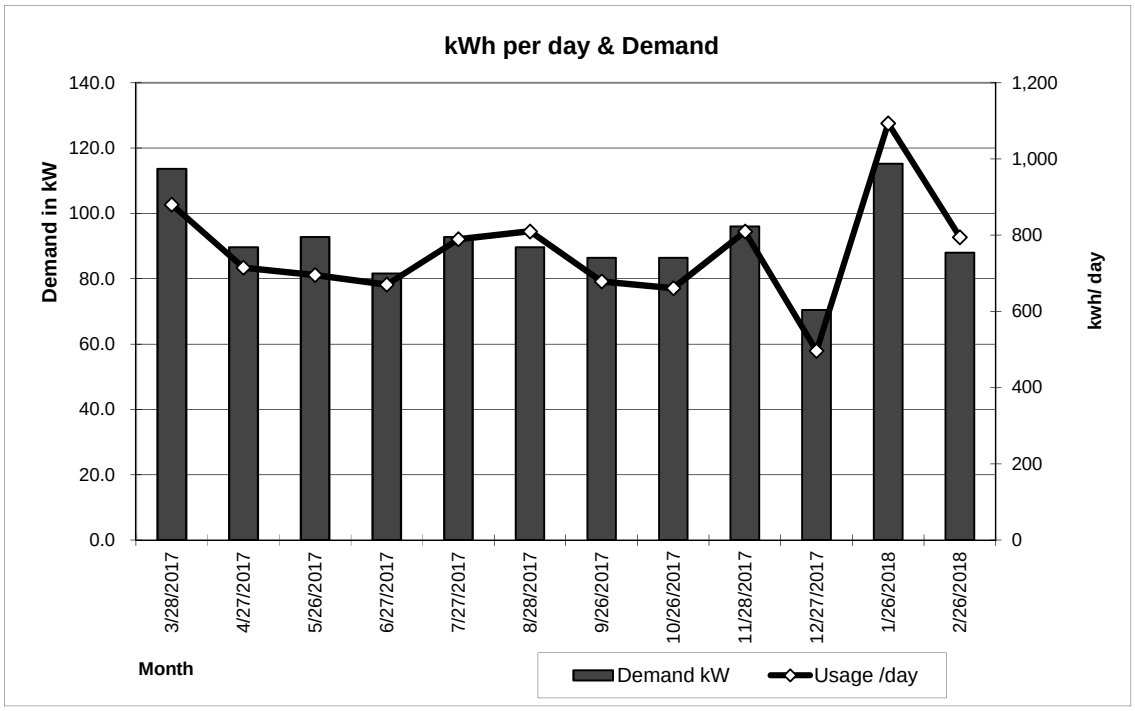
Client: Law Library
Address: 77 West Eagle
Gross Area: 29,338 s.f.
32,229 Btu/s.f./Yr
$ 0.93 /s.f.
3.9 watts/s.f.

Utility: National Grid
Account # ending in 13100
Rate: SC2D
Meter Charge: $ 52.52 / month
Demand Charge: $ 11.89 / kW
Supplier: Fluent Energy
Supplier Acct. # 0
Taxes: 0.00000%

Month Ending	Days	Usage Energy kWh	Usage Demand kW	Electricity Charges Utility Cost	Electricity Charges Supply Costs	Total Electricity Cost	Demand Cost	Energy $/kWh	Load Factor	Usage /day
3/28/2017	30	26,400	113.6	$ 1,680	$ 744	$ 2,424	$ 1,351	$ 0.039	0.32	880
4/27/2017	30	21,440	89.6	$ 1,215	$ 657	$ 1,872	$ 1,066	$ 0.035	0.33	715
5/26/2017	29	20,160	92.8	$ 1,268	$ 869	$ 2,138	$ 1,104	$ 0.049	0.31	695
6/27/2017	32	21,440	81.6	$ 1,150	$ 839	$ 1,989	$ 971	$ 0.045	0.34	670
7/27/2017	30	23,680	92.8	$ 1,277	$ 1,242	$ 2,519	$ 1,104	$ 0.058	0.35	789
8/28/2017	32	25,920	89.6	$ 1,251	$ 1,076	$ 2,327	$ 1,066	$ 0.047	0.38	810
9/26/2017	29	19,680	86.4	$ 1,189	$ 760	$ 1,949	$ 1,028	$ 0.044	0.33	679
10/26/2017	30	19,840	86.4	$ 1,176	$ 691	$ 1,866	$ 1,028	$ 0.040	0.32	661
11/28/2017	33	26,720	96.0	$ 1,392	$ 866	$ 2,258	$ 1,142	$ 0.040	0.35	810
12/27/2017	29	14,400	70.4	$ 987	$ 510	$ 1,497	$ 837	$ 0.042	0.29	497
1/26/2018	30	32,800	115.2	$ 1,675	$ 2,619	$ 4,294	$ 1,370	$ 0.088	0.40	1,093
2/26/2018	31	24,640	88.0	$ 1,218	$ 843	$ 2,061	$ 1,047	$ 0.039	0.38	795
	365	**277,120**	**1,102.4**	**$ 15,478**	**$ 11,716**	**$ 27,194**	**$ 13,112**	**$ 0.049**	**0.35**	**759**

Annual Energy: **277,120 kWh / year** **$ 27,194 /year**
Peak Demand: **115 kW Peak**
Average Demand: **92 kW**

Unit Costs
Demand **$ 11.894 $/kW**
Energy **$ 0.049 $/kWh Incremental**
Blended **$ 0.098 $/kWh Blended**



Note:

ELECTRICITY CONSUMPTION AND COST ANALYSIS

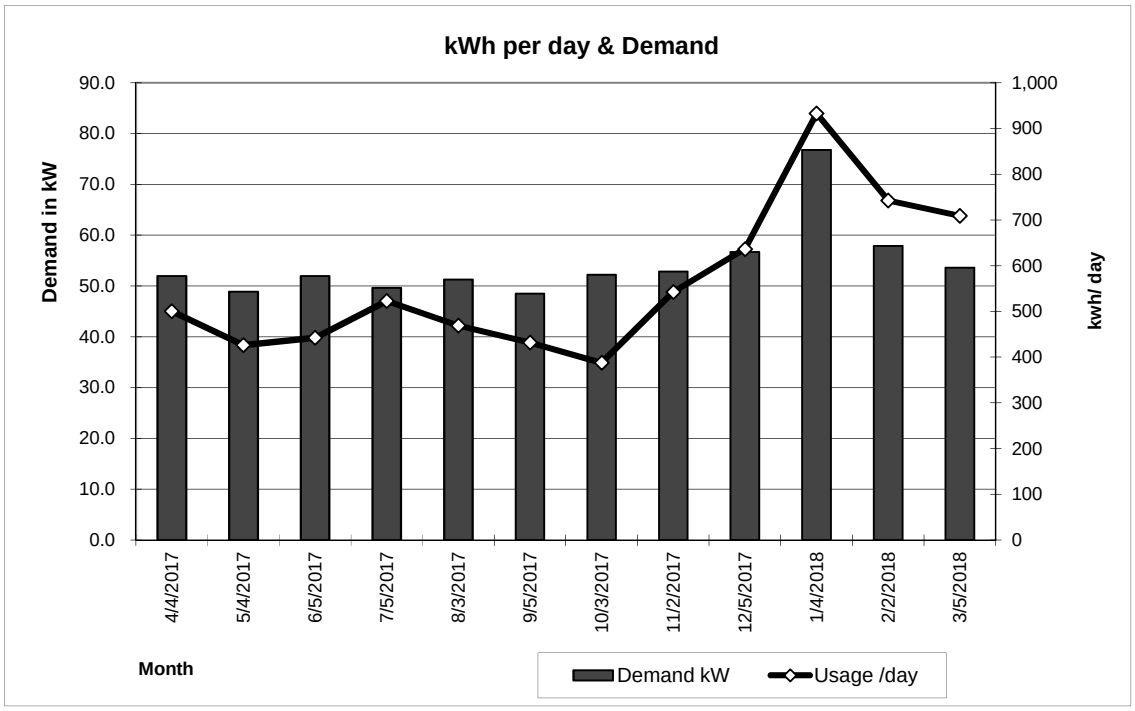
Client: Aurora Highway
Address: 119 Ellicott Road
Gross Area: 43,463 s.f.
16,103 Btu/s.f./Yr
$ 0.37 /s.f.
1.8 watts/s.f.

Utility: NYSEG
Account # ending in 34401
Rate: SC2 & others
Meter Charge: $ 46.30 / month
Demand Charge: $ 9.25 / kW
Supplier: Fluent Energy
Supplier Acct. # 0
Taxes: 0.00000%

Month Ending	Days	Usage Energy kWh	Usage Demand kW	Electricity Charges Utility Cost	Electricity Charges Supply Costs	Total Electricity Cost	Demand Cost	Energy $/kWh	Load Factor	Usage /day
4/4/2017	30	15,022	51.9	$ 651	$ 448	$ 1,099	$ 481	$ 0.038	0.40	501
5/4/2017	30	12,784	48.9	$ 622	$ 509	$ 1,132	$ 452	$ 0.050	0.36	426
6/5/2017	32	14,148	52.0	$ 683	$ 576	$ 1,259	$ 481	$ 0.052	0.35	442
7/5/2017	30	15,678	49.6	$ 677	$ 789	$ 1,465	$ 459	$ 0.061	0.44	523
8/3/2017	29	13,596	51.3	$ 644	$ 590	$ 1,233	$ 474	$ 0.052	0.38	469
9/5/2017	33	14,256	48.5	$ 605	$ 510	$ 1,115	$ 449	$ 0.043	0.37	432
10/3/2017	28	10,852	52.2	$ 497	$ 433	$ 930	$ 483	$ 0.037	0.31	388
11/2/2017	30	16,272	52.8	$ 621	$ 546	$ 1,166	$ 489	$ 0.039	0.43	542
12/5/2017	33	21,004	56.7	$ 666	$ 676	$ 1,343	$ 525	$ 0.037	0.47	636
1/4/2018	30	27,992	76.8	$ 725	$ 2,058	$ 2,784	$ 710	$ 0.072	0.51	933
2/2/2018	29	21,534	57.9	$ 620	$ 826	$ 1,446	$ 536	$ 0.040	0.53	743
3/5/2018	31	21,986	53.6	$ 645	$ 630	$ 1,275	$ 496	$ 0.033	0.55	709
	365	**205,124**	**652.2**	**$ 7,656**	**$ 8,591**	**$ 16,246**	**$ 6,035**	**$ 0.047**	**0.44**	**562**

Annual Energy: **205,124 kWh / year** **$ 16,246 /year**
Peak Demand: **77 kW Peak**
Average Demand: **54 kW**

Unit Costs
Demand **$ 9.254 $/kW**
Energy **$ 0.047 $/kWh Incremental**
Blended **$ 0.079 $/kWh Blended**



Note:

ELECTRICITY CONSUMPTION AND COST ANALYSIS

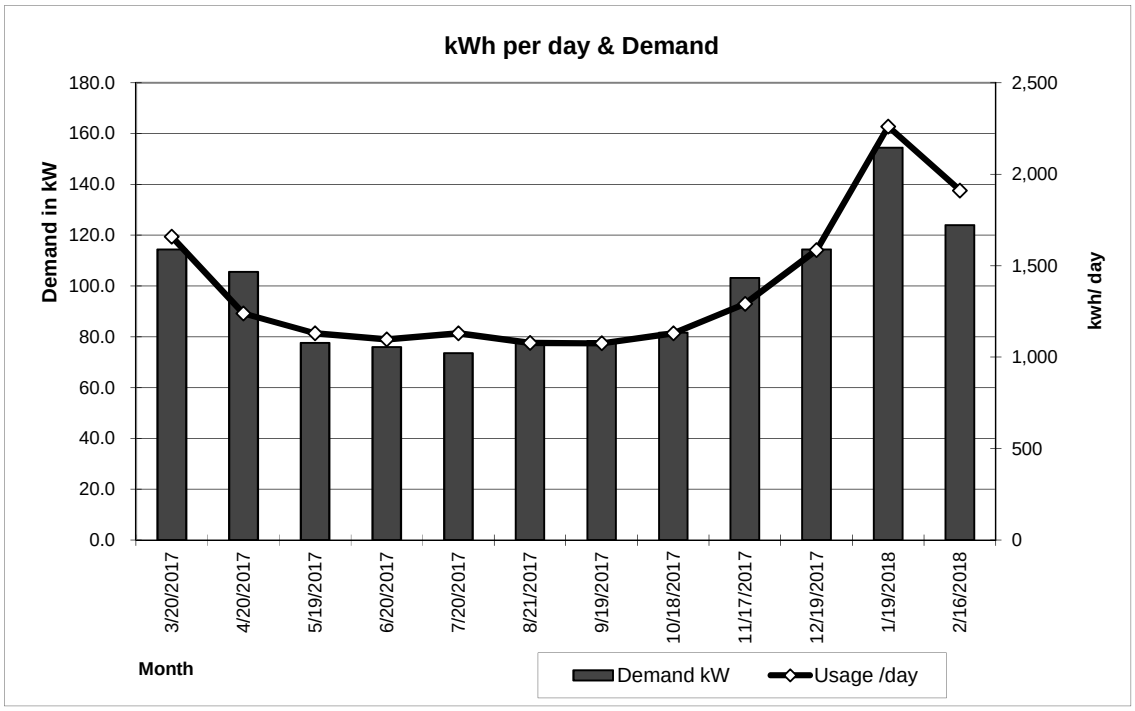
Client: Health Mall
Address: 1500 Broadway
Gross Area: 24,638 s.f.
69,453 Btu/s.f./Yr
$ 1.60 /s.f.
6.3 watts/s.f.

Utility: National Grid
Account # ending in 12110
Rate: SC2D
Meter Charge: $ 52.52 / month
Demand Charge: $ 11.88 / kW
Supplier: Fluent Energy
Supplier Acct. # 0
Taxes: 0.00000%

Month Ending	Days	Usage Energy kWh	Usage Demand kW	Electricity Charges Utility Cost	Electricity Charges Supply Costs	Total Electricity Cost	Demand Cost	Energy $/kWh	Load Factor	Usage /day
3/20/2017	30	49,760	114.4	$ 1,862	$ 1,359	$ 3,221	$ 1,359	$ 0.036	0.60	1,659
4/20/2017	31	38,400	105.6	$ 1,588	$ 1,186	$ 2,774	$ 1,255	$ 0.038	0.49	1,239
5/19/2017	29	32,800	77.6	$ 1,184	$ 1,317	$ 2,501	$ 922	$ 0.047	0.61	1,131
6/20/2017	32	35,120	76.0	$ 1,190	$ 1,422	$ 2,612	$ 903	$ 0.047	0.60	1,098
7/20/2017	30	33,920	73.6	$ 1,137	$ 1,661	$ 2,798	$ 875	$ 0.055	0.64	1,131
8/21/2017	32	34,480	77.6	$ 1,176	$ 1,560	$ 2,737	$ 922	$ 0.051	0.58	1,078
9/19/2017	29	31,200	78.4	$ 1,187	$ 1,068	$ 2,255	$ 932	$ 0.041	0.57	1,076
10/18/2017	29	32,800	81.6	$ 1,213	$ 1,316	$ 2,529	$ 970	$ 0.046	0.58	1,131
11/17/2017	30	38,720	103.2	$ 1,547	$ 1,316	$ 2,863	$ 1,226	$ 0.041	0.52	1,291
12/19/2017	32	50,720	114.4	$ 1,753	$ 1,679	$ 3,432	$ 1,359	$ 0.040	0.58	1,585
1/19/2018	31	70,080	154.4	$ 2,421	$ 5,552	$ 7,973	$ 1,835	$ 0.087	0.61	2,261
2/16/2018	28	53,520	124.0	$ 1,791	$ 1,991	$ 3,782	$ 1,474	$ 0.042	0.64	1,911
	363	**501,520**	**1,180.8**	**$ 18,050**	**$ 21,427**	**$ 39,477**	**$ 14,032**	**$ 0.049**	**0.59**	**1,382**

Annual Energy: **501,520 kWh / year** **$ 39,477 /year**
Peak Demand: **154 kW Peak**
Average Demand: **98 kW**

Unit Costs
Demand **$ 11.884 $/kW**
Energy **$ 0.049 $/kWh Incremental**
Blended **$ 0.079 $/kWh Blended**



Note:

ELECTRICITY CONSUMPTION AND COST ANALYSIS

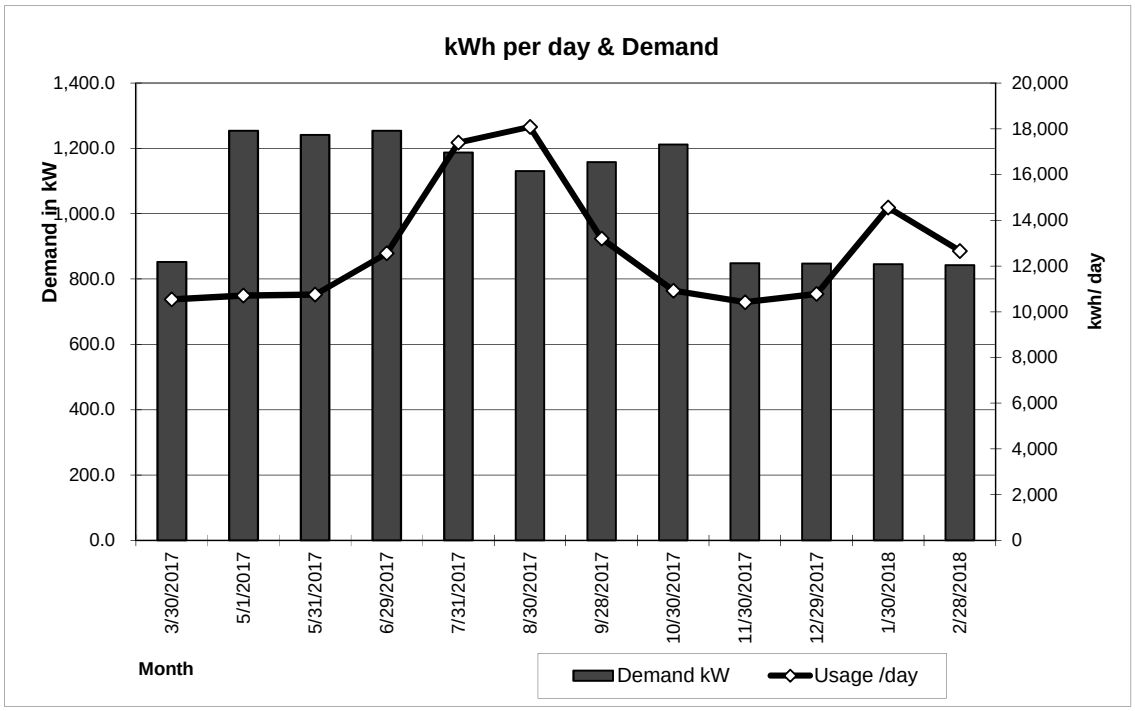
Client: County Court & Old County Hall
Address: 25 Delaware & 92 Franklin
Gross Area: 435,000 s.f.
36,440 Btu/s.f./Yr
$ 0.88 /s.f.
2.9 watts/s.f.

Utility: National Grid
Account # ending in 6101
Rate: SC3 & others
Meter Charge: $ 607.22 / month
Demand Charge: $ 10.12 / kW
Supplier: Fluent Energy
Supplier Acct. # 0
Taxes: 0.00000%

Month Ending	Days	Usage Energy kWh	Usage Demand kW	Electricity Charges Utility Cost	Electricity Charges Supply Costs	Total Electricity Cost	Demand Cost	Energy $/kWh	Load Factor	Usage /day
3/30/2017	30	316,020	852.0	$ 12,372	$ 9,659	$ 22,031	$ 8,625	$ 0.040	0.52	10,534
5/1/2017	32	342,803	1,254.4	$ 16,786	$ 11,186	$ 27,972	$ 12,699	$ 0.043	0.36	10,713
5/31/2017	30	322,554	1,240.9	$ 16,508	$ 16,655	$ 33,163	$ 12,563	$ 0.062	0.36	10,752
6/29/2017	29	364,098	1,253.7	$ 16,864	$ 16,786	$ 33,650	$ 12,692	$ 0.056	0.42	12,555
7/31/2017	32	556,877	1,187.2	$ 17,352	$ 28,290	$ 45,642	$ 12,019	$ 0.059	0.61	17,402
8/30/2017	30	542,488	1,130.3	$ 17,030	$ 21,689	$ 38,719	$ 11,443	$ 0.049	0.67	18,083
9/28/2017	29	382,852	1,158.4	$ 15,903	$ 16,706	$ 32,609	$ 11,727	$ 0.053	0.47	13,202
10/30/2017	32	349,598	1,212.2	$ 16,309	$ 13,120	$ 29,429	$ 12,272	$ 0.047	0.38	10,925
11/30/2017	31	322,984	848.0	$ 11,917	$ 11,210	$ 23,127	$ 8,585	$ 0.043	0.51	10,419
12/29/2017	29	312,742	847.7	$ 12,032	$ 13,469	$ 25,501	$ 8,582	$ 0.052	0.53	10,784
1/30/2018	32	465,628	845.3	$ 11,750	$ 34,508	$ 46,258	$ 8,558	$ 0.080	0.72	14,551
2/28/2018	29	367,146	842.5	$ 11,503	$ 12,872	$ 24,375	$ 8,529	$ 0.042	0.63	12,660
	365	**4,645,790**	**12,672.6**	**$ 176,326**	**$ 206,151**	**$ 382,477**	**$ 128,294**	**$ 0.053**	**0.51**	**12,728**

Annual Energy: **4,645,790 kWh / year** **$ 382,477 /year**
Peak Demand: **1,254 kW Peak**
Average Demand: **1,056 kW**

Unit Costs
Demand **$ 10.124 $/kW**
Energy **$ 0.053 $/kWh Incremental**
Blended **$ 0.082 $/kWh Blended**



Note:

ELECTRICITY CONSUMPTION AND COST ANALYSIS

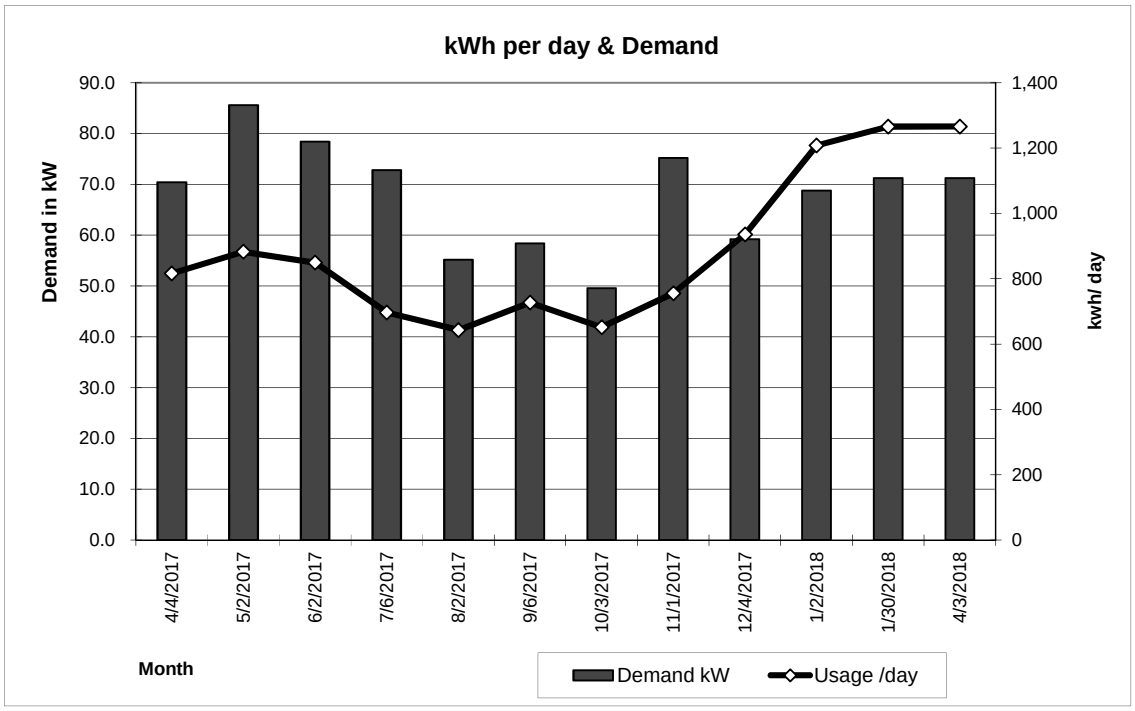
Client: CRP Bunker
Address: 6121 Chestnut Ridge Road
Gross Area: 10,000 s.f.
123,733 Btu/s.f./Yr
$ 2.35 /s.f.
8.6 watts/s.f.

Utility: NYSEG
Account # ending in 70603
Rate: SC3: Primary: 25 kW Min & others
Meter Charge: $ 101.17 / month
Demand Charge: $ 6.05 / kW
Supplier: 0
Supplier Acct. # 0
Taxes: 0.00000%

Month Ending	Days	Usage Energy kWh	Usage Demand kW	Electricity Charges Utility Cost	Electricity Charges Supply Costs	Total Electricity Cost	Demand Cost	Energy $/kWh	Load Factor	Usage /day
4/4/2017	30	24,480	70.4	$ 639	$ 703	$ 1,342	$ 426	$ 0.033	0.48	816
5/2/2017	28	24,720	85.6	$ 911	$ 712	$ 1,622	$ 518	$ 0.041	0.43	883
6/2/2017	31	26,320	78.4	$ 776	$ 1,110	$ 1,886	$ 475	$ 0.050	0.45	849
7/6/2017	34	23,680	72.8	$ 790	$ 974	$ 1,765	$ 441	$ 0.052	0.40	696
8/2/2017	27	17,360	55.2	$ 611	$ 920	$ 1,531	$ 334	$ 0.063	0.49	643
9/6/2017	35	25,440	58.4	$ 673	$ 943	$ 1,616	$ 353	$ 0.046	0.52	727
10/3/2017	27	17,600	49.6	$ 527	$ 690	$ 1,218	$ 300	$ 0.046	0.55	652
11/1/2017	29	21,920	75.2	$ 707	$ 737	$ 1,443	$ 455	$ 0.040	0.42	756
12/4/2017	33	30,880	59.2	$ 668	$ 930	$ 1,598	$ 358	$ 0.037	0.66	936
1/2/2018	29	35,040	68.8	$ 726	$ 1,622	$ 2,348	$ 416	$ 0.052	0.73	1,208
1/30/2018	28	35,440	71.2	$ 774	$ 2,424	$ 3,198	$ 431	$ 0.075	0.74	1,266
4/3/2018	63	79,760	71.2	$ 1,501	$ 2,475	$ 3,976	$ 431	$ 0.042	0.74	1,266
	394	**362,640**	**816.0**	**$ 9,303**	**$ 14,241**	**$ 23,543**	**$ 4,939**	**$ 0.048**	**0.62**	**920**

Annual Energy: **362,640 kWh / year** **$ 23,543 /year**
Peak Demand: **86 kW Peak**
Average Demand: **68 kW**

Unit Costs
Demand **$ 6.053 $/kW**
Energy **$ 0.048 $/kWh Incremental**
Blended **$ 0.065 $/kWh Blended**



Note:

ELECTRICITY CONSUMPTION AND COST ANALYSIS

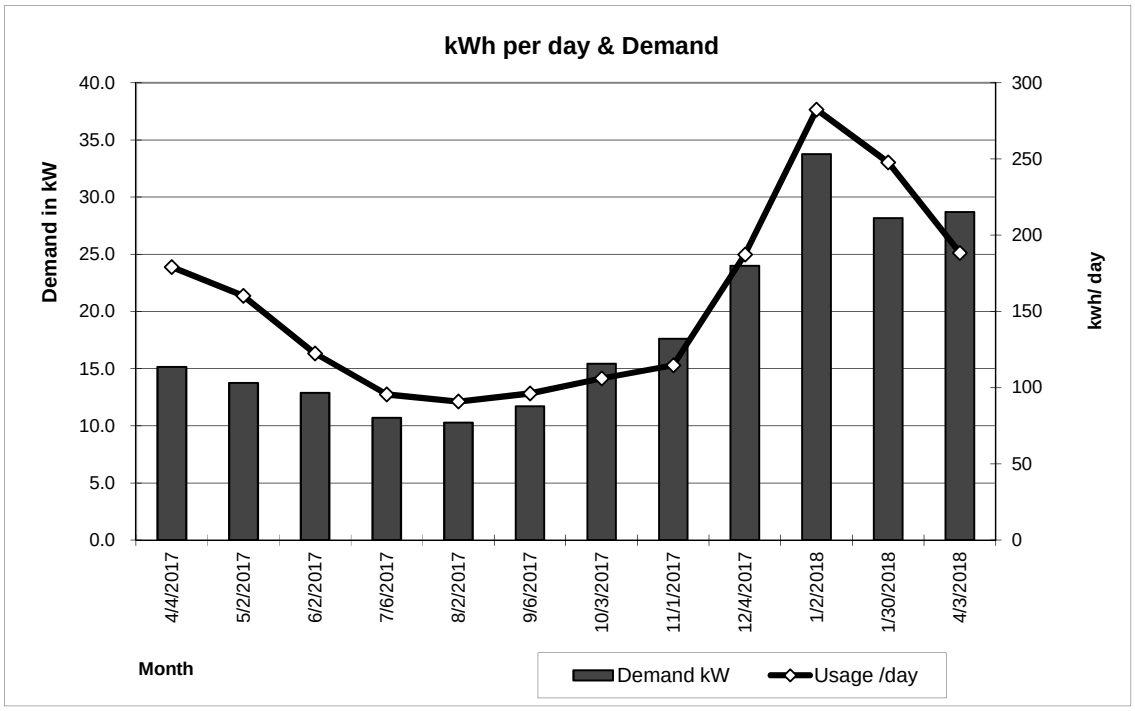
Client: CRP Casino
Address: 6121 Chestnut Ridge Road
Gross Area: 13,000 s.f.
16,294 Btu/s.f./Yr
$ 0.45 /s.f.
2.6 watts/s.f.

Utility: NYSEG
Account # ending in 06078
Rate: SC2: Commercial: 5 kW Min & othe
Meter Charge: $ 48.62 / month
Demand Charge: $ 9.55 / kW
Supplier: 0
Supplier Acct. # 0
Taxes: 0.00000%

Month Ending	Days	Usage Energy kWh	Usage Demand kW	Electricity Charges Utility Cost	Electricity Charges Supply Costs	Total Electricity Cost	Demand Cost	Energy $/kWh	Load Factor	Usage /day
4/4/2017	30	5,375	15.2	$ 227	$ 164	$ 391	$ 145	$ 0.037	0.49	179
5/2/2017	28	4,486	13.8	$ 232	$ 138	$ 369	$ 131	$ 0.042	0.49	160
6/2/2017	31	3,796	12.9	$ 206	$ 165	$ 371	$ 123	$ 0.053	0.40	122
7/6/2017	34	3,250	10.7	$ 188	$ 139	$ 327	$ 102	$ 0.054	0.37	96
8/2/2017	27	2,453	10.3	$ 172	$ 128	$ 299	$ 98	$ 0.062	0.37	91
9/6/2017	35	3,368	11.7	$ 189	$ 130	$ 320	$ 112	$ 0.047	0.34	96
10/3/2017	27	2,861	15.4	$ 213	$ 113	$ 326	$ 147	$ 0.046	0.29	106
11/1/2017	29	3,327	17.6	$ 237	$ 116	$ 353	$ 168	$ 0.041	0.27	115
12/4/2017	33	6,178	24.0	$ 314	$ 240	$ 553	$ 229	$ 0.045	0.32	187
1/2/2018	29	8,191	33.8	$ 416	$ 399	$ 815	$ 323	$ 0.054	0.35	282
1/30/2018	28	6,938	28.2	$ 358	$ 432	$ 790	$ 269	$ 0.068	0.37	248
4/3/2018	63	11,862	28.7	$ 566	$ 382	$ 948	$ 274	$ 0.049	0.27	188
	394	**62,083**	**222.2**	**$ 3,317**	**$ 2,546**	**$ 5,863**	**$ 2,122**	**$ 0.050**	**0.39**	**158**

Annual Energy: **62,083 kWh / year** **$ 5,863 /year**
Peak Demand: **34 kW Peak**
Average Demand: **19 kW**

Unit Costs
Demand **$ 9.553 $/kW**
Energy **$ 0.050 $/kWh Incremental**
Blended **$ 0.094 $/kWh Blended**



Note:

ELECTRICITY CONSUMPTION AND COST ANALYSIS

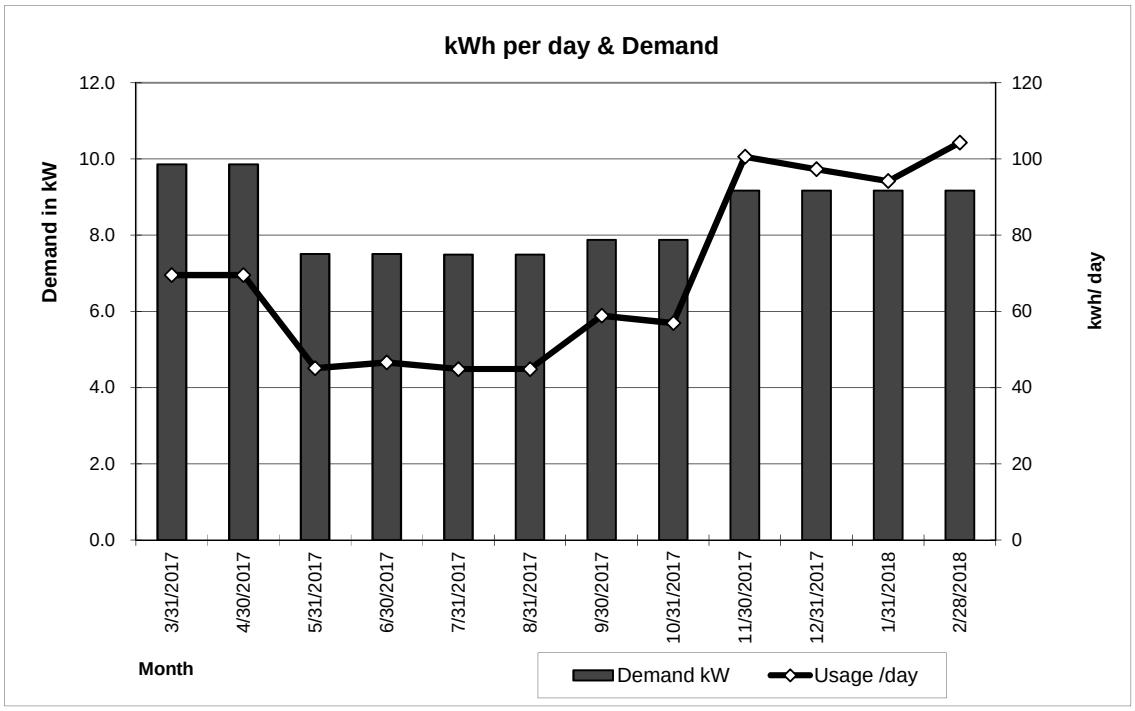
Client: CRP Office
Address: 6121 Chestnut Ridge Road
Gross Area: 7,000 s.f.
12,263 Btu/s.f./Yr
$ 0.35 /s.f.
1.4 watts/s.f.

Utility: NYSEG
Account # ending in 76731
Rate: SC2: Commercial: 5 kW Min & othe
Meter Charge: $ 24.31 / month
Demand Charge: $ 9.55 / kW
Supplier: 0
Supplier Acct. # 0
Taxes: 0.00000%

Month Ending	Days	Usage Energy kWh	Usage Demand kW	Electricity Charges Utility Cost	Electricity Charges Supply Costs	Total Electricity Cost	Demand Cost	Energy $/kWh	Load Factor	Usage /day
3/31/2017	30	2,086	9.9	$ 135	$ 70	$ 205	$ 94	$ 0.041	0.29	70
4/30/2017	30	2,086	9.9	$ 135	$ 70	$ 205	$ 94	$ 0.041	0.29	70
5/31/2017	31	1,399	7.5	$ 109	$ 63	$ 172	$ 72	$ 0.054	0.25	45
6/30/2017	30	1,399	7.5	$ 109	$ 63	$ 172	$ 72	$ 0.054	0.26	47
7/31/2017	31	1,391	7.5	$ 105	$ 58	$ 163	$ 72	$ 0.048	0.25	45
8/31/2017	31	1,391	7.5	$ 105	$ 58	$ 163	$ 72	$ 0.048	0.25	45
9/30/2017	30	1,766	7.9	$ 108	$ 64	$ 173	$ 75	$ 0.041	0.31	59
10/31/2017	31	1,766	7.9	$ 108	$ 64	$ 173	$ 75	$ 0.041	0.30	57
11/30/2017	30	3,017	9.2	$ 128	$ 164	$ 292	$ 88	$ 0.060	0.46	101
12/31/2017	31	3,017	9.2	$ 128	$ 164	$ 292	$ 88	$ 0.060	0.44	97
1/31/2018	31	2,921	9.2	$ 123	$ 99	$ 222	$ 88	$ 0.038	0.43	94
2/28/2018	28	2,921	9.2	$ 123	$ 99	$ 222	$ 88	$ 0.038	0.47	104
	364	**25,158**	**102.2**	**$ 1,415**	**$ 1,038**	**$ 2,454**	**$ 976**	**$ 0.047**	**0.34**	**69**

Annual Energy: **25,158 kWh / year** **$ 2,454 /year**
Peak Demand: **10 kW Peak**
Average Demand: **9 kW**

Unit Costs
Demand **$ 9.553 $/kW**
Energy **$ 0.047 $/kWh Incremental**
Blended **$ 0.098 $/kWh Blended**



Note:

ELECTRICITY CONSUMPTION AND COST ANALYSIS

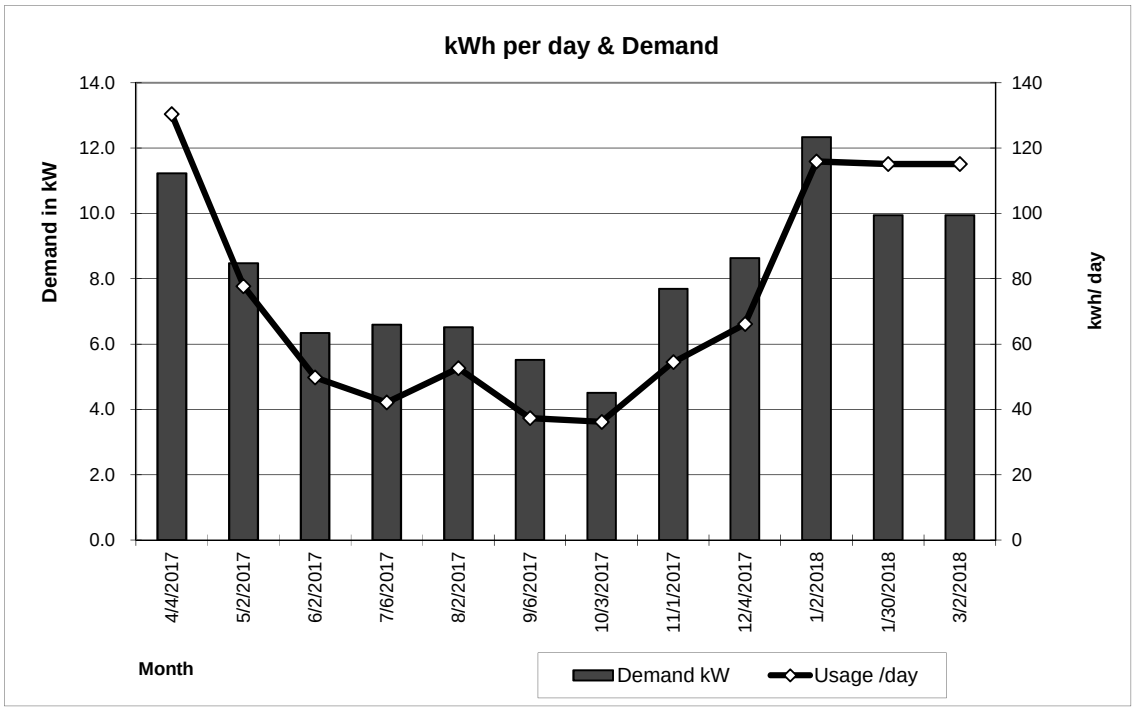
Client: CRP Radio Tower
Address: 6121 Chestnut Ridge Road
Gross Area: 3,500 s.f.
26,015 Btu/s.f./Yr
$ 0.72 /s.f.
3.5 watts/s.f.

Utility: NYSEG
Account # ending in 85406
Rate: SC2: Commercial: 5 kW Min & othe
Meter Charge: $ 24.31 / month
Demand Charge: $ 9.55 / kW
Supplier: 0
Supplier Acct. # 0
Taxes: 0.00000%

Month Ending	Days	Usage Energy kWh	Usage Demand kW	Electricity Charges Utility Cost	Electricity Charges Supply Costs	Total Electricity Cost	Demand Cost	Energy $/kWh	Load Factor	Usage /day
4/4/2017	30	3,911	11.2	$ 154	$ 116	$ 270	$ 107	$ 0.035	0.48	130
5/2/2017	28	2,177	8.5	$ 133	$ 65	$ 197	$ 81	$ 0.042	0.38	78
6/2/2017	31	1,544	6.3	$ 100	$ 67	$ 167	$ 61	$ 0.053	0.33	50
7/6/2017	34	1,433	6.6	$ 105	$ 61	$ 166	$ 63	$ 0.055	0.27	42
8/2/2017	27	1,421	6.5	$ 104	$ 78	$ 181	$ 62	$ 0.067	0.34	53
9/6/2017	35	1,308	5.5	$ 89	$ 50	$ 138	$ 53	$ 0.047	0.28	37
10/3/2017	27	977	4.5	$ 75	$ 39	$ 114	$ 43	$ 0.048	0.33	36
11/1/2017	29	1,579	7.7	$ 109	$ 54	$ 164	$ 73	$ 0.042	0.30	54
12/4/2017	33	2,183	8.6	$ 122	$ 68	$ 189	$ 82	$ 0.038	0.32	66
1/2/2018	29	3,362	12.3	$ 163	$ 158	$ 321	$ 118	$ 0.053	0.39	116
1/30/2018	28	3,223	9.9	$ 143	$ 227	$ 370	$ 95	$ 0.078	0.48	115
3/2/2018	31	3,568	9.9	$ 129	$ 117	$ 246	$ 95	$ 0.035	0.48	115
	362	**26,686**	**97.7**	**$ 1,424**	**$ 1,099**	**$ 2,523**	**$ 933**	**$ 0.049**	**0.38**	**74**

Annual Energy: **26,686 kWh / year** **$ 2,523 /year**
Peak Demand: **12 kW Peak**
Average Demand: **8 kW**

Unit Costs
Demand **$ 9.553 $/kW**
Energy **$ 0.049 $/kWh Incremental**
Blended **$ 0.095 $/kWh Blended**



Note:

ELECTRICITY CONSUMPTION AND COST ANALYSIS

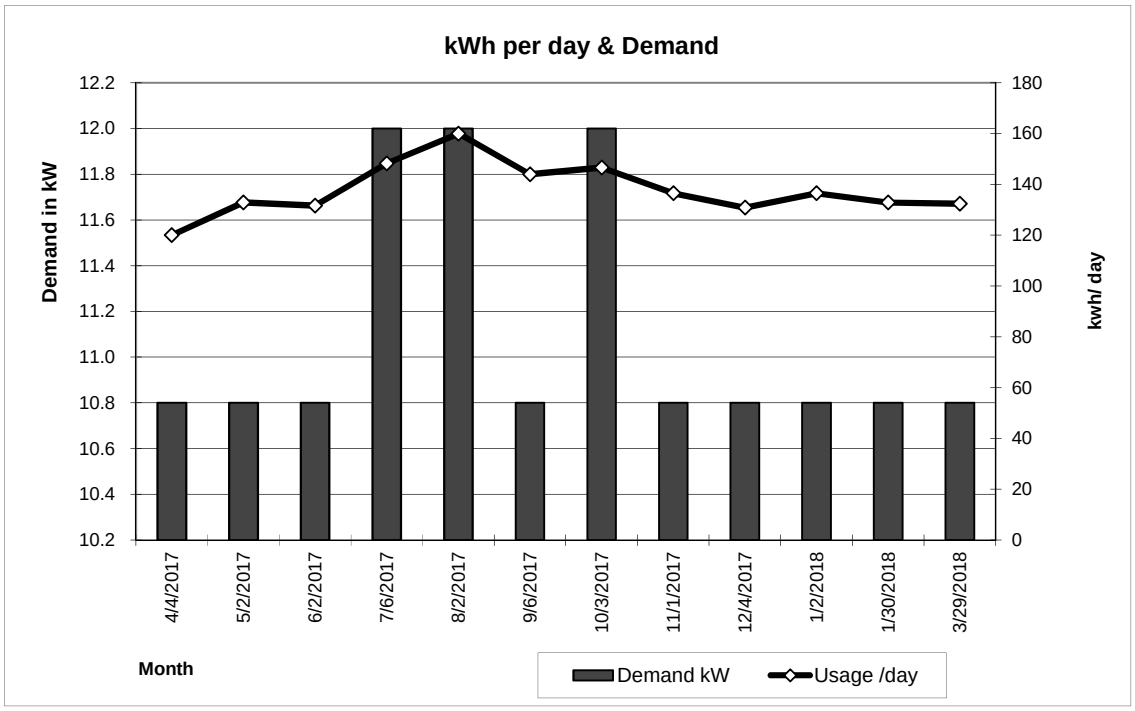
Client: CRP Truck Shop
Address: 6121 Chestnut Ridge Road
Gross Area: 8,000 s.f.
22,775 Btu/s.f./Yr
$ 0.58 /s.f.
1.5 watts/s.f.

Utility: NYSEG
Account # ending in 38261
Rate: SC3: Primary: 25 kW Min & others
Meter Charge: $ 101.17 / month
Demand Charge: $ 6.05 / kW
Supplier: 0
Supplier Acct. # 0
Taxes: 0.00000%

Month Ending	Days	Usage Energy kWh	Usage Demand kW	Electricity Charges Utility Cost	Electricity Charges Supply Costs	Total Electricity Cost	Demand Cost	Energy $/kWh	Load Factor	Usage /day
4/4/2017	30	3,600	10.8	$ 175	$ 103	$ 278	$ 65	$ 0.031	0.46	120
5/2/2017	28	3,720	10.8	$ 203	$ 107	$ 310	$ 65	$ 0.038	0.51	133
6/2/2017	31	4,080	10.8	$ 194	$ 172	$ 366	$ 65	$ 0.049	0.51	132
7/6/2017	34	5,040	12.0	$ 222	$ 207	$ 429	$ 73	$ 0.051	0.51	148
8/2/2017	27	4,320	12.0	$ 214	$ 229	$ 443	$ 73	$ 0.062	0.56	160
9/6/2017	35	5,040	10.8	$ 206	$ 187	$ 393	$ 65	$ 0.045	0.56	144
10/3/2017	27	3,960	12.0	$ 199	$ 155	$ 354	$ 73	$ 0.045	0.51	147
11/1/2017	29	3,960	10.8	$ 191	$ 133	$ 324	$ 65	$ 0.040	0.53	137
12/4/2017	33	4,320	10.8	$ 191	$ 130	$ 321	$ 65	$ 0.036	0.51	131
1/2/2018	29	3,960	10.8	$ 186	$ 183	$ 369	$ 65	$ 0.051	0.53	137
1/30/2018	28	3,720	10.8	$ 187	$ 254	$ 442	$ 65	$ 0.074	0.51	133
3/29/2018	58	7,680	10.8	$ 364	$ 240	$ 605	$ 65	$ 0.044	0.51	132
	389	**53,400**	**133.2**	**$ 2,531**	**$ 2,102**	**$ 4,633**	**$ 806**	**$ 0.047**	**0.56**	**137**

Annual Energy: **53,400 kWh / year** **$ 4,633 /year**
Peak Demand: **12 kW Peak**
Average Demand: **11 kW**

Unit Costs
Demand **$ 6.053 $/kW**
Energy **$ 0.047 $/kWh Incremental**
Blended **$ 0.087 $/kWh Blended**



Note:

ELECTRICITY CONSUMPTION AND COST ANALYSIS

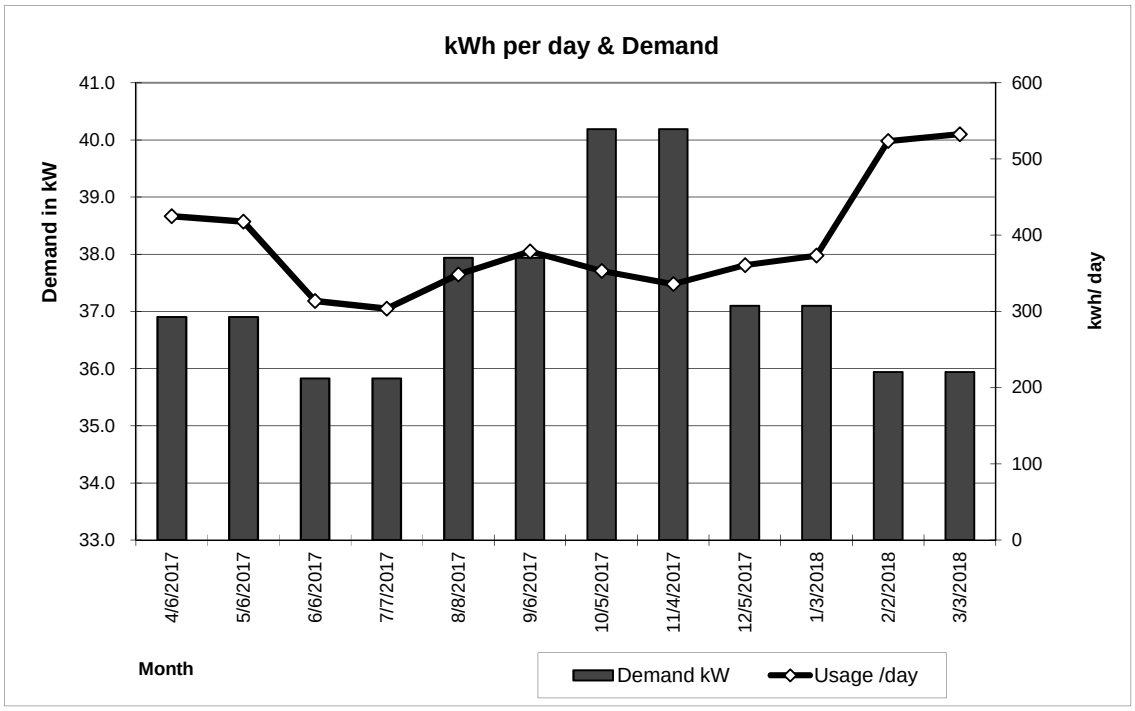
Client: Harlem District Highway
Address: 1080 Harlem Road
Gross Area: 24,530 s.f.
19,471 Btu/s.f./Yr
$ 0.49 /s.f.
1.6 watts/s.f.

Utility: NYSEG
Account # ending in 38580
Rate: SC2 & others
Meter Charge: $ 34.73 / month
Demand Charge: $ 9.32 / kW
Supplier: Fluent Energy
Supplier Acct. # 0
Taxes: 0.00000%

Month Ending	Days	Usage Energy kWh	Usage Demand kW	Electricity Charges Utility Cost	Electricity Charges Supply Costs	Total Electricity Cost	Demand Cost	Energy $/kWh	Load Factor	Usage /day
4/6/2017	30	12,749	36.9	$ 471	$ 372	$ 843	$ 344	$ 0.036	0.48	425
5/6/2017	31	12,749	36.9	$ 471	$ 372	$ 843	$ 344	$ 0.036	0.47	418
6/6/2017	31	9,564	35.8	$ 503	$ 351	$ 854	$ 334	$ 0.051	0.36	314
7/7/2017	32	9,564	35.8	$ 503	$ 351	$ 854	$ 334	$ 0.051	0.35	304
8/8/2017	32	10,984	37.9	$ 546	$ 530	$ 1,076	$ 354	$ 0.063	0.38	349
9/6/2017	29	10,984	37.9	$ 546	$ 530	$ 1,076	$ 354	$ 0.063	0.42	379
10/5/2017	29	10,245	40.2	$ 523	$ 395	$ 918	$ 375	$ 0.050	0.37	353
11/4/2017	31	10,245	40.2	$ 523	$ 395	$ 918	$ 375	$ 0.050	0.35	336
12/5/2017	31	11,007	37.1	$ 490	$ 358	$ 848	$ 346	$ 0.042	0.41	361
1/3/2018	30	11,007	37.1	$ 490	$ 358	$ 848	$ 346	$ 0.042	0.42	373
2/2/2018	30	15,446	35.9	$ 505	$ 905	$ 1,410	$ 335	$ 0.067	0.61	524
3/3/2018	29	15,446	35.9	$ 505	$ 905	$ 1,410	$ 335	$ 0.067	0.62	533
	361	**139,986**	**447.8**	**$ 6,074**	**$ 5,823**	**$ 11,897**	**$ 4,173**	**$ 0.052**	**0.43**	**388**

Annual Energy: **139,986 kWh / year** **$ 11,897 /year**
Peak Demand: **40 kW Peak**
Average Demand: **37 kW**

Unit Costs
Demand **$ 9.320 $/kW**
Energy **$ 0.052 $/kWh Incremental**
Blended **$ 0.085 $/kWh Blended**



Note:

ELECTRICITY CONSUMPTION AND COST ANALYSIS

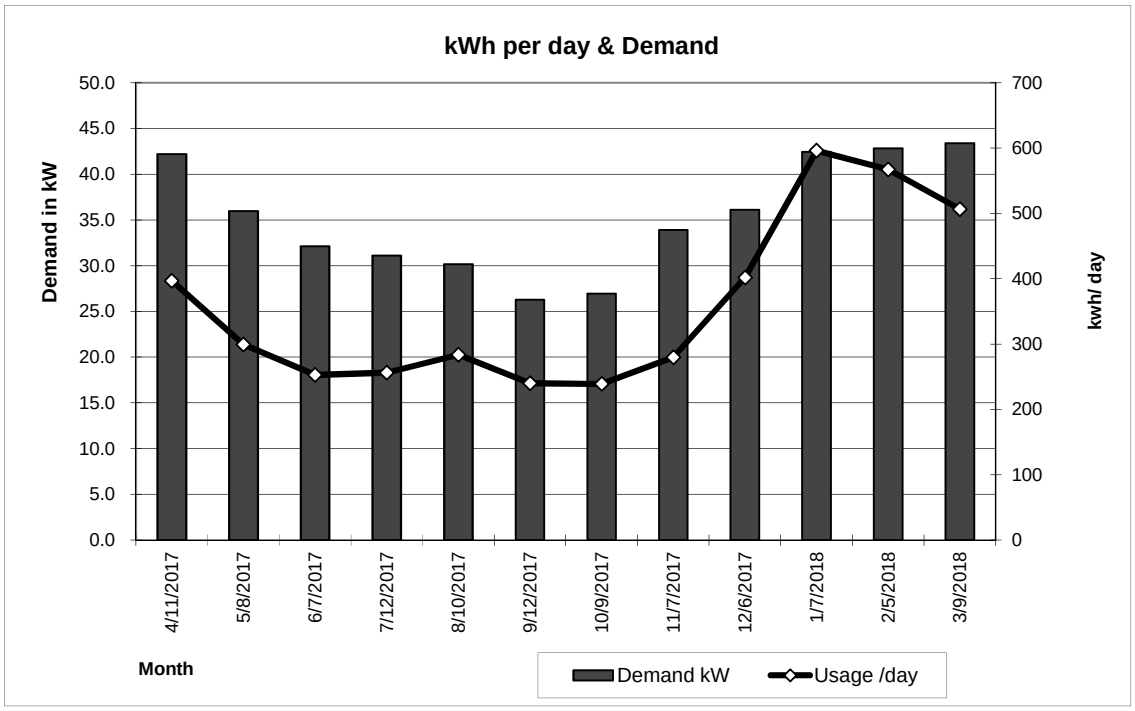
Client: Concord Highway
Address: 9125 Sibley Rd
Gross Area: 27,683 s.f.
16,104 Btu/s.f./Yr
$ 0.43 /s.f.
1.6 watts/s.f.

Utility: NYSEG
Account # ending in 43179
Rate: SC2 & others
Meter Charge: $ 69.45 / month
Demand Charge: $ 9.26 / kW
Supplier: Fluent Energy
Supplier Acct. # 0
Taxes: 0.00000%

Month Ending	Days	Usage Energy kWh	Usage Demand kW	Electricity Charges Utility Cost	Electricity Charges Supply Costs	Total Electricity Cost	Demand Cost	Energy $/kWh	Load Factor	Usage /day
4/11/2017	30	11,900	42.2	$ 608	$ 372	$ 980	$ 391	$ 0.044	0.39	397
5/8/2017	27	8,086	36.0	$ 545	$ 252	$ 797	$ 333	$ 0.049	0.35	299
6/7/2017	30	7,591	32.1	$ 490	$ 327	$ 817	$ 298	$ 0.059	0.33	253
7/12/2017	35	8,977	31.1	$ 511	$ 408	$ 919	$ 288	$ 0.062	0.34	256
8/10/2017	29	8,232	30.2	$ 478	$ 415	$ 892	$ 279	$ 0.066	0.39	284
9/12/2017	33	7,925	26.3	$ 421	$ 295	$ 716	$ 244	$ 0.051	0.38	240
10/9/2017	27	6,451	27.0	$ 409	$ 258	$ 667	$ 250	$ 0.054	0.37	239
11/7/2017	29	8,119	33.9	$ 487	$ 269	$ 755	$ 314	$ 0.046	0.34	280
12/6/2017	29	11,649	36.1	$ 533	$ 402	$ 935	$ 335	$ 0.046	0.46	402
1/7/2018	32	19,071	42.5	$ 642	$ 1,228	$ 1,871	$ 393	$ 0.074	0.58	596
2/5/2018	29	16,455	42.8	$ 627	$ 807	$ 1,435	$ 397	$ 0.059	0.55	567
3/9/2018	32	16,203	43.4	$ 597	$ 500	$ 1,098	$ 402	$ 0.039	0.49	506
	362	**130,656**	**423.5**	**$ 6,350**	**$ 5,533**	**$ 11,882**	**$ 3,923**	**$ 0.055**	**0.43**	**361**

Annual Energy: **130,656 kWh / year** **$ 11,882 /year**
Peak Demand: **43 kW Peak**
Average Demand: **35 kW**

Unit Costs
Demand **$ 9.263 $/kW**
Energy **$ 0.055 $/kWh Incremental**
Blended **$ 0.091 $/kWh Blended**



Note:

ELECTRICITY CONSUMPTION AND COST ANALYSIS

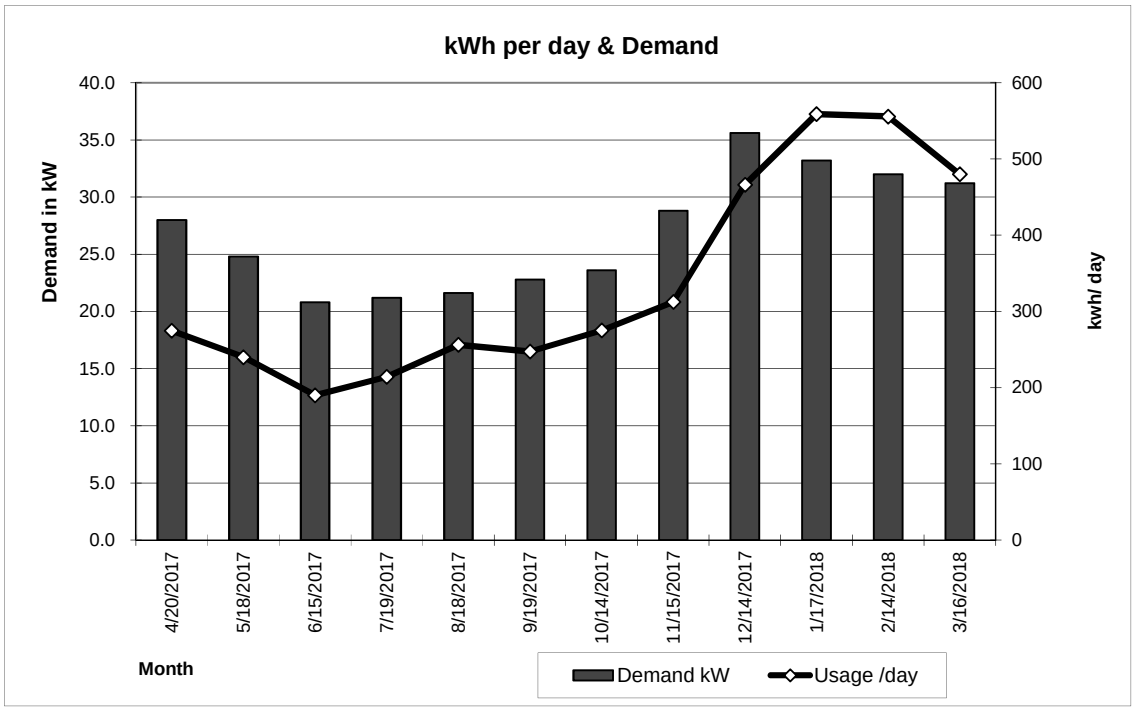
Client: Hamburg Highway
Address: 50 West Avenue
Gross Area: 33,036 s.f.
12,654 Btu/s.f./Yr
$ 0.29 /s.f.
1.1 watts/s.f.

Utility: NYSEG
Account # ending in 10441
Rate: SC2
Meter Charge: $ 23.15 / month
Demand Charge: $ 9.32 / kW
Supplier: Fluent Energy
Supplier Acct. # 0
Taxes: 0.00000%

Month Ending	Days	Usage Energy kWh	Usage Demand kW	Electricity Charges Utility Cost	Electricity Charges Supply Costs	Total Electricity Cost	Demand Cost	Energy $/kWh	Load Factor	Usage /day
4/20/2017	30	8,240	28.0	$ 378	$ 247	$ 625	$ 261	$ 0.041	0.41	275
5/18/2017	28	6,720	24.8	$ 334	$ 270	$ 604	$ 231	$ 0.052	0.40	240
6/15/2017	28	5,320	20.8	$ 282	$ 216	$ 498	$ 194	$ 0.053	0.38	190
7/19/2017	34	7,280	21.2	$ 315	$ 349	$ 664	$ 198	$ 0.061	0.42	214
8/18/2017	30	7,680	21.6	$ 312	$ 358	$ 670	$ 201	$ 0.058	0.49	256
9/19/2017	32	7,920	22.8	$ 311	$ 284	$ 595	$ 212	$ 0.045	0.45	248
10/14/2017	25	6,880	23.6	$ 304	$ 278	$ 582	$ 220	$ 0.049	0.49	275
11/15/2017	32	10,000	28.8	$ 377	$ 337	$ 713	$ 268	$ 0.042	0.45	313
12/14/2017	29	13,520	35.6	$ 460	$ 434	$ 894	$ 332	$ 0.040	0.55	466
1/17/2018	34	19,000	33.2	$ 479	$ 1,380	$ 1,858	$ 309	$ 0.080	0.70	559
2/14/2018	28	15,560	32.0	$ 407	$ 613	$ 1,020	$ 298	$ 0.045	0.72	556
3/16/2018	30	14,400	31.2	$ 412	$ 412	$ 824	$ 291	$ 0.035	0.64	480
	360	**122,520**	**323.6**	**$ 4,370**	**$ 5,179**	**$ 9,548**	**$ 3,016**	**$ 0.051**	**0.53**	**340**

Annual Energy: **122,520 kWh / year** **$ 9,548 /year**
Peak Demand: **36 kW Peak**
Average Demand: **27 kW**

Unit Costs
Demand **$ 9.320 $/kW**
Energy **$ 0.051 $/kWh Incremental**
Blended **$ 0.078 $/kWh Blended**



Note:

ELECTRICITY CONSUMPTION AND COST ANALYSIS

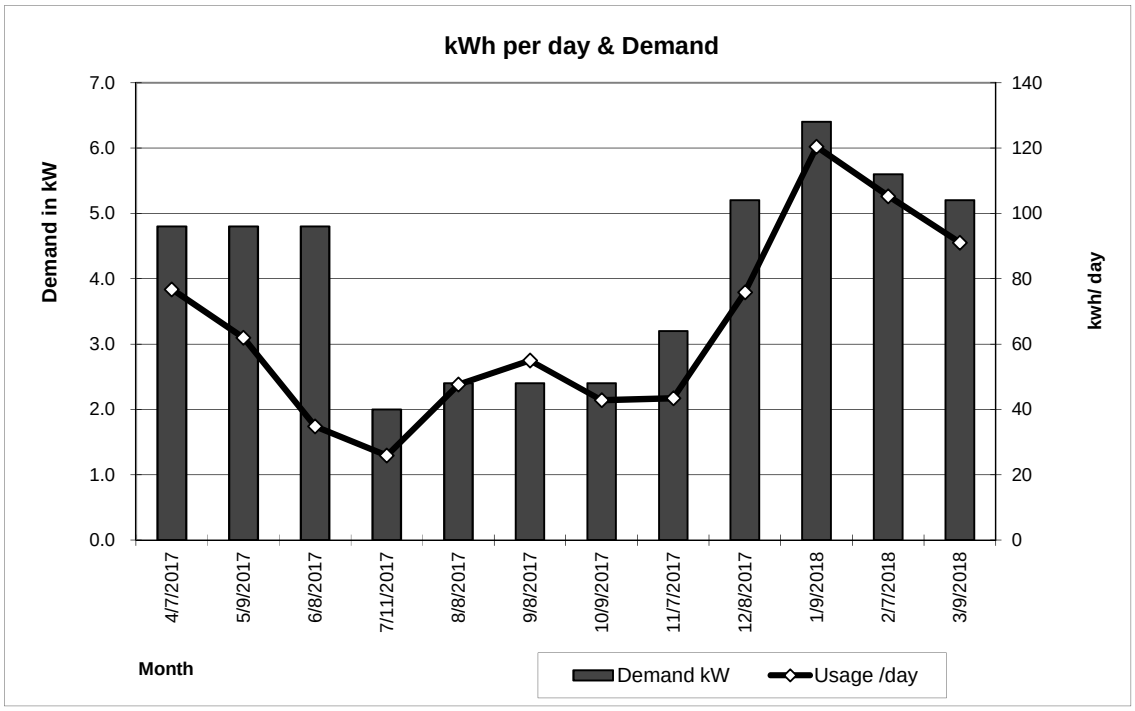
Client: Angola Highway
Address: 8752 Delameter Rd
Gross Area: 17,788 s.f.
4,565 Btu/s.f./Yr
$ 0.17 /s.f.
0.4 watts/s.f.

Utility: National Grid
Account # ending in 99108
Rate: SC2 & others
Meter Charge: $ 72.74 / month
Demand Charge: $ 11.53 / kW
Supplier: Fluent Energy
Supplier Acct. # 0
Taxes: 0.00000%

Month Ending	Days	Usage Energy kWh	Usage Demand kW	Electricity Charges Utility Cost	Electricity Charges Supply Costs	Total Electricity Cost	Demand Cost	Energy $/kWh	Load Factor	Usage /day
4/7/2017	30	2,303	4.8	$ 188	$ 74	$ 262	$ 55	$ 0.058	0.67	77
5/9/2017	32	1,983	4.8	$ 166	$ 64	$ 229	$ 55	$ 0.051	0.54	62
6/8/2017	30	1,045	4.8	$ 153	$ 43	$ 196	$ 55	$ 0.065	0.30	35
7/11/2017	33	853	2.0	$ 121	$ 38	$ 159	$ 23	$ 0.074	0.54	26
8/8/2017	28	1,334	2.4	$ 126	$ 70	$ 195	$ 28	$ 0.071	0.83	48
9/8/2017	31	1,703	2.4	$ 132	$ 63	$ 195	$ 28	$ 0.056	0.95	55
10/9/2017	31	1,329	2.4	$ 130	$ 53	$ 183	$ 28	$ 0.062	0.74	43
11/7/2017	29	1,258	3.2	$ 142	$ 41	$ 183	$ 37	$ 0.059	0.56	43
12/8/2017	31	2,351	5.2	$ 181	$ 78	$ 259	$ 60	$ 0.054	0.61	76
1/9/2018	32	3,853	6.4	$ 213	$ 272	$ 485	$ 74	$ 0.088	0.78	120
2/7/2018	29	3,053	5.6	$ 186	$ 145	$ 331	$ 65	$ 0.064	0.78	105
3/9/2018	30	2,732	5.2	$ 183	$ 81	$ 264	$ 60	$ 0.048	0.73	91
	366	**23,797**	**49.2**	**$ 1,920**	**$ 1,022**	**$ 2,942**	**$ 567**	**$ 0.063**	**0.67**	**65**

Annual Energy: **23,797 kWh / year** **$ 2,942 /year**
Peak Demand: **6 kW Peak**
Average Demand: **4 kW**

Unit Costs
Demand **$ 11.530 $/kW**
Energy **$ 0.063 $/kWh Incremental**
Blended **$ 0.124 $/kWh Blended**



Note:

ELECTRICITY CONSUMPTION AND COST ANALYSIS

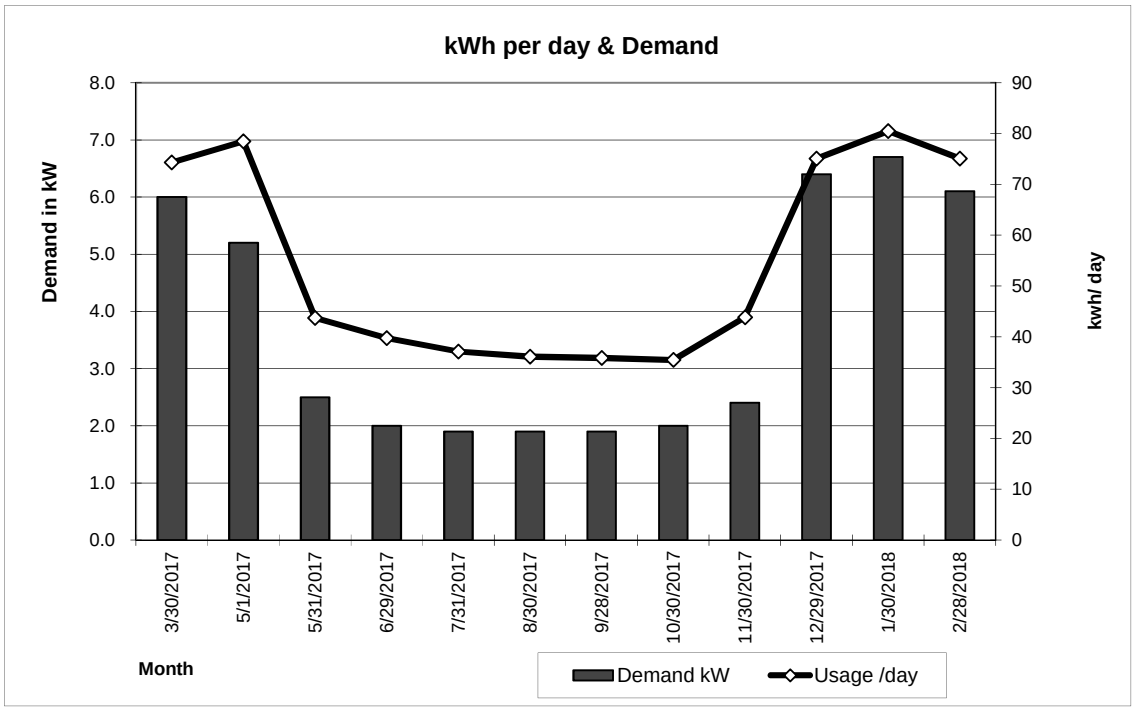
Client: Collins Highway
Address: 14020 Jennings Road
Gross Area: 17,850 s.f.
3,811 Btu/s.f./Yr
$ 0.12 /s.f.
0.4 watts/s.f.

Utility: National Grid
Account # ending in 31106
Rate: SC2D
Meter Charge: $ 52.12 / month
Demand Charge: $ 11.52 / kW
Supplier: Fluent Energy
Supplier Acct. # 0
Taxes: 0.00000%

Month Ending	Days	Usage Energy kWh	Usage Demand kW	Electricity Charges Utility Cost	Electricity Charges Supply Costs	Total Electricity Cost	Demand Cost	Energy $/kWh	Load Factor	Usage /day
3/30/2017	30	2,229	6.0	$ 144	$ 65	$ 209	$ 69	$ 0.039	0.52	74
5/1/2017	32	2,511	5.2	$ 126	$ 77	$ 203	$ 60	$ 0.036	0.63	78
5/31/2017	30	1,312	2.5	$ 90	$ 56	$ 146	$ 29	$ 0.049	0.73	44
6/29/2017	29	1,152	2.0	$ 83	$ 47	$ 129	$ 23	$ 0.047	0.83	40
7/31/2017	32	1,187	1.9	$ 81	$ 61	$ 143	$ 22	$ 0.058	0.81	37
8/30/2017	30	1,082	1.9	$ 81	$ 45	$ 126	$ 22	$ 0.048	0.79	36
9/28/2017	29	1,040	1.9	$ 80	$ 41	$ 121	$ 22	$ 0.045	0.79	36
10/30/2017	32	1,134	2.0	$ 82	$ 38	$ 120	$ 23	$ 0.040	0.74	35
11/30/2017	31	1,359	2.4	$ 89	$ 44	$ 133	$ 28	$ 0.039	0.76	44
12/29/2017	29	2,177	6.4	$ 141	$ 87	$ 228	$ 74	$ 0.047	0.49	75
1/30/2018	32	2,575	6.7	$ 142	$ 190	$ 332	$ 77	$ 0.079	0.50	80
2/28/2018	29	2,177	6.1	$ 136	$ 73	$ 208	$ 70	$ 0.039	0.51	75
	365	**19,935**	**45.0**	**$ 1,274**	**$ 823**	**$ 2,097**	**$ 518**	**$ 0.048**	**0.62**	**55**

Annual Energy: **19,935 kWh / year** **$ 2,097 /year**
Peak Demand: **7 kW Peak**
Average Demand: **4 kW**

Unit Costs
Demand **$ 11.521 $/kW**
Energy **$ 0.048 $/kWh Incremental**
Blended **$ 0.105 $/kWh Blended**



Note:

ELECTRICITY CONSUMPTION AND COST ANALYSIS

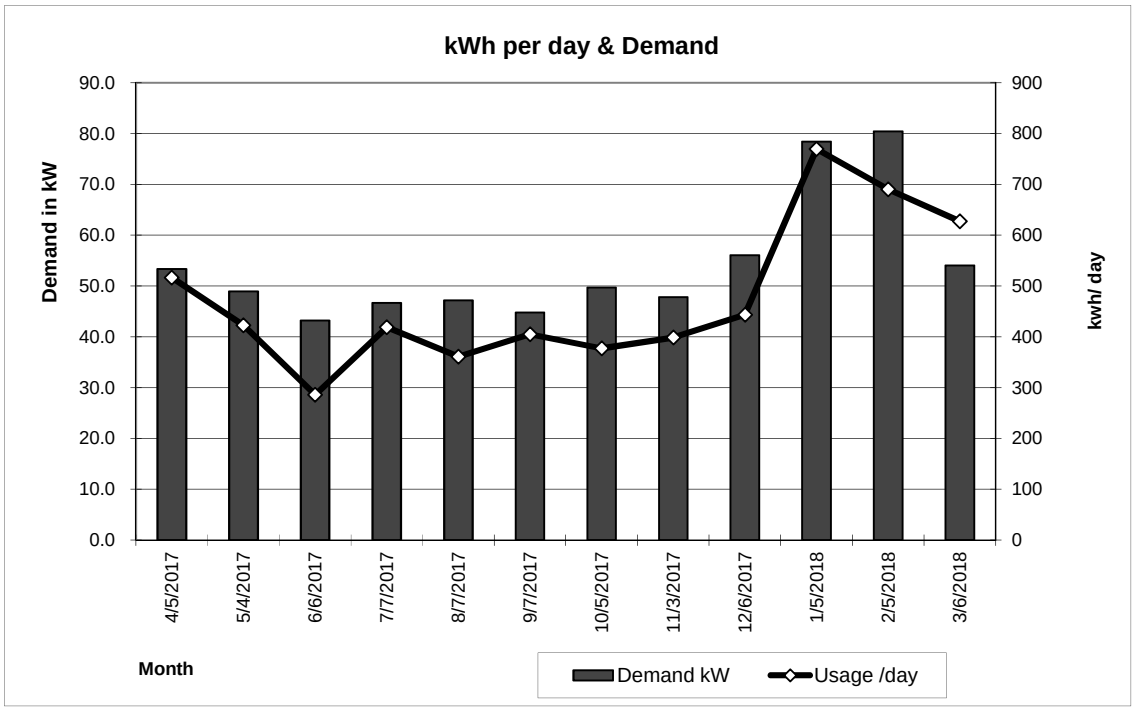
Client: Clarence Highway
Address: 5105 Salt Road
Gross Area: 35,482 s.f.
16,669 Btu/s.f./Yr
$ 0.40 /s.f.
2.3 watts/s.f.

Utility: NYSEG
Account # ending in 61428
Rate: SC1: Outdoor Lighting & others
Meter Charge: $ 23.96 / month
Demand Charge: $ 6.51 / kW
Supplier: Fluent Energy
Supplier Acct. # 0
Taxes: 0.00000%

Month Ending	Days	Usage Energy kWh	Usage Demand kW	Electricity Charges Utility Cost	Electricity Charges Supply Costs	Total Electricity Cost	Demand Cost	Energy $/kWh	Load Factor	Usage /day
4/5/2017	30	15,500	53.4	$ 571	$ 467	$ 1,038	$ 347	$ 0.043	0.40	517
5/4/2017	29	12,250	48.9	$ 622	$ 377	$ 999	$ 318	$ 0.054	0.36	422
6/6/2017	33	9,434	43.2	$ 515	$ 395	$ 911	$ 281	$ 0.064	0.28	286
7/7/2017	31	12,982	46.7	$ 672	$ 569	$ 1,241	$ 304	$ 0.070	0.37	419
8/7/2017	31	11,186	47.2	$ 570	$ 583	$ 1,153	$ 307	$ 0.073	0.32	361
9/7/2017	31	12,547	44.8	$ 550	$ 458	$ 1,008	$ 292	$ 0.055	0.38	405
10/5/2017	28	10,569	49.7	$ 549	$ 421	$ 970	$ 323	$ 0.059	0.32	377
11/3/2017	29	11,559	47.8	$ 525	$ 386	$ 912	$ 311	$ 0.050	0.35	399
12/6/2017	33	14,634	56.1	$ 582	$ 456	$ 1,038	$ 365	$ 0.044	0.33	443
1/5/2018	30	23,089	78.4	$ 672	$ 1,418	$ 2,090	$ 510	$ 0.067	0.41	770
2/5/2018	31	21,395	80.4	$ 673	$ 1,122	$ 1,795	$ 523	$ 0.058	0.36	690
3/6/2018	29	18,198	54.1	$ 553	$ 545	$ 1,098	$ 352	$ 0.040	0.48	628
	365	**173,343**	**650.6**	**$ 7,053**	**$ 7,198**	**$ 14,251**	**$ 4,234**	**$ 0.056**	**0.37**	**475**

Annual Energy: **173,343 kWh / year** **$ 14,251 /year**
Peak Demand: **80 kW Peak**
Average Demand: **54 kW**

Unit Costs
Demand **$ 6.509 $/kW**
Energy **$ 0.056 $/kWh Incremental**
Blended **$ 0.082 $/kWh Blended**



Note:

ELECTRICITY CONSUMPTION AND COST ANALYSIS

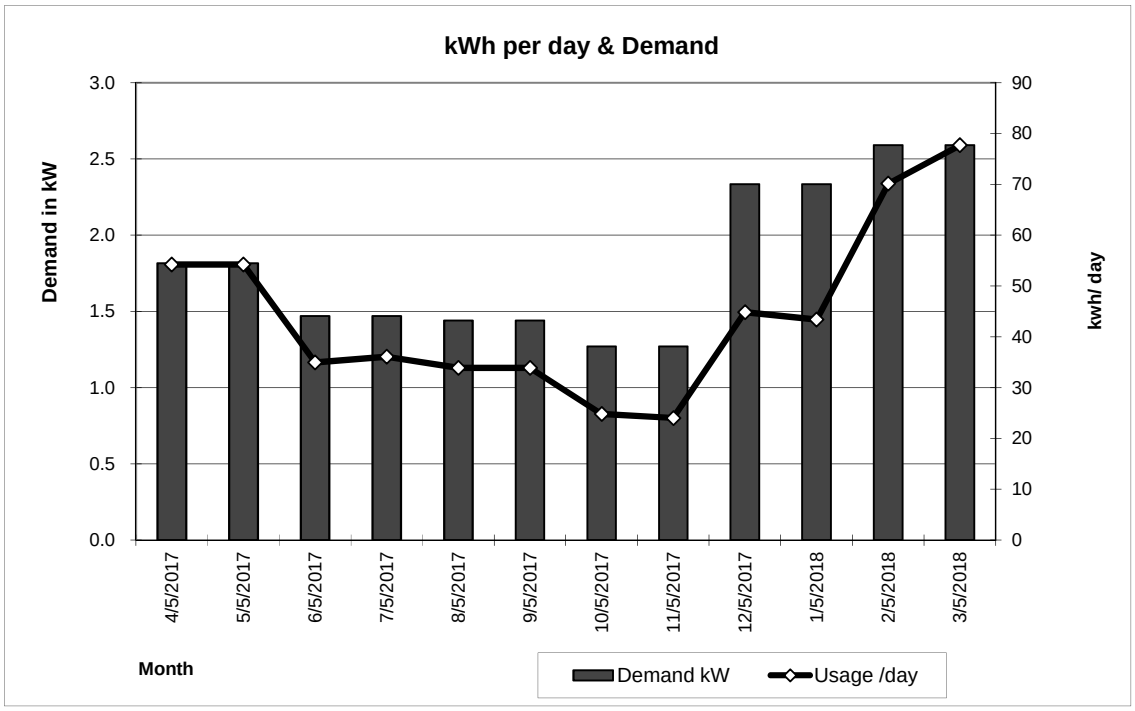
Client: South Protection Hwy
Address: 9988 South Protection Rd.
Gross Area: 6,917 s.f.
7,919 Btu/s.f./Yr
$ 0.21 /s.f.
0.4 watts/s.f.

Utility: NYSEG
Account # ending in 76789
Rate: SC2
Meter Charge: $ 11.58 / month
Demand Charge: $ 9.32 / kW
Supplier: Fluent Energy
Supplier Acct. # 0
Taxes: 0.00000%

Month Ending	Days	Usage Energy kWh	Usage Demand kW	Electricity Charges Utility Cost	Electricity Charges Supply Costs	Total Electricity Cost	Demand Cost	Energy $/kWh	Load Factor	Usage /day
4/5/2017	30	1,627	1.8	$ 64	$ 48	$ 112	$ 17	$ 0.051	1.24	54
5/5/2017	30	1,627	1.8	$ 64	$ 48	$ 112	$ 17	$ 0.051	1.24	54
6/5/2017	31	1,083	1.5	$ 62	$ 40	$ 101	$ 14	$ 0.070	0.99	35
7/5/2017	30	1,083	1.5	$ 62	$ 40	$ 101	$ 14	$ 0.070	1.02	36
8/5/2017	31	1,052	1.4	$ 62	$ 51	$ 114	$ 13	$ 0.084	0.98	34
9/5/2017	31	1,052	1.4	$ 62	$ 51	$ 114	$ 13	$ 0.084	0.98	34
10/5/2017	30	745	1.3	$ 53	$ 29	$ 82	$ 12	$ 0.078	0.81	25
11/5/2017	31	745	1.3	$ 53	$ 29	$ 82	$ 12	$ 0.078	0.79	24
12/5/2017	30	1,346	2.3	$ 76	$ 44	$ 120	$ 22	$ 0.065	0.80	45
1/5/2018	31	1,346	2.3	$ 76	$ 44	$ 120	$ 22	$ 0.065	0.77	43
2/5/2018	31	2,176	2.6	$ 86	$ 124	$ 210	$ 24	$ 0.080	1.13	70
3/5/2018	28	2,176	2.6	$ 86	$ 124	$ 210	$ 24	$ 0.080	1.25	78
	364	**16,054**	**21.8**	**$ 807**	**$ 672**	**$ 1,479**	**$ 204**	**$ 0.071**	**1.02**	**44**

Annual Energy: **16,054 kWh / year** **$ 1,479 /year**
Peak Demand: **3 kW Peak**
Average Demand: **2 kW**

Unit Costs
Demand **$ 9.320 $/kW**
Energy **$ 0.071 $/kWh Incremental**
Blended **$ 0.092 $/kWh Blended**



Note:

ELECTRICITY CONSUMPTION AND COST ANALYSIS

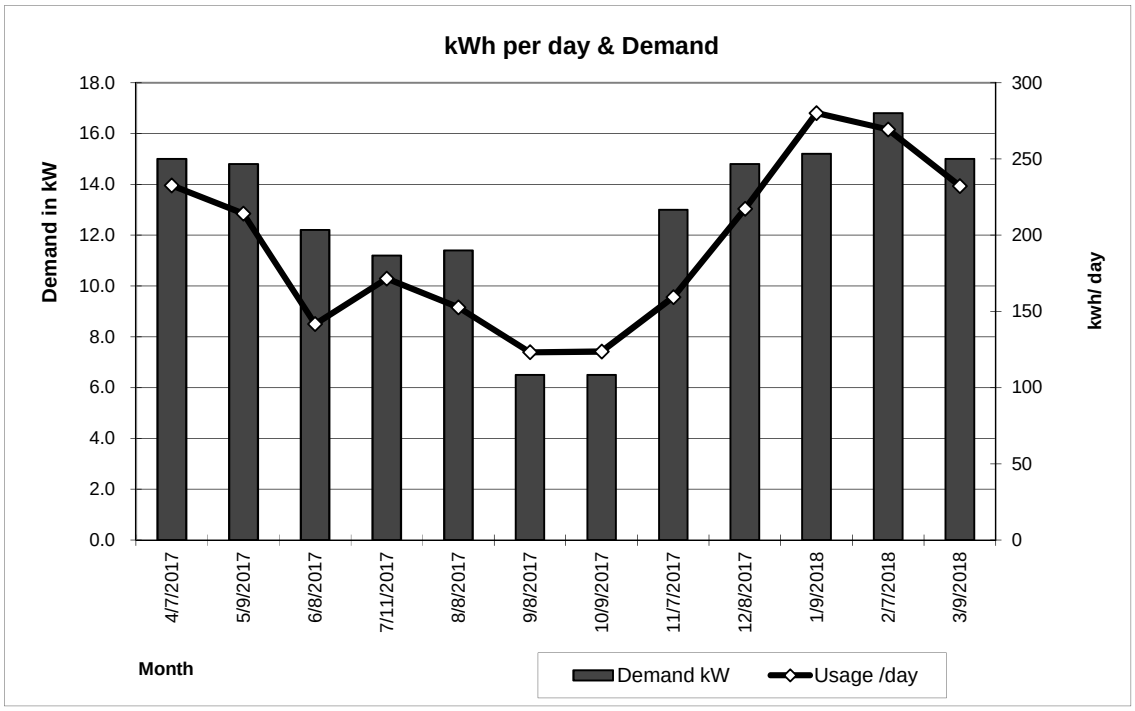
Client: Tonawanda Highway
Address: 1870 Military Road
Gross Area: 17,538 s.f.
13,768 Btu/s.f./Yr
$ 0.33 /s.f.
1.0 watts/s.f.

Utility: National Grid
Account # ending in 14103
Rate: SC2D
Meter Charge: $ 52.12 / month
Demand Charge: $ 11.53 / kW
Supplier: Fluent Energy
Supplier Acct. # 0
Taxes: 0.00000%

Month Ending	Days	Usage Energy kWh	Usage Demand kW	Electricity Charges Utility Cost	Electricity Charges Supply Costs	Total Electricity Cost	Demand Cost	Energy $/kWh	Load Factor	Usage /day
4/7/2017	30	6,979	15.0	$ 287	$ 224	$ 511	$ 173	$ 0.041	0.65	233
5/9/2017	32	6,855	14.8	$ 262	$ 221	$ 483	$ 171	$ 0.038	0.60	214
6/8/2017	30	4,249	12.2	$ 219	$ 175	$ 394	$ 141	$ 0.047	0.48	142
7/11/2017	33	5,661	11.2	$ 216	$ 252	$ 468	$ 129	$ 0.051	0.64	172
8/8/2017	28	4,272	11.4	$ 207	$ 222	$ 428	$ 131	$ 0.057	0.56	153
9/8/2017	31	3,820	6.5	$ 152	$ 140	$ 293	$ 75	$ 0.043	0.79	123
10/9/2017	31	3,832	6.5	$ 150	$ 152	$ 302	$ 75	$ 0.046	0.79	124
11/7/2017	29	4,619	13.0	$ 230	$ 151	$ 382	$ 150	$ 0.039	0.51	159
12/8/2017	31	6,734	14.8	$ 267	$ 224	$ 491	$ 171	$ 0.040	0.61	217
1/9/2018	32	8,965	15.2	$ 292	$ 631	$ 924	$ 175	$ 0.078	0.77	280
2/7/2018	29	7,812	16.8	$ 284	$ 372	$ 655	$ 194	$ 0.052	0.67	269
3/9/2018	30	6,969	15.0	$ 267	$ 205	$ 473	$ 173	$ 0.036	0.65	232
	366	**70,767**	**152.4**	**$ 2,834**	**$ 2,969**	**$ 5,803**	**$ 1,758**	**$ 0.048**	**0.64**	**193**

Annual Energy: **70,767 kWh / year** **$ 5,803 /year**
Peak Demand: **17 kW Peak**
Average Demand: **13 kW**

Unit Costs
Demand **$ 11.534 $/kW**
Energy **$ 0.048 $/kWh Incremental**
Blended **$ 0.082 $/kWh Blended**



Note:

Natural Gas Consumption Data

The natural gas consumption and cost data shows the monthly use and cost information for the period from March 2017 through February 2018. This information was used to determine the value of each unit of thermal energy.

The following page contains the natural gas analysis for each account in table and graphic forms.

NATURAL GAS CONSUMPTION AND COST ANALYSIS

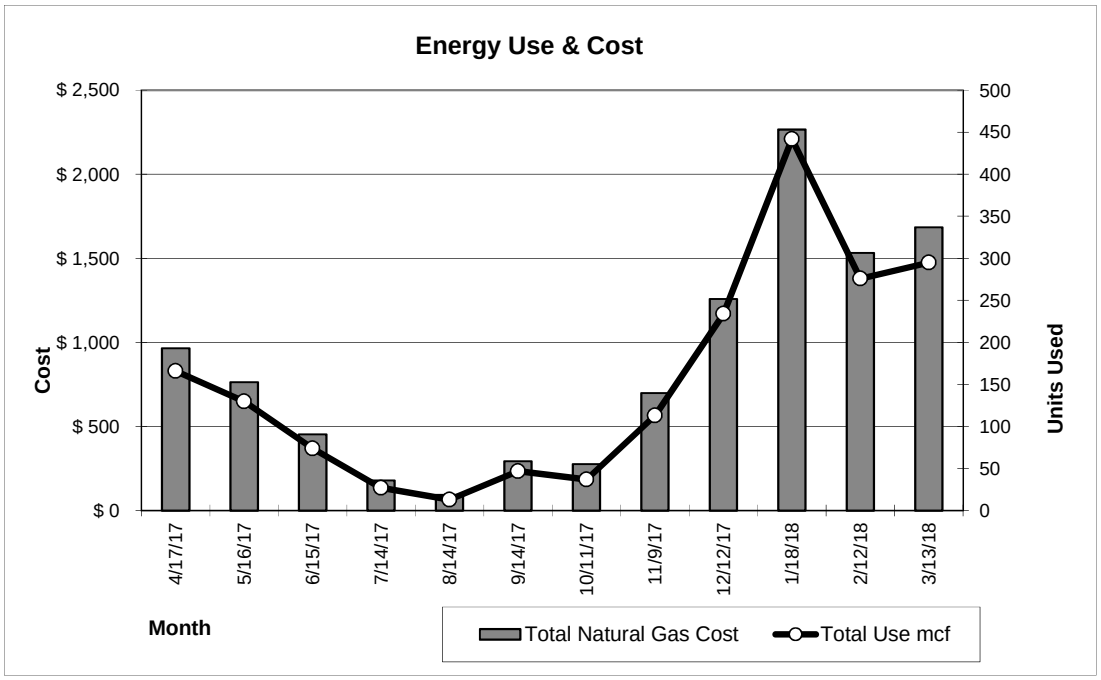
Client: Jesse Nash Health Center
Address: 608 William
37,500 s.f.
50,923 Btu/s.f./Yr
$ 0.28 /s.f.

Natural Gas
Use & Cost Summary:

Utility: **National Fuel**
Account # : ending in 6904,
Rate: **TC 1.0 COMM: < 5 MMCF**
Billing unit: mcf
BTU/Unit: **1,030,000**
Meter Charge: **$ 0.00** / month
Supplier: **0**

Month Ending	# Days	Utility Charges mcfs	Utility Charges Cost	Supplier Charges mcfs	Supplier Charges Cost	**Total Use mcf**	**Total Natural Gas Cost**	Average $/mcf
4/17/17	30	166	$ 439	166	$ 526	166	$ 964	$ 5.81
5/16/17	29	130	$ 313	130	$ 451	130	$ 764	$ 5.88
6/15/17	30	74	$ 195	74	$ 258	74	$ 453	$ 6.12
7/14/17	29	27	$ 87	27	$ 93	27	$ 180	$ 6.66
8/14/17	31	13	$ 51	13	$ 43	13	$ 93	$ 7.18
9/14/17	31	47	$ 141	47	$ 151	47	$ 292	$ 6.22
10/11/17	27	37	$ 149	37	$ 127	37	$ 276	$ 7.45
11/9/17	29	113	$ 300	113	$ 399	113	$ 699	$ 6.18
12/12/17	33	234	$ 527	234	$ 730	234	$ 1,257	$ 5.37
1/18/18	37	442	$ 868	442	$ 1,398	442	$ 2,267	$ 5.13
2/12/18	25	276	$ 592	276	$ 940	276	$ 1,532	$ 5.55
3/13/18	29	295	$ 685	295	$ 1,000	295	$ 1,685	$ 5.71
	360	**1,854**	**$ 4,347**	**1,854**	**$ 6,115**	**1,854**	**$ 10,462**	$ 5.64

Annual Natural Gas Cost **$ 10,462** **/year**
Annual Natural Gas Consumption **1,854** **mcf**
Average Unit Cost per mcf: **$ 5.643** **$ 5.48** **/ Mbtu**



Note:

NATURAL GAS CONSUMPTION AND COST ANALYSIS

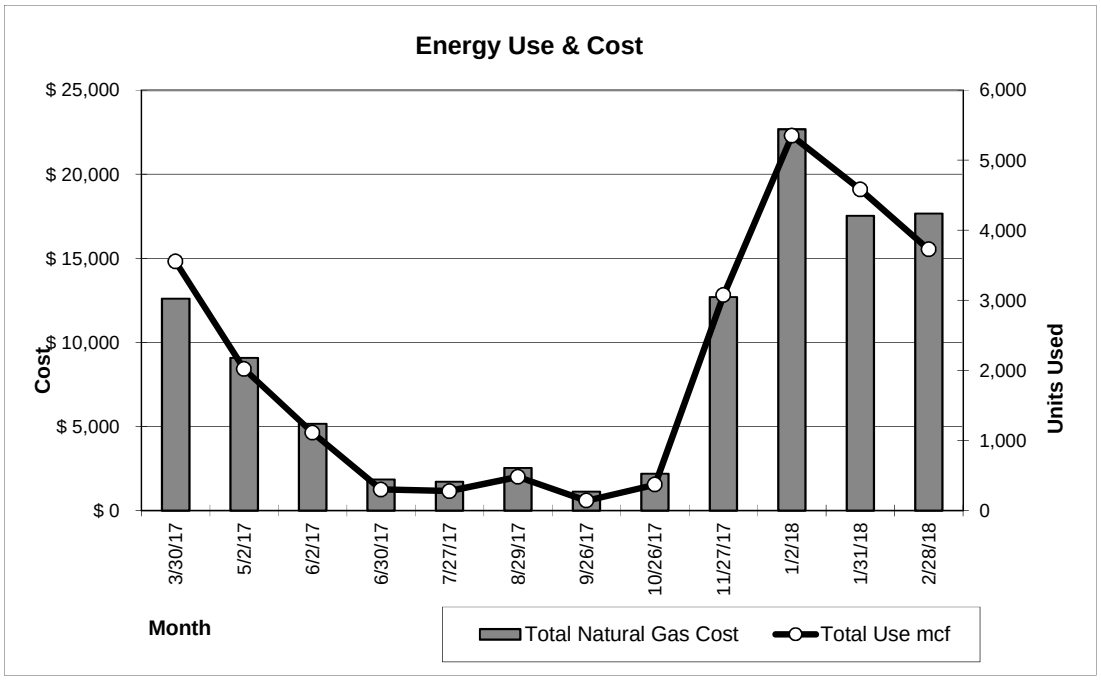
Client: Erie County
Address: Holding Center
330,111 s.f.
77,947 Btu/s.f./Yr
$ 0.32 /s.f.

Natural Gas
Use & Cost Summary:

Utility: **National Fuel**
Account # : ending in 310 ,
Rate: **TC 2.0 COMM: 25-55 MMCF**
Billing unit: mcf
BTU/Unit: **1,030,000**
Meter Charge: **$ 708.89** / month
Supplier: **Fluent Energy**

Month Ending	# Days	Utility Charges mcfs	Utility Charges Cost	Supplier Charges mcfs	Supplier Charges Cost	**Total Use mcf**	**Total Natural Gas Cost**	Average $/mcf
3/30/17	30	3,554	$ 5,083	3,554	$ 7,518	3,554	$ 12,601	$ 3.35
5/2/17	33	2,018	$ 3,065	2,018	$ 6,012	2,018	$ 9,077	$ 4.15
6/2/17	31	1,109	$ 1,866	1,109	$ 3,296	1,109	$ 5,162	$ 4.02
6/30/17	28	300	$ 937	300	$ 913	300	$ 1,850	$ 3.80
7/27/17	27	278	$ 922	278	$ 793	278	$ 1,715	$ 3.63
8/29/17	33	482	$ 1,197	482	$ 1,333	482	$ 2,530	$ 3.78
9/26/17	28	141	$ 737	141	$ 384	141	$ 1,121	$ 2.92
10/26/17	30	372	$ 987	372	$ 1,195	372	$ 2,182	$ 3.96
11/27/17	32	3,073	$ 4,593	3,073	$ 8,105	3,073	$ 12,698	$ 3.90
1/2/18	36	5,348	$ 7,645	5,348	$ 15,027	5,348	$ 22,673	$ 4.11
1/31/18	29	4,580	$ 6,074	4,580	$ 11,459	4,580	$ 17,534	$ 3.67
2/28/18	28	3,729	$ 5,024	3,729	$ 12,625	3,729	$ 17,649	$ 4.54
	365	**24,982**	**$ 38,131**	**24,982**	**$ 68,660**	**24,982**	**$ 106,791**	$ 3.93

Annual Natural Gas Cost **$ 106,791** **/year**
Annual Natural Gas Consumption **24,982** **mcf**
Average Unit Cost per mcf: **$ 3.934** **$ 3.82** **/ Mbtu**



Note:

NATURAL GAS CONSUMPTION AND COST ANALYSIS

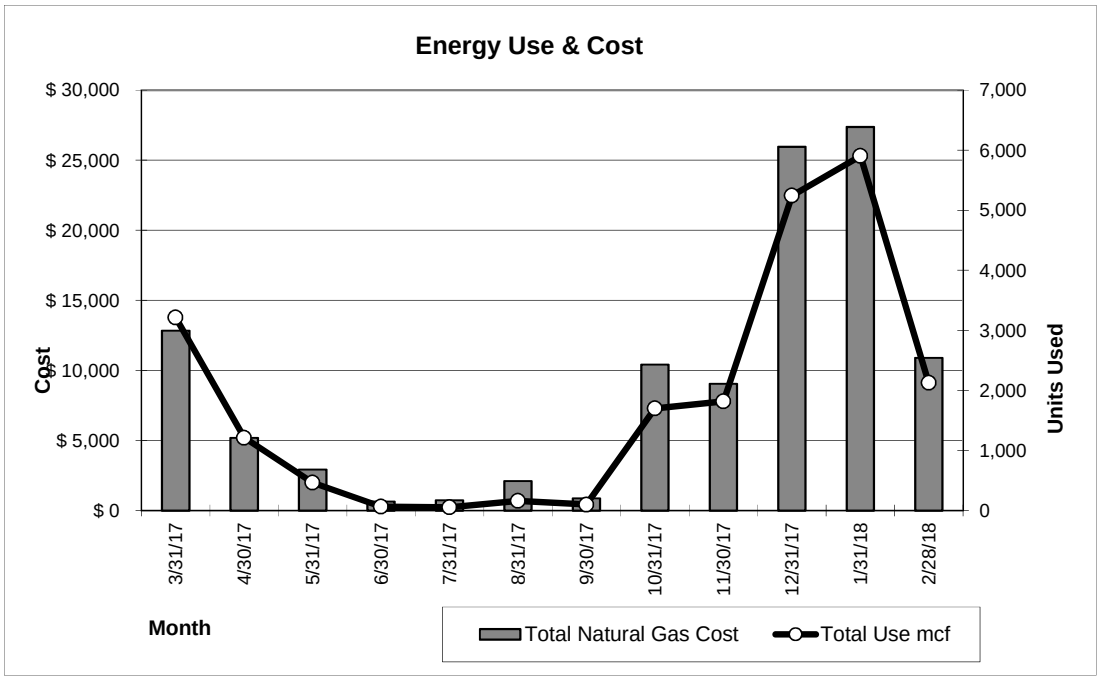
Client: Rath Building
Address: 95 Franklin Street
513,924 s.f.
44,207 Btu/s.f./Yr
$ 0.21 /s.f.

Natural Gas
Use & Cost Summary:

Utility: **National Fuel**
Account # : ending in 9702,
Rate: **TC 1.1 COMM: 5-25 MMCF**
Billing unit: mcf
BTU/Unit: **1,030,000**
Meter Charge: **$ 323.92** / month
Supplier: **Fluent Energy**

Month Ending	# Days	Utility Charges mcfs	Utility Charges Cost	Supplier Charges mcfs	Supplier Charges Cost	**Total Use mcf**	**Total Natural Gas Cost**	Average $/mcf
3/31/17	30	3,212	$ 5,372	3,212	$ 7,465	3,212	$ 12,838	$ 3.90
4/30/17	30	1,213	$ 2,096	1,213	$ 3,081	1,213	$ 5,177	$ 4.00
5/31/17	31	465	$ 1,617	465	$ 1,300	465	$ 2,918	$ 5.58
6/30/17	30	63	$ 467	63	$ 174	63	$ 641	$ 5.02
7/31/17	31	55	$ 572	55	$ 159	55	$ 731	$ 7.36
8/31/17	31	159	$ 1,683	159	$ 429	159	$ 2,113	$ 11.24
9/30/17	30	100	$ 586	100	$ 282	100	$ 868	$ 5.45
10/31/17	31	1,699	$ 4,149	1,699	$ 6,268	1,699	$ 10,416	$ 5.94
11/30/17	30	1,817	$ 3,523	1,817	$ 5,523	1,817	$ 9,046	$ 4.80
12/31/17	31	5,245	$ 8,460	5,245	$ 17,504	5,245	$ 25,965	$ 4.89
1/31/18	31	5,904	$ 9,787	5,904	$ 17,599	5,904	$ 27,386	$ 4.58
2/28/18	28	2,125	$ 3,698	2,125	$ 7,195	2,125	$ 10,893	$ 4.97
	364	**22,057**	**$ 42,011**	**22,057**	**$ 66,980**	**22,057**	**$ 108,990**	$ 4.77

Annual Natural Gas Cost **$ 108,990** **/year**
Annual Natural Gas Consumption **22,057** **mcf**
Average Unit Cost per mcf: **$ 4.765** **$ 4.63** **/ Mbtu**



Note:

NATURAL GAS CONSUMPTION AND COST ANALYSIS

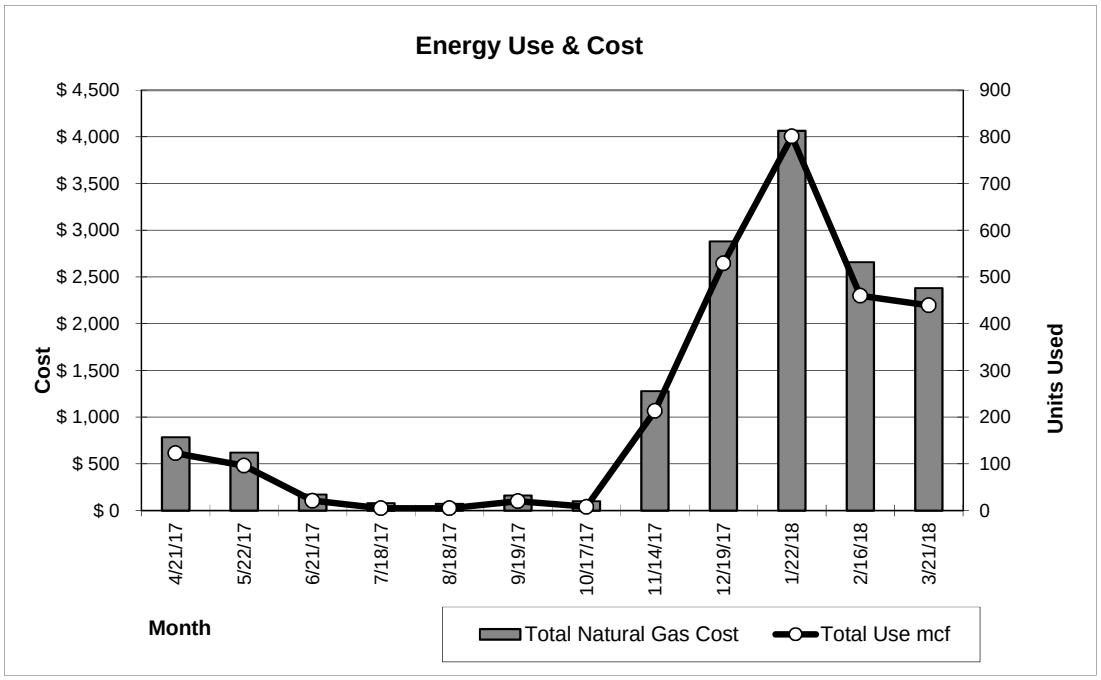
Client: Fire Training
Address: 3359 Broadway St.
35,200 s.f.
79,591 Btu/s.f./Yr
$ 0.43 /s.f.

Natural Gas
Use & Cost Summary:

Utility: **National Fuel**
Account # : ending in 5807, 8207
Rate: **TC 1.0 COMM: < 5 MMCF**
Billing unit: mcf
BTU/Unit: **1,030,000**
Meter Charge: **$ 37.80** / month
Supplier: **Fluent Energy**

Month Ending	# Days	Utility Charges mcfs	Utility Charges Cost	Supplier Charges mcfs	Supplier Charges Cost	**Total Use mcf**	**Total Natural Gas Cost**	Average $/mcf
4/21/17	30	123	$ 388	123	$ 398	123	$ 786	$ 6.08
5/22/17	31	96	$ 292	96	$ 330	96	$ 622	$ 6.09
6/21/17	30	21	$ 99	21	$ 73	21	$ 172	$ 6.39
7/18/17	27	5	$ 61	5	$ 17	5	$ 78	$ 8.04
8/18/17	31	5	$ 59	5	$ 14	5	$ 73	$ 7.04
9/19/17	32	20	$ 98	20	$ 64	20	$ 162	$ 6.21
10/17/17	28	8	$ 73	8	$ 27	8	$ 100	$ 7.78
11/14/17	28	213	$ 563	213	$ 714	213	$ 1,277	$ 5.82
12/19/17	35	529	$ 1,194	529	$ 1,685	529	$ 2,879	$ 5.37
1/22/18	34	801	$ 1,581	801	$ 2,486	801	$ 4,067	$ 5.03
2/16/18	25	460	$ 1,025	460	$ 1,632	460	$ 2,657	$ 5.69
3/21/18	33	439	$ 985	439	$ 1,397	439	$ 2,382	$ 5.34
	364	**2,720**	**$ 6,418**	**2,720**	**$ 8,837**	**2,720**	**$ 15,255**	$ 5.44

Annual Natural Gas Cost **$ 15,255** **/year**
Annual Natural Gas Consumption **2,720** **mcf**
Average Unit Cost per mcf: **$ 5.442** **$ 5.28** **/ Mbtu**



Note:

NATURAL GAS CONSUMPTION AND COST ANALYSIS

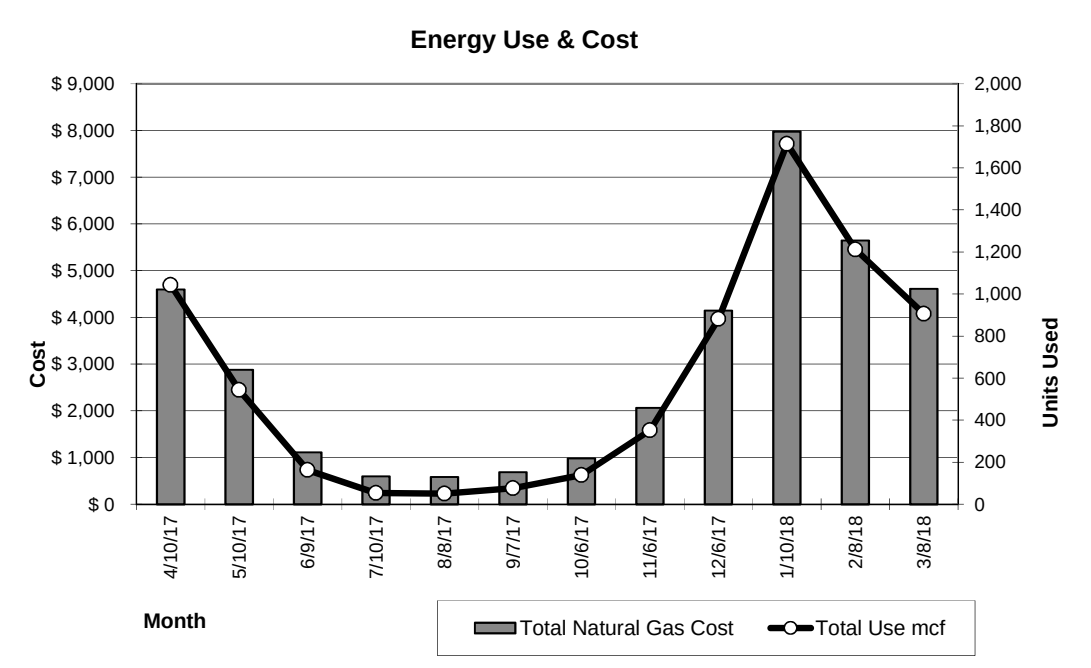
Client: Youth Detention
Address: 810 East Ferry Street
62,555 s.f.
117,532 Btu/s.f./Yr
$ 0.57 /s.f.

Natural Gas
Use & Cost Summary:

Utility: **National Fuel**
Account # : ending in 4708, 5803
Rate: **TC 1.1 COMM: 5-25 MMCF**
Billing unit: mcf
BTU/Unit: **1,030,000**
Meter Charge: **$ 342.82** / month
Supplier: **Fluent Energy**

Month Ending	# Days	Utility Charges mcfs	Utility Charges Cost	Supplier Charges mcfs	Supplier Charges Cost	**Total Use mcf**	**Total Natural Gas Cost**	Average $/mcf
4/10/17	30	1,044	$ 2,084	1,044	$ 2,511	1,044	$ 4,595	$ 4.07
5/10/17	30	544	$ 1,244	544	$ 1,632	544	$ 2,876	$ 4.66
6/9/17	30	163	$ 619	163	$ 490	163	$ 1,109	$ 4.69
7/10/17	31	54	$ 438	54	$ 161	54	$ 598	$ 4.76
8/8/17	29	51	$ 436	51	$ 145	51	$ 581	$ 4.65
9/7/17	30	77	$ 478	77	$ 210	77	$ 689	$ 4.52
10/6/17	29	140	$ 585	140	$ 396	140	$ 981	$ 4.58
11/6/17	31	352	$ 954	352	$ 1,109	352	$ 2,064	$ 4.89
12/6/17	30	881	$ 1,858	881	$ 2,286	881	$ 4,143	$ 4.31
1/10/18	35	1,715	$ 3,232	1,715	$ 4,745	1,715	$ 7,977	$ 4.45
2/8/18	29	1,212	$ 2,303	1,212	$ 3,343	1,212	$ 5,646	$ 4.38
3/8/18	28	906	$ 1,807	906	$ 2,804	906	$ 4,611	$ 4.71
	362	**7,138**	**$ 16,039**	**7,138**	**$ 19,831**	**7,138**	**$ 35,869**	$ 4.45

Annual Natural Gas Cost **$ 35,869** **/year**
Annual Natural Gas Consumption **7,138** **mcf**
Average Unit Cost per mcf: **$ 4.449** **$ 4.32** **/ Mbtu**



Note:

NATURAL GAS CONSUMPTION AND COST ANALYSIS

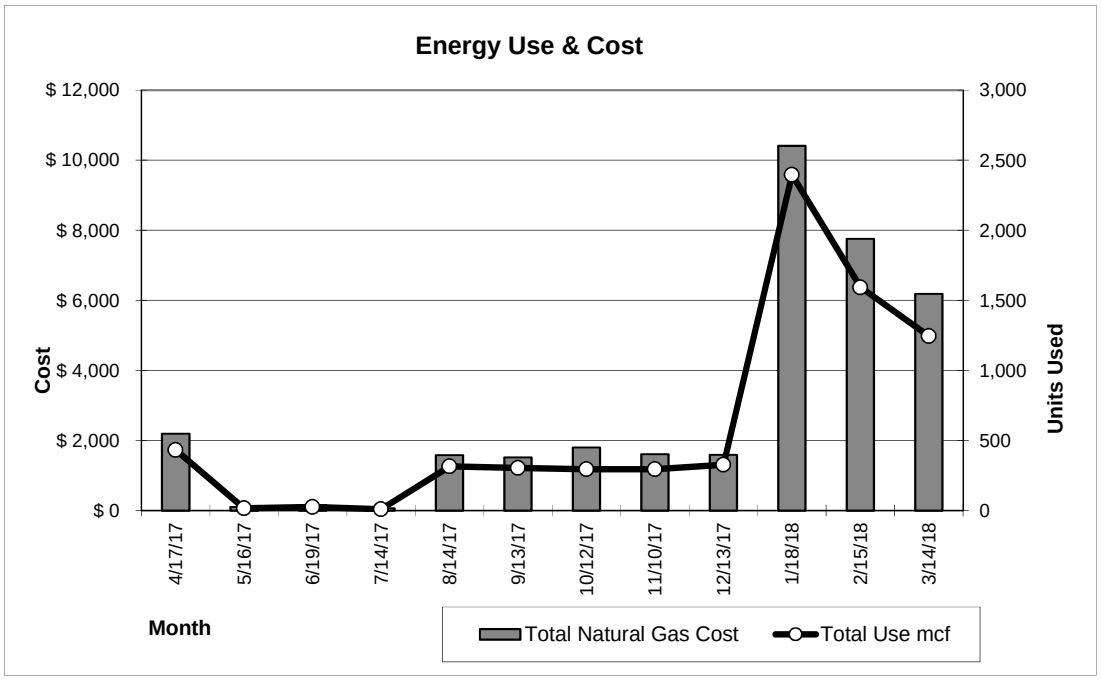
Client: Family Court
Address: 1 Niagara Square
170,000 s.f.
43,963 Btu/s.f./Yr
$ 0.21 /s.f.

Natural Gas
Use & Cost Summary:

Utility: **National Fuel**
Account # : ending in 0703,
Rate: **TC 1.0 COMM: < 5 MMCF**
Billing unit: mcf
BTU/Unit: **1,030,000**
Meter Charge: **$ 18.90** / month
Supplier: **Fluent Energy**

Month Ending	# Days	Utility Charges mcfs	Utility Charges Cost	Supplier Charges mcfs	Supplier Charges Cost	**Total Use mcf**	**Total Natural Gas Cost**	Average $/mcf
4/17/17	30	433	$ 1,071	433	$ 1,122	433	$ 2,193	$ 5.02
5/16/17	29	16	$ 58	16	$ 48	16	$ 106	$ 5.45
6/19/17	34	25	$ 81	25	$ 75	25	$ 157	$ 5.50
7/14/17	25	10	$ 40	10	$ 29	10	$ 69	$ 5.01
8/14/17	31	315	$ 699	315	$ 886	315	$ 1,585	$ 4.97
9/13/17	30	305	$ 678	305	$ 836	305	$ 1,514	$ 4.90
10/12/17	29	295	$ 932	295	$ 872	295	$ 1,803	$ 6.05
11/10/17	29	296	$ 712	296	$ 895	296	$ 1,607	$ 5.37
12/13/17	33	327	$ 719	327	$ 867	327	$ 1,586	$ 4.79
1/18/18	36	2,396	$ 3,989	2,396	$ 6,422	2,396	$ 10,411	$ 4.34
2/15/18	28	1,593	$ 3,018	1,593	$ 4,740	1,593	$ 7,758	$ 4.86
3/14/18	27	1,245	$ 2,649	1,245	$ 3,530	1,245	$ 6,179	$ 4.95
	361	**7,256**	**$ 14,647**	**7,256**	**$ 20,321**	**7,256**	**$ 34,968**	$ 4.79

Annual Natural Gas Cost **$ 34,968** **/year**
Annual Natural Gas Consumption **7,256** **mcf**
Average Unit Cost per mcf: **$ 4.788** **$ 4.65** **/ Mbtu**



Note:

NATURAL GAS CONSUMPTION AND COST ANALYSIS

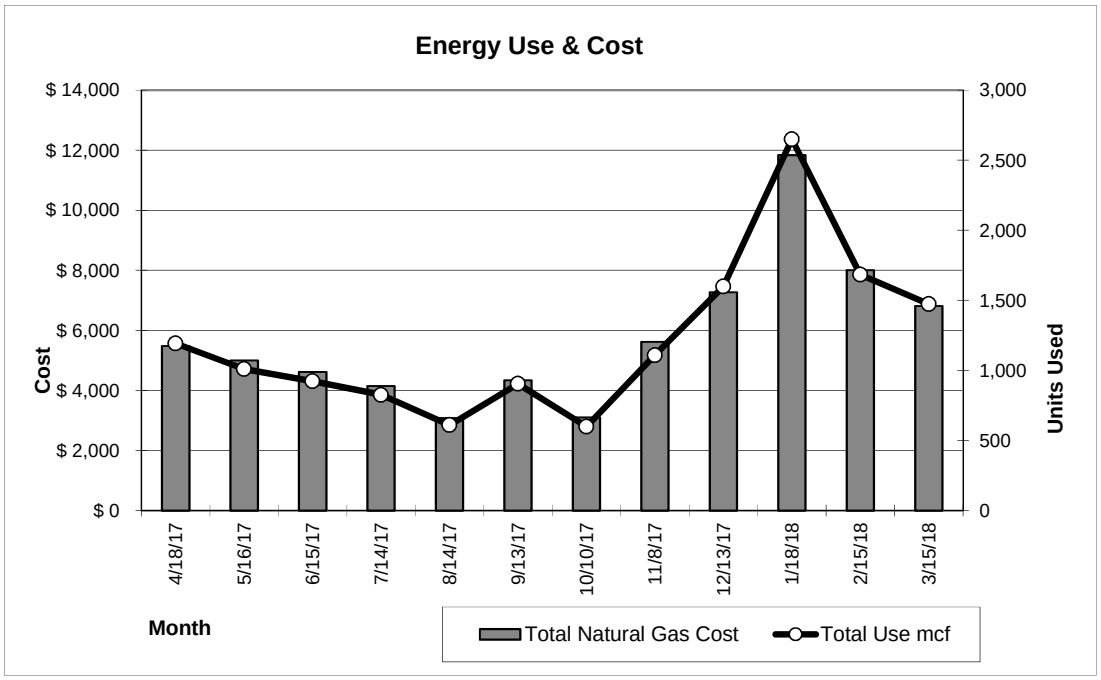
Client: Public Safety Campus
Address: 45 Elm Street
114,000 s.f.
131,741 Btu/s.f./Yr
$ 0.61 /s.f.

Natural Gas
Use & Cost Summary:

Utility: **National Fuel**
Account # : ending in 2706,
Rate: **TC 1.1 COMM: 5-25 MMCF**
Billing unit: mcf
BTU/Unit: **1,030,000**
Meter Charge: **$ 323.92** / month
Supplier: **Fluent Energy**

Month Ending	# Days	Utility Charges mcfs	Utility Charges Cost	Supplier Charges mcfs	Supplier Charges Cost	**Total Use mcf**	**Total Natural Gas Cost**	Average $/mcf
4/18/17	30	1,193	$ 2,290	1,193	$ 3,185	1,193	$ 5,475	$ 4.32
5/16/17	28	1,010	$ 1,987	1,010	$ 3,015	1,010	$ 5,002	$ 4.63
6/15/17	30	923	$ 1,843	923	$ 2,773	923	$ 4,616	$ 4.65
7/14/17	29	826	$ 1,705	826	$ 2,440	826	$ 4,145	$ 4.63
8/14/17	31	611	$ 1,364	611	$ 1,718	611	$ 3,083	$ 4.52
9/13/17	30	905	$ 1,862	905	$ 2,479	905	$ 4,341	$ 4.44
10/10/17	27	599	$ 1,344	599	$ 1,755	599	$ 3,099	$ 4.63
11/8/17	29	1,109	$ 2,208	1,109	$ 3,412	1,109	$ 5,620	$ 4.78
12/13/17	35	1,599	$ 3,044	1,599	$ 4,227	1,599	$ 7,272	$ 4.35
1/18/18	36	2,649	$ 4,738	2,649	$ 7,100	2,649	$ 11,838	$ 4.35
2/15/18	28	1,683	$ 2,998	1,683	$ 5,008	1,683	$ 8,006	$ 4.56
3/15/18	28	1,474	$ 2,659	1,474	$ 4,153	1,474	$ 6,812	$ 4.40
	361	**14,581**	**$ 28,042**	**14,581**	**$ 41,266**	**14,581**	**$ 69,308**	$ 4.49

Annual Natural Gas Cost **$ 69,308** **/year**
Annual Natural Gas Consumption **14,581** **mcf**
Average Unit Cost per mcf: **$ 4.487** **$ 4.36** **/ Mbtu**



Note:

NATURAL GAS CONSUMPTION AND COST ANALYSIS

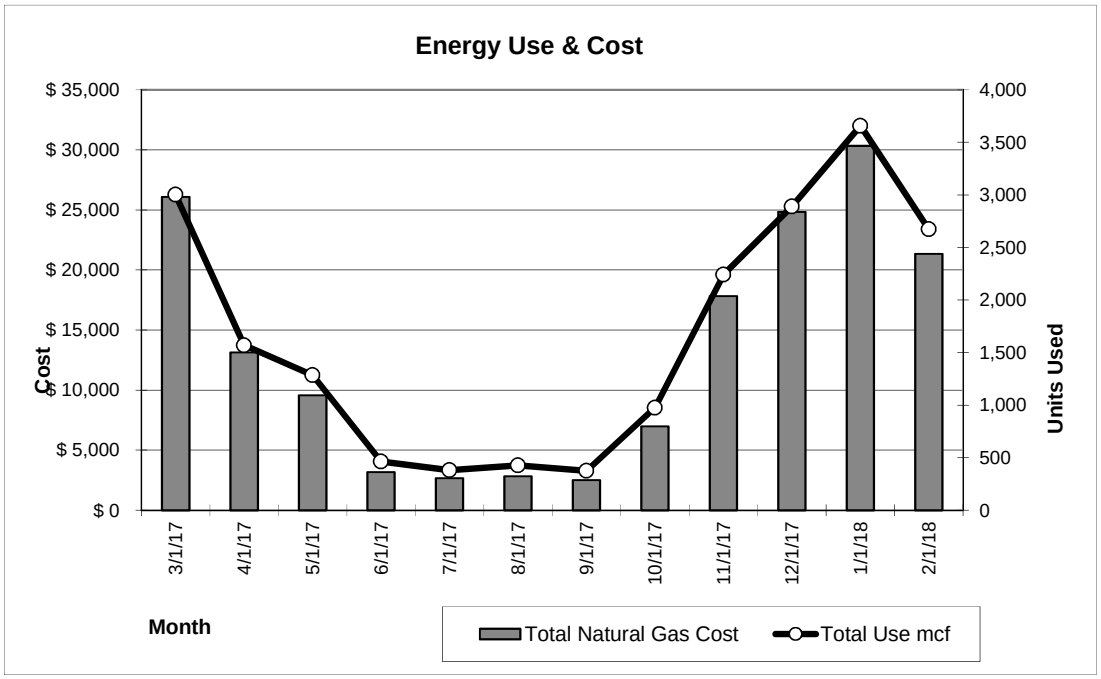
Client: Correctional Facility
Address: 11581 Walden Ave.
208,280 s.f.
98,630 Btu/s.f./Yr
$ 0.77 /s.f.

Natural Gas
Use & Cost Summary:

Utility: **National Fuel**
Account # : ending in 8947, 8948
Rate: **0**
Billing unit: mcf
BTU/Unit: **1,030,000**
Meter Charge: **$ 45.00** / month
Supplier: **Reserve Gas**

Month Ending	# Days	Utility Charges mcfs	Utility Charges Cost	Supplier Charges mcfs	Supplier Charges Cost	**Total Use mcf**	**Total Natural Gas Cost**	Average $/mcf
3/1/17	30	3,002	$ 0	3,002	$ 26,069	3,002	$ 26,069	$ 8.67
4/1/17	31	1,570	$ 0	1,570	$ 13,144	1,570	$ 13,144	$ 8.35
5/1/17	30	1,284	$ 0	1,284	$ 9,558	1,284	$ 9,558	$ 7.41
6/1/17	31	463	$ 0	463	$ 3,187	463	$ 3,187	$ 6.78
7/1/17	30	382	$ 0	382	$ 2,662	382	$ 2,662	$ 6.85
8/1/17	31	427	$ 0	427	$ 2,825	427	$ 2,825	$ 6.50
9/1/17	31	375	$ 0	375	$ 2,516	375	$ 2,516	$ 6.59
10/1/17	30	976	$ 0	976	$ 6,994	976	$ 6,994	$ 7.12
11/1/17	31	2,241	$ 0	2,241	$ 17,831	2,241	$ 17,831	$ 7.94
12/1/17	30	2,890	$ 0	2,890	$ 24,815	2,890	$ 24,815	$ 8.57
1/1/18	31	3,658	$ 0	3,658	$ 30,345	3,658	$ 30,345	$ 8.28
2/1/18	31	2,675	$ 0	2,675	$ 21,343	2,675	$ 21,343	$ 7.96
	367	**19,944**	**$ 0**	**19,944**	**$ 161,289**	**19,944**	**$ 161,289**	$ 8.06

Annual Natural Gas Cost **$ 161,289** **/year**
Annual Natural Gas Consumption **19,944** **mcf**
Average Unit Cost per mcf: **$ 8.060** **$ 7.83** **/ Mbtu**



Note:

NATURAL GAS CONSUMPTION AND COST ANALYSIS

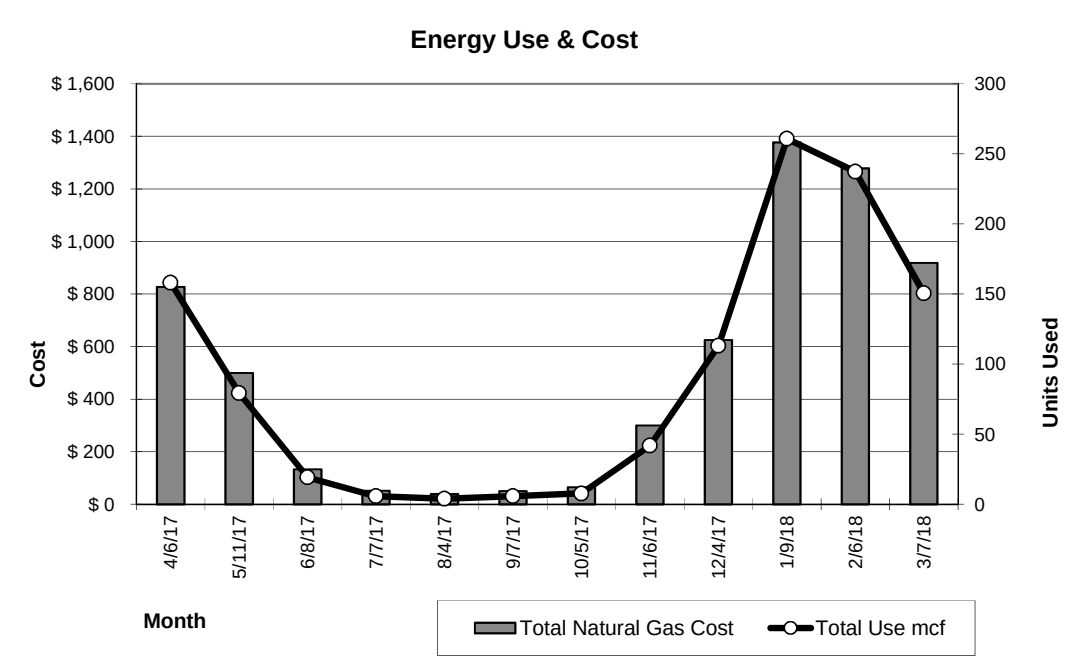
Client: Law Library
Address: 77 West Eagle
29,338 s.f.
38,022 Btu/s.f./Yr
$ 0.21 /s.f.

Natural Gas
Use & Cost Summary:

Utility: **National Fuel**
Account # : ending in 3305,
Rate: **TC 1.0 COMM: < 5 MMCF**
Billing unit: mcf
BTU/Unit: **1,030,000**
Meter Charge: **$ 0.00** / month
Supplier: **0**

Month Ending	# Days	Utility Charges mcfs	Utility Charges Cost	Supplier Charges mcfs	Supplier Charges Cost	**Total Use mcf**	**Total Natural Gas Cost**	Average $/mcf
4/6/17	30	158	$ 378	158	$ 449	158	$ 827	$ 5.23
5/11/17	35	79	$ 225	79	$ 275	79	$ 500	$ 6.31
6/8/17	28	19	$ 66	19	$ 67	19	$ 133	$ 6.91
7/7/17	29	6	$ 31	6	$ 20	6	$ 51	$ 8.91
8/4/17	28	4	$ 26	4	$ 13	4	$ 39	$ 10.07
9/7/17	34	6	$ 31	6	$ 18	6	$ 50	$ 8.69
10/5/17	28	8	$ 40	8	$ 25	8	$ 65	$ 8.46
11/6/17	32	42	$ 148	42	$ 152	42	$ 300	$ 7.17
12/4/17	28	113	$ 281	113	$ 344	113	$ 625	$ 5.53
1/9/18	36	261	$ 531	261	$ 847	261	$ 1,378	$ 5.28
2/6/18	28	237	$ 526	237	$ 752	237	$ 1,278	$ 5.39
3/7/18	29	151	$ 375	151	$ 543	151	$ 918	$ 6.10
	365	**1,083**	**$ 2,658**	**1,083**	**$ 3,506**	**1,083**	**$ 6,164**	$ 5.69

Annual Natural Gas Cost **$ 6,164** **/year**
Annual Natural Gas Consumption **1,083** **mcf**
Average Unit Cost per mcf: **$ 5.692** **$ 5.53** **/ Mbtu**



Note:

NATURAL GAS CONSUMPTION AND COST ANALYSIS

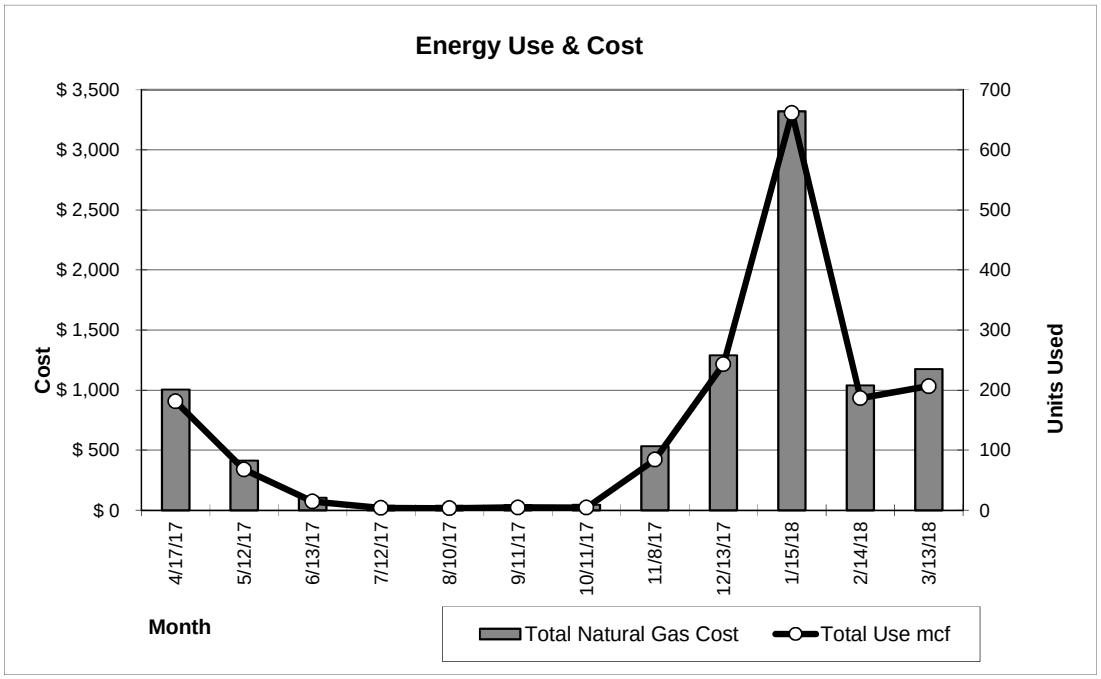
Client: Aurora Highway
Address: 119 Ellicott Road
43,463 s.f.
39,398 Btu/s.f./Yr
$ 0.21 /s.f.

Natural Gas
Use & Cost Summary:

Utility: **National Fuel**
Account # : ending in 2702,
Rate: **TC 1.0 COMM: < 5 MMCF**
Billing unit: mcf
BTU/Unit: **1,030,000**
Meter Charge: **$ 0.00** / month
Supplier: **Fluent Energy**

Month Ending	# Days	Utility Charges mcfs	Utility Charges Cost	Supplier Charges mcfs	Supplier Charges Cost	**Total Use mcf**	**Total Natural Gas Cost**	Average $/mcf
4/17/17	30	181	$ 448	181	$ 558	181	$ 1,006	$ 5.55
5/12/17	25	68	$ 178	68	$ 236	68	$ 414	$ 6.08
6/13/17	32	15	$ 52	15	$ 51	15	$ 103	$ 7.07
7/12/17	29	4	$ 25	4	$ 13	4	$ 38	$ 10.07
8/10/17	29	4	$ 25	4	$ 12	4	$ 37	$ 10.19
9/11/17	32	5	$ 28	5	$ 15	5	$ 43	$ 9.10
10/11/17	30	4	$ 31	4	$ 15	4	$ 46	$ 10.42
11/8/17	28	84	$ 234	84	$ 299	84	$ 533	$ 6.32
12/13/17	35	243	$ 529	243	$ 759	243	$ 1,289	$ 5.30
1/15/18	33	662	$ 1,221	662	$ 2,100	662	$ 3,321	$ 5.02
2/14/18	30	186	$ 405	186	$ 633	186	$ 1,038	$ 5.57
3/13/18	27	207	$ 481	207	$ 693	207	$ 1,174	$ 5.68
	360	**1,663**	**$ 3,656**	**1,663**	**$ 5,384**	**1,663**	**$ 9,041**	$ 5.44

Annual Natural Gas Cost **$ 9,041** **/year**
Annual Natural Gas Consumption **1,663** **mcf**
Average Unit Cost per mcf: **$ 5.438** **$ 5.28** **/ Mbtu**



Note:

NATURAL GAS CONSUMPTION AND COST ANALYSIS

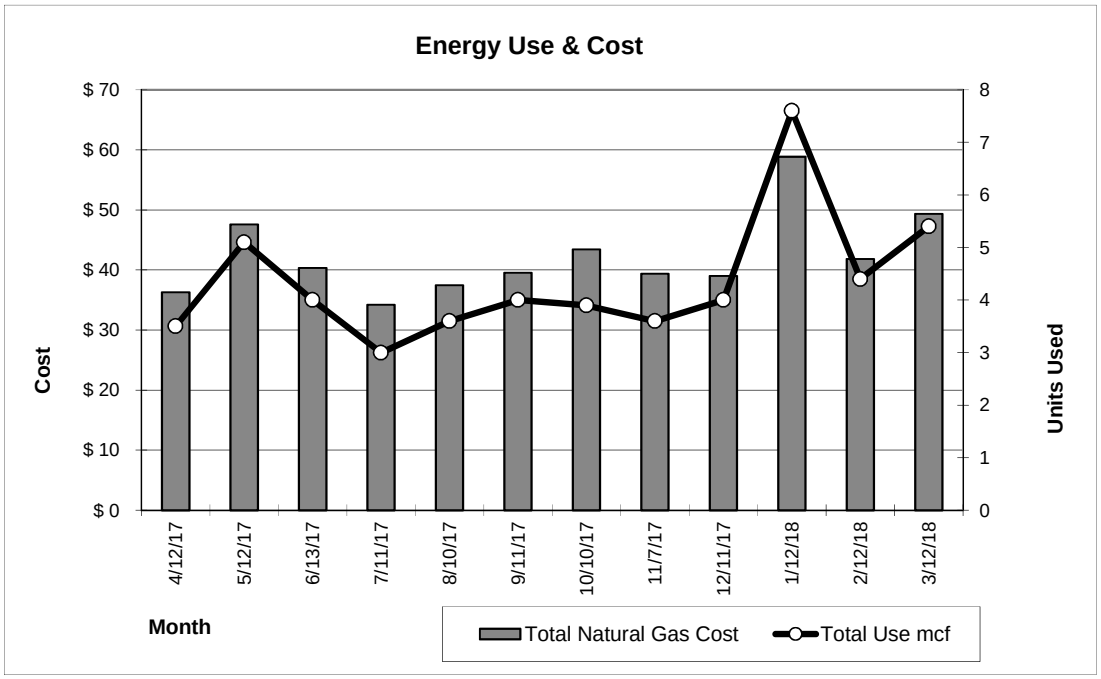
Client: Health Mall
Address: 1500 Broadway
24,638 s.f.
2,178 Btu/s.f./Yr
$ 0.02 /s.f.

Natural Gas
Use & Cost Summary:

Utility: **National Fuel**
Account # : ending in 3709,
Rate: **TC 1.0 COMM: < 5 MMCF**
Billing unit: mcf
BTU/Unit: **1,030,000**
Meter Charge: **$ 18.90** / month
Supplier: **Fluent Energy**

Month Ending	# Days	Utility Charges mcfs	Utility Charges Cost	Supplier Charges mcfs	Supplier Charges Cost	**Total Use mcf**	**Total Natural Gas Cost**	Average $/mcf
4/12/17	30	4	$ 26	4	$ 10	4	$ 36	$ 4.97
5/12/17	30	5	$ 30	5	$ 18	5	$ 48	$ 5.63
6/13/17	32	4	$ 26	4	$ 14	4	$ 40	$ 5.35
7/11/17	28	3	$ 24	3	$ 10	3	$ 34	$ 5.10
8/10/17	30	4	$ 26	4	$ 12	4	$ 37	$ 5.15
9/11/17	32	4	$ 27	4	$ 13	4	$ 40	$ 5.15
10/10/17	29	4	$ 30	4	$ 13	4	$ 43	$ 6.29
11/7/17	28	4	$ 27	4	$ 13	4	$ 39	$ 5.69
12/11/17	34	4	$ 27	4	$ 12	4	$ 39	$ 5.02
1/12/18	32	8	$ 35	8	$ 24	8	$ 59	$ 5.26
2/12/18	31	4	$ 27	4	$ 15	4	$ 42	$ 5.20
3/12/18	28	5	$ 31	5	$ 18	5	$ 49	$ 5.63
	364	**52**	**$ 334**	**52**	**$ 173**	**52**	**$ 507**	$ 5.38

Annual Natural Gas Cost **$ 507** **/year**
Annual Natural Gas Consumption **52** **mcf**
Average Unit Cost per mcf: **$ 5.381** **$ 5.22** **/ Mbtu**



Note:

NATURAL GAS CONSUMPTION AND COST ANALYSIS

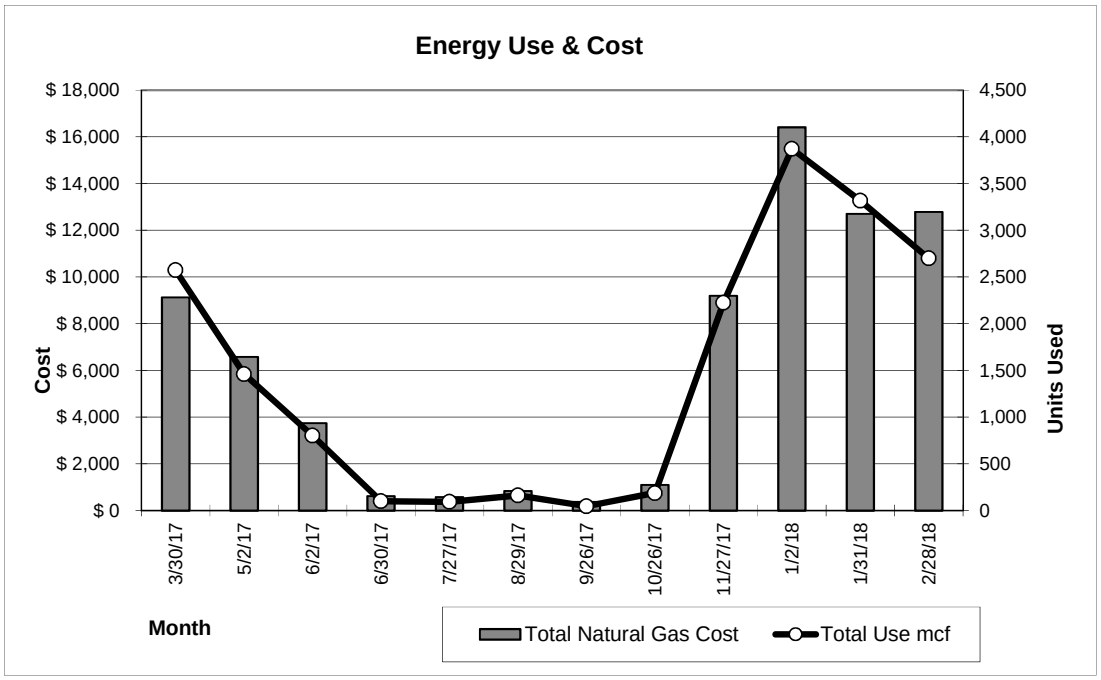
Client: County Court & Old County Hall
Address: 25 Delaware & 92 Franklin
435,000 s.f.
41,530 Btu/s.f./Yr
$ 0.17 /s.f.

Utility: **National Fuel**
Account # : ending in 310 ,
Rate: **TC 2.0 COMM: 25-55 MMCF**
Billing unit: mcf
BTU/Unit: **1,030,000**
Meter Charge: **$ 708.89** / month
Supplier: **Fluent Energy**

Natural Gas
Use & Cost Summary:

Month Ending	# Days	Utility Charges mcfs	Utility Charges Cost	Supplier Charges mcfs	Supplier Charges Cost	**Total Use mcf**	**Total Natural Gas Cost**	Average $/mcf
3/30/17	30	2,574	$ 3,681	2,574	$ 5,444	2,574	$ 9,125	$ 3.27
5/2/17	33	1,461	$ 2,219	1,461	$ 4,354	1,461	$ 6,573	$ 4.01
6/2/17	31	803	$ 1,351	803	$ 2,387	803	$ 3,738	$ 3.77
6/30/17	28	100	$ 312	100	$ 304	100	$ 617	($ 0.92)
7/27/17	27	93	$ 307	93	$ 264	93	$ 572	($ 1.48)
8/29/17	33	161	$ 399	161	$ 444	161	$ 843	$ 0.84
9/26/17	28	47	$ 246	47	$ 128	47	$ 374	($ 7.13)
10/26/17	30	187	$ 497	187	$ 602	187	$ 1,099	$ 2.08
11/27/17	32	2,225	$ 3,326	2,225	$ 5,869	2,225	$ 9,195	$ 3.81
1/2/18	36	3,872	$ 5,536	3,872	$ 10,882	3,872	$ 16,418	$ 4.06
1/31/18	29	3,316	$ 4,399	3,316	$ 8,298	3,316	$ 12,697	$ 3.61
2/28/18	28	2,700	$ 3,638	2,700	$ 9,142	2,700	$ 12,780	$ 4.47
	365	**17,539**	**$ 25,912**	**17,539**	**$ 48,118**	**17,539**	**$ 74,031**	$ 3.74

Annual Natural Gas Cost **$ 74,031** **/year**
Annual Natural Gas Consumption **17,539** **mcf**
Average Unit Cost per mcf: **$ 3.736** **$ 3.63** **/ Mbtu**



Note:

NATURAL GAS CONSUMPTION AND COST ANALYSIS

Client: CRP Casino
Address: 6121 Chestnut Ridge Road
13,000 s.f.
68,674 Btu/s.f./Yr
$ 0.42 /s.f.

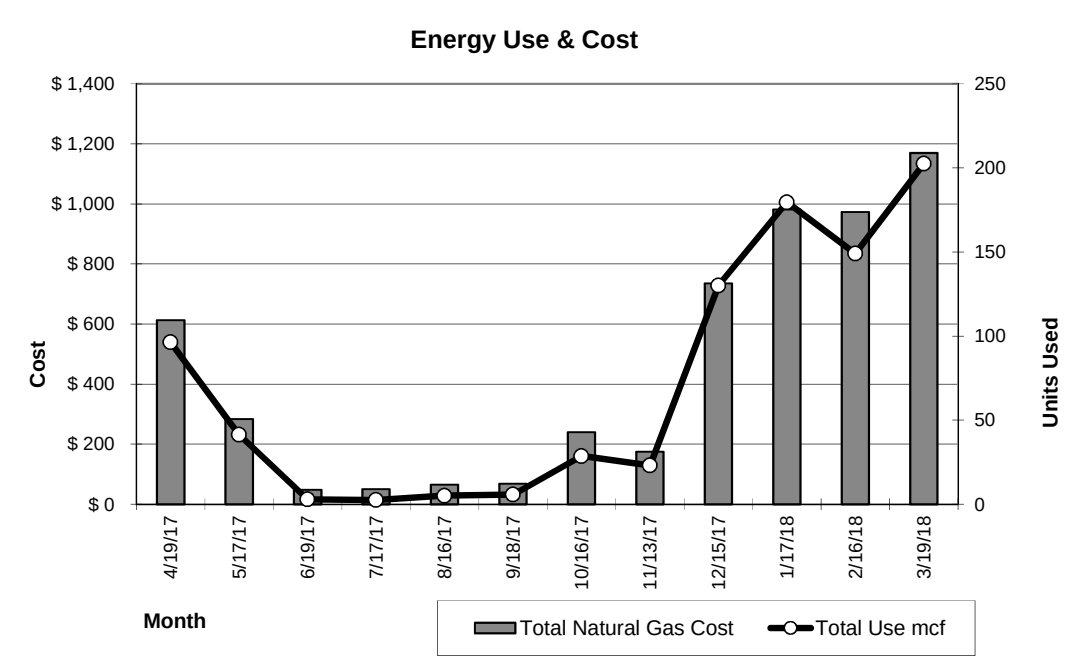
Utility: **National Fuel**
Account # : ending in 2709, 4808
Rate: **TC 1.0 COMM: < 5 MMCF**
Billing unit: mcf
BTU/Unit: **1,030,000**
Meter Charge: **$ 37.80** / month
Supplier: **0**

Natural Gas

Use & Cost Summary:

Month Ending	# Days	Utility Charges mcfs	Utility Charges Cost	Supplier Charges mcfs	Supplier Charges Cost	**Total Use mcf**	**Total Natural Gas Cost**	Average $/mcf
4/19/17	30	96	$ 299	96	$ 314	96	$ 613	$ 5.98
5/17/17	28	41	$ 140	41	$ 144	41	$ 284	$ 5.96
6/19/17	33	3	$ 37	3	$ 11	3	$ 48	$ 3.60
7/17/17	28	3	$ 40	3	$ 10	3	$ 50	$ 5.00
8/16/17	30	5	$ 46	5	$ 19	5	$ 65	$ 5.35
9/18/17	33	6	$ 48	6	$ 21	6	$ 69	$ 5.44
10/16/17	28	29	$ 134	29	$ 105	29	$ 240	$ 7.04
11/13/17	28	23	$ 94	23	$ 81	23	$ 175	$ 5.96
12/15/17	32	130	$ 322	130	$ 413	130	$ 735	$ 5.36
1/17/18	33	180	$ 397	180	$ 585	180	$ 982	$ 5.26
2/16/18	30	149	$ 400	149	$ 573	149	$ 973	$ 6.27
3/19/18	31	203	$ 491	203	$ 679	203	$ 1,170	$ 5.59
	364	**867**	**$ 2,448**	**867**	**$ 2,956**	**867**	**$ 5,404**	$ 5.71

Annual Natural Gas Cost **$ 5,404** **/year**
Annual Natural Gas Consumption **867** **mcf**
Average Unit Cost per mcf: **$ 5.712** **$ 5.55** **/ Mbtu**



Note:

NATURAL GAS CONSUMPTION AND COST ANALYSIS

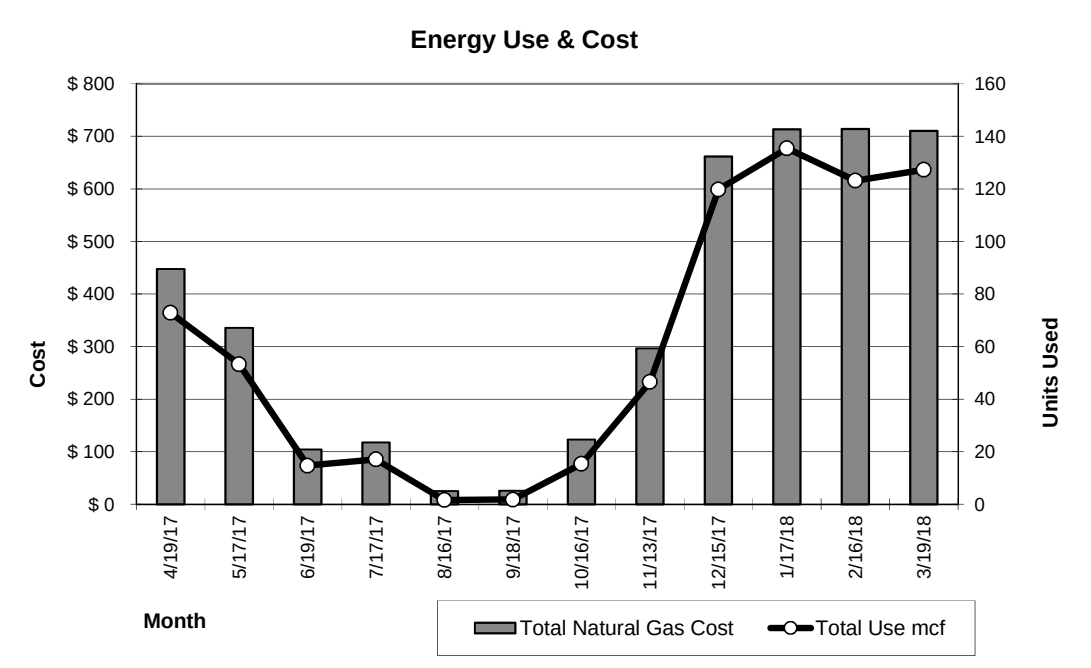
Client: CRP Office
Address: 6121 Chestnut Ridge Road
7,000 s.f.
107,238 Btu/s.f./Yr
$ 0.61 /s.f.

Natural Gas
Use & Cost Summary:

Utility: **National Fuel**
Account # : ending in 2611,
Rate: **TC 1.0 COMM: < 5 MMCF**
Billing unit: mcf
BTU/Unit: **1,030,000**
Meter Charge: **$ 18.90** / month
Supplier: **0**

Month Ending	# Days	Utility Charges mcfs	Utility Charges Cost	Supplier Charges mcfs	Supplier Charges Cost	**Total Use mcf**	**Total Natural Gas Cost**	Average $/mcf
4/19/17	30	73	$ 215	73	$ 232	73	$ 447	$ 5.89
5/17/17	28	53	$ 151	53	$ 185	53	$ 336	$ 5.94
6/19/17	33	15	$ 53	15	$ 51	15	$ 104	$ 5.79
7/17/17	28	17	$ 59	17	$ 58	17	$ 118	$ 5.77
8/16/17	30	2	$ 20	2	$ 5	2	$ 25	$ 3.73
9/18/17	33	2	$ 20	2	$ 6	2	$ 26	$ 3.89
10/16/17	28	15	$ 69	15	$ 54	15	$ 123	$ 6.78
11/13/17	28	47	$ 138	47	$ 159	47	$ 296	$ 5.97
12/15/17	32	120	$ 284	120	$ 378	120	$ 662	$ 5.37
1/17/18	33	135	$ 286	135	$ 427	135	$ 713	$ 5.13
2/16/18	30	123	$ 289	123	$ 425	123	$ 714	$ 5.65
3/19/18	31	127	$ 301	127	$ 409	127	$ 710	$ 5.43
	364	**729**	**$ 1,885**	**729**	**$ 2,389**	**729**	**$ 4,275**	$ 5.55

Annual Natural Gas Cost **$ 4,275** **/year**
Annual Natural Gas Consumption **729** **mcf**
Average Unit Cost per mcf: **$ 5.554** **$ 5.39** **/ Mbtu**



Note:

NATURAL GAS CONSUMPTION AND COST ANALYSIS

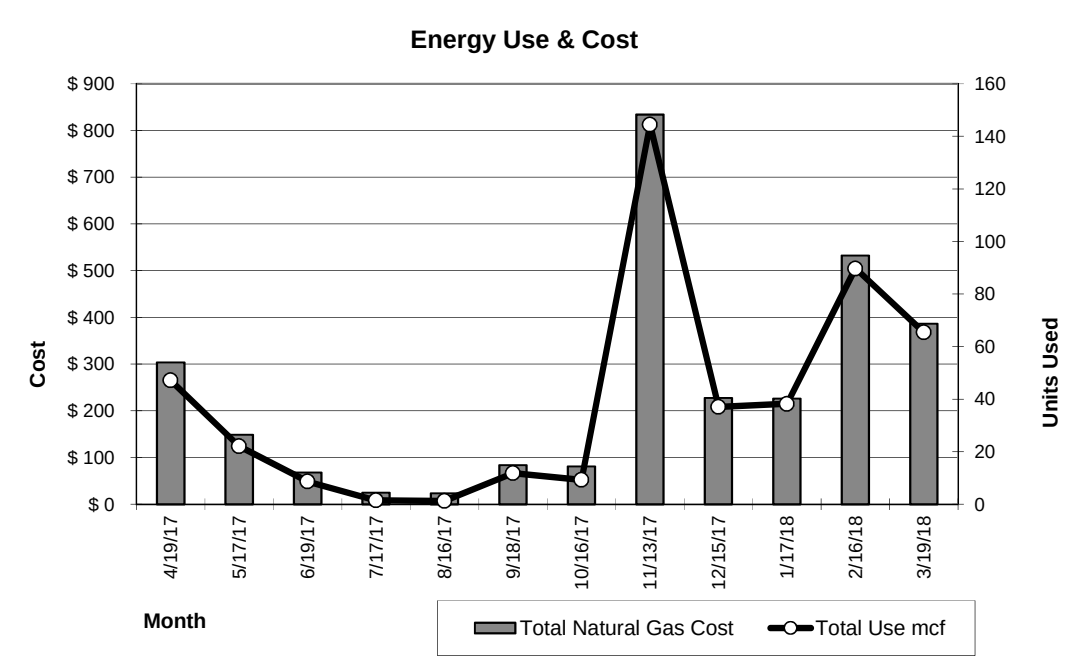
Client: CRP Radio Tower
Address: 6121 Chestnut Ridge Road
3,500 s.f.
140,286 Btu/s.f./Yr
$ 0.84 /s.f.

Natural Gas
Use & Cost Summary:

Utility: **National Fuel**
Account # : ending in 2306,
Rate: **TC 1.0 COMM: < 5 MMCF**
Billing unit: mcf
BTU/Unit: **1,030,000**
Meter Charge: **$ 18.90** / month
Supplier: **0**

Month Ending	# Days	Utility Charges mcfs	Utility Charges Cost	Supplier Charges mcfs	Supplier Charges Cost	**Total Use mcf**	**Total Natural Gas Cost**	Average $/mcf
4/19/17	30	47	$ 153	47	$ 150	47	$ 304	$ 6.04
5/17/17	28	22	$ 72	22	$ 77	22	$ 149	$ 5.88
6/19/17	33	9	$ 38	9	$ 30	9	$ 68	$ 5.63
7/17/17	28	2	$ 19	2	$ 5	2	$ 24	$ 3.70
8/16/17	30	1	$ 19	1	$ 4	1	$ 23	$ 3.22
9/18/17	33	12	$ 46	12	$ 38	12	$ 84	$ 5.51
10/16/17	28	9	$ 48	9	$ 33	9	$ 81	$ 6.63
11/13/17	28	145	$ 342	145	$ 493	145	$ 834	$ 5.64
12/15/17	32	37	$ 111	37	$ 117	37	$ 227	$ 5.63
1/17/18	33	38	$ 106	38	$ 120	38	$ 226	$ 5.42
2/16/18	30	90	$ 223	90	$ 310	90	$ 532	$ 5.72
3/19/18	31	65	$ 176	65	$ 210	65	$ 386	$ 5.62
	364	**477**	**$ 1,352**	**477**	**$ 1,587**	**477**	**$ 2,939**	$ 5.69

Annual Natural Gas Cost **$ 2,939** **/year**
Annual Natural Gas Consumption **477** **mcf**
Average Unit Cost per mcf: **$ 5.690** **$ 5.52** **/ Mbtu**



Note:

NATURAL GAS CONSUMPTION AND COST ANALYSIS

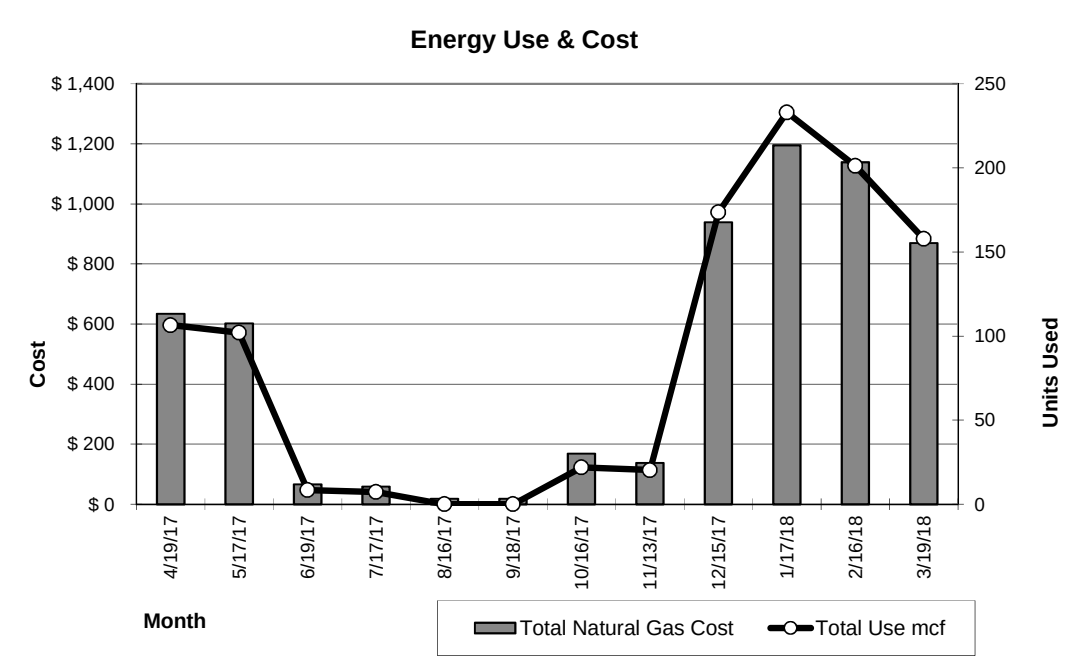
Client: CRP Truck Shop
Address: 6121 Chestnut Ridge Road
8,000 s.f.
132,844 Btu/s.f./Yr
$ 0.73 /s.f.

Natural Gas
Use & Cost Summary:

Utility: **National Fuel**
Account # : ending in 2404,
Rate: **TC 1.0 COMM: < 5 MMCF**
Billing unit: mcf
BTU/Unit: **1,030,000**
Meter Charge: **$ 18.90** / month
Supplier: **0**

Month Ending	# Days	Utility Charges mcfs	Utility Charges Cost	Supplier Charges mcfs	Supplier Charges Cost	**Total Use mcf**	**Total Natural Gas Cost**	Average $/mcf
4/19/17	30	107	$ 295	107	$ 339	107	$ 634	$ 5.78
5/17/17	28	102	$ 249	102	$ 353	102	$ 602	$ 5.72
6/19/17	33	8	$ 37	8	$ 29	8	$ 66	$ 5.62
7/17/17	28	7	$ 34	7	$ 25	7	$ 59	$ 5.50
8/16/17	30	0	$ 18	0	$ 0	0	$ 18	#DIV/0!
9/18/17	33	0	$ 18	0	$ 0	0	$ 18	#DIV/0!
10/16/17	28	22	$ 92	22	$ 77	22	$ 169	$ 6.85
11/13/17	28	20	$ 69	20	$ 69	20	$ 138	$ 5.87
12/15/17	32	174	$ 391	174	$ 548	174	$ 939	$ 5.30
1/17/18	33	233	$ 461	233	$ 735	233	$ 1,196	$ 5.05
2/16/18	30	201	$ 444	201	$ 694	201	$ 1,139	$ 5.57
3/19/18	31	158	$ 363	158	$ 507	158	$ 870	$ 5.39
	364	**1,032**	**$ 2,470**	**1,032**	**$ 3,377**	**1,032**	**$ 5,847**	$ 5.45

Annual Natural Gas Cost **$ 5,847** **/year**
Annual Natural Gas Consumption **1,032** **mcf**
Average Unit Cost per mcf: **$ 5.447** **$ 5.29** **/ Mbtu**



Note:

NATURAL GAS CONSUMPTION AND COST ANALYSIS

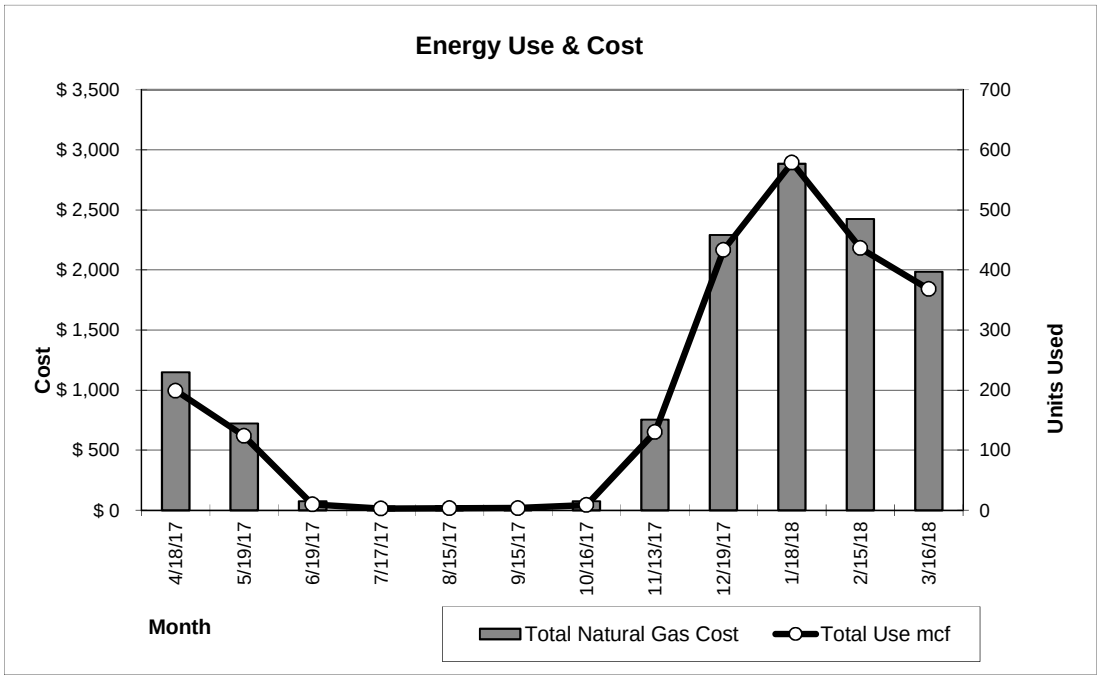
Client: Harlem District Highway
Address: 1080 Harlem Road
24,530 s.f.
96,487 Btu/s.f./Yr
$ 0.51 /s.f.

Natural Gas
Use & Cost Summary:

Utility: **National Fuel**
Account # : ending in 2301,
Rate: **TC 1.0 COMM: < 5 MMCF**
Billing unit: mcf
BTU/Unit: **1,030,000**
Meter Charge: **$ 18.90** / month
Supplier: **Fluent Energy**

Month Ending	# Days	Utility Charges mcfs	Utility Charges Cost	Supplier Charges mcfs	Supplier Charges Cost	**Total Use mcf**	**Total Natural Gas Cost**	Average $/mcf
4/18/17	30	199	$ 513	199	$ 636	199	$ 1,149	$ 5.68
5/19/17	31	124	$ 293	124	$ 429	124	$ 722	$ 5.67
6/19/17	31	10	$ 40	10	$ 34	10	$ 75	$ 5.68
7/17/17	28	3	$ 22	3	$ 9	3	$ 32	$ 4.71
8/15/17	29	3	$ 24	3	$ 11	3	$ 35	$ 4.83
9/15/17	31	4	$ 25	4	$ 12	4	$ 36	$ 4.84
10/16/17	31	9	$ 45	9	$ 31	9	$ 76	$ 6.46
11/13/17	28	130	$ 311	130	$ 443	130	$ 755	$ 5.66
12/19/17	36	433	$ 915	433	$ 1,376	433	$ 2,291	$ 5.25
1/18/18	30	579	$ 1,078	579	$ 1,808	579	$ 2,886	$ 4.95
2/15/18	28	437	$ 917	437	$ 1,508	437	$ 2,425	$ 5.51
3/16/18	29	368	$ 778	368	$ 1,207	368	$ 1,985	$ 5.34
	362	**2,298**	**$ 4,960**	**2,298**	**$ 7,504**	**2,298**	**$ 12,464**	$ 5.33

Annual Natural Gas Cost **$ 12,464** **/year**
Annual Natural Gas Consumption **2,298** **mcf**
Average Unit Cost per mcf: **$ 5.326** **$ 5.17** **/ Mbtu**



Note:

NATURAL GAS CONSUMPTION AND COST ANALYSIS

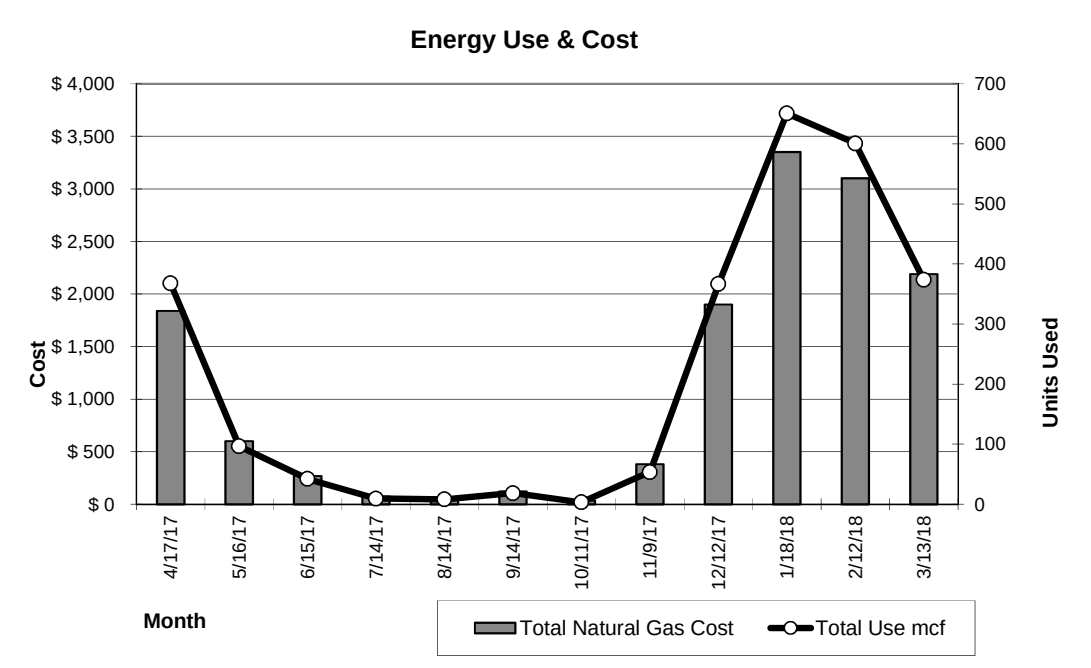
Client: Concord Highway
Address: 9125 Sibley Rd
27,683 s.f.
96,399 Btu/s.f./Yr
$ 0.50 /s.f.

Natural Gas
Use & Cost Summary:

Utility: **National Fuel**
Account # : ending in 9804,
Rate: **TC 1.0 COMM: < 5 MMCF**
Billing unit: mcf
BTU/Unit: **1,030,000**
Meter Charge: **$ 18.90** / month
Supplier: **Fluent Energy**

Month Ending	# Days	Utility Charges mcfs	Utility Charges Cost	Supplier Charges mcfs	Supplier Charges Cost	**Total Use mcf**	**Total Natural Gas Cost**	Average $/mcf
4/17/17	30	368	$ 806	368	$ 1,032	368	$ 1,838	$ 4.95
5/16/17	29	96	$ 266	96	$ 336	96	$ 601	$ 6.04
6/15/17	30	42	$ 122	42	$ 146	42	$ 268	$ 5.91
7/14/17	29	10	$ 40	10	$ 33	10	$ 73	$ 5.67
8/14/17	31	8	$ 36	8	$ 27	8	$ 63	$ 5.49
9/14/17	31	19	$ 63	19	$ 60	19	$ 123	$ 5.63
10/11/17	27	3	$ 25	3	$ 10	3	$ 35	$ 5.03
11/9/17	29	54	$ 180	54	$ 202	54	$ 382	$ 6.77
12/12/17	33	367	$ 787	367	$ 1,113	367	$ 1,900	$ 5.13
1/18/18	37	651	$ 1,217	651	$ 2,135	651	$ 3,352	$ 5.12
2/12/18	25	601	$ 1,213	601	$ 1,890	601	$ 3,103	$ 5.13
3/13/18	29	374	$ 830	374	$ 1,359	374	$ 2,189	$ 5.81
	360	**2,591**	**$ 5,583**	**2,591**	**$ 8,344**	**2,591**	**$ 13,927**	$ 5.29

Annual Natural Gas Cost **$ 13,927** **/year**
Annual Natural Gas Consumption **2,591** **mcf**
Average Unit Cost per mcf: **$ 5.288** **$ 5.13** **/ Mbtu**



Note:

NATURAL GAS CONSUMPTION AND COST ANALYSIS

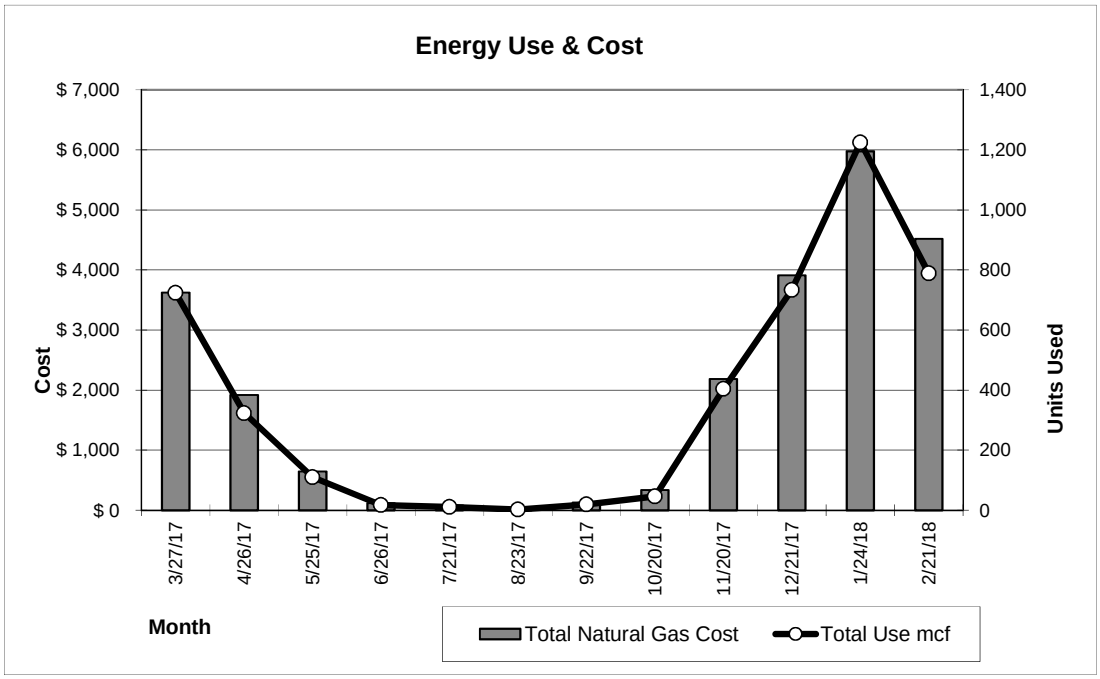
Client: Hamburg Highway
Address: 50 West Avenue
33,036 s.f.
137,349 Btu/s.f./Yr
$ 0.71 /s.f.

Natural Gas
Use & Cost Summary:

Utility: **National Fuel**
Account # : ending in 8805,
Rate: **TC 1.0 COMM: < 5 MMCF**
Billing unit: mcf
BTU/Unit: **1,030,000**
Meter Charge: **$ 18.90** / month
Supplier: **Fluent Energy**

Month Ending	# Days	Utility Charges mcfs	Utility Charges Cost	Supplier Charges mcfs	Supplier Charges Cost	**Total Use mcf**	**Total Natural Gas Cost**	Average $/mcf
3/27/17	30	723	$ 1,596	723	$ 2,025	723	$ 3,622	$ 4.98
4/26/17	30	324	$ 823	324	$ 1,094	324	$ 1,917	$ 5.87
5/25/17	29	110	$ 266	110	$ 380	110	$ 646	$ 5.70
6/26/17	32	17	$ 59	17	$ 59	17	$ 118	$ 5.88
7/21/17	25	11	$ 44	11	$ 36	11	$ 80	$ 5.66
8/23/17	33	3	$ 23	3	$ 9	3	$ 31	$ 4.66
9/22/17	30	20	$ 67	20	$ 63	20	$ 130	$ 5.65
10/20/17	28	46	$ 171	46	$ 167	46	$ 338	$ 6.89
11/20/17	31	404	$ 863	404	$ 1,322	404	$ 2,186	$ 5.36
12/21/17	31	734	$ 1,542	734	$ 2,368	734	$ 3,910	$ 5.30
1/24/18	34	1,225	$ 2,200	1,225	$ 3,779	1,225	$ 5,980	$ 4.87
2/21/18	28	789	$ 1,645	789	$ 2,875	789	$ 4,520	$ 5.71
	361	**4,405**	**$ 9,300**	**4,405**	**$ 14,178**	**4,405**	**$ 23,478**	$ 5.28

Annual Natural Gas Cost **$ 23,478** **/year**
Annual Natural Gas Consumption **4,405** **mcf**
Average Unit Cost per mcf: **$ 5.278** **$ 5.12** **/ Mbtu**



Note:

NATURAL GAS CONSUMPTION AND COST ANALYSIS

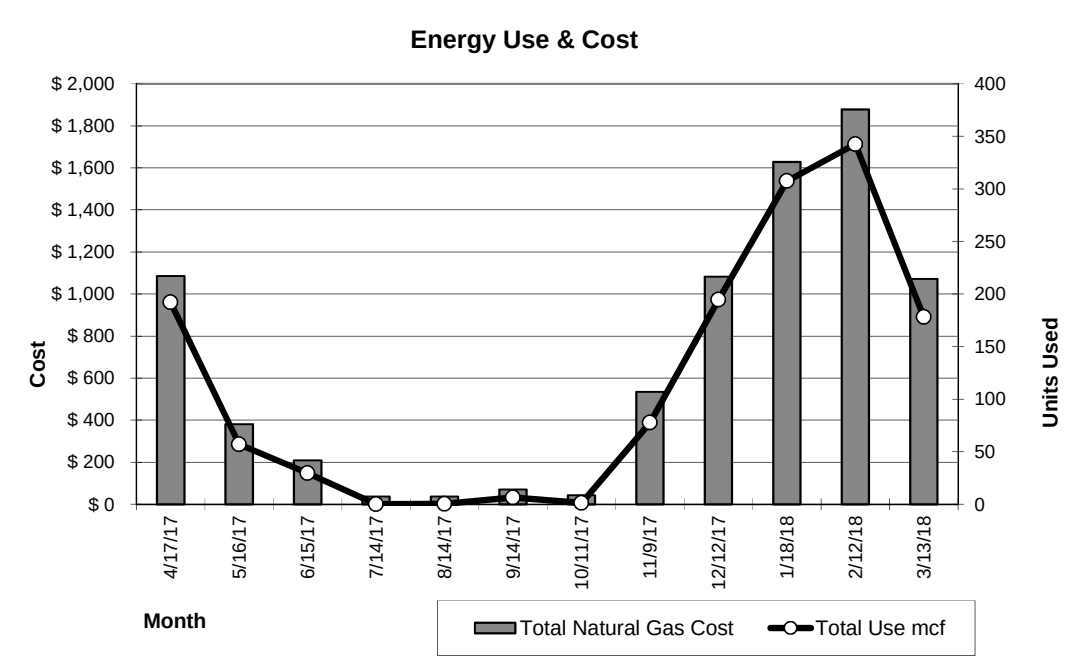
Client: Angola Highway
Address: 8752 Delameter Rd
17,788 s.f.
80,348 Btu/s.f./Yr
$ 0.45 /s.f.

Natural Gas
Use & Cost Summary:

Utility: **National Fuel**
Account # : ending in 5608, 1607
Rate: **TC 1.0 COMM: < 5 MMCF**
Billing unit: mcf
BTU/Unit: **1,030,000**
Meter Charge: **$ 37.80** / month
Supplier: **Fluent Energy**

Month Ending	# Days	Utility Charges mcfs	Utility Charges Cost	Supplier Charges mcfs	Supplier Charges Cost	**Total Use mcf**	**Total Natural Gas Cost**	Average $/mcf
4/17/17	30	192	$ 507	192	$ 579	192	$ 1,086	$ 5.45
5/16/17	29	57	$ 183	57	$ 198	57	$ 381	$ 6.01
6/15/17	30	30	$ 106	30	$ 103	30	$ 208	$ 5.78
7/14/17	29	0	$ 36	0	$ 1	0	$ 36	($ 6.70)
8/14/17	31	0	$ 36	0	$ 1	0	$ 37	($ 3.43)
9/14/17	31	6	$ 50	6	$ 21	6	$ 70	$ 5.11
10/11/17	27	1	$ 38	1	$ 5	1	$ 42	$ 3.25
11/9/17	29	78	$ 256	78	$ 279	78	$ 535	$ 6.41
12/12/17	33	195	$ 479	195	$ 602	195	$ 1,082	$ 5.37
1/18/18	37	308	$ 640	308	$ 989	308	$ 1,629	$ 5.17
2/12/18	25	343	$ 743	343	$ 1,135	343	$ 1,878	$ 5.37
3/13/18	29	178	$ 464	178	$ 607	178	$ 1,071	$ 5.80
	360	**1,388**	**$ 3,536**	**1,388**	**$ 4,520**	**1,388**	**$ 8,056**	$ 5.48

Annual Natural Gas Cost **$ 8,056** **/year**
Annual Natural Gas Consumption **1,388** **mcf**
Average Unit Cost per mcf: **$ 5.479** **$ 5.32** **/ Mbtu**



Note:

NATURAL GAS CONSUMPTION AND COST ANALYSIS

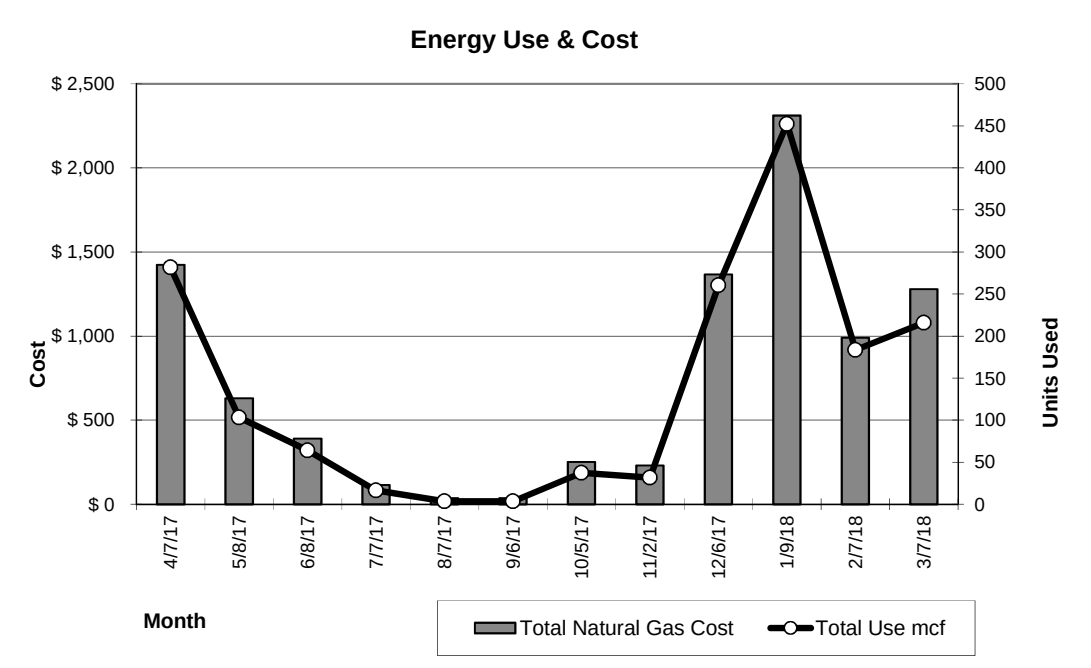
Client: Collins Highway
Address: 14020 Jennings Road
17,850 s.f.
95,424 Btu/s.f./Yr
$ 0.51 /s.f.

Natural Gas
Use & Cost Summary:

Utility: **National Fuel**
Account # : ending in 6605,
Rate: **TC 1.0 COMM: < 5 MMCF**
Billing unit: mcf
BTU/Unit: **1,030,000**
Meter Charge: **$ 18.90** / month
Supplier: **Fluent Energy**

Month Ending	# Days	Utility Charges mcfs	Utility Charges Cost	Supplier Charges mcfs	Supplier Charges Cost	**Total Use mcf**	**Total Natural Gas Cost**	Average $/mcf
4/7/17	30	282	$ 619	282	$ 805	282	$ 1,424	$ 4.99
5/8/17	31	103	$ 271	103	$ 359	103	$ 630	$ 5.93
6/8/17	31	64	$ 170	64	$ 222	64	$ 391	$ 5.82
7/7/17	29	16	$ 57	16	$ 57	16	$ 114	$ 5.82
8/7/17	31	4	$ 25	4	$ 12	4	$ 37	$ 4.94
9/6/17	30	4	$ 25	4	$ 12	4	$ 36	$ 4.86
10/5/17	29	37	$ 127	37	$ 123	37	$ 251	$ 6.20
11/2/17	28	32	$ 113	32	$ 118	32	$ 231	$ 6.67
12/6/17	34	260	$ 571	260	$ 796	260	$ 1,367	$ 5.18
1/9/18	34	452	$ 846	452	$ 1,467	452	$ 2,313	$ 5.07
2/7/18	29	183	$ 404	183	$ 586	183	$ 990	$ 5.30
3/7/18	28	216	$ 502	216	$ 777	216	$ 1,279	$ 5.84
	364	**1,654**	**$ 3,730**	**1,654**	**$ 5,333**	**1,654**	**$ 9,064**	$ 5.34

Annual Natural Gas Cost **$ 9,064** **/year**
Annual Natural Gas Consumption **1,654** **mcf**
Average Unit Cost per mcf: **$ 5.344** **$ 5.19** **/ Mbtu**



Note:

NATURAL GAS CONSUMPTION AND COST ANALYSIS

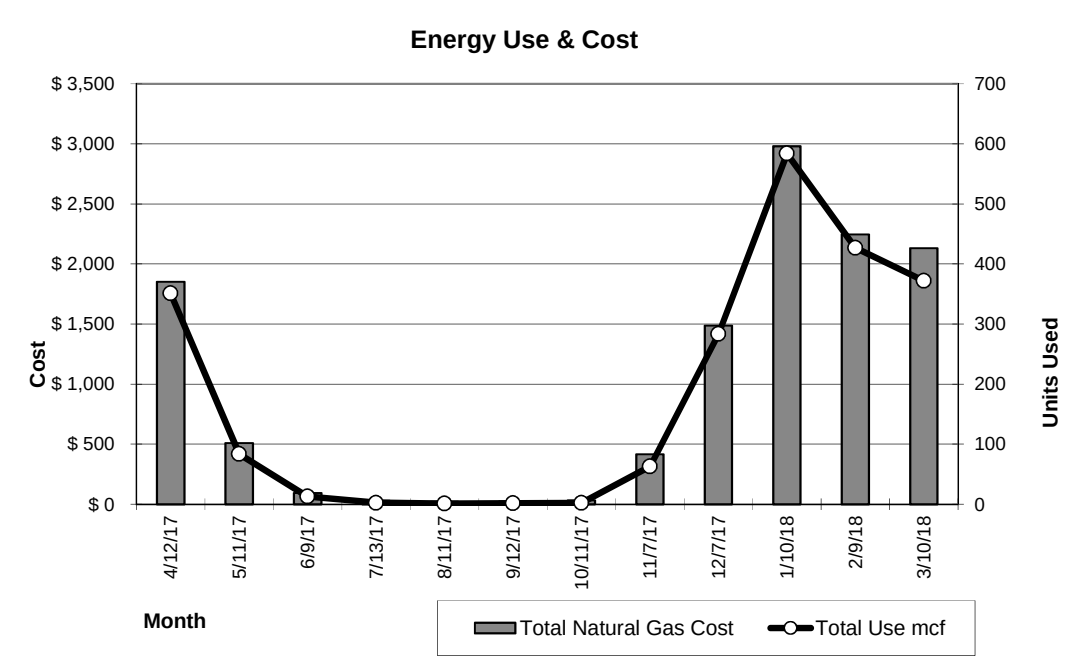
Client: Clarence Highway
Address: 5105 Salt Road
35,482 s.f.
63,413 Btu/s.f./Yr
$ 0.33 /s.f.

Natural Gas
Use & Cost Summary:

Utility: **National Fuel**
Account # : ending in 4705,
Rate: **TC 1.0 COMM: < 5 MMCF**
Billing unit: mcf
BTU/Unit: **1,030,000**
Meter Charge: **$ 18.90** / month
Supplier: **Fluent Energy**

Month Ending	# Days	Utility Charges mcfs	Utility Charges Cost	Supplier Charges mcfs	Supplier Charges Cost	**Total Use mcf**	**Total Natural Gas Cost**	Average $/mcf
4/12/17	30	351	$ 810	351	$ 1,041	351	$ 1,850	$ 5.22
5/11/17	29	84	$ 219	84	$ 290	84	$ 509	$ 5.87
6/9/17	29	13	$ 48	13	$ 45	13	$ 94	$ 5.74
7/13/17	34	3	$ 22	3	$ 9	3	$ 30	$ 4.63
8/11/17	29	1	$ 19	1	$ 4	1	$ 23	$ 3.03
9/12/17	32	2	$ 20	2	$ 5	2	$ 25	$ 3.67
10/11/17	29	2	$ 23	2	$ 8	2	$ 32	$ 5.28
11/7/17	27	63	$ 190	63	$ 224	63	$ 415	$ 6.29
12/7/17	30	284	$ 614	284	$ 872	284	$ 1,487	$ 5.18
1/10/18	34	584	$ 1,094	584	$ 1,887	584	$ 2,981	$ 5.07
2/9/18	30	427	$ 860	427	$ 1,386	427	$ 2,246	$ 5.22
3/10/18	29	372	$ 829	372	$ 1,301	372	$ 2,130	$ 5.68
	362	**2,185**	**$ 4,748**	**2,185**	**$ 7,073**	**2,185**	**$ 11,821**	$ 5.31

Annual Natural Gas Cost **$ 11,821** **/year**
Annual Natural Gas Consumption **2,185** **mcf**
Average Unit Cost per mcf: **$ 5.308** **$ 5.15** **/ Mbtu**



Note:

NATURAL GAS CONSUMPTION AND COST ANALYSIS

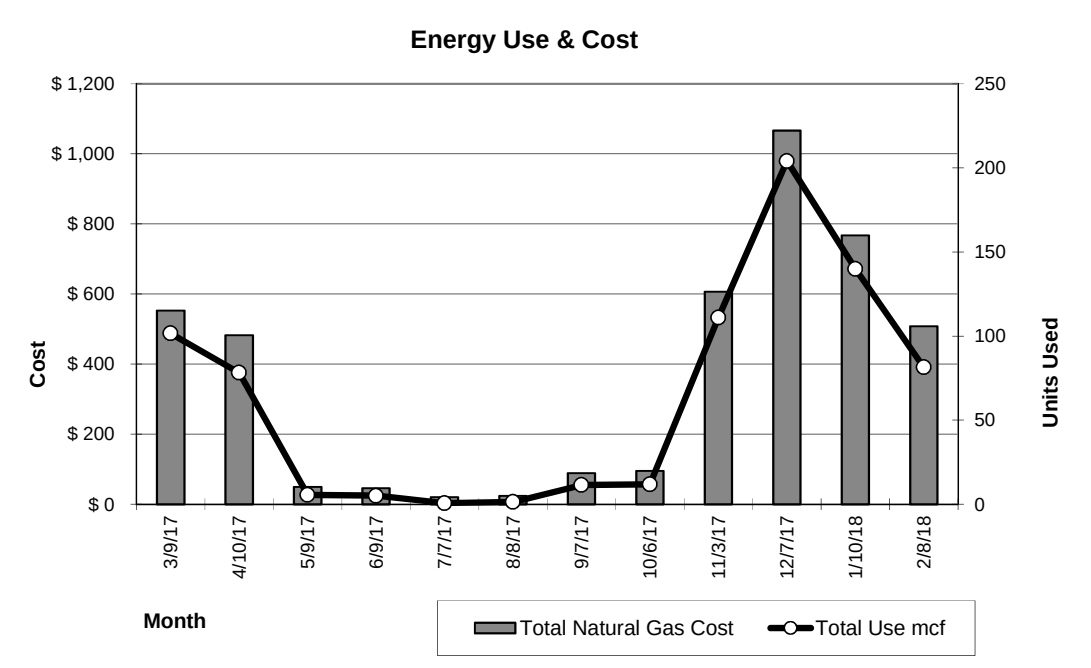
Client: South Protection Hwy
Address: 9988 South Protection Rd.
6,917 s.f.
112,039 Btu/s.f./Yr
$ 0.62 /s.f.

Natural Gas
Use & Cost Summary:

Utility: **National Fuel**
Account # : ending in 1806,
Rate: **TC 1.0 COMM: < 5 MMCF**
Billing unit: mcf
BTU/Unit: **1,030,000**
Meter Charge: **$ 18.90** / month
Supplier: **0**

Month Ending	# Days	Utility Charges mcfs	Utility Charges Cost	Supplier Charges mcfs	Supplier Charges Cost	**Total Use mcf**	**Total Natural Gas Cost**	Average $/mcf
3/9/17	30	102	$ 256	102	$ 297	102	$ 553	$ 5.26
4/10/17	32	78	$ 211	78	$ 272	78	$ 483	$ 5.93
5/9/17	29	6	$ 30	6	$ 19	6	$ 49	$ 5.39
6/9/17	31	5	$ 28	5	$ 18	5	$ 46	$ 5.35
7/7/17	28	1	$ 18	1	$ 2	1	$ 20	$ 2.06
8/8/17	32	1	$ 19	1	$ 5	1	$ 24	$ 3.36
9/7/17	30	12	$ 51	12	$ 38	12	$ 89	$ 6.09
10/6/17	29	12	$ 51	12	$ 44	12	$ 95	$ 6.41
11/3/17	28	111	$ 267	111	$ 340	111	$ 607	$ 5.30
12/7/17	34	204	$ 407	204	$ 660	204	$ 1,066	$ 5.13
1/10/18	34	140	$ 316	140	$ 451	140	$ 767	$ 5.35
2/8/18	29	82	$ 218	82	$ 290	82	$ 508	$ 6.01
	366	**752**	**$ 1,872**	**752**	**$ 2,436**	**752**	**$ 4,308**	$ 5.42

Annual Natural Gas Cost **$ 4,308** **/year**
Annual Natural Gas Consumption **752** **mcf**
Average Unit Cost per mcf: **$ 5.424** **$ 5.27** **/ Mbtu**



Note:

NATURAL GAS CONSUMPTION AND COST ANALYSIS

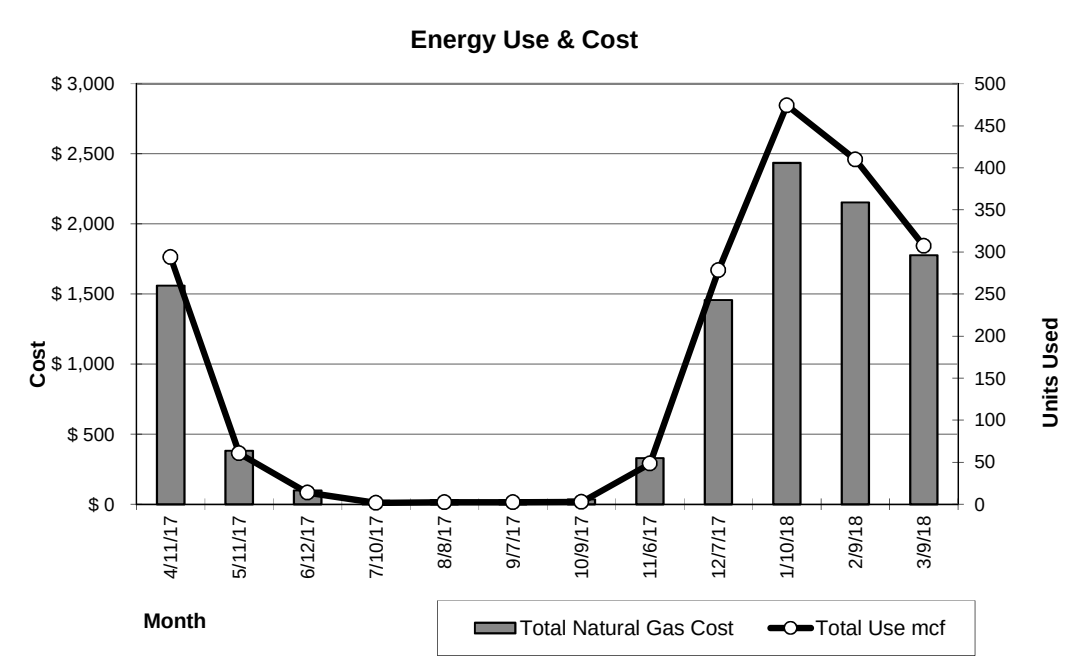
Client: Tonawanda Highway
Address: 1870 Military Road
17,538 s.f.
111,340 Btu/s.f./Yr
$ 0.59 /s.f.

Natural Gas
Use & Cost Summary:

Utility: **National Fuel**
Account # : ending in 0101,
Rate: **TC 1.0 COMM: < 5 MMCF**
Billing unit: mcf
BTU/Unit: **1,030,000**
Meter Charge: **$ 18.90** / month
Supplier: **Fluent Energy**

Month Ending	# Days	Utility Charges mcfs	Utility Charges Cost	Supplier Charges mcfs	Supplier Charges Cost	**Total Use mcf**	**Total Natural Gas Cost**	Average $/mcf
4/11/17	30	294	$ 692	294	$ 867	294	$ 1,559	$ 5.24
5/11/17	30	61	$ 171	61	$ 211	61	$ 382	$ 5.99
6/12/17	32	14	$ 51	14	$ 48	14	$ 99	$ 5.76
7/10/17	28	2	$ 20	2	$ 6	2	$ 26	$ 4.00
8/8/17	29	2	$ 21	2	$ 8	2	$ 29	$ 4.40
9/7/17	30	3	$ 22	3	$ 8	3	$ 30	$ 4.44
10/9/17	32	3	$ 25	3	$ 9	3	$ 34	$ 5.63
11/6/17	28	49	$ 153	49	$ 175	49	$ 328	$ 6.37
12/7/17	31	278	$ 601	278	$ 855	278	$ 1,456	$ 5.17
1/10/18	34	474	$ 903	474	$ 1,533	474	$ 2,437	$ 5.10
2/9/18	30	410	$ 824	410	$ 1,330	410	$ 2,154	$ 5.21
3/9/18	28	307	$ 694	307	$ 1,082	307	$ 1,776	$ 5.72
	362	**1,896**	**$ 4,178**	**1,896**	**$ 6,132**	**1,896**	**$ 10,310**	$ 5.32

Annual Natural Gas Cost **$ 10,310** **/year**
Annual Natural Gas Consumption **1,896** **mcf**
Average Unit Cost per mcf: **$ 5.319** **$ 5.16** **/ Mbtu**



Note:

8. PROJECT COSTS

Because, Erie County is considering entering into an energy performance contract more accurate project costs where required. A local mechanical contractor was used for estimating the implementation costs of each measure. Below is the table of costs provided.

Building	FIM #	ECM Description	Est. Material Costs	Est. Labor Costs	Total Cost
Jesse Nash Health Center	1	Lighting Interior Retrofit	$44,505	$66,757	$111,262
Jesse Nash Health Center	1	Lighting Interior Controls			
Jesse Nash Health Center	2	Lighting Exterior Retrofit	$837	$1,256	$2,093
Jesse Nash Health Center	30	Pipe Insulation	$267	$400	$667
Jesse Nash Health Center	4	Replace Hvac System	$668,448	$1,002,671	$1,671,119
Jesse Nash Health Center	36	Vending Machine Occupancy Controls	$273	$409	$682
Jesse Nash Health Center	3	Weatherization	$8,544	$12,816	$21,360
Sheriff's/BOE	1	120 West Eagle Interior Retrofit	$10,424	$15,635	$26,059
Sheriff's/BOE	1	120 West Eagle Interior Contols			
Sheriff's/BOE	1	134 West Eagle Interior Retrofit	$40,691	$61,037	$101,728
Sheriff's/BOE	1	134 West Eagle Interior Controls			
Sheriff's/BOE	5	134 W. Eagle Night Setback With Steam Valves	$30,011	$45,017	$75,028
Sheriff's/BOE	6	Install Exhaust Fan Controls 134 W Eagle	$14,059	$21,088	$35,147
Sheriff's/BOE	7	Steam Traps	$23,056	$34,585	$57,641
Sheriff's/BOE	8	Removable Insulation Blankets	$9,186	$13,779	$22,966
Holding Center	1	Holding Center Interior Retrofit	$171,397	$257,096	$428,493
Holding Center	1	Holding Center Interior Controls			
Holding Center	33	Replace Chiller	$153,872	$230,808	$384,680
Holding Center	34	Install Condensing Domestic Hot Water Heaters	$80,123	$120,185	$200,309
Holding Center	9	Cap Abandon Ahu Roof Penetration	$4,897	$7,345	$12,242
Holding Center	10	Insulate Steam Pipes	$860	$1,289	$2,149
Holding Center	30	Pipe Insulation	$1,863	$2,795	$4,658
Holding Center	39	Extend Ddc To Uncontrolled Equipment/Pneumatics	$581,436	$872,155	$1,453,591
Holding Center	43	Add Variable Speed Drive To Hot Water Pump	$26,465	$39,698	$66,163
Holding Center	48	Add Variable Speed Drive To Chilled Water Pumps	$13,602	$20,403	$34,005
Holding Center	36	Vending Machine Occupancy Controls	$954	$1,432	$2,386
Holding Center	37	Open Balance Valve	$1,129	$1,694	$2,823
Holding Center	7	Steam Traps	$26,168	$39,252	$65,420
Holding Center	3	Holding Center Weatherization	$6,989	$10,483	$17,472
Holding Center	42	Kitchen Hood Controls	$19,748	$29,622	$49,371
Holding Center	44	Walk-In Refrigeration	$8,907	$13,360	$22,267
Sheriff's	1	10 Delaware Interior Retrofit	$3,819	$5,728	$9,547
Sheriff's	1	10 Delaware Interior Controls			
Sheriff's	2	10 Delware Exterior Retrofit	$685	$1,027	$1,712
Sheriff's	7	Steam Traps	$1,785	$2,678	$4,463
Sheriff's	3	10 Delaware Weatherization	$333	$500	$833
Holding Center	35	Add Heat Recovery	$57,243	$85,865	$143,108
Holding Center	46	Install Vfds On Supply/Return Fans	$13,543	$20,314	$33,857
Holding Center	6	Install Exhaust Fan Controls Holding Center	$5,276	$7,914	$13,191
Holding Center	11	Kitchen Booster Heater	$9,665	$14,497	$24,161

Rath Building	12	Ah-10 Controls	$13,873	$20,809	$34,682
Rath Building	13	Snow Melt System Controls	$57,956	$86,934	$144,890
Rath Building	14	Optimal Start	$1,482	$2,223	$3,706
Rath Building	43	Add Variable Speed Drive To Hot Water Pump	$32,860	$49,290	$82,150
Rath Building	15	Heating Season Chilled Water Pump Controls	$17,489	$26,233	$43,722
Rath Building	46	Add Ac Unit Return Fan Vfds	$32,572	$48,858	$81,430
Rath Building	16	Reducing Speed Of Ac-1 & Ac-2 Unit Fans	$1,541	$2,312	$3,854
Rath Building	17	Add Controls To Vestibule Electric Heaters	$6,121	$9,182	$15,303
Rath Building	41	Holiday Scheduling	$1,482	$2,223	$3,706
Rath Building	40	Extend Ddc To Dhw Pumps	$2,371	$3,557	$5,928
Rath Building	18	Add Vfd To Electric Vault Fan	$6,582	$9,873	$16,456
Rath Building	36	Vending Machine Occupancy Controls	$545	$818	$1,364
Rath Building	19	Chiller Plant Optimization	$102,855	$154,283	$257,138
Rath Building	3	Weatherization	$13,240	$19,860	$33,100
Rath Building	32	Install Premium Efficiency Motors	$4,743	$7,114	$11,857
Rath Building	20	Install Ventilation Controls Ahu-11	$11,679	$17,519	$29,198
Fire Training Academy	1	Lighting Interior Retrofit	$36,963	$55,444	$92,407
Fire Training Academy	1	Lighting Interior Controls			
Fire Training Academy	2	Lighting Exterior Retrofit	$7,032	$10,548	$17,580
Fire Training Academy	21	Replace Rooftop Units	$41,244	$61,865	$103,109
Fire Training Academy	22	Install Condensing Unit Heaters	$13,899	$20,849	$34,748
Fire Training Academy	23	Replace Air Rotation Unit	$35,968	$53,952	$89,921
Fire Training Academy	36	Vending Machine Occupancy Controls	$273	$409	$682
Fire Training Academy	6	Install Ventilation Controls	$196	$293	$489
Fire Training Academy	45	Ventilate Based On Occupancy	$6,493	$9,740	$16,233
Fire Training Academy	40	Extend Ddc To Dhw Pumps	$1,690	$2,534	$4,224
Fire Training Academy	3	Weatherization	$23,435	$35,152	$58,587
Hazmat Storage	38	Improve Temperature Control Hazmat	$311	$467	$778
New Storage	38	Improve Temperature Control New Storage	$734	$1,101	$1,835
Youth Detention	1	Lighting Interior Retrofit	$51,547	$77,321	$128,868
Youth Detention	1	Lighting Interior Controls			
Youth Detention	2	Lighting Exterior Retrofit	$11,995	$17,993	$29,988
Youth Detention	31	Install More Efficient Boiler	$53,195	$79,792	$132,987
Youth Detention	11	Kitchen Booster Heater	$10,392	$15,588	$25,981
Youth Detention	34	Install Condensing Domestic Hot Water Heater	$5,254	$7,881	$13,136
Youth Detention	30	Pipe Insulation	$504	$756	$1,260
Youth Detention	37	Open Isolation Valve	$1,129	$1,694	$2,823
Youth Detention	45	Ventilate Based On Occupancy	$4,031	$6,047	$10,078
Youth Detention	6	Install Ventilation Controls	$4,565	$6,847	$11,412
Youth Detention	3	Weatherization	$9,094	$13,641	$22,734
Youth Detention	42	Kitchen Hood Controls	$20,771	$31,157	$51,928
Youth Detention	44	Walk-in Refrigeration	$4,441	$6,661	$11,102

Family Court	24	Replace Snow Melt Slab Sensors	$57,956	$86,934	$144,890
Family Court	14	Optimal Start	$1,245	$1,868	$3,113
Family Court	43	Add Variable Speed Drives To Hot Water Pumps	$30,157	$45,236	$75,393
Family Court	41	Holiday Scheduling	$1,245	$1,868	$3,113
Family Court	40	Extend Ddc To Dhw Pumps	$1,807	$2,710	$4,517
Family Court	3	Weatherization	$8,958	$13,437	$22,395
Family Court	34	Install Condensing Domestic Hot Water Heater	$6,994	$10,491	$17,485
Family Court	30	Pipe Insulation	$445	$667	$1,112
Family Court	37	Open Balance Valve	$1,186	$1,779	$2,964
Family Court	25	Close Vav By Occupancy & Sp Reset	$3,794	$5,691	$9,486
Public Safety Campus	1	Lighting Interior Retrofit	$162,326	$243,490	$405,816
Public Safety Campus	2	Lighting Exterior Retrofit	$3,882	$5,823	$9,705
Public Safety Campus	33	Replace Chiller	$194,457	$291,685	$486,141
Public Safety Campus	36	Vending Machine Occupancy Controls	$409	$614	$1,023
Public Safety Campus	3	Weatherization	$5,502	$8,252	$13,754
Public Safety Campus	26	Replace Dx With Chilled Water	$64,819	$97,228	$162,047
Correctional Facility	1	Lighting Interior Retrofit	$172,513	$258,769	$431,282
Correctional Facility	1	Lighting Interior Controls			
Correctional Facility	2	Lighting Exterior Retrofit	$23,124	$34,686	$57,810
Correctional Facility	32	Install Premium Efficiency Motors	$1,694	$2,541	$4,235
Correctional Facility	37	Open Triple Duty Valve	$1,186	$1,779	$2,964
Correctional Facility	43	Add Variable Speed Drive To Hot Water Pump	$15,926	$23,888	$39,814
Correctional Facility	40	Extend Ddc To Dhw Pumps	$3,498	$5,247	$8,744
Correctional Facility	45	Ventilate Based On Occupancy Ahu 7	$14,059	$21,088	$35,147
Correctional Facility	25	Close Vav By Occupancy & Sp Reset Ahu 5&6	$7,340	$11,010	$18,350
Correctional Facility	36	Vending Machine Occupancy Controls	$409	$614	$1,023
Correctional Facility	3	Weatherization	$5,502	$8,252	$13,754
Correctional Facility	42	Kitchen Hood Controls	$16,334	$24,501	$40,835
Correctional Facility	44	Walk-In Refrigeration	$9,869	$14,804	$24,674
Correctional Facility	38	Improve Temp Control 2nd Floor Fin	$7,292	$10,938	$18,230
Law Library	1	Lighting Interior Retrofit	$26,624	$39,936	$66,560
Law Library	1	Lighting Interior Controls			
Law Library	31	Install More Efficient Boiler	$19,921	$29,882	$49,803
Law Library	21	Replace Rooftop Units	$76,294	$114,441	$190,736
Law Library	45	Ventilate Based On Occupancy	$8,469	$12,704	$21,173
Law Library	40	Extend Ddc To Dhw Pumps	$1,609	$2,414	$4,023
Law Library	3	Weatherization	$4,301	$6,452	$10,753
Aurora Barn	1	Lighting Interior Retrofit	$24,442	$36,663	$61,105
Aurora Barn	1	Lighting Interior Controls			
Aurora Barn	2	Lighting Exterior Retrofit	$2,712	$4,068	$6,781
Aurora Barn	22	Install Condensing Unit Heaters	$9,572	$14,358	$23,930
Aurora Barn	36	Vending Machine Occupancy Controls	$273	$409	$682
Aurora Barn	38	Improve Temperature Control	$3,468	$5,202	$8,670
Aurora Barn	6	Install Ventilation Controls	$148	$222	$371
Aurora Barn	3	Weatherization	$22,685	$34,027	$56,711

Old County Hall	1	Old County Hall Lighting Interior Retrofit	$154,348	$231,522	$385,870
Old County Hall	1	Old County Hall Lighting Interior Controls			
Old County Hall	27	Add Hw Heat Exchanger To Electric Dhw Heater	$9,610	$14,415	$24,026
Old County Hall	28	Install Gravity Relief Dampers	$6,311	$9,467	$15,779
Health Mall	1	Lighting Interior Retrofit	$22,678	$34,017	$56,695
Health Mall	30	Pipe Insulation	$254	$381	$635
Health Mall	39	Extend Ddc To Uncontrolled Equipment	$11,405	$17,108	$28,513
Health Mall	36	Vending Machine Occupancy Controls	$273	$409	$682
Health Mall	3	Weatherization	$3,324	$4,986	$8,310
Health Mall	40	Extend Ddc To Dhw Pumps	$3,501	$5,251	$8,752
Erie County Court(Annex)	1	Erie County Court (Annex) Lighting Interior Retrofit	$262,951	$394,427	$657,378
Erie County Court(Annex)	1	Erie County Court (Annex) Lighting Interior Controls			
Erie County Court(Annex)	31	Install More Efficient Boiler	$105,903	$158,854	$264,757
Erie County Court(Annex)	34	Install Condensing Domestic Hot Water Heater	$18,990	$28,485	$47,476
Erie County Court(Annex)	30	Pipe Insulation	$978	$1,467	$2,445
Erie County Court(Annex)	40	Extend Ddc To Dhw Pumps	$2,431	$3,646	$6,077
Erie County Court(Annex)	36	Vending Machine Occupancy Controls	$545	$818	$1,364
Erie County Court(Annex)	37	Open Triple Duty Valve	$1,129	$1,694	$2,823
Erie County Court(Annex)	3	Weatherization	$7,090	$10,636	$17,726
Erie County Court(Annex)	35	Add Heat Recovery To Ahu-Gb And Ahu-35N	$61,904	$92,856	$154,760
Casino	1	Lighting Interior Retrofit	$7,998	$11,998	$19,996
Casino	2	Lighting Exterior Retrofit	$7,025	$10,538	$17,564
Casino	30	Pipe Insulation	$563	$845	$1,408
Casino	38	Improve Temperature Control	$296	$445	$741
Casino	36	Vending Machine Occupancy Controls	$136	$205	$341
Casino	3	Weatherization	$23,026	$34,539	$57,565
Park Office	1	Lighting Interior Retrofit	$8,376	$12,564	$20,940
Park Office	2	Lighting Exterior Retrofit	$640	$960	$1,599
Park Office	31	Install More Efficient Boiler	$11,846	$17,769	$29,615
Park Office	30	Pipe Insulation	$504	$756	$1,260
Park Office	38	Improve Temperature Control	$193	$289	$482
Radio Repair Building	1	Lighting Interior Retrofit	$10,316	$15,474	$25,790
Radio Repair Building	31	Install More Efficient Boiler	$10,482	$15,724	$26,206
Radio Repair Building	38	Improve Temperature Control	$385	$578	$963
Truck Maint. Shop	1	Lighting Interior Retrofit	$4,651	$6,976	$11,627
Truck Maint. Shop	38	Improve Temperature Control	$193	$289	$482
Truck Maint. Shop	31	Install More Efficient Boiler	$15,238	$22,857	$38,095
Sheriff's Bunker	1	Lighting Interior Retrofit	$14,453	$21,680	$36,133
Sheriff's Bunker	2	Lighting Exterior Retrofit	$1,300	$1,951	$3,251
Sheriff's Bunker	32	Replace Ah Supply Motor	$1,249	$1,873	$3,122
Sheriff's Bunker	32	Replace Exhaust Fans B&C	$2,319	$3,479	$5,799
Sheriff's Bunker	47	Add Controls To Exhaust Fans B&C	$5,869	$8,804	$14,673
Sheriff's Bunker	32	Replace Fan D	$470	$705	$1,175

Harlem District Hwy	1	Lighting Interior Retrofit	$18,706	$28,059	$46,764
Harlem District Hwy	1	Lighting Interior Controls			
Harlem District Hwy	2	Lighting Exterior Retrofit	$623	$934	$1,557
Harlem District Hwy	22	Install Condensing Unit Heaters	$50,371	$75,557	$125,928
Harlem District Hwy Buildings and Grounds	31	Install More Efficient Boiler	$4,648	$6,972	$11,619
Harlem District Hwy Maintenance Shop	29	Install Condensing Furnaces	$5,688	$8,532	$14,220
Harlem District Hwy Maintenance Shop	34	Install Condensing Domestic Hot Water Heater	$1,659	$2,489	$4,148
Harlem District Hwy	30	Pipe Insulation	$480	$720	$1,200
Harlem District Hwy	38	Improve Temperature Control	$3,040	$4,560	$7,600
Harlem District Hwy	3	Weatherization	$23,395	$35,093	$58,489
East Concord Hwy	1	Lighting Interior Retrofit	$22,809	$34,213	$57,022
East Concord Hwy	1	Lighting Interior Controls			
East Concord Hwy	2	Lighting Exterior Retrofit	$2,600	$3,900	$6,501
East Concord Hwy	22	Install Condensing Unit Heaters	$36,981	$55,471	$92,452
East Concord Hwy Maintenance Shop	31	Install More Efficient Boiler	$4,715	$7,073	$11,788
East Concord Hwy	30	Pipe Insulation	$847	$1,270	$2,117
East Concord Hwy Vehicle Storage	36	Vending Machine Occupancy Controls	$273	$409	$682
East Concord Hwy Maintenance Shop	40	Install Aquastat To Control Dhw Recirc Pump	$565	$847	$1,412
East Concord Hwy Vehicle Storage	6	Install Ventilation Controls	$148	$222	$371
East Concord Hwy	3	Weatherization	$18,348	$27,522	$45,870
East Concord Hwy Vehicle Storage	38	Improve Temperature Control Office/Storage Only	$565	$847	$1,412
Hamburg Hwy	1	Lighting Interior Retrofit	$14,043	$21,064	$35,107
Hamburg Hwy	1	Lighting Interior Controls			
Hamburg Hwy	2	Lighting Exterior Retrofit	$815	$1,223	$2,038
Hamburg Hwy	22	Install Condensing Unit Heaters	$72,254	$108,382	$180,636
Hamburg Hwy Maintenance Shop	30	Pipe Insulation	$282	$423	$706
Hamburg Hwy	38	Improve Temperature Control	$2,312	$3,468	$5,780
Hamburg Hwy Maintenance Shop	36	Vending Machine Occupancy Controls	$273	$409	$682
Hamburg Hwy	3	Weatherization	$11,680	$17,520	$29,201
Angola Hwy	1	Lighting Interior Retrofit	$7,329	$10,994	$18,323
Angola Hwy	2	Lighting Exterior Retrofit	$1,442	$2,163	$3,605
Angola Hwy	38	Improve Temperature Control	$2,119	$3,179	$5,299
Angola Hwy	3	Weatherization	$14,216	$21,324	$35,540
Collins Hwy	1	Lighting Interior Retrofit	$7,531	$11,296	$18,826
Collins Hwy	1	Lighting Interior Controls			
Collins Hwy	2	Lighting Exterior Retrofit	$1,433	$2,150	$3,584
Collins Hwy	22	Install Condensing Unit Heaters	$22,939	$34,409	$57,348
Collins Hwy Maintenance Shop	31	Install More Efficient Boiler	$4,782	$7,174	$11,956
Collins Hwy Maintenance Shop	30	Pipe Insulation	$706	$1,059	$1,764
Collins Hwy	38	Improve Temperature Control	$918	$1,376	$2,294
Collins Hwy	3	Weatherization	$12,739	$19,109	$31,849
Clarence Hwy	1	Lighting Interior Retrofit	$28,842	$43,263	$72,105
Clarence Hwy	1	Lighting Interior Controls			
Clarence Hwy	2	Lighting Exterior Retrofit	$1,630	$2,445	$4,074
Clarence Hwy	22	Install Condensing Unit Heaters	$41,966	$62,949	$104,915
Clarence Hwy Maintenance Shop	29	Install Condensing Furnaces	$3,414	$5,121	$8,536
Clarence Hwy Maintenance Shop	34	Install Condensing Domestic Hot Water Heater	$6,872	$10,309	$17,181
Clarence Hwy Maintenance Shop	30	Pipe Insulation	$311	$466	$776
Clarence Hwy	38	Improve Temperature Control	$1,906	$2,858	$4,764
Clarence Hwy Maintenance Shop	6	Install Ventilation Controls	$148	$222	$371
Clarence Hwy	3	Weatherization	$7,361	$11,041	$18,402
South Protection Hwy	1	Lighting Interior Retrofit	$3,310	$4,966	$8,276
South Protection Hwy	2	Lighting Exterior Retrofit	$1,352	$2,028	$3,380
South Protection Hwy	22	Install Condensing Unit Heaters	$6,950	$10,424	$17,374
South Protection Hwy	38	Improve Temperature Control	$988	$1,482	$2,470
South Protection Hwy	3	Weatherization	$10,735	$16,103	$26,838
Tonawanda Hwy	1	Lighting Interior Retrofit	$7,324	$10,986	$18,310
Tonawanda Hwy	1	Lighting Interior Controls			
Tonawanda Hwy	2	Lighting Exterior Retrofit	$1,177	$1,765	$2,942
Tonawanda Hwy	22	Install Condensing Unit Heaters	$29,981	$44,972	$74,953
Tonawanda Hwy	38	Improve Temperature Control	$1,553	$2,329	$3,882
Tonawanda Hwy	3	Weatherization	$14,805	$22,208	$37,013
			$ 5,064,109	**$ 7,596,164**	**$ 12,660,274**

9. LOAN SUBSIDIES AND INCENTIVES

AVAILABLE FUNDING SOURCES

The success of this Energy Study depends entirely upon the implementation of its recommendations. To assist and encourage the implementation of Energy Conservation Measures, the following sources of full or partial funding have been identified.

Methods of Funding ECM's

There are a number of options available to fund the recommendations contained in this report. Among these are:

Full Financing. There are a number of ways to finance the entire cost of the energy conservation project. Among these are:

- Capital Budget. The measures could be funded entirely through the annual capital budget. The disadvantage of this approach is that the ECM's must compete with other projects and capital dollars for any given year are limited. This approach may require the project to be split into a number of implementation phases in order to spread the expense out over multiple budget years.
- Leasing of Proceeds. A lease is a non-cancelable contract extended over a fixed period of time. Leasing allows 100% financing of all ECM's and conserves capital for other important facility projects. Other advantages of a lease are: flexible terms, full use without ownership, obsolescence protection, creates a new credit source and can act as hedge against inflation. This process allows the energy conservation project to be funded through savings realized in the client's operating budget.
- Bank Loan. This type of financial instrument pays project costs through regular installments. A loan results in direct ownership of installed measures and allows depreciation of them. Drawbacks to a loan are: capitalizes equipment relatively short term, exhausts credit lines, covenant restrictions and may require compensation balances, down payments and origination fees.
- Performance Contract. There are companies that specialize in implementing and financing Energy Conservation Measures. These are Energy Service Companies (ESCOs) or Performance Contractors. Depending on the specific needs of the owners, they may finance the cost of implementation of the ECMs and even guarantee the savings. This way the owner may avoid any up-front expenses and pay for the improvements to the property or equipment from the proceeds saved on energy consumption over a period of time without extending their credit with a financial institution.

Partial Financing. There are a number of programs that offer partial funding of projects, based on the type of measure or the type of energy being saved.

- Utility Incentives. Electric utilities periodically offer incentives on various measures that save electricity or install energy efficient electric technology. Natural gas utilities also may offer incentives for equipment replacements that conserve natural gas.
- Additional NYSERDA Assistance Certain projects may qualify for additional funding from NYSERDA. Generally, these projects have implementation costs greater than $50,000. For information on the current NYSERDA programs, visit www.nyserda.ny.gov/All-Programs.

10. APPENDIX A (ENERGY CALCULATIONS)

CALCULATIONS FOR IMPACT OF REDUCED LIGHTING ON HEATING AND AIR CONDITIONING

FIM 1.1

Client: Jesse Nash Health Center
Address: 608 William

INPUT DATA:

	Heating Energy		Cooling Energy	
Fuel:	**Natural Gas**		**Electric**	
Units:	**mcf**		**kWh**	
Fuel Cost:	**$ 5.643**	per mcf	**$ 0.048**	per kWh
Fuel Conversion Factor:	**1,030,000**	Btu per mcf	**3,412**	Btu per kWh
Efficiency:	**78.0%**		**1.60**	kW/Ton
			90%	of building is air conditioned

	52,383	Lighting Retrofit
	7,471	Installing Sensors
Annual Lighting Savings:	**59,854**	kWh per Year
	12	months per year of lighting operation
	4,988	kwh/month

For **8** months/year the lighting retrofit will impact heating costs
20% of light fixtures are within 10 feet of an exterior wall
For **4** months/year the lighting retrofit will impact cooling costs

CALCULATIONS:

Replacement Natural Gas because of Reduced Lighting Energy

Useful Heat from Lights during the heating season that is no longer available is:

= kwh Lighting Savings per month x No. Months of Heating impact x % of fixtures located near exterior walls

= **7,980 kWh =** 27,229,370 BTU = 34 mcf

Replacement Natural Gas usage

Useful Heat from Lights in kwh x 3412 BTU/kwh / Heating Fuel Conversion Factor / Heating Fuel Efficiency

Replacement Natural Gas Cost = mcf x $per mcf

	Fuel Usage		Fuel Cost	
Useful Heat from Lights	7,980	kWh	n/a	
Replacement Gas	**(34)**	**mcf**		**per year**

Reduced Air Conditioning because of Reduced Lighting

Reduced Air Conditioning Lighting Load during the cooling season from Lighting that is no longer present is:

= kwh Lighting Savings per month x No. Months Lighting Retrofit will impact cooling costs x % of building cooled

= **17,956 kWh =** 61,266,084 BTU

Reduced Air Conditioning Energy Requirements [kWh] =

Reduce Air Conditioning Lighting Load x (3412 Btu / kWh) x (1 ton-hr / 12,000 Btu) x (1.6 kW / ton)

Reduced Air Conditioning Cost = Reduced Air Conditioning Energy Requirements x Cost per kWh

Reduced Air Conditioning Energy Requirements = 8,169 kWh per year
Reduced Air Conditioning Cost = per year

Net Impact on Heating and Air Conditioning Costs because of Lighting Retrofit

Heating Fuel	**(33.9)**	**mcf**	**$ 0**
Cooling	**8,169**	**‹Wh per yea**	**$ 0**

Project: Erie County
Building: Jesse Nash Health Center
Date: 7/3/2019

Heating System Efficiency:	78%
Average Fuel Cost ($/unit):	$0.55
Correction Factor:	100%

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product	
Single door sweeps	8	3	1/4	1/12	=	0.5	
Single door perimeters	8	17	1/8	1/12	=	1.416666667	
Double door sweeps & astragals	2	20	1/4	1/12	=	0.833333333	
Double door perimeters	2	20	1/8	1/12	=	0.416666667	
Garage door	1	24	1/8	1/12	=	0.25	
Roof top ventilators	12	64	1/6	1/12	=	0.888888889	*assume roof f
Roof/wall joint	1	530	1/8	1/12	=	5.520833333	
Bulkhead	1	11	1/4	1/12	=	0.229166667	
					Total =	10.05555556	ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
1320	50%	0.0449	72	34.25	0.0101	11.6	1153.402

Occupied Infiltration Savings

Specific Heat of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Occupied (%/week)	Heating Season Bin Hours (Occupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	1153.402	37.75	29.76%	4335	103000	78%	751.260

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
1448	50%	0.0449	67	34.14	0.0101	11.6	1218.918

Unoccupied Infiltration Savings

Specific Hear of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Unoccupied (%/week)	Heating Season Bin Hours (Unoccupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	1218.918	32.86	70.24%	4301	103000	78%	1618.328

Totals

Units of Fuel per Year (units/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
2369.587	103000	9.708737864	244.0675064

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
2369.59	$0.55	1298.196699

Total Cost Savings: **$1,298.20**
Cost to Retrofit: **$14,412.00**
Simple Payback: **11.10 years**

Project: Erie County
Building: Jesse Nash Health Center
Date: 7/3/2019

Cooling System Efficiency (kW/ton):	1.14
EER:	10.526
Average Fuel Cost ($/unit):	$0.08

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product	
Single door sweeps	8	3	1/4	1/12	=	0.5	
Single door perimeters	8	17	1/8	1/12	=	1.416666667	
Double door sweeps & astragals	2	20	1/4	1/12	=	0.833333333	
Double door perimeters	2	20	1/8	1/12	=	0.416666667	
Garage door weather-stripping	1	24	1/8	1/12	=	0.25	
Roof top ventilator sealing	12	64	1/6	1/12	=	0.888888889	*assume roof fans open during occupied hours
Roof/wall joint sealing	1	530	1/8	1/12	=	5.520833333	
Bulkhead	1	11	1/4	1/12	=	0.229166667	
					Total =	10.05555556	ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot ^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
1320	50%	0.0449	72	80.14	0.0101	11.6	866.724

Occupied Infiltration Savings Ref: ASHRAE 2013 Fundamentals 18.13 (8)

Air Total Heat Factor C_t	Flow Rate (cfm) Q_{occ}	Average Outdoor Air Enthalpy h	Cooling Supply Air Enthalpy h	% Building Occupied	Cooling Season Bin Hours	% Building Area Cooled	Btu/hrs per Ton	Cooling (kWh)
4.50	866.724	32	22.7	29.76%	1,122	100%	10,526	1380.72

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot ^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
1448	50%	0.0449	77	74.77	0.0101	11.6	812.343

Unoccupied Infiltration Savings Ref: ASHRAE 2013 Fundamentals 18.13 (8)

Air Total Heat Factor C_t	Flow Rate (cfm) Q_{occ}	Average Outdoor Air Enthalpy h	Cooling Supply Air Enthalpy h	% Building Occupied	Cooling Season Bin Hours	% Building Area Cooled	Btu/hrs per Ton	Cooling (kWh)
4.50	812.343	32	22.7	70.24%	449	100%	10,526	1222.278979

Totals

kWh per Year (kWh/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
2603.003	3,412	293.08	8.881446673

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
2603.00	$0.08	205.6372471

Total Cost Savings: **$205.64**
Cost to Retrofit: Cost carried on heating page
Simple Payback: **0.00 years**

CALCULATIONS TO INSTALL MORE EFFICIENT BOILERS

FIM 1.4 Jesse Nash Health Center

INPUT DATA:

Fuel Data	Present	Proposed		Adjustments for Other Measures:		
Type:	Natural Gas	Natural Gas		Fuel Savings		
Units:	**mcf**	**mcf**		**207**	mcf	AHU to RTUs
Unit cost:	**$ 5.643**	**$ 5.643**	/ unit	**172**	mcf	Temp. Control
BTU/unit:	**1,030,000**	**1,030,000**	BTU/ unit	**237**	mcf	Weatherization
				0	mcf	
Present Annual Fuel Consumption:				**0**	mcf	
Present Heating Fuel Use:	1,649	mcf		615	mcf	
% of Bldg. Heated by Boiler:	100%					
Present Boiler Fuel Use:	**1,649**	**mcf**				
			1,260	MMBtu Useful Heat Output (present)		
% of Bldg. Heat Supplied by Boiler:	100%		**497**	MMBTU Saved Other Measures (at Old CE)		
Proposed Boiler Useful Heat Output:	1,260	mcf	764	MMBTU Req'd from New Boilers		

Field Measurments - Boiler Eff.

Boiler #1	Boiler #2	Boiler #3	Boiler #4	**Average Eff.**
79.1%	76.6%	79.4%	78.3%	**78.4%**

	Present Boilers			Proposed		
	B1-4	N/A		New Boiler	New Boiler	
% of Boiler Fuel Use	100%	0%		50%	50%	of useful output
1649 mcf =	1,649	0	**mcf**			
Boiler Firing Rate	1,000	0	kBtuh Input	399	399	kBtuh Input
Combustion Efficiency	78.4%	78.4%		92.5%	92.5%	
Jacket Losses	1.25%	0.00%	of capacity	0.50%	0.50%	of capacity
Combustion Tested?	YES	No				
Avg.Firing rate is =	40%	0%		40%	40%	Avg. Firing Rate
Boiler Capacity	771	0	kBtuh Output	367	367	kBtuh Output
Boiler is hot when OAT<	65	65	°F.	65	65	°F.
Hours/ Yr. Unit is Hot	5,252	0	hrs.	8,760	8,760	hrs.
Off-Cycle Flue Losses	2.50%	0.00%	of capacity	0.25%	0.25%	of capacity
Off-Cycle Hours/Year	1,007	0	hrs.	6,011	6,011	hrs.
Jacket Losses	51	0	MBtu/yr.	16	16	MBtu/yr.
Off-Cycle Flue Losses	19	0	MBtu/yr.	6	6	MBtu/yr.
Useful Heat Output	1,260	0	MBtu/yr.	382	382	MBtu/yr.
	1,260	MBtu/yr.		764	MBtu/yr.	
37,500 sq.ft. served by boilers	27	btu input/sq.ft.		21	btu input/sq.ft.	
	74.2%	AFUE		424	424	mcf
				88%	AFUE	

CALCULATIONS:

Off-Cycle Flue Losses = Boiler kBtuh Output x 1000 x % Off-Cycle Flue Losses x Hrs Off-Cycle per Year / 1,000,000
Jacket Losses = Boiler kBtuh Output x 1000 x % Jacket Losses x Hrs Hot per Year / 1,000,000
Useful Heat Output = Htg Fuel Use x BTU per Unit x Present Efficiency / 1,000,000 - Off Cycle Losses - Jacket Losses
Proposed Annual Fuel Consumption =
(Proposed Off-Cycle & Jacket Losses + Useful Heat Output) / Proposed Efficiency x 1,000,000 / BTU per Unit

	Annual Fuel Consumption	units	Annual Cost
Present:	1,649	mcf	
- Fuel Saved by Other FIMs	615	mcf	
Proposed:	847	mcf	
Annual Savings:	**186**	mcf	

CALCULATIONS TO REPLACE HVAC SYSTEM (BASELINE AHU)
FIM 1.4 Jesse Nash Health Center

BASELINE HVAC ENERGY USE

Input Data:

Occ. Space Temperature Setpoint	**72**	°F
Occ. Building Load Coefficient:	**5,615**	BTU/Hr/Deg. F.
Unocc. Building Load Coefficient:	**6,239**	BTU/Hr/Deg. F.
AHU Serves:	**37,500**	square feet floor area
Occ. Internal Heat Gains:	195,524	BTU/hr
Unocc. Internal Heat Gains:	75,810	BTU/hr

AHU System Data:

	CFM	Temp	
SA:	**20,000**		
Minimum OA:	**2,000**		cfm due to exhaust
Return Air:	**18,000**	**72**	°F
SAT Setpoint	**65**	°F	
ODA/RA Damper Control:	**ASHRAE Cycle III**		
MAT Setpoint	**65**	°F	
Avg Reheat Temp:	**68**	°F	

Cooling System Data:

kW/ton:	**1.60**	
kWh Cost:	**$ 0.048**	/kWh
Mechanical Cooling?:	**Y**	
Cooling Activation Temp:	**50**	°F

Heating System Data:

Fuel Type:	**Natural Gas**	
Units:	**mcf**	
Cost of Fuel:	**$5.643**	/mcf
Heat Content:	**1,030,000**	Btu/mcf
Combustion Efficiency:	**78.4%**	

Fan Motor Data:

	HP:	Loading:	Eff:		
SF	**20.0**	**75%**	**87.5%**	12.8	kW
RF	**5.0**	**75%**	**83.1%**	3.4	kW
				16.2	kW total

Bin Data Based on: Buffalo, NY

For Energy Calculation, use Strategy # **1**

Bin Data		Building	Net	Outdoor Air Control Strategies 1	2	3	Net OA Volume		Ideal	Preheat	Cooling Coil				Heat Required - Btuh				
		Envelope	Heating	Min OA	Economizer	ASHRAE III	OA	Result.	SAT	Coil	Coil LAT	Q Cooling			MAT to	SAT to	Total	Total	Total
Temp	Occ.	Load-Btuh	Load-Btuh	OA cfm	OA cfm	OA cfm	CFM	MAT	Setpoint	LAT	(SAT)	Btuh	Btu/yr	kWh/yr	PHC LAT	Avg Reheat	Btuh	Annual Btu	mcf/yr.
(2.5)	0.0	418,300	222,776	2,000	2,000	2,000	2,000	64.6	82.3	65.0	65.0	-	-	-	9,720	373,976	383,696	0	-
2.5	2.0	390,226	194,702	2,000	2,000	2,014	2,000	65.1	81.0	65.1	65.1	-	-	-	-	344,822	344,822	689,644	1
7.5	9.0	362,153	166,628	2,000	2,000	2,171	2,000	65.6	79.7	65.6	65.6	-	-	-	-	305,948	305,948	2,753,534	3
12.5	27.0	334,079	138,554	2,000	2,000	2,353	2,000	66.1	78.4	66.1	66.1	-	-	-	0	267,074	267,074	7,211,008	9
17.5	112.0	306,005	110,481	2,000	2,000	2,569	2,000	66.6	77.1	66.6	66.6	-	-	-	-	228,201	228,201	25,558,460	32
22.5	111.0	277,931	82,407	2,000	2,000	2,828	2,000	67.1	75.8	67.1	67.1	-	-	-	-	189,327	189,327	21,015,263	26
27.5	73.0	249,857	54,333	2,000	2,000	3,146	2,000	67.6	74.5	67.6	67.6	-	-	-	-	150,453	150,453	10,983,058	14
32.5	130.0	221,783	26,259	2,000	2,000	3,544	2,000	68.1	73.2	68.1	68.1	-	-	-	-	111,579	111,579	14,505,272	18
37.5	178.0	193,709	(1,815)	2,000	2,000	4,058	2,000	68.6	71.9	68.6	68.6	-	-	-	-	72,705	72,705	12,941,521	16
42.5	179.0	165,636	(29,889)	2,000	2,000	4,746	2,000	69.1	70.6	69.1	69.1	-	-	-	-	33,831	33,831	6,055,809	8
47.5	150.0	137,562	(57,963)	2,000	2,460	5,714	2,000	69.6	69.3	69.6	69.6	-	-	-	-	-	-	0	-
52.5	98.0	109,488	(86,036)	2,000	5,134	7,179	2,000	70.1	68.0	70.1	65.0	109,080	10,689,840	1,425	-	65,164	65,164	6,386,038	8
57.5	152.0	81,414	(114,110)	2,000	11,463	9,655	2,000	70.6	66.7	70.6	65.0	119,880	18,221,760	2,430	-				
62.5	232.0	53,340	(142,184)	2,000	20,000	14,737	2,000	71.1	65.4	71.1	65.0	130,680	30,317,760	4,042	-				
67.5	170.0	25,266	(170,258)	2,000	2,000	20,000	2,000	71.6	64.1	71.6	65.0	141,480	24,051,600	3,207	-				
72.5	163.0	(2,807)	(198,332)	2,000	2,000	2,000	2,000	72.1	62.8	72.1	65.0	152,280	24,821,640	3,310	-				
77.5	168.0	(30,881)	(226,406)	2,000	2,000	2,000	2,000	72.6	61.5	72.6	65.0	163,080	27,397,440	3,653	-				
82.5	119.0	(58,955)	(254,479)	2,000	2,000	2,000	2,000	73.1	60.2	73.1	65.0	173,880	20,691,720	2,759	-				
87.5	15.0	(87,029)	(282,553)	2,000	2,000	2,000	2,000	73.6	58.9	73.6	65.0	184,680	2,770,200	369	-	-	-	0	-
																			mcf

Total: **2,088** hours x 16.2 kW fan = 33,732 kwh fan/yr. Total Cooling: 21,195 kwh Total Heating: 134

Bin Data Based on: Buffalo, NY

For Energy Calculation, use Strategy # **1**

Bin Data		Building	Net	Outdoor Air Control Strategies 1	2	3	Net OA Volume		Ideal	Preheat	Cooling Coil				Heat Required - Btuh				
		Envelope	Heating	Min OA	Economizer	ASHRAE III	OA	Result.	SAT	Coil	Coil LAT	Q Cooling			MAT to	SAT to	Total	Total	Total
Temp	Unocc.	Load-Btuh	Load-Btuh	OA cfm	OA cfm	OA cfm	CFM	MAT	Setpoint	LAT	(SAT)	Btuh	Btu/yr	kWh/yr	PHC LAT	Avg Reheat	Btuh	Annual Btu	Total Heating:/yr.
(2.5)	1.0	464,778	388,968	2,000	2,000	2,000	2,000	64.6	90.0	65.0	65.0	-	-	-	9,720	540,168	549,888	549,888	1
2.5	29.0	433,585	357,775	2,000	2,000	2,014	2,000	65.1	88.6	65.1	65.1	-	-	-	-	507,895	507,895	14,728,959	18
7.5	53.0	402,392	326,582	2,000	2,000	2,171	2,000	65.6	87.1	65.6	65.6	-	-	-	-	465,902	465,902	24,692,804	31
12.5	192.0	371,199	295,389	2,000	2,000	2,353	2,000	66.1	85.7	66.1	66.1	-	-	-	0	423,909	423,909	81,390,493	101
17.5	346.0	340,005	264,196	2,000	2,000	2,569	2,000	66.6	84.2	66.6	66.6	-	-	-	-	381,916	381,916	132,142,819	164

22.5	289.0	308,812	233,003	2,000	2,000	2,828	2,000	67.1	82.8	67.1	67.1	-	-	-	-	339,923	339,923	98,237,604	122
27.5	313.0	277,619	201,809	2,000	2,000	3,146	2,000	67.6	81.3	67.6	67.6	-	-	-	-	297,929	297,929	93,251,887	116
32.5	517.0	246,426	170,616	2,000	2,000	3,544	2,000	68.1	79.9	68.1	68.1	-	-	-	-	255,936	255,936	132,319,014	164
37.5	758.0	215,233	139,423	2,000	2,000	4,058	2,000	68.6	78.5	68.6	68.6	-	-	-	-	213,943	213,943	162,168,825	201
42.5	615.0	184,040	108,230	2,000	2,000	4,746	2,000	69.1	77.0	69.1	69.1	-	-	-	-	171,950	171,950	105,749,180	131
47.5	595.0	152,846	77,037	2,000	2,000	5,714	2,000	69.6	75.6	69.6	69.6	-	-	-	-	129,957	129,957	77,324,255	96
52.5	495.0	121,653	45,844	2,000	2,000	7,179	2,000	70.1	74.1	70.1	65.0	109,080	53,994,600	7,199	-				
57.5	550.0	90,460	14,650	2,000	2,000	9,655	2,000	70.6	72.7	70.6	65.0	119,880	65,934,000	8,791	-		-	0	-
62.5	703.0	59,267	(16,543)	2,000	2,000	14,737	2,000	71.1	71.2	71.1	65.0	130,680	91,868,040	12,249	-		-	0	-
67.5	567.0	28,074	(47,736)	2,000	19,301	20,000	2,000	71.6	69.8	71.6	65.0	141,480	80,219,160	10,696	-		-	0	-
72.5	336.0	(3,119)	(78,929)	2,000	2,000	2,000	2,000	72.1	68.3	72.1	65.0	152,280	51,166,080	6,822	-		-	0	-
77.5	219.0	(34,312)	(110,122)	2,000	2,000	2,000	2,000	72.6	66.9	72.6	65.0	163,080	35,714,520	4,762	-		-	0	-
82.5	87.0	(65,506)	(141,315)	2,000	2,000	2,000	2,000	73.1	65.5	73.1	65.0	173,880	15,127,560	2,017	-		-	0	-
87.5	7.0	(96,699)	(172,509)	2,000	2,000	2,000	2,000	73.6	64.0	73.6	65.0	184,680	1,292,760	172	-		-	0	-

Total Heating:

Total: **6,672**

Total Cooling: 52,709 kwh

Total Heating: 1,143

100% Unocc Fan Duty Cycle

6,672 hours x 16.2 kW fan = 107,786 kwh fan/yr.

Present Energy	**Fan kwh**	**Cooling kwh**	**AHU Heating mcf**
Occ.	33,732	21,195	134
Unocc.	107,786	52,709	1,143
Total	**141,518**	**73,904**	**1,277**

Proposed Energy	**Fan kwh**	**Cooling kwh**	**RTU Heating mcf**	**Furnace Heating mcf**
Occ.	33,067	17,598	600	105
Unocc.	21,133	61,516	470	
Total	**54,200**	**79,115**	**1,070**	**105**
Savings	87,318	-5,211	207	-105

CALCULATIONS TO REPLACE HVAC SYSTEM cont. **(PROPOSED RTU'S)**

FIM 1.4 Jesse Nash Health Center

PROPOSED HVAC ENERGY USE

Input Data:

Occ. Space Temperature Setpoint	**72**	°F
Occ. Building Load Coefficient:	**5,053**	BTU/Hr/Deg. F.
Unocc. Building Load Coefficient:	**5,615**	BTU/Hr/Deg. F.
RTUs Serves:	**33,750**	square feet floor area
Occ. Internal Heat Gains:	175,972	BTU/hr
Unocc. Internal Heat Gains:	68,229	BTU/hr

AHU System Data:

	CFM	Temp
SA:	**22,420**	
Minimum OA:	**9,605**	cfm due to exhaust
Return Air:	**12,815**	**72** °F
SAT Setpoint	**60**	°F
ODA/RA Damper Control:	**ASHRAE Cycle III**	
MAT Setpoint	**60**	°F
Avg Reheat Temp:	**69**	°F

Cooling System Data:

kW/ton: **0.86**

kWh Cost: **$ 0.048** /kWh

Mechanical Cooling?: **Y**

Cooling Activation Temp: **50** °F

Heating System Data:

Fuel Type: **Natural Gas**

Units: **mcf**

Cost of Fuel: **$5.643** /mcf

Heat Content: **1,030,000** Btu/mcf

Boiler Efficiency: **92.5%**

RTU Fuel Efficiency: **82.0%**

Fan Motor Data:

	HP:	BHP	~Eff:	
SF	**24.0**	**19.0**	**89.5%**	15.8 kW
RF	**0.0**	**0%**	**100.0%**	0.0 kW
				15.8 kW total

Bin Data Based on: Buffalo, NY

For Energy Calculation, use Strategy # **2**

Bin Data		Building	Net	1	2	3	Net OA Volume		Ideal	Preheat	Cooling Coil				Heat Required - Btuh				
		Envelope	Heating	Min OA	Economizer	ASHRAE III	OA	Result.	SAT	Coil	Coil LAT	Q Cooling			MAT to	SAT to	Total	Total	Total
Temp	Occ.	Load-Btuh	Load-Btuh	OA cfm	OA cfm	OA cfm	CFM	MAT	Setpoint	LAT	(SAT)	Btuh	Btu/yr	kWh/yr	PHC LAT	Avg Reheat	Btuh	Annual Btu	mcf/yr.
(2.5)	0.0	376,470	200,498	9,605	9,605	9,605	9,605	40.1	80.3	60.0	60.0	-	-	-	482,255	491,062	973,317	0	-
2.5	2.0	351,204	175,232	9,605	9,605	9,605	9,605	42.2	79.2	60.0	60.0	-	-	-	430,388	465,795	896,183	1,792,366	2
7.5	9.0	325,937	149,965	9,605	9,605	9,605	9,605	44.4	78.2	60.0	60.0	-	-	-	378,521	440,529	819,050	7,371,447	8
12.5	27.0	300,671	124,699	9,605	9,605	9,605	9,605	46.5	77.1	60.0	60.0	-	-	-	326,654	415,262	741,916	20,031,738	22
17.5	112.0	275,404	99,432	9,605	9,605	9,605	9,605	48.7	76.1	60.0	60.0	-	-	-	274,787	389,996	664,783	74,455,671	82
22.5	111.0	250,138	74,166	9,605	9,605	9,605	9,605	50.8	75.1	60.0	60.0	-	-	-	222,920	364,729	587,649	65,229,075	72
27.5	73.0	224,871	48,900	9,605	9,605	9,605	9,605	52.9	74.0	60.0	60.0	-	-	-	171,053	339,463	510,516	37,267,658	41
32.5	130.0	199,605	23,633	9,605	9,605	9,605	9,605	55.1	73.0	60.0	60.0	-	-	-	119,186	314,196	433,382	56,339,714	61
37.5	178.0	174,339	(1,633)	9,605	9,605	9,605	9,605	57.2	71.9	60.0	60.0	-	-	-	67,319	288,930	356,249	63,412,314	68
42.5	179.0	149,072	(26,900)	9,605	9,605	9,605	9,605	59.4	70.9	60.0	60.0	-	-	-	15,452	263,663	279,116	49,961,675	53
47.5	150.0	123,806	(52,166)	9,605	9,605	10,981	9,605	61.5	69.8	61.5	61.5	-	-	-	-	201,982	201,982	30,297,307	32
52.5	98.0	98,539	(77,433)	9,605	9,605	13,797	9,605	63.6	68.8	63.6	60.0	88,282	8,651,626	618	-	213,130	213,130	20,886,788	22
57.5	152.0	73,273	(102,699)	9,605	9,605	18,554	9,605	65.8	67.8	65.8	60.0	140,149	21,302,633	1,522	-	187,864	187,864	28,555,333	30
62.5	232.0	48,006	(127,966)	9,605	22,420	22,420	22,420	62.5	66.7	62.5	60.0	60,534	14,043,888	1,003	-	162,598	162,598	37,722,638	40
67.5	170.0	22,740	(153,232)	9,605	9,605	22,420	9,605	70.1	65.7	70.1	60.0	243,883	41,460,093	2,961	-	137,331	137,331	23,346,291	25
72.5	163.0	(2,527)	(178,499)	9,605	9,605	9,605	9,605	72.2	64.6	72.2	60.0	295,750	48,207,234	3,443	-	112,065	112,065	18,266,541	19
77.5	168.0	(27,793)	(203,765)	9,605	9,605	9,605	9,605	74.4	63.6	74.4	60.0	347,617	58,399,639	4,171	-	86,798	86,798	14,582,100	15
82.5	119.0	(53,060)	(229,031)	9,605	9,605	9,605	9,605	76.5	62.5	76.5	60.0	399,484	47,538,584	3,396	-	61,532	61,532	7,322,279	8
87.5	15.0	(78,326)	(254,298)	9,605	9,605	9,605	9,605	78.6	61.5	78.6	60.0	451,351	6,770,264	484	-	36,265	36,265	543,980	1
																			mcf

Total: **2,088** hours x 15.8 kW fan = 33,067 kwh fan/yr.

Total Cooling: 17,598 kwh

Total Heating: 600

Bin Data Based on: Buffalo, NY

For Energy Calculation, use Strategy # **2**

Bin Data		Building	Net	1	2	3	Net OA Volume		Ideal	Preheat	Cooling Coil				Heat Required - Btuh				
		Envelope	Heating	Min OA	Economizer	ASHRAE III	OA	Result.	SAT	Coil	Coil LAT	Q Cooling			MAT to	SAT to	Total	Total	Total
Temp	Unocc.	Load-Btuh	Load-Btuh	OA cfm	OA cfm	OA cfm	CFM	MAT	Setpoint	LAT	(SAT)	Btuh	Btu/yr	kWh/yr	PHC LAT	Avg Reheat	Btuh	Annual Btu	Total Heating:/yr.
(2.5)	1.0	418,300	350,071				-	72.0	86.5	72.0	72.0	-	-	-	-	350,071	350,071	350,071	0.7
2.5	29.0	390,226	321,998				-	72.0	85.3	72.0	72.0	-	-	-	-	321,998	321,998	9,337,931	3.0
7.5	53.0	362,153	293,924				-	72.0	84.1	72.0	72.0	-	-	-	-	293,924	293,924	15,577,960	8.3
12.5	192.0	334,079	265,850				-	72.0	83.0	72.0	72.0	-	-	-	0	265,850	265,850	51,043,187	31.3
17.5	346.0	306,005	237,776				-	72.0	81.8	72.0	72.0	-	-	-	-	237,776	237,776	82,270,529	27.7
22.5	289.0	277,931	209,702				-	72.0	80.7	72.0	72.0	-	-	-	-	209,702	209,702	60,603,952	16.1
27.5	313.0	249,857	181,628				-	72.0	79.5	72.0	72.0	-	-	-	-	181,628	181,628	56,849,694	24.8

32.5	517.0	221,783	153,555				-	72.0	78.3	72.0	72.0	-	-	-	-	153,555	153,555	79,387,716	28.7
37.5	758.0	193,709	125,481				-	72.0	77.2	72.0	72.0	-	-	-	-	125,481	125,481	95,114,399	23.6
42.5	615.0	165,636	97,407				-	72.0	76.0	72.0	72.0	-	-	-	-	97,407	97,407	59,905,242	15.3
47.5	595.0	137,562	69,333				-	72.0	74.9	72.0	72.0	-	-	-	-	69,333	69,333	41,253,170	7.1
52.5	495.0	109,488	41,259				-	72.0	73.7	72.0	60.0	290,563	143,828,784	10,273	-	331,822	331,822	164,252,097	52.9
57.5	550.0	81,414	13,185				-	72.0	72.5	72.0	60.0	290,563	159,809,760	11,415	-	303,749	303,749	167,061,719	74.0
62.5	703.0	53,340	(14,888)				-	72.0	71.4	72.0	60.0	290,563	204,265,930	14,590	-	275,675	275,675	193,799,342	49.2
67.5	567.0	25,266	(42,962)				-	72.0	70.2	72.0	60.0	290,563	164,749,334	11,768	-	247,601	247,601	140,389,711	42.4
72.5	336.0	(2,807)	(71,036)				-	72.0	69.1	72.0	60.0	290,563	97,629,235	6,974	-	219,527	219,527	73,761,093	38.7
77.5	219.0	(30,881)	(99,110)				-	72.0	67.9	72.0	60.0	290,563	63,633,341	4,545	-	191,453	191,453	41,928,256	23.9
82.5	87.0	(58,955)	(127,184)				-	72.0	66.7	72.0	60.0	290,563	25,278,998	1,806	-	163,379	163,379	14,214,006	2.6
87.5	7.0	(87,029)	(155,258)				-	72.0	65.6	72.0	60.0	290,563	2,033,942	145	-	135,306	135,306	947,139	-

Total Heating:

Total: **6,672**

Total Cooling: 61,516 kwh

Total Heating: 470

20% Unocc Fan Duty Cycle

1,334 hours x 15.8 kW fan = 21,133 kwh fan/yr.

Proposed Energy	**Fan kwh**	**Cooling kwh**	**Heating mcf**
Occ.	33,067	17,598	600
Unocc.	21,133	61,516	470
Total	**54,200**	**79,115**	**1,070**

CALCULATIONS TO REPLACE HVAC SYSTEM cont. (BASEMENT FURNACE)

FIM 1.4 Jesse Nash Health Center

INPUT DATA:

Select Closest Facility Type:			Type:	Natural Gas	
Small Office			Units:	mcf	
Select City Closest to Site	EFLH heat		Unit cost:	$ 5.643	/mcf
Buffalo	760		BTU/unit	1,030,000	Btu/mcf
			Electricity:	$ 0.048	/kwh
Firing Rate	# Furnaces				
114,000	1				
	0				
Totals	1	114,000	Btu/hour total		
Total heating fuel use:		1,260	mcf		
		10%	of building served by these furnaces		
Proposed AFUE		94.0%	Condensing furnace with variable speed BPM motor		

CALCULATIONS:

Present Fuel Use = Total Firing Rate x EFLHheat / Btu per unit fuel
Proposed Annual Fuel Use =
(Present Annual Fuel Use x Present Efficiency) / Proposed Efficiency
Furnace Output in MBtu/year = Fuel consumption x AFUE x BTU per unit fuel / 1,000,000
Furnace Electricity = Furnace output in MBtu per year x kwh per MBtu
where Mbtu = one million BTUs

	Annual Fuel Consumption (mcf)	Furnace Output in MBtu/year	Furnace Electricity kWh/MBtu	kWh	Annual Cost
Proposed Conumption:	105	102	5	509	

CALCULATIONS TO IMPROVE TEMPERATURE CONTROL

FIM 1.4 Jesse Nash Health Center

INPUT DATA: 50% of Building to be Setback

		Current	Proposed	
Heating T Setpoint:	Occupied	72	72	deg. F.
	Unoccupied	72	65	deg. F.
Cooling T Setpoint:	Occupied	72	72	deg. F.
	Unoccupied	72	80	deg. F.
HVAC Schedule	Occupied	40.0	40.0	Hours per week
	Unoccupied	128.0	128.0	Hours per week
Q internal gains:	Occupied	97,762	97,762	Btuh
	Unoccupied	37,905	37,905	Btuh
Q internal gains:	Schedule	40	40	Hours per week
BLC:	Occupied	3,887	3,887	Btuh/deg. F.
	Unoccupied	4,199	4,199	Btuh/deg. F.

Fuel Data	Heating	Cooling		
Type:	Natural Gas	Electricity		
Units:	**mcf**	kwh		
Unit cost:	**$ 5.643**	$ 0.048		
BTU/unit	**1,030,000**	3,412		
Efficiency/ COP:	**78.4%**	2.20	COP, = EER	7.5

CALCULATIONS:

Current		Buffalo, 40 hrs./week				
Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use mcf	Cooling Energy kwh
(2.5)	0	1	191,992	275,100	0	
2.5	2	29	172,555	254,103	10	
7.5	9	53	153,118	233,107	17	
12.5	27	192	133,681	212,110	55	
17.5	112	346	114,244	191,113	98	
22.5	111	289	94,807	170,117	74	
27.5	73	313	75,370	149,120	65	
32.5	130	517	55,933	128,124	91	
37.5	178	758	36,497	107,127	109	
42.5	179	615	17,060	86,130	69	
47.5	150	595	(2,377)	65,134	48	
52.5	98	495	(21,814)	44,137	27	
57.5	152	550	(41,251)	23,141	16	
62.5	232	703	(60,688)	2,144	2	
67.5	170	567	(80,125)	(18,852)	0	
72.5	163	336	(99,706)	(40,005)	0	
77.5	168	219	(119,143)	(61,001)	0	
82.5	119	87	(138,580)	(81,998)	0	
87.5	15	7	(158,017)	(102,994)	0	
	8,760	hours			680	0

Proposed		Buffalo, 40 hrs./week				
Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use	Cooling Energy kwh

(2.5)	0	1	191,992	245,549	0	
2.5	2	29	172,555	224,552	8	
7.5	9	53	153,118	203,556	15	
12.5	27	192	133,681	182,559	48	
17.5	112	346	114,244	161,563	85	
22.5	111	289	94,807	140,566	63	
27.5	73	313	75,370	119,569	53	
32.5	130	517	55,933	98,573	72	
37.5	178	758	36,497	77,576	81	
42.5	179	615	17,060	56,580	47	
47.5	150	595	(2,377)	35,583	26	
52.5	98	495	(21,814)	14,587	9	
57.5	152	550	(41,251)	(6,410)	0	
62.5	232	703	(60,688)	(27,407)	0	
67.5	170	567	(80,125)	(37,905)	0	
72.5	163	336	(99,706)	(37,905)	0	
77.5	168	219	(119,143)	(37,905)	0	
82.5	119	87	(138,580)	(48,403)	0	
87.5	15	7	(158,017)	(69,400)	0	
	8,760	hours			509	0

		Present	Proposed	Savings
Heating	mcf	680	509	172

CALCULATIONS FOR EXISTING HW PUMP USAGE
FIM 1.4 Jesse Nash Health Center

Pump Type: **Hot Water**

$ 0.048 per kWh

	Existing	Proposed	
Minimum Flow:	**90**	**36**	GPM = 40% of GPMdes.
Motor Efficiency:	**86.5%**	**86.5%**	
Pump Efficiency:	**75.0%**	0.9	BHP design
		1.5	HP Nameplate
VSD Efficiency:		**97%**	
OA Lockout Temp:		**55**	°F

Design Conditions:

	90	GPMdes
	30	ft Total Head (TH)
-	**15**	ft head minimum (Fixed Minimum Head)
	15	pipe losses (Variable Head)

Bin Data for Buffalo, 40 hrs./week

Periods: **Occupied** **Unocc.**

Approx. Flow Increment: **8%** **8%** per bin

Unocc. flow is = **80%** of Occupied flow at design.

Forumulae: FMH = Fixed Minimum Head

H2 = FMH + ((TH - FMH) x ((GPM2/GPMdes)^2))

BHP = (GPM2x H2) / (3960 x pump efficiency)

kW = BHP x 0.746 kW / Motor Eff / VFD Eff

Bin	Occupied	Percent	Occupied		New	% Speed	Occupied kW		Occupied kWh	
Temp	Hours	Flow	GPM2	Head H2	BHP	Occupied	Present	Proposed	Present	Proposed
(2.5)	**-**	**100%**	**90**	30.0	0.9	**100%**	0.0	0.8	-	-
2.5	**2.0**	**92%**	**83**	27.7	0.8	**96%**	0.8	0.7	2	1
7.5	**9.0**	**85%**	**76**	25.7	0.7	**93%**	0.8	0.6	7	5
12.5	**27.0**	**78%**	**70**	24.1	0.6	**90%**	0.8	0.5	21	14
17.5	**112.0**	**72%**	**64**	22.7	0.5	**87%**	0.8	0.4	88	49
22.5	**111.0**	**66%**	**59**	21.5	0.4	**85%**	0.8	0.4	87	42
27.5	**73.0**	**61%**	**55**	20.5	0.4	**83%**	0.8	0.3	57	24
32.5	**130.0**	**56%**	**50**	19.7	0.3	**81%**	0.8	0.3	102	38
37.5	**178.0**	**51%**	**46**	19.0	0.3	**79%**	0.8	0.3	140	47
42.5	**179.0**	**47%**	**42**	18.3	0.3	**78%**	0.8	0.2	140	42
47.5	**128.0**	**43%**	**39**	17.8	0.2	**77%**	0.8	0.2	100	27
52.5	**63.0**	**40%**	**36**	17.4	0.2	**76%**	0.8	0.2	49	12
57.5	**95.0**	**0%**	**-**	15.0	-	**0%**	0.8	0.0	-	-
62.5	**88.0**	**0%**	**-**	15.0	-	**0%**	0.8	0.0	-	-
67.5	**38.0**	**0%**	**-**	15.0	-	**0%**	0.8	0.0	-	-
72.5	**29.0**	**0%**	**-**	15.0	-	**0%**	0.8	0.0	-	-
77.5	**26.0**	**0%**	**-**	15.0	-	**0%**	0.8	0.0	-	-
	1,288	Occupied						Occupied kwh/year	794	302

Bin	Unocc.	Percent	Unocc.		New	% Speed	Unocc. kW		Unocc. kWh	
Temp	Hours	Flow	GPM2	Head H2	BHP	Unocc.	Present	Proposed	Present	Proposed
(2.5)	**1.0**	**80%**	**72**	24.6	0.6	**91%**	0.8	0.5	1	1
2.5	**29.0**	**74%**	**66**	23.1	0.5	**88%**	0.8	0.5	23	13
7.5	**53.0**	**68%**	**61**	21.9	0.4	**85%**	0.8	0.4	42	21
12.5	**192.0**	**62%**	**56**	20.8	0.4	**83%**	0.8	0.3	151	67
17.5	**346.0**	**57%**	**52**	19.9	0.3	**82%**	0.8	0.3	272	106
22.5	**289.0**	**53%**	**47**	19.2	0.3	**80%**	0.8	0.3	227	79
27.5	**313.0**	**49%**	**44**	18.5	0.3	**79%**	0.8	0.2	246	76
32.5	**517.0**	**45%**	**40**	18.0	0.2	**77%**	0.8	0.2	406	112
37.5	**747.0**	**41%**	**37**	17.5	0.2	**76%**	0.8	0.2	586	145
42.5	**550.0**	**40%**	**36**	17.4	0.2	**76%**	0.8	0.2	432	103
47.5	**353.0**	**40%**	**36**	17.4	0.2	**76%**	0.8	0.2	277	66
52.5	**275.0**	**40%**	**36**	17.4	0.2	**76%**	0.8	0.2	216	52
57.5	**221.0**	**0%**	**-**	15.0	-	**0%**	0.8	0.0	-	-
62.5	**171.0**	**0%**	**-**	15.0	-	**0%**	0.8	0.0	-	-
67.5	**40.0**	**0%**	**-**	15.0	-	**0%**	0.8	0.0	-	-
72.5	**16.0**	**0%**	**-**	15.0	-	**0%**	0.8	0.0	-	-
77.5	**18.0**	**0%**	**-**	15.0	-	**0%**	0.8	0.0	-	-
82.5	**5.0**	**0%**	**-**	15.0	-	**0%**	0.8	0.0	-	-
	4,136	Unocc.						Unocc. kwh/year	2,877	841
	5,424	bin hours/year total						Total kWh / year	3,671	1,142

CALCULATIONS FOR VARIABLE SPEED DRIVE ON NEWHOT WATER PUMPS

FIM 1.4 Jesse Nash Health Center

Pump Type: **Hot Water**

$ 0.048 per kWh

	Existing	Proposed	
Minimum Flow:	**80**	**32**	GPM = 40% of GPMdes.
Motor Efficiency:	**89.5%**	**89.5%**	
Pump Efficiency:	**75.0%**	1.3	BHP design
		3.0	HP Nameplate
VSD Efficiency:		**97%**	
OA Lockout Temp:		**55**	°F

Design Conditions:

	80	GPMdes
	50	ft Total Head (TH)
-	**15**	ft head minimum (Fixed Minimum Head)
	35	pipe losses (Variable Head)

Bin Data for Buffalo, 40 hrs./week

Periods:	**Occupied**	**Unocc.**	
Approx. Flow Increment:	**8%**	**8%**	per bin
Unocc. flow is =	**80%**	of Occupied flow at design.	

Forumulae: FMH = Fixed Minimum Head

H2 = FMH + ((TH - FMH) x ((GPM2/GPMdes)^2))

BHP = (GPM2x H2) / (3960 x pump efficiency)

kW = BHP x 0.746 kW / Motor Eff / VFD Eff

Bin	Occupied	Percent	Occupied		New	% Speed	Occupied kW		Occupied kWh	
Temp	Hours	Flow	GPM2	Head H2	BHP	Occupied	Present	Proposed	Present	Proposed
(2.5)	**-**	**100%**	**80**	50.0	1.3	**100%**	0.0	1.2	-	-
2.5	**2.0**	**92%**	**74**	44.6	1.1	**94%**	1.1	1.0	2	2
7.5	**9.0**	**85%**	**68**	40.1	0.9	**90%**	1.1	0.8	10	7
12.5	**27.0**	**78%**	**62**	36.2	0.8	**85%**	1.1	0.7	30	18
17.5	**112.0**	**72%**	**57**	33.0	0.6	**81%**	1.1	0.5	126	61
22.5	**111.0**	**66%**	**53**	30.2	0.5	**78%**	1.1	0.5	125	51
27.5	**73.0**	**61%**	**49**	27.9	0.5	**75%**	1.1	0.4	82	29
32.5	**130.0**	**56%**	**45**	25.9	0.4	**72%**	1.1	0.3	146	43
37.5	**178.0**	**51%**	**41**	24.2	0.3	**70%**	1.1	0.3	200	51
42.5	**179.0**	**47%**	**38**	22.8	0.3	**68%**	1.1	0.2	201	45
47.5	**128.0**	**43%**	**35**	21.6	0.3	**66%**	1.1	0.2	144	28
52.5	**63.0**	**40%**	**32**	20.6	0.2	**64%**	1.1	0.2	71	12
57.5	**95.0**	**0%**	**-**	15.0	-	**0%**	1.1	0.0	-	-
62.5	**88.0**	**0%**	**-**	15.0	-	**0%**	1.1	0.0	-	-
67.5	**38.0**	**0%**	**-**	15.0	-	**0%**	1.1	0.0	-	-
72.5	**29.0**	**0%**	**-**	15.0	-	**0%**	1.1	0.0	-	-
77.5	**26.0**	**0%**	**-**	15.0	-	**0%**	1.1	0.0	-	-
	1,288	Occupied						Occupied kwh/year	1,137	347

Bin	Unocc.	Percent	Unocc.		New	% Speed	Unocc. kW		Unocc. kWh	
Temp	Hours	Flow	GPM2	Head H2	BHP	Unocc.	Present	Proposed	Present	Proposed
(2.5)	**1.0**	**80%**	**64**	37.4	0.8	**86%**	1.1	0.7	1	1
2.5	**29.0**	**74%**	**59**	34.0	0.7	**82%**	1.1	0.6	33	17
7.5	**53.0**	**68%**	**54**	31.0	0.6	**79%**	1.1	0.5	60	26
12.5	**192.0**	**62%**	**50**	28.6	0.5	**76%**	1.1	0.4	216	79
17.5	**346.0**	**57%**	**46**	26.5	0.4	**73%**	1.1	0.4	389	122
22.5	**289.0**	**53%**	**42**	24.7	0.4	**70%**	1.1	0.3	325	87
27.5	**313.0**	**49%**	**39**	23.2	0.3	**68%**	1.1	0.3	352	82
32.5	**517.0**	**45%**	**36**	22.0	0.3	**66%**	1.1	0.2	581	117
37.5	**747.0**	**41%**	**33**	20.9	0.2	**65%**	1.1	0.2	839	148
42.5	**550.0**	**40%**	**32**	20.6	0.2	**64%**	1.1	0.2	618	105
47.5	**353.0**	**40%**	**32**	20.6	0.2	**64%**	1.1	0.2	397	67
52.5	**275.0**	**40%**	**32**	20.6	0.2	**64%**	1.1	0.2	309	52
57.5	**221.0**	**0%**	**-**	15.0	-	**0%**	1.1	0.0	-	-
62.5	**171.0**	**0%**	**-**	15.0	-	**0%**	1.1	0.0	-	-
67.5	**40.0**	**0%**	**-**	15.0	-	**0%**	1.1	0.0	-	-
72.5	**16.0**	**0%**	**-**	15.0	-	**0%**	1.1	0.0	-	-
77.5	**18.0**	**0%**	**-**	15.0	-	**0%**	1.1	0.0	-	-
82.5	**5.0**	**0%**	**-**	15.0	-	**0%**	1.1	0.0	-	-
	4,136	Unocc.						Unocc. kwh/year	4,119	903
	5,424	bin hours/year total						Total kWh / year	5,256	1,250

CALCULATIONS TO EXTEND DDC TO DHW PUMPS

FIM 1.4 Jesse Nash Health Center

	DHW Fuel		Pump	
Type:	**Natural Gas**		**Electricity**	
Units:	**mcf**		**kwh**	
Unit cost:	$ 5.643	/mcf	**$ 0.048**	$/kWh
Heat Content of Fuel:	1,030,000	Btu/mcf		
Combustion Efficiency:	**80.0%**			

INPUT

Building Conditioned Floor Area	Schedule	hrs/week	Wks/yr	Hrs/yr.
37,500 sq.ft.	Heating	**40**	**42**	1,680
	Non-heating	**40**	**10**	400
				2,080

Electricity Savings for DHW Recirculation Pumps

Formula:

kwh = HP x % Loading x 0.746 kw per HP / motor efficiency x Qty. x Hours

Motor Description	Motor HP	Qty	Motor Loading	Motor Type	Motor y	Annual Hours Present	Annual Hours Proposed	Annual kWh Present	Annual kWh Proposed
DHW Recirc	**1/25**	**1**	70%	Std.	45.0%	8,760	2,080	407	97
								407	97

Thermal Savings for DHW Recirculation Pumps

Motor Description	Motor GPM	Recirc ΔT	DHW Eff.	DHW Losses Btuh	Annual Hours Present	Annual Hours Proposed	Annual mcf Present	Annual mcf Proposed
DHW Recirc	**3**	1.0	80%	1,499	8,760	2,080	16	4
							16	4

Formulae:

DHW Losses = GPM x Recirc ΔT x 60 min per hour x 8.33 lbs per gallon

Annual MMBtu = DHW Losses / DHW Efficiency x Annual Hours / heat content of fuel

Recirc ΔT = temperature drop between DHW leaving boiler room and returning recirculation DHW

Pump Power Savings	310	kwh
DHW Fuel Savings	12	mcf

CALCULATIONS TO DECOMMISSION AIR COMPRESSOR

FIM 1.4 Jesse Nash Health Center

DATA AND CALCULATIONS:

kWh:	$ 0.048	per kWh
Demand:	$ 11.89	per kW

Formula:

Demand kW = (Qty x HP x 0.746 kW/HP x % Load) / % Efficiency
Annual kWh = Demand kW x Annual Hours
Demand $ Savings = (Present kW - New kW) x months of demand x Monthly demand charge
kWh $ Savings = (Present kWh - New kWh) x Cost per kWh

		Motor			Motor Efficiency		Annual Motor Run Hours		Months of Demand
#	Description	Nominal HP	Qty	Loading vs. Nom.	Present	New	Existing	New	Savings
1	Air Compressor Motor	3/4	1	75%	75.5%	75.5%	2,891	0	12

		Total	Demand kW		Annual kWh		Motor	$ Savings	Cost
#	Description	BHP/	Present	New	Present	New	Type	Total	$
1	Air Compressor Motor	0.6	0.56	0.00	1,607	0	TEFC		
		0.6	0.6	0.0	1,607	0		$ 0	$ 0

ODP = open drip-proof
TEFC = totally enclosed fan-cooled

Peak KW Demand Savings:	0.6	kW
Annual KW Demand Savings:	6.7	kW
Annual kWh Savings:	1,607	kWh

CALCULATIONS TO PIPE INSULATION

FIM 1.30 Jesse Nash Health Center

Fuel Information

	Heating System		DHW System
Type:	**Natural Gas**		**Natural Gas**
Units:	mcf		mcf
Unit cost:	$ 5.643	/mcf	$ 5.643
Conversion Factor:	1,030,000	Btu/mcf	1,030,000
Efficiency:	78%	Heating	78%

Basic Inputs

	Type #1	Type #2	Type #3	Type #4	Type #5
Fluid	**DHW**	**DHW**	**Steam**	**DHW**	**Hot Water**
Pipe Material	**Dull Copper**	**Dull Copper**	**Steel**	**Steel**	**Steel**
O.D., inches (d)	**1.50**	**0.50**	**1.00**	**2.00**	**2.00**
Total Length, ft	**26**	**10**	**0**	**0**	**0**
Fluid Temperature Inside Pipe, °F (Ts)	**120**	**120**	**215**	**110**	**160**
Ambient Temperature, °F (Ta)	**65**	**65**	**65**	**65**	**65**
Annual Operating Hours	**8,760**	**8,760**	**2,187**	**2,187**	**2,187**
New Insulation Thickness, inches	**1.0**	**1.0**	**2.0**	**2.0**	**2.0**
Thermal Conductivity - "k" (Btu-in/hr-sq ft	**0.25**	**0.25**	**0**	**0**	**0**
Heat Loss - Bare Pipe					
C factor	**1.016**	**1.016**	**1.016**	**1.016**	**1.016**
emissivity based on pipe material	0.440	0.440	0.940	0.940	0.940
Outside Radius Pipe, inches (Ri)	1	0	1	1	1
Outside Radius Insulation, inches (Rs)	1.8	1.3	2.5	3.0	3.0
h convection, Btu/hr - s.f. pipe surface area -°	1.20	1.49	1.58	1.08	1.26
h radiation, Btu/hr - s.f. pipe surface area - °F	0.51	0.51	1.41	1.06	1.22
h total	1.71	2.00	2.99	2.14	2.48
Pipe area, sq ft/lin ft of pipe	0.393	0.131	0.262	0.523	0.523
Q bare, Btu/hr-lin ft	**37**	**14**	**117**	**50**	**123**
Heat Loss - Insulated Pipe					
Q i, Btu/hr-sq ft of outer area of insulation	9.3	6.8	9.3	3.4	7.2
Insulation Area - sq ft/lin ft of pipe	0.9	0.7	1.3	1.6	1.6
Q insul, Btu/hr-lin ft	**8.5**	**4.5**	**12.2**	**5.4**	**11.3**
Avoided Energy Loss					
Existing Loss - MBtu/year	8.4	1.3	0.0	0.0	0.0
Proposed Loss - MBtu/year	1.9	0.4	0.0	0.0	0.0
Avoided Loss - MBtu/year	6.5	0.9	0.0	0.0	0.0
Total Avoided Fuel Consumption					
9 Units Saved	8	1	0	0	0
Natural Gas Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
$/year					

	Fibrous Glass "k" (Btu-in/hr-sq ft-°F)	
Mean Temp. °F	Johns Manville	ASTM C 547
0	0.22	0.25
50	0.22	0.25
75	0.23	0.25
100	0.24	0.25
200	0.29	0.31
300	0.36	0.40
500	0.59	0.63

Emissivity:	
Steel	0.94
Dull Copper	0.44
Bright Copper	0.08

C:
1 for horizontal cylinders
1 for longer vertical cylinders

Natural Gas		
12	-	existing
3	-	proposed
9	-	savings

Formulas:

Based on ASHRAE 1993 Fundamentals Handbook pages 20.9 and 22.17

h convection = C x {(1 / d) ^ 0.2} x { (1 / ((Ts + Ta)/2)) ^ 0.181 } x { (Ts - Ta) ^ 0.266 }

h radiation = { emissivity x 0.1713 x 10 ^ -8 x [(Ta + 460) ^ 4 - (Ts +460) ^ 4]} / (Ta - Ts)

Q bare = h total x Pipe Area x (Ts - Ta)

Q i = (Ts - Ta) / { [Rs x (ln (Rs / Ri)] / k }

Q insul = Q i x Insul Area

Total Avoided Consumption = (Q bare - Q insul) x Total length of pipe x Annual Operating Hours

CALCULATIONS FOR VENDING MACHINE OCCUPANCY CONTROL
FIM 1.36 Jesse Nash Health Center

Electricity
Unit cost: **$ 0.048** /kwh

INPUT DATA:

Machine Type	Qty.	Volts	Amps	Present Operation Hrs/Day	Present Operation Days/Yr.	Machine Location is Occupied Hrs/Day	Machine Location is Occupied Days/Yr.
Refrigerated	**1**	**115**	**11.0**	**24**	**365**	**8**	**255**
Non Refrigerated	**1**	**115**	**3.0**	**24**	**365**	**8**	**255**

* Lighting watts is included in the volt / amp data and Total kW

Lighting Savings						Present	Proposed
Machine Type	Lighting * Watts/ unit	Lighting Found	Ltg. Watts	Present Hrs/Yr.	Proposed Hrs/Yr.	Lighting kWh/yr.	Lighting kWh/Yr.
Refrigerated	**128**	**On**	128	8,760	2,880	1,121	369
Non Refrigerated	**28**	**On**	28	8,760	2,880	245	81
						1,367	449

Compressor Savings						
	Duty Cycle		Compressor Hours		Present	Proposed
Compressor kW	Present Normal	Proposed Nite	Present Hrs/Yr.	Proposed Hrs/Yr.	Compressor kWh/yr.	Compressor kWh/Yr.
0.884	**33%**	**12.5%**	2,891	1,513	2,555	1,338
					2,555	1,338

CALCULATIONS:

Ltg kWh =Ltg Watts / 1000 x # units x Hrs per Day x Days per Yr
Compressor kWh=(volts x amps x 0.80 pf/ 1000 - ltg watts)x # units x hrs per day x days per yr x duty cycle

Ltg kWh with Control = Ltg watts per unit /1000 x # units x (Occ Hrs per Yr + Unocc Hrs x Nite Duty Cycle)
Prop Compressor Run Hours = Occ Hrs x Existing Duty Cycle + Unocc Hrs x Unocc Duty Cycle)
Compressor kWh with Control=(volts x amps x 0.80 pf -ltg watts)/1000 x # units x prop compressor hrs per y

Electricity Cost Savings = Electricity Savings x Electricity Unit Cost

	Lighting	Compressor	Total	
Existing Annual Electricity Use:	1,367	2,555	3,922	kWh
Proposed Annual Electricity Use:	449	1,338	1,787	kWh
Total Annual Savings:	917	1,218	2,135	kWh
			54%	reduction

CALCULATIONS FOR IMPACT OF REDUCED LIGHTING ON HEATING AND AIR CONDITIONING

FIM 2/11/24/25.1

Client: Erie County
Address: Holding Center

INPUT DATA:

	Heating Energy		Cooling Energy	
Fuel:	**Natural Gas**		**Electric**	
Units:	**mcf**		**kWh**	
Fuel Cost:	**$ 3.934**	per mcf	**$ 0.054**	per kWh
Fuel Conversion Factor:	**1,030,000**	Btu per mcf	**3,412**	Btu per kWh
Efficiency:	**85.0%**		**0.85**	kW/Ton
			66%	of building is air conditioned

	500,554	Lighting Retrofit
	1,748	Installing Sensors
Annual Lighting Savings:	**502,301**	kWh per Year
	12	months per year of lighting operation
	41,858	kwh/month

For	**6**	months/year the lighting retrofit will impact heating costs
	20%	of light fixtures are within 10 feet of an exterior wall
For	**3**	months/year the lighting retrofit will impact cooling costs

CALCULATIONS:

Replacement Natural Gas because of Reduced Lighting Energy

Useful Heat from Lights during the heating season that is no longer available is:

= kwh Lighting Savings per month x No. Months of Heating impact x % of fixtures located near exterior walls

= **50,230 kWh =** 171,385,257 BTU = 196 mcf

Replacement Natural Gas usage

Useful Heat from Lights in kwh x 3412 BTU/kwh / Heating Fuel Conversion Factor / Heating Fuel Efficiency

Replacement Natural Gas Cost = mcf x $per mcf

	Fuel Usage		Fuel Cost	
Useful Heat from Lights	50,230	kWh	n/a	
Replacement Gas	**(196)**	**mcf**		**per year**

Reduced Air Conditioning because of Reduced Lighting

Reduced Air Conditioning Lighting Load during the cooling season from Lighting that is no longer present is:

= kwh Lighting Savings per month x No. Months Lighting Retrofit will impact cooling costs x % of building cooled

= **82,785 kWh =** 282,462,151 BTU

Reduced Air Conditioning Energy Requirements [kWh] =

Reduce Air Conditioning Lighting Load x (3412 Btu / kWh) x (1 ton-hr / 12,000 Btu) x (0.85 kW / ton)

Reduced Air Conditioning Cost = Reduced Air Conditioning Energy Requirements x Cost per kWh

Reduced Air Conditioning Energy Requirements =	**20,008**	**kWh per year**
Reduced Air Conditioning Cost =		**per year**

Net Impact on Heating and Air Conditioning Costs because of Lighting Retrofit

Heating Fuel	**(195.8)**	**mcf**	
Cooling	**20,008**	**kWh per year**	**$ 0**

Project: Erie County
Building: Holding Center
Date: 7/3/2019

Heating System Efficiency:	85%
Average Fuel Cost ($/unit):	$0.41
Correction Factor:	100%

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product
Single door sweeps	13	3	1/8	1/12	=	0.40625
Single door perimeters	13	17	1/16	1/12	=	1.151041667
Double door sweeps & astragals	2	20	1/8	1/12	=	0.416666667
Double door perimeters	2	20	1/16	1/12	=	0.208333333
Garage doors	3	128	3/16	1/12	=	2
					Total =	4.182291667 ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
602.25	50%	0.09433	72	34.25	0.0092	11.6	659.657

Occupied Infiltration Savings

Specific Heat of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Occupied (%/week)	Heating Season Bin Hours	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	659.657	37.75	29.76%	4335	103000	85%	396.301

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
602.25	50%	0.09433	67	34.14	0.0092	11.6	627.153

Unoccupied Infiltration Savings

Specific Hear of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Unoccupied (%/week)	Heating Season Bin Hours	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	627.153	32.86	70.24%	4301	103000	85%	768.002

Totals

Units of Fuel per Year (units/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
1164.303	103000	9.708737864	119.9231841

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
1164.30	$0.41	480.6999741

Total Cost Savings: **$480.70**
Cost to Retrofit: **$12,378.00**
Simple Payback: **25.75 years**

Project: Erie County
Building: Holding Center
Date: 7/3/2019

Cooling System Efficiency (kW/ton):	1.27
EER:	9.449
Average Fuel Cost ($/unit):	$0.07

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product
Single door sweeps	13	3	1/8	1/12	=	0.40625
Single door perimeters	13	17	1/16	1/12	=	1.151041667
Double door sweeps & astragals	2	20	1/8	1/12	=	0.416666667
Double door perimeters	2	20	1/16	1/12	=	0.208333333
Garage door weather-stripping	3	128	1/8	1/12	=	1.333333333
					Total =	3.515625 ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (°F)	Average Outdoor Air Temperature (°F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
506.25	50%	0.09433	72	80.14	0.0092	11.6	358.491

Occupied Infiltration Savings Ref: ASHRAE 2013 Fundamentals 18.13 (8)

Air Total Heat Factor C_t	Flow Rate (cfm) Q_{occ}	Average Outdoor Air Enthalpy h	Cooling Supply Air Enthalpy h	% Building Occupied	Cooling Season Bin Hours	% Building Area Cooled	Btu/hrs per Ton	Cooling (kWh)
4.50	358.491	32	22.7	29.76%	1,122	100%	9,449	636.21

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (°F)	Average Outdoor Air Temperature (°F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
506.25	50%	0.09433	77	74.77	0.0092	11.6	256.594

Unoccupied Infiltration Savings Ref: ASHRAE 2013 Fundamentals 18.13 (8)

Air Total Heat Factor C_t	Flow Rate (cfm) Q_{occ}	Average Outdoor Air Enthalpy h	Cooling Supply Air Enthalpy h	% Building Occupied	Cooling Season Bin Hours	% Building Area Cooled	Btu/hrs per Ton	Cooling (kWh)
4.50	256.594	32	22.7	70.24%	449	100%	9,449	430.1067828

Totals

kWh per Year (kWh/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
1066.321	3,412	293.08	3.638288533

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
1066.32	$0.07	78.68048101

Total Cost Savings: **$78.68**
Cost to Retrofit: Cost carried on heating page
Simple Payback: **0.00 years**

Project: Erie County
Building: Sheriffs
Date: 7/3/2019

Heating System Efficiency:	85%
Average Fuel Cost ($/unit):	$0.47
Correction Factor:	100%

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product
Single door sweeps	2	3	3/16	1/12	=	0.09375
Single door perimeters	2	17	1/8	1/12	=	0.354166667
					Total =	0.447916667 ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot ^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
64.5	50%	0.06283	72	34.25	0.0071	11.6	58.826

Occupied Infiltration Savings

Specific Heat of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Occupied (%/week)	Heating Season Bin Hours (Occupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	58.826	37.75	29.76%	4335	103000	85%	35.341

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot ^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
64.5	50%	0.06283	67	34.14	0.0071	11.6	56.044

Unoccupied Infiltration Savings

Specific Hear of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Unoccupied (%/week)	Heating Season Bin Hours (Unoccupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	56.044	32.86	70.24%	4301	103000	85%	68.631

Totals

Units of Fuel per Year (units/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
103.972	103000	9.708737864	10.70909168

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
103.97	$0.47	48.86672901

Total Cost Savings: **$48.87**
Cost to Retrofit: **$590.00**
Simple Payback: **12.07 years**

Project: Erie County
Building: Sheriffs
Date: 7/3/2019

Cooling System Efficiency (kW/ton):	0.595
EER:	20.168
Average Fuel Cost ($/unit):	$0.07

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product
Single door sweeps	2	3	1/8	1/12	=	0.0625
Single door perimeters	2	17	1/16	1/12	=	0.177083333
					Total =	0.239583333 ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
34.5	50%	0.06283	72	80.14	0.0071	11.6	20.892

Occupied Infiltration Savings Ref: ASHRAE 2013 Fundamentals 18.13 (8)

Air Total Heat Factor C_t	Flow Rate (cfm) Q_{occ}	Average Outdoor Air Enthalpy h	Cooling Supply Air Enthalpy h	% Building Occupied	Cooling Season Bin Hours	% Building Area Cooled	Btu/hrs per Ton	Cooling (kWh)
4.50	20.892	32	22.7	29.76%	1,122	100%	20,168	17.37

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
34.5	50%	0.06283	77	74.77	0.0071	11.6	15.575

Unoccupied Infiltration Savings Ref: ASHRAE 2013 Fundamentals 18.13 (8)

Air Total Heat Factor C_t	Flow Rate (cfm) Q_{occ}	Average Outdoor Air Enthalpy h	Cooling Supply Air Enthalpy h	% Building Occupied	Cooling Season Bin Hours	% Building Area Cooled	Btu/hrs per Ton	Cooling (kWh)
4.50	15.575	32	22.7	70.24%	449	100%	20,168	12.23155851

Totals

kWh per Year (kWh/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
29.602	3,412	293.08	0.10100253

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
29.60	$0.07	2.042548242

Total Cost Savings: **$2.04**
Cost to Retrofit: Cost carried on heating page
Simple Payback: **0.00 years**

Project: Erie County
Building: Sheriffs/BOE
Date: 7/3/2019

Heating System Efficiency:	86%
Average Fuel Cost ($/unit):	$0.47
Correction Factor:	100%

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product
Single door sweeps	9	3	3/16	1/12	=	0.421875
Single door perimeters	9	17	1/8	1/12	=	1.59375
Garage doors	3	136	3/16	1/12	=	2.125
Tri-fold doors	2	108	1/8	1/12	=	1.125
Roof top ventilators	7	28	1/6	1/12	=	0.38888889
					Total =	5.65451389

*assume roof fans open during occupied hours

ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
758.25	50%	0.07858	72	34.25	0.00815	11.6	764.203

Occupied Infiltration Savings

Specific Heat of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Occupied (%/week)	Heating Season Bin Hours (Occupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	764.203	37.75	29.76%	5848	103000	86%	612.145

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
814.25	50%	0.07858	72	67	0.00815	11.6	496.887

Unoccupied Infiltration Savings

Specific Hear of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Unoccupied (%/week)	Heating Season Bin Hours (Unoccupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	496.887	5	70.24%	5848	103000	86%	124.425

Totals

Units of Fuel per Year (units/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
736.570	103000	9.708737864	75.86670096

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
736.57	$0.47	346.1878588

Total Cost Savings: **$346.19**
Cost to Retrofit: **$9,854.00**
Simple Payback: **28.46 years**

CALCULATIONS FOR 134 W. EAGLE NIGHT SETBACK WITH STEAM VALVES

FIM 2/11/24/25.5 Erie County

INPUT DATA: 34% of Building to be Setback

		Current	Proposed	
Heating T Setpoint:	Occupied	74	60	deg. F.
	Unoccupied	74	60	deg. F.
Cooling T Setpoint:	Occupied	74	74	deg. F.
	Unoccupied	80	80	deg. F.
HVAC Schedule	Occupied	60.0	108.0	Hours per week
	Unoccupied	108.0	60.0	Hours per week
Q internal gains:	Occupied	444,111	444,111	Btuh
	Unoccupied	86,475	86,475	Btuh
Q internal gains:	Schedule	60	108	Hours per week
BLC:	Occupied	38,239	38,239	Btuh/deg. F.
	Unoccupied	37,580	37,580	Btuh/deg. F.

Fuel Data	Heating	Cooling		
Type:	Natural Gas	Electricity		
Units:	**mcf**	kwh		
Unit cost:	**$ 3.934**	$ 0.05		
BTU/unit	**1,030,000**	3,412		
Efficiency/ COP:	**86.7%**	4.69	COP, = EER	16.0

CALCULATIONS:

Current — Buffalo, 168 hrs./week

Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use mcf	Cooling Energy kwh
(2.5)	1	0	2,481,139	2,788,427	3	0
2.5	31	0	2,289,946	2,600,525	80	0
7.5	62	0	2,098,753	2,412,622	146	0
12.5	219	0	1,907,561	2,224,720	468	0
17.5	458	0	1,716,368	2,036,818	881	0
22.5	400	0	1,525,175	1,848,916	683	0
27.5	386	0	1,333,982	1,661,014	577	0
32.5	647	0	1,142,789	1,473,112	828	0
37.5	936	0	951,597	1,285,210	998	0
42.5	794	0	760,404	1,097,308	676	0
47.5	745	0	569,211	909,406	475	0
52.5	593	0	378,018	721,504	251	0
57.5	702	0	186,825	533,602	147	0
62.5	935	0	(4,367)	345,700	0	0
67.5	737	0	(195,560)	157,798	0	0
72.5	499	0	(386,753)	(30,105)	0	0
77.5	387	0	(577,946)	(86,475)	0	0
82.5	206	0	(769,139)	(180,426)	0	0
87.5	22	0	(960,331)	(368,328)	0	0
92.5	0	0	(1,151,524)	(556,230)	0	0
97.5	0	0	(1,342,717)	(744,132)	0	0
102.5	0	0	(1,533,910)	(932,035)	0	0
107.5	0	0	(1,725,103)	(1,119,937)	0	0
	8,760	hours			6,213	0

Proposed		Buffalo, 168 hrs./week				
Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use	Cooling Energy kwh
(2.5)	0	1	1,945,799	2,262,301	3	0
2.5	7	24	1,754,606	2,074,399	70	0
7.5	20	42	1,563,414	1,886,497	124	0
12.5	57	162	1,372,221	1,698,595	396	0
17.5	179	279	1,181,028	1,510,692	709	0
22.5	142	258	989,835	1,322,790	540	0
27.5	107	279	798,642	1,134,888	450	0
32.5	227	420	607,450	946,986	600	0
37.5	278	658	416,257	759,084	689	0
42.5	275	519	225,064	571,182	401	0
47.5	211	534	33,871	383,280	237	0
52.5	164	429	(157,322)	195,378	94	0
57.5	246	456	(348,514)	7,476	4	0
62.5	347	588	(444,111)	(86,475)	0	0
67.5	256	481	(444,111)	(86,475)	0	0
72.5	236	263	(444,111)	(86,475)	0	0
77.5	226	161	(577,946)	(86,475)	0	0
82.5	139	67	(769,139)	(180,426)	0	0
87.5	15	7	(960,331)	(368,328)	0	0
92.5	0	0	(1,151,524)	(556,230)	0	0
97.5	0	0	(1,342,717)	(744,132)	0	0
102.5	0	0	(1,533,910)	(932,035)	0	0
107.5	0	0	(1,725,103)	(1,119,937)	0	0
	8,760	hours			4,317	0

		Present	Proposed	Savings
Heating	mcf	6,213	4,317	1,896

CALCULATIONS TO INSTALL CONTROLS ON EXHAUST FANS HOLDING CENTER

FIM 2.6 **Erie County** Penthouse Intake / Exhaust Fans

INPUT DATA:

Exhaust Fans to be controlled

	Present	Proposed	
Ventilation	1,800	1,800	cfm
Ventilation	168	168	hrs./week
Heat Recovery	0%	0%	
HP	0.50	0.50	BHP
T Setpoint:	72	72	degrees F
	28.2	28.2	btu/Lb enthalpy

FUEL DATA:

Type:	Natural Gas	Electricity	
Units:	mcf	kwh	
Unit cost:	$ 3.934	$ 0.054	/unit
Heat Content:	1,030,000	3,412	Btu/unit
Efficiency:	85.0%	4.69	
		16.0	EER

CALCULATIONS:

Bin Mid-Pt.	Enthalpy	Present Hours	Proposed Hours	Present kBtu	Proposed kBtu	Present Fan kWh	Proposed Fan kWh
(2.5)	0.0	1		145	0	0	0
2.5	1.8	31		4,185	0	12	0
7.5	2.8	62		7,769	0	23	0
12.5	4.0	219		25,314	0	82	0
17.5	5.6	458		48,490	0	171	0
22.5	7.5	400		38,464	0	149	0
27.5	9.0	386		33,369	0	144	0
32.5	10.8	647		49,647	0	241	0
37.5	12.9	935		62,732	0	349	0
42.5	15.1	793		45,503	0	296	0
47.5	17.5	744		35,458	0	278	0
52.5	19.6	593		22,464	0	221	0
57.5	21.5	702		19,774	0	262	0
62.5	24.2	934		17,256	0	349	0
67.5	27.6	736		6,443	0	275	0
72.5	29.5	499	499			186	186
77.5	31.0	387	387			144	144
82.5	33.1	206	206			77	77
87.5	35.5	22	22			8	8
92.5	0.0	0	0			0	0
97.5	0.0	0	0			0	0
102.5	0.0	0	0			0	0
107.5	0.0	0	0			0	0
		8,754	1,114	Present	Proposed		
	Heating Energy	kBtu		417,013	0		
	Cooling energy	kBtu		0	0	Savings	Savings
	Heating Fuel		mcf	476	0	476	
	Cooling energy		kwh	0	0	0	
	Fan energy		kwh	3,265	416	2,850	
			kwh	3,265	416	2,850	

Summary Table

Location	Baseline mcf	Proposed mcf	Saving (mcf)	Baseline kwh	Proposed kwh	Saving (kWh)
Penthouse Mech.	476	0	476	3,265	416	2,850
Roof of 134 E Eagle	582	171	411	5,857	2,964	2,893
	1,058	171	887	9,122	3,379	5,743

CALCULATIONS TO INSTALL CONTROLS ON 134 W. EAGLE EXHAUST FANS FIM 25.6 Erie County

INPUT DATA:

Exhaust Fans to be controlled

	Present	Proposed	
Ventilation	2,200	2,200	cfm
Ventilation	168	168	hrs./week
Heat Recovery	0%	0%	
HP	0.60	0.60	BHP
T Setpoint:	72	72	degrees F
	28.2	28.2	btu/Lb enthalpy

FUEL DATA:

Type:	Natural Gas	Electricity	
Units:	mcf	kwh	
Unit cost:	$ 3.934	$ 0.054	/unit
Heat Content:	1,030,000	3,412	Btu/unit
Efficiency:	85.0%	4.69	
		15.0	EER

CALCULATIONS:

Bin Mid-Pt.	Enthalpy	Present Hours	Proposed Hours	Present kBtu	Proposed kBtu	Present Fan kWh	Proposed Fan kWh
(2.5)	0.0	1	1	177	126	0	0
2.5	1.8	31	6	5,116	1,062	14	3
7.5	2.8	62	10	9,495	1,478	28	4
12.5	4.0	219	23	30,939	3,282	98	10
17.5	5.6	458	59	59,266	7,585	205	26
22.5	7.5	400	144	47,012	16,928	179	64
27.5	9.0	386	188	40,784	19,863	173	84
32.5	10.8	647	156	60,680	14,681	289	70
37.5	12.9	935	303	76,673	24,826	419	136
42.5	15.1	793	284	55,614	19,926	355	127
47.5	17.5	744	229	43,338	13,347	333	103
52.5	19.6	593	229	27,456	10,607	265	102
57.5	21.5	702	183	24,169	6,287	314	82
62.5	24.2	934	260	21,090	5,869	418	116
67.5	27.6	736	359	7,875	3,834	330	160
72.5	29.5	499	249	-6,569	-3,275	223	111
77.5	31.0	387	180	-10,873	-5,061	173	81
82.5	33.1	206	156	-10,062	-7,629	92	70
87.5	35.5	22	89	-1,580	-6,390	10	40
92.5	0.0	0	19	0	-939	0	9
97.5	0.0	0	2	0	-108	0	1
102.5	0.0	0	1	0	-52	0	0
107.5	0.0	0	0	0	0	0	0
		8,754	3,129	Present	Proposed		

Heating Energy	kBtu		509,683	149,699		
Cooling energy	kBtu		(29,084)	(23,454)	Savings	Savings
Heating Fuel		mcf	582	171	411	
Cooling energy		kwh	1,939	1,564	375	
Fan energy		kwh	3,918	1,400	2,518	
		kwh	5,857	2,964	2,893	

H2O Applied Technologies LLC
Project: **Erie County NY**
CM: **Steam Trap Retrofit**
Survey Type **Detailed**

Eng: **DCOX**
Date: **4/17/2019**

FIM 2/11/24/25.7

Steam Trap Retrofit					
	Baseline	Post - Retro	Annual Savings		
Building	Water/Sewer	Water/Sewer	Water/Sewer	Thermal	Electricity
	(Kgal/yr)	(kgal/yr)	(kgal/yr)	(MMBtu/yr)	(kwh/yr)
134/120 West Eagle	-	-	-	1,077	-
Aurora Barn	-	-	-	-	-
Chestnut Ridge Park	-	-	-	-	-
Clarence Hwy	-	-	-	-	-
Correctional Facility	-	-	-	-	-
Erie County Court (Annex)	-	-	-	-	-
Family Court	-	-	-	-	-
Fire Training	-	-	-	-	-
Hamburg hwy	-	-	-	-	-
Harlem District	-	-	-	-	-
Health Mall	-	-	-	-	-
Holding Center	-	-	-	1,223	-
Jesse Nash Health Center	-	-	-	-	-
Law Libray	-	-	-	-	-
Medical Examiners Office	-	-	-	-	-
Old County Hall	-	-	-	-	-
Public Saftey Campus	-	-	-	-	-
Rath Building	-	-	-	-	-
Sheriff's	-	-	-	84	-
Youth Detention	-	-	-	-	-
Totals	-	-	-	2,384	-

Baseline: 43,796.63
5%

H2O Applied Technologies LLC
Erie County NY

Summary - Removable Insulation Covers

FIM 24/25.8

4/17/2019

Summary - Removable Insulation Covers					
Building/ Facility	Baseline	Post - Retro	Annual Savings		
	Water/Sewer	Water/Sewer	Water/Sewer	Thermal	Electricity
	(Kgal/yr)	(kgal/yr)	(kgal/yr)	(MMBtu/yr)	(kwh/yr)
134/120 West Eagle	-	-	-	**288**	-
Totals	-	-	-	**288**	-
Baseline:				43,796.63	
				1%	

CALCULATIONS FOR CAP ABANDON AHU ROOF PENETRATION
FIM 2.9

Client: Erie County
Address: Holding Center

INPUT DATA:

Occupied Temp	**72** °F		Type:	**Natural Gas**	
	532 °R		Units:	**mcf**	
Unoccupied Temp	**66** °F		Unit cost:	**$ 3.934**	/mcf
	526 °R		BTU/Unit	**1,030,000**	Btu/mcf
Height of Building:	**60** ft.		Boiler Eff.	**85.0%**	
(g) Gravitational Acceleration:	**32.17** ft/s^2		CF2	1.085	Btu/hr-deg F-cfm
(c) Discharge coefficient (.65 to .70):	**0.65**				
Proposed Air Flow Reduction:	**90%**				

Calculate Free Opening in Round Duct with Round Damper

Item #	Duct width (inch)	Damper length (inch)	Area at Full open Position (sqft)	Percent Free Area (%)	Free Area (sqft)
Fan #4 (Holding Center)	**22**	**22**	3.4	**50%**	1.68
Fan #6 (Holding Center)	**22**	**16**	2.4	**50%**	1.22
AHU (roof of 134 W.Eagle	**36**	**36**	9.0	**50%**	4.50
					7.40

CALCULATIONS:

Bin Data for: BUFFALO

Bin Temp (°F)	Total Hours	Bin Temp (°R)	Flow Q (ft^3/s)	Flow Q (CFM)	Unoccupied Present Losses (BTU's/yr)	Unoccupied Proposed Losses (BTU's/yr)
(2.5)	**1**	457	112	6,715	542,773	54,277
2.5	**31**	462	108	6,486	15,160,832	1,516,083
7.5	**62**	467	104	6,248	27,109,118	2,710,912
12.5	**219**	472	100	6,001	84,840,593	8,484,059
17.5	**458**	477	96	5,743	155,540,813	15,554,081
22.5	**400**	482	91	5,473	117,585,000	11,758,500
27.5	**386**	487	86	5,190	96,718,924	9,671,892
32.5	**647**	492	81	4,889	135,576,387	13,557,639
37.5	**936**	497	76	4,569	160,099,002	16,009,900
42.5	**794**	502	70	4,225	107,383,526	10,738,353
47.5	**745**	507	64	3,851	76,258,724	7,625,872
52.5	**593**	512	57	3,435	43,101,337	4,310,134
57.5	**702**	517	49	2,962	32,716,983	3,271,698
62.5	**935**	522	40	2,398	23,109,000	2,310,900
67.5	**737**	527	28	1,650		
72.5	**499**	532				
77.5	**387**	537				
82.5	**206**	542				
87.5	**22**	547				
92.5	**-**	552				
97.5	**-**	557				
	8,760				1,075,743,013	107,574,301

Formulas:

Q = discharge coefficient x flow area x SQRT(2 x gravitational acceleration x Height x $(T_i - T_0 / T_i)$

Proposed Annual Fuel Consumption = Losses BTU / Fuel Heat Content / Boiler Eff.

	Annual Fuel Consumption	
Present:	1,229	mcf
Proposed:	123	mcf
Annual Savings:	1,106	mcf

CALCULATIONS TO INSULATE STEAM PIPES

FIM 24.10 Erie County

Fuel Information

	Heating System		DHW System
Type:	**Natural Gas**		**Natural Gas**
Units:	mcf		mcf
Unit cost:	$ 3.934	/mcf	$ 3.934
Conversion Factor:	1,030,000	Btu/mcf	1,030,000
Efficiency:	85%	Heating	84%

Basic Inputs

	Type #1	Type #2	Type #3	Type #4	Type #5
Location	134 (3rd floor)	135 (3rd floor)	Basement 120		
Fluid	**Steam**	**Steam**	**Steam**	**DHW**	**Hot Water**
Pipe Material	**Steel**	**Steel**	**Steel**	**Steel**	**Steel**
O.D., inches (d)	**1.50**	**1.00**	**3.00**	**1.00**	**1.00**
Total Length, ft	**84**	**232**	**66**	**0**	**0**
Fluid Temperature Inside Pipe, °F (Ts)	**200**	**200**	**200**	**110**	**160**
Ambient Temperature, °F (Ta)	**75**	**75**	**75**	**75**	**75**
Annual Operating Hours	**8,760**	**8,760**	**8,760**	**2,187**	**2,187**
New Insulation Thickness, inches	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**
Thermal Conductivity - "k" (Btu-in/hr-sq ft-°F)	**0**	**0**	**0**	**0**	**0**
Heat Loss - Bare Pipe					
C factor	**1.016**	**1.016**	**1.016**	**1.016**	**1.016**
emissivity based on pipe material	0.940	0.940	0.940	0.940	0.940
Outside Radius Pipe, inches (Ri)	1	1	2	1	1
Outside Radius Insulation, inches (Rs)	2.8	2.5	3.5	2.5	2.5
h convection, Btu/hr - s.f. pipe surface area -°F	1.39	1.51	1.21	1.15	1.40
h radiation, Btu/hr - s.f. pipe surface area - °F	1.39	1.39	1.39	1.09	1.25
h total	2.78	2.89	2.60	2.24	2.65
Pipe area, sq ft/lin ft of pipe	0.393	0.262	0.785	0.262	0.262
Q bare, Btu/hr-lin ft	**136**	**95**	**255**	**21**	**59**
Heat Loss - Insulated Pipe					
Q i, Btu/hr-sq ft of outer area of insulation	8.7	7.8	10.5	2.2	5.3
Insulation Area - sq ft/lin ft of pipe	1.4	1.3	1.8	1.3	1.3
Q insul, Btu/hr-lin ft	**12.6**	**10.2**	**19.3**	**2.8**	**6.9**
Avoided Energy Loss					
Existing Loss - MBtu/year	100.3	192.4	147.4	0.0	0.0
Proposed Loss - MBtu/year	9.3	20.7	11.2	0.0	0.0
Avoided Loss - MBtu/year	91.0	171.7	136.2	0.0	0.0
Total Avoided Fuel Consumption					
456 Units Saved	104	196	156	0	0
Natural Gas Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
$ 0 $/year					

Formulas:

Based on ASHRAE 1993 Fundamentals Handbook pages 20.9 and 22.17

h convection = C x {(1 / d) ^ 0.2} x { (1 / ((Ts + Ta)/2)) ^ 0.181 } x { (Ts - Ta) ^ 0.266 }

h radiation = { emissivity x 0.1713 x 10 ^ -8 x [(Ta + 460) ^ 4 - (Ts +460) ^ 4]} / (Ta - Ts)

Q bare = h total x Pipe Area x (Ts - Ta)

Q i = (Ts - Ta) / { [Rs x (ln (Rs / Ri)] / k }

Q insul = Q i x Insul Area

Total Avoided Consumption = (Q bare - Q insul) x Total length of pipe x Annual Operating Hours

CALCULATIONS TO KITCHEN BOOSTER HEATER

FIM 2.11 Erie County

INPUT DATA:

	Present Fuel		Proposed Fuel		
Fuel:	**Natural Gas**		Natural Gas		
Units:	mcf		mcf		
Fuel Cost:	$ 3.93	per mcf	$ 3.93	per mcf	
Fuel Conversion Factor:	1,030,000	Btu per mcf	1,030,000	Btu per mcf	
Annual DHW Consumption:	Present		Proposed		
Hot Water Usage:	**2.4**	Gallons/person	2.4	Gallons/person	
Number of Persons	**500**	(estimate)	500	(estimate)	
Days of Usage:	**365**	per year	365	per year	
Hours of Usage per Day:	6	hours	6	hours	
Average inlet water Temp:	55	degrees F	140	degrees F	
Average hot water temp:	180	degrees F	180	degrees F	
Storage Tank Losses:	Present Tank		Proposed Tank		
Tank U factor:	0.14	Btu/SF/Hour	0.12	Btu/SF/Hour	
Height of Tank:	24.0	inches	1.0	inches	
Diameter of Tank:	6.0	inches	1.0	inches	
	1	gallons/tank	0	gallons/tank	
# of Tanks	1	Qty.	1	Qty.	
Hours Tank is Hot:	8,760	Hours	2,190		
Water Temperature:	180	Deg. F.	180		
Ambient Temperature:	70	Deg. F.	70		
Recirculation Losses:	0.0%	of boiler capaci	0	BTUh	
	8,760	hours/year	8,760	hours/year	100%
Boiler Jacket & Flue Losses:					
Burner Input	500,000	BTUH	251,000	BTUH	
Efficiency:	**85.0%**		96.0%		
Boiler Output Capacity	425,000	BTU output	240,960	BTU output	
Jacket & Flue Losses:	0.5%	of boiler capaci	0.5%	of boiler capacity	
Boiler is Hot:	8,760	hours/year	2,190	hours/year	100%

CALCULATIONS:

	Present		Proposed	
Consumption Energy:	456,067,500	BTU output rqc	145,941,600	BTU output rqd/yr
Tank Energy Losses:	476,700	BTU/year	946	BTU/year
Recirculation Losses:	0	BTU/year	0	BTU/year
Boiler Jacket Losses:	18,615,000	BTU/year	2,638,512	BTU/year
Output BTU/Year	475,159,200		148,581,058	
Annual Fuel Consumption	543	mcf	150	mcf
Demand	0	billed kW /yr.	0	kW
Annual Fuel Cost				
Annual Savings:	**392**	**mcf**	**$ 0**	**per year**

CALCULATIONS TO INSULATE HEATING AND DOMESTIC HOT WATER PIPES

FIM 2/11/24/25.30 Erie County

Fuel Information

	Heating System		DHW System
Type:	**Natural Gas**		**Natural Gas**
Units:	mcf		mcf
Unit cost:	$ 3.934	/mcf	$ 3.934
Conversion Factor:	1,030,000	Btu/mcf	1,030,000
Efficiency:	85%	Heating	84%

Basic Inputs

	Type #1	Type #2	Type #3	Type #4	Type #5
Location	Kitchen	Kitchen	AHU6 mech rm	134 DHW	135 DHW
Fluid	**DHW**	**DHW**	**Hot Water**	**DHW**	**DHW**
Pipe Material	**Dull Copper**	**Dull Copper**	**Steel**	**Dull Copper**	**Dull Copper**
O.D., inches (d)	**2.00**	**1.50**	**4.00**	**3.00**	**1.00**
Total Length, ft	**26**	**8**	**3**	**6**	**10**
Fluid Temperature Inside Pipe, °F (Ts)	**172**	**172**	**160**	**110**	**110**
Ambient Temperature, °F (Ta)	**70**	**70**	**70**	**70**	**70**
Annual Operating Hours	**8,760**	**8,760**	**2,187**	**2,187**	**2,187**
New Insulation Thickness, inches	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**
Thermal Conductivity - "k" (Btu-in/hr-sq ft	**0**	**0**	**0**	**0**	**0**
Heat Loss - Bare Pipe					
C factor	**1.016**	**1.016**	**1.016**	**1.016**	**1.016**
emissivity based on pipe material	0.440	0.440	0.940	0.440	0.440
Outside Radius Pipe, inches (Ri)	1	1	2	2	1
Outside Radius Insulation, inches (Rs)	3.0	2.8	4.0	3.5	2.5
h convection, Btu/hr - s.f. pipe surface area -°	1.27	1.35	1.08	0.96	1.20
h radiation, Btu/hr - s.f. pipe surface area - °F	0.60	0.60	1.23	0.50	0.50
h total	1.87	1.94	2.31	1.47	1.70
Pipe area, sq ft/lin ft of pipe	0.523	0.393	1.047	0.785	0.262
Q bare, Btu/hr-lin ft	**100**	**78**	**218**	**46**	**18**
Heat Loss - Insulated Pipe					
Q i, Btu/hr-sq ft of outer area of insulation	7.7	7.1	8.1	3.4	2.5
Insulation Area - sq ft/lin ft of pipe	1.6	1.4	2.1	1.8	1.3
Q insul, Btu/hr-lin ft	**12.1**	**10.3**	**17.0**	**6.2**	**3.3**
Avoided Energy Loss					
Existing Loss - MBtu/year	22.7	5.4	1.4	0.6	0.4
Proposed Loss - MBtu/year	2.8	0.7	0.1	0.1	0.1
Avoided Loss - MBtu/year	19.9	4.7	1.3	0.5	0.3
Total Avoided Fuel Consumption					
31 Units Saved	23	5	2	1	0
Natural Gas Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
$ 0 $/year					

Formulas:

Based on ASHRAE 1993 Fundamentals Handbook pages 20.9 and 22.17

h convection = C x {(1 / d) ^ 0.2} x { (1 / ((Ts + Ta)/2)) ^ 0.181 } x { (Ts - Ta) ^ 0.266 }

h radiation = { emissivity x 0.1713 x 10 ^ -8 x [(Ta + 460) ^ 4 - (Ts +460) ^ 4]} / (Ta - Ts)

Q bare = h total x Pipe Area x (Ts - Ta)

Q i = (Ts - Ta) / { [Rs x (ln (Rs / Ri)] / k }

Q insul = Q i x Insul Area

Total Avoided Consumption = (Q bare - Q insul) x Total length of pipe x Annual Operating Hours

CALCULATIONS TO REPLACE CHILLER with air cooled efficient

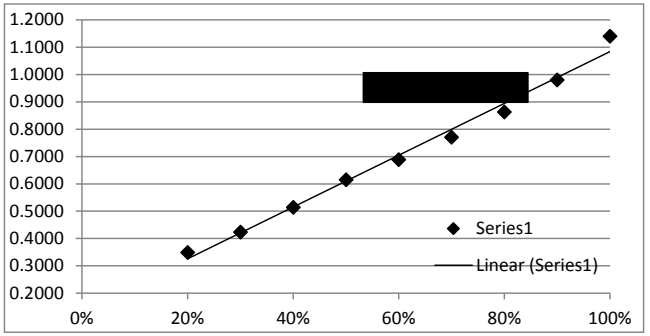
FIM 2.33 Erie County

						$ 0.054	per kWh	
Chiller Serves:	Comfort Cooling					$ 6.665	per kW	
Process load:	0	hours per week						
Process load:	0	tons occupied		Chiller Data				
Process load:	0	tons unoccupied				Tons	kW/ton	
Comfort Cooling	150	tons peak		Existing	air cooled existing	150	1.270	summer
Unocc. load is =		of peak tons			air cooled existing	0	1.270	winter
	150	tons total summer peak		Proposed	air cooled efficient	150	1.140	summer
					air cooled efficient	0	1.140	winter
Bin Data Based on:		May 1 - Sep 30			60	°F changeover from winter to summer chiller		
		70	hours per week					
	Periods:	Occupied	Unocc.			38%	savings	
	AC Load Increment:	12%	12%	for comfort cooling		$ 4,235	savings	
	No Comfort Cooling below:	55	°F					
		Tons						

Bin	Occupied	Load	Existing		Proposed		Occupied kW/ton		Occupied kWh		Peak kW	
Temp	Hours	Tons	% load	tons online	% load	tons online	Present	Proposed	Present	Proposed	Present	Proposed
57.5	**702.0**	**29**	20%	150	20%	150	0.87	0.32	17,911	6,590	26	9
62.5	**935.0**	**47**	31%	150	31%	150	0.90	0.43	39,015	18,694	42	20
67.5	**737.0**	**64**	43%	150	43%	150	0.93	0.54	43,670	25,324	59	34
72.5	**499.0**	**81**	54%	150	54%	150	0.97	0.65	39,187	26,192	79	52
77.5	**387.0**	**98**	66%	150	66%	150	1.02	0.76	38,721	28,785	100	74
82.5	**206.0**	**116**	77%	150	77%	150	1.08	0.87	25,621	20,606	124	100
87.5	**22.0**	**133**	89%	150	89%	150	1.15	0.98	3,346	2,848	152	129
92.5	**-**	**150**	100%	150	100%	150	1.23	1.08	-	-	-	-
	8,760	Occupied					Occupied kwh/year		207,472	129,040		
	9,125	bin hours/year total					Total kWh / year		207,472	129,040	152.1	129.4
									78,432	kwh/yr sav	22.7	kW sav.
									38%	savings		

150 Ton Smardt Chiller

%load	Cap	kW/ton	Ambient Temp
100%	150	1.1400	95.0
90%	135	0.9805	90.6
80%	120	0.8627	86.1
70%	105	0.7704	81.7
60%	90	0.6885	77.2
50%	75	0.6153	72.8
40%	60	0.5139	68.3
30%	45	0.4237	63.9
20%	30	0.3488	59.4
10%	15	0.4844	55.0



CALCULATIONS TO INSTALL CONDENSING DOMESTIC HOT WATER HEATERS
FIM 2/11/24/25.34 Erie County

INPUT DATA:

	Present Fuel		Proposed Fuel	
Fuel:	**Natural Gas**		Natural Gas	
Units:	mcf		mcf	
Fuel Cost:	$ 3.93	per mcf	$ 3.93	per mcf
Fuel Conversion Factor:	1,030,000	Btu per mcf	1,030,000	Btu per mcf

Elec?

Annual DHW Consumption:	Present		Proposed	
Hot Water Usage:	**12.0**	Gallons/person	12.0	Gallons/person
Number of persons:	**500**	(estimate)	500	(estimate)
Days of Usage:	**365**	per year	365	per year
Hours of Usage per Day:	16	hours	16	hours
Average inlet water Temp:	50	degrees F	50	degrees F
Average hot water temp:	125	degrees F	125	degrees F

Storage Tank Losses:	Present Tank		Proposed Tank	
Tank U factor:	0.25	Btu/SF/Hour	0.25	Btu/SF/Hour
ave. Height of Tank:	65.0	inches	65.0	inches
ave. Diameter of Tank:	48.0	inches	48.0	inches
	457	gallons/tank	457	gallons/tank
# of Tanks	5	Qty.	5	Qty.
Hours Tank is Hot:	8,760	Hours	8,760	
Water Temperature:	125	Deg. F.	125	
Ambient Temperature:	75	Deg. F.	75	

Annual DHW Eff.	Hours	Eff.	standby losses
Heating Season	5,252	85.0%	**2.5%**
Non-Heating Season	3,508	75.0%	
	8,760	81.0%	2.5%

Recirculation Losses:					
	0.0%	of boiler capacity =	0	BTUh	
	8,760	hours/year	8,760	hours/year	100%

Boiler Jacket & Flue Losses:					
Burner Input	2,318,000	BTUH	1,084,900	BTUH	
Blended Efficiency:	**81.0%**		90.0%		
Boiler Output Capacity	1,877,474	BTU output	976,410	BTU output	
Jacket & Flue Losses:	2.5%	of boiler capacity	0.5%	of boiler capacity	
Boiler is Hot:	8,760	hours/year	8,760	hours/year	100%

CALCULATIONS:

	Present		Proposed	
Consumption Energy:	1,368,202,500	BTU output rqd/yr	1,368,202,500	BTU output rqd/yr
Tank Energy Losses:	51,017,693	BTU/year	51,017,693	BTU/year
Recirculation Losses:	0	BTU/year	0	BTU/year
Boiler Jacket Losses:	411,166,840	BTU/year	42,766,758	BTU/year
Output BTU/Year	1,830,387,033		1,461,986,951	
Annual Fuel Consumption	2,194	mcf	1,577	mcf
Demand	0	billed kW /yr.	0	kW
Annual Fuel Cost	$ 8,631		$ 6,204	
Annual Savings:	**617**	**mcf**	**$ 2,427**	**per year**
	0			
	0	billed kW /yr.		

Based on the inputs at left, the monthly fuel usages are:

	Present		Proposed	
Consumption	137	mcf	123	mcf
Tank Losses	5	mcf	5	mcf
Recirculation	0	mcf	0	mcf
Boiler & Piping	41	mcf	4	mcf
Monthly usage:	183	mcf /mo.	131	mcf /mo.

TOO HIGH!

Present base use=	0	mcf /mo.	0	mcf /mo.
	975	FLH	1,497	FLH
	11.1%	annual duty cycl	17.1%	annual duty cycle
DHW Usage	2,190,000	gallons	2,190,000	gallons DHW/year
	547,500	gal/qtr	547,500	gal/qtr
	182,500	gal/mo.	182,500	gal/mo.

Additional Associated Savings

		Present		Proposed		Savings
1	Non-Heating Season Steam Distribution Losses	**363**	**mcf**	0	mcf	$ 1,427
2	Uncontrolled Steam Radiators in AC Areas	**302**	**mcf**	0	mcf	$ 1,188
3	Pony Boiler Standy losses	**157**	**mcf**	0	mcf	$ 617
4	Additional Cooling Load From Distribution Losses / Uncontrolled Radiators	**24,900**	**kWh**	0	kWh	$ 1,345
5	Condensate Pumps	**113**	**kWh**	0	kWh	$ 6
		1,438				

Holding Center DHW gas

Summer Boiler Load	1,257	mcf	
non Summer DHW Load	1,760	mcf	Estimated Wasted Summer Boiler Fuel
	3,018	mcf	824
	$ 11,872		

CALCULATIONS FOR NON-HEATING SEASON STEAM DISTRIBUTION LOSSES
cont. Erie County
FIM 2/11/24/25.43

Fuel Information

	Heating System		DHW System
Type:	**Natural Gas**		**Natural Gas**
Units:	mcf		mcf
Unit cost:	$ 3.934	/mcf	$ 3.934
Conversion Factor:	1,030,000	Btu/mcf	1,030,000
Efficiency:	81.0%	Heating	81.0%

Fibrous Glass "k" (Btu-in/hr-sq ft-°F)		
Mean Temp. °F	Johns Manvi	ASTM C 547
0	0.22	0.25
50	0.22	0.25
75	0.23	0.25
100	0.24	0.25
200	0.29	0.31
300	0.36	0.40
500	0.59	0.63

Basic Inputs

		Type #1	Type #2	Type #3	Type #4	Type #5
Fluid		**Steam**	**Steam**	**Steam**	**Steam**	**Steam**
Pipe Material		**Steel**	**Steel**	**Steel**	**Steel**	**Steel**
	O.D., inches (d)	**6.00**	**4.00**	**3.00**	**2.00**	**1.25**
	Total Length, ft	**930**	**240**	**300**	**360**	**360**
Fluid Temperature Inside Pipe, °F	(Ts)	**215**	**212**	**215**	**215**	**215**
Ambient Temperature, °F	(Ta)	**65**	**65**	**65**	**65**	**65**
Annual Operating Hours		**3,508**	**3,508**	**2,187**	**2,187**	**2,187**
	New Insulation Thickness, inches	**1.0**	**1.0**	**2.0**	**2.0**	**2.0**
	Thermal Conductivity - "k" (Btu-in/hr-sq ft-°F)	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**
Heat Loss - Insulated Pipe						
Q i, Btu/hr-sq ft of outer area of insulation		32.6	30.2	12.6	11.4	10.0
Insulation Area - sq ft/lin ft of pipe		2.1	1.6	1.8	1.6	1.4
Q insul, Btu/hr-lin ft		**68.2**	**47.4**	**23.2**	**17.9**	**13.7**
Avoided Energy Loss						
Avoided Loss - MBtu/year		222.6	39.9	15.2	14.1	10.8
Total Avoided Fuel Consumption						
	363	Units Saved	267	48	18	17	13
	Natural Gas	Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
	$ 1,427	$/year	**$ 1,049**	**$ 188**	**$ 72**	**$ 66**	**$ 51**

Emissivity:	
Steel	0.94

Natural Gas		
#DIV/0!	#DIV/0!	savings

Formulas:

Based on ASHRAE 1993 Fundamentals Handbook pages 20.9 and 22.17

h convection = C x {(1 / d) ^ 0.2} x { (1 / ((Ts + Ta)/2)) ^ 0.181 } x { (Ts - Ta) ^ 0.266 }
h radiation = { emissivity x 0.1713 x 10 ^ -8 x [(Ta + 460) ^ 4 - (Ts +460) ^ 4]} / (Ta - Ts)
Q bare = h total x Pipe Area x (Ts - Ta)

Q i = (Ts - Ta) / { [Rs x (ln (Rs / Ri)] / k }
Q insul = Q i x Insul Area

Total Avoided Consumption = (Q bare - Q insul) x Total length of pipe x Annual Operating Hours

Avoided Cooling Load From Distribution Losses

Chiller Plant Eff.	0.80	kW/ton
Disribution Losses =	363	mcf
	31,125	ton of cooling
	24,900	kWh

CALCULATIONS TO INSTALL CONDENSING DOMESTIC HOT WATER HEATERS
cont. **Erie County**
FIM 2/11/24/25.34

DATA AND CALCULATIONS:

kWh:	$ 0.054	per kWh
Demand:	$ 6.67	per kW

Formula:

Demand kW = (Qty x HP x 0.746 kW/HP x % Load) / % Efficiency
Annual kWh = Demand kW x Annual Hours
Demand $ Savings = (Present kW - New kW) x months of demand x Monthly demand charge
kWh $ Savings = (Present kWh - New kWh) x Cost per kWh

		Motor			Motor Efficiency		Summer Motor Run Hours		Months of Demand
#	Description	Nominal HP	Qty	Loading vs. Nom.	Present	New	Existing	New	Savings
1	Condensate Pumps	3	3	75%	89.5%	89.5%	20		0

		Total	Demand kW		Annual kWh		Motor	$ Savings	
#	Description	BHP/	Present	New	Present	New	Type	Total	
1	Condensate Pumps	6.8	5.63	0.00	113	0	TEFC	$ 6	
		6.8	5.6	0.0	113	0		$ 6	

ODP = open drip-proof
TEFC = totally enclosed fan-cooled

Peak KW Demand Savings:	5.6	kW
Annual KW Demand Savings:	0.0	kW
Annual kWh Savings:	113	kWh

CALCULATIONS FOR ADD HEAT RECOVERY AHU-2

FIM 2.35 Erie County

INPUT DATA:

Exhaust Operating Hours:	**168**	hours per week during the Heating Season
% of time operating:	100%	
AHU Discharge Air Temperature:	**65**	°F
Proposed Heat Recovery Efficiency:	**65%**	
Additional Fan Static Pressure:	**1.00**	inches w.c.
Fan Efficiency:	**60%**	

	Outdoor Air	Exhaust Air	
	CFM	CFM	Temp
Air Flows:	**8,600**	**8,600**	**74**
Motor Efficiency:	**94.1%**	**94.1%**	

Heating Fuel:	**Natural Gas**	
Units:	**mcf**	
Fuel Cost:	**$ 3.934**	per mcf
Heat Content:	**1,030,000**	Btu per mcf
Boiler Efficiency:	**85.0%**	
Electricity Cost		
Units:	**kwh**	
Fuel Cost:	**$ 0.054**	per kwh
	$ 6.67	$/kW
Cooling Energy Use:	**0.80**	kw per ton

Heat recovery system is not used if outdoor air temperature
a) is within **2** degrees of discharge air setpoint or
b) is above **100** degrees

Additonal Electrical Power Required:

Fans

Supply air:	2.26	HP
Exhaust air:	2.26	HP

Pump Data

47	GPM
45	ft. head
55%	Pump eff.
0.96	BHP
90.0%	Motor Eff.
0.80	kW

Bin Data for **Cleveland, Ohio**

Bin Data		Req'd	Make-up Air Unit Operating Costs - Present				Heat Recovery Unit		Future Operating Costs - w/ Heat Recovery Unit				Add'l. Energy				
			Energy Required		Heating	Cooling	Potential	Actual			Heating	Cooling	Fan	Pump			
Temp.	Hours	SAT	Btuh	Btu/yr	mcf	kwh	ΔT	LAT	Btuh	Btu/yr	mcf	kwh	kwh	kwh			
92.5	**22**	**65**	(256,603)	(5,645,255)	0	376	(12.0)	80.5	(144,397)	(3,176,739)	0	212	79	18			
87.5	**62**	**65**	(209,948)	(13,016,745)	0	868	(8.8)	78.7	(128,068)	(7,940,214)	0	529	222	50			
82.5	**324**	**65**	(163,293)	(52,906,770)	0	3,527	(5.5)	77.0	(111,739)	(36,203,347)	0	2,414	1,158	259			
77.5	**491**	**65**	(116,638)	(57,269,013)	0	3,818	(2.3)	75.2	(95,409)	(46,846,052)	0	3,123	1,756	392			
72.5	**707**	**65**	(69,983)	(49,477,628)	0	3,299	1.0	72.5	(69,983)	(49,477,628)	0	3,299	2,528	0			
67.5	**682**	**65**	(23,328)	(15,909,355)	0	1,061	4.2	67.5	(23,328)	(15,909,355)	0	1,061	2,439	0			
62.5	**936**	**65**	23,328	21,834,540	25	0	7.5	65.0	0	0	0	0	3,347	748			
57.5	**727**	**65**	69,983	50,877,278	58	0	10.7	65.0	0	0	0	0	2,599	581			
52.5	**705**	**65**	116,638	82,229,438	94	0	14.0	65.0	0	0	0	0	2,521	563			
47.5	**540**	**65**	163,293	88,177,950	101	0	17.2	64.7	2,566	1,385,654	2	0	1,931	431			
42.5	**499**	**65**	209,948	104,763,803	120	0	20.5	63.0	18,895	9,428,742	11	0	1,784	399			
37.5	**920**	**65**	256,603	236,074,300	270	0	23.7	61.2	35,225	32,406,563	37	0	3,290	735			
32.5	**800**	**65**	303,258	242,606,000	277	0	27.0	59.5	51,554	41,243,020	47	0	2,860	639			
27.5	**518**	**65**	349,913	181,254,675	207	0	30.2	57.7	67,883	35,163,407	40	0	1,852	414			
22.5	**349**	**65**	396,568	138,402,058	158	0	33.5	56.0	84,212	29,390,084	34	0	1,248	279			
17.5	**263**	**65**	443,223	116,567,518	133	0	36.7	54.2	100,542	26,442,421	30	0	940	210			
12.5	**127**	**65**	489,878	62,214,443	71	0	40.0	52.5	116,871	14,842,588	17	0	454	101			
7.5	**47**	**65**	536,533	25,217,028	29	0	43.2	50.7	133,200	6,260,401	7	0	168	38			
2.5	**41**	**65**	583,188	23,910,688	27	0	46.5	49.0	149,529	6,130,700	7	0	147	33			
(2.5)	**0**	**65**	629,843	0	0	0	49.7	47.2	165,859	0	0	0	0	0			
0.0	**0**	**65**	606,515	0	0	0	48.1	48.1	157,694	0	0	0	0	0			
0.0	**0**	**65**	606,515	0	0	0	48.1	48.1	157,694	0	0	0	0	0			
0.0	**0**	**65**	606,515	0	0	0	48.1	48.1	157,694	0	0	0	0	0			
0.0	**0**	**65**	606,515	0	0	0	48.1	48.1	157,694	0	0	0	0	0			
	8,760	Total Hours			1,570	12,948					232	10,637	31,322	5,889			

	mcfs	Heat $	kwh	kW/year	Elec $	Total $
Present Heating & Cooling Cost:	1,570		12,948			
Proposed Heating & Cooling Cost:	232		10,637			
Annual Thermal Savings:	1,338		2,311			
Additional Fan Electricity			(31,322)			
Additional Pump Electricity			(5,889)			
Aditional Demand Costs				(48.5)		
Annual Net Savings:	**1,338**		**(34,900)**	**kwh**		

CALCULATIONS AHU-6

FOR FIM 2.35 Erie County

INPUT DATA:

Exhaust Operating Hours: **168** hours per week during the Heating Season
% of time operating: 100%

AHU Discharge Air Temperature: **65** °F

Proposed Heat Recovery Efficiency: **65%**
Additional Fan Static Pressure: **1.00** inches w.c.
Fan Efficiency: **60%**

	Outdoor Air	Exhaust Air	
	CFM	CFM	Temp
Air Flows:	**4,020**	**4,020**	**74**
Motor Efficiency:	**94.1%**	**94.1%**	

Heating Fuel: **Natural Gas**
Units: **mcf**
Fuel Cost: **$ 3.934** per mcf
Heat Content: **1,030,000** Btu per mcf
Boiler Efficiency: **85.0%**

Electricity Cost
Units: **kwh**
Fuel Cost: **$ 0.054** per kwh
$ 6.67 $/kW
Cooling Energy Use: **0.80** kw per ton

Heat recovery system is not used if outdoor air temperature
a) is within **2** degrees of discharge air setpoint or
b) is above **100** degrees

Additonal Electrical Power Required:

Fans
Supply air: 1.05 HP
Exhaust air: 1.05 HP

Pump Data
22 GPM
45 ft. head
55% Pump eff.
0.45 BHP
90.0% Motor Eff.
0.37 kW

Bin Data for **Cleveland, Ohio**

Bin Data		Req'd	Make-up Air Unit Operating Costs - Present				Heat Recovery Unit		Future Operating Costs - w/ Heat Recovery Unit				Add'l. Energy				
			Energy Required		Heating	Cooling	Potential	Actual			Heating	Cooling	Fan	Pump	Savings		
Temp.	Hours	SAT	Btuh	Btu/yr	mcf	kwh	ΔT	LAT	Btuh	Btu/yr	mcf	kwh	kwh	kwh	Positive	Negative	Total
92.5	**22**	**65**	(119,947)	(2,638,829)	0	176	(12.0)	80.5	(67,497)	(1,484,941)	0	99	37	8			
87.5	**62**	**65**	(98,138)	(6,084,572)	0	406	(8.8)	78.7	(59,864)	(3,711,589)	0	247	104	23			
82.5	**324**	**65**	(76,330)	(24,730,839)	0	1,649	(5.5)	77.0	(52,231)	(16,922,960)	0	1,128	542	121			
77.5	**491**	**65**	(54,521)	(26,769,934)	0	1,785	(2.3)	75.2	(44,598)	(21,897,806)	0	1,460	821	183			
72.5	**707**	**65**	(32,713)	(23,127,914)	0	1,542	1.0	72.5	(32,713)	(23,127,914)	0	1,542	1,182	0			
67.5	**682**	**65**	(10,904)	(7,436,699)	0	496	4.2	67.5	(10,904)	(7,436,699)	0	496	1,140	0			
62.5	**936**	**65**	10,904	10,206,378	12	0	7.5	65.0	0	0	0	0	1,564	350			
57.5	**727**	**65**	32,713	23,782,169	27	0	10.7	65.0	0	0	0	0	1,215	272			
52.5	**705**	**65**	54,521	38,437,481	44	0	14.0	65.0	0	0	0	0	1,178	263			
47.5	**540**	**65**	76,330	41,218,065	47	0	17.2	64.7	1,199	647,712	1	0	903	202			
42.5	**499**	**65**	98,138	48,970,987	56	0	20.5	63.0	8,832	4,407,389	5	0	834	186			
37.5	**920**	**65**	119,947	110,351,010	126	0	23.7	61.2	16,465	15,148,184	17	0	1,538	344			
32.5	**800**	**65**	141,755	113,404,200	130	0	27.0	59.5	24,098	19,278,714	22	0	1,337	299			
27.5	**518**	**65**	163,564	84,726,023	97	0	30.2	57.7	31,731	16,436,848	19	0	866	193			
22.5	**349**	**65**	185,372	64,694,915	74	0	33.5	56.0	39,364	13,738,156	16	0	583	130			
17.5	**263**	**65**	207,181	54,488,537	62	0	36.7	54.2	46,997	12,360,295	14	0	440	98			
12.5	**127**	**65**	228,989	29,081,635	33	0	40.0	52.5	54,630	6,938,047	8	0	212	47			
7.5	**47**	**65**	250,798	11,787,494	13	0	43.2	50.7	62,263	2,926,374	3	0	79	18			
2.5	**41**	**65**	272,606	11,176,856	13	0	46.5	49.0	69,896	2,865,746	3	0	69	15			
(2.5)	**0**	**65**	294,415	0	0	0	49.7	47.2	77,529	0	0	0	0	0			
0.0	**0**	**65**	283,511	0	0	0	48.1	48.1	73,713	0	0	0	0	0			
0.0	**0**	**65**	283,511	0	0	0	48.1	48.1	73,713	0	0	0	0	0			
0.0	**0**	**65**	283,511	0	0	0	48.1	48.1	73,713	0	0	0	0	0			
0.0	**0**	**65**	283,511	0	0	0	48.1	48.1	73,713	0	0	0	0	0			
	8,760	Total Hours			734	6,053					108	4,972	14,641	2,753			

	mcfs	Heat $	kwh	kW/year	Elec $	Total $
Present Heating & Cooling Cost:	734		6,053			
Proposed Heating & Cooling Cost:	108		4,972			
Annual Thermal Savings:	625		1,080			
Additional Fan Electricity			(14,641)			
Additional Pump Electricity			(2,753)			
Aditional Demand Costs				(22.7)		
Annual Net Savings:	**625**		**(16,314)**	**kwh**		

CALCULATIONS

AHU-7

FOR FIM 2.35 Erie County

INPUT DATA:

Exhaust Operating Hours:	**168**	hours per week during the Heating Season
% of time operating:	100%	
AHU Discharge Air Temperature:	**65**	°F
Proposed Heat Recovery Efficiency:	**65%**	
Additional Fan Static Pressure:	**1.00**	inches w.c.
Fan Efficiency:	**60%**	

	Outdoor Air	Exhaust Air	
	CFM	CFM	Temp
Air Flows:	**4,020**	**4,020**	**74**
Motor Efficiency:	**94.1%**	**94.1%**	

Heating Fuel:	**Natural Gas**	
Units:	**mcf**	
Fuel Cost:	**$ 3.934**	per mcf
Heat Content:	**1,030,000**	Btu per mcf
Boiler Efficiency:	**85.0%**	
Electricity Cost		
Units:	**kwh**	
Fuel Cost:	**$ 0.054**	per kwh
	$ 6.67	$/kW
Cooling Energy Use:	**0.80**	kw per ton

Heat recovery system is not used if outdoor air temperature
a) is within **2** degrees of discharge air setpoint or
b) is above **100** degrees

Additonal Electrical Power Required:

Fans		
Supply air:	1.05	HP
Exhaust air:	1.05	HP
Pump Data		
	22	GPM
	45	ft. head
	55%	Pump eff.
	0.45	BHP
	90.0%	Motor Eff.
	0.37	kW

Bin Data for **Cleveland, Ohio**

Bin Data		Req'd	Make-up Air Unit Operating Costs - Present				Heat Recovery Unit		Future Operating Costs - w/ Heat Recovery Unit				Add'l. Energy				
			Energy Required		Heating	Cooling	Potential	Actual			Heating	Cooling	Fan	Pump	Savings		
Temp.	Hours	SAT	Btuh	Btu/yr	mcf	kwh	ΔT	LAT	Btuh	Btu/yr	mcf	kwh	kwh	kwh	Positive	Negative	Total
92.5	**22**	**65**	(119,947)	(2,638,829)	0	176	(12.0)	80.5	(67,497)	(1,484,941)	0	99	37	8			
87.5	**62**	**65**	(98,138)	(6,084,572)	0	406	(8.8)	78.7	(59,864)	(3,711,589)	0	247	104	23			
82.5	**324**	**65**	(76,330)	(24,730,839)	0	1,649	(5.5)	77.0	(52,231)	(16,922,960)	0	1,128	542	121			
77.5	**491**	**65**	(54,521)	(26,769,934)	0	1,785	(2.3)	75.2	(44,598)	(21,897,806)	0	1,460	821	183			
72.5	**707**	**65**	(32,713)	(23,127,914)	0	1,542	1.0	72.5	(32,713)	(23,127,914)	0	1,542	1,182	0			
67.5	**682**	**65**	(10,904)	(7,436,699)	0	496	4.2	67.5	(10,904)	(7,436,699)	0	496	1,140	0			
62.5	**936**	**65**	10,904	10,206,378	12	0	7.5	65.0	0	0	0	0	1,564	350			
57.5	**727**	**65**	32,713	23,782,169	27	0	10.7	65.0	0	0	0	0	1,215	272			
52.5	**705**	**65**	54,521	38,437,481	44	0	14.0	65.0	0	0	0	0	1,178	263			
47.5	**540**	**65**	76,330	41,218,065	47	0	17.2	64.7	1,199	647,712	1	0	903	202			
42.5	**499**	**65**	98,138	48,970,987	56	0	20.5	63.0	8,832	4,407,389	5	0	834	186			
37.5	**920**	**65**	119,947	110,351,010	126	0	23.7	61.2	16,465	15,148,184	17	0	1,538	344			
32.5	**800**	**65**	141,755	113,404,200	130	0	27.0	59.5	24,098	19,278,714	22	0	1,337	299			
27.5	**518**	**65**	163,564	84,726,023	97	0	30.2	57.7	31,731	16,436,848	19	0	866	193			
22.5	**349**	**65**	185,372	64,694,915	74	0	33.5	56.0	39,364	13,738,156	16	0	583	130			
17.5	**263**	**65**	207,181	54,488,537	62	0	36.7	54.2	46,997	12,360,295	14	0	440	98			
12.5	**127**	**65**	228,989	29,081,635	33	0	40.0	52.5	54,630	6,938,047	8	0	212	47			
7.5	**47**	**65**	250,798	11,787,494	13	0	43.2	50.7	62,263	2,926,374	3	0	79	18			
2.5	**41**	**65**	272,606	11,176,856	13	0	46.5	49.0	69,896	2,865,746	3	0	69	15			
(2.5)	**0**	**65**	294,415	0	0	0	49.7	47.2	77,529	0	0	0	0	0			
0.0	**0**	**65**	283,511	0	0	0	48.1	48.1	73,713	0	0	0	0	0			
0.0	**0**	**65**	283,511	0	0	0	48.1	48.1	73,713	0	0	0	0	0			
0.0	**0**	**65**	283,511	0	0	0	48.1	48.1	73,713	0	0	0	0	0			
0.0	**0**	**65**	283,511	0	0	0	48.1	48.1	73,713	0	0	0	0	0			
	8,760	Total Hours			734	6,053					108	4,972	14,641	2,753			

	mcfs	Heat $	kwh	kW/year	Elec $	Total $
Present Heating & Cooling Cost:	734		6,053			
Proposed Heating & Cooling Cost:	108		4,972			
Annual Thermal Savings:	625		1,080			
Additional Fan Electricity			(14,641)			
Additional Pump Electricity			(2,753)			
Aditional Demand Costs				(22.7)		
Annual Net Savings:	**625**		**(16,314)**	**kwh**		

CALCULATIONS FOR VENDING MACHINE OCCUPANCY CONTROL
FIM 2/25.36 Erie County

Electricity
Unit cost: **$ 0.054** /kwh

INPUT DATA:

Machine Type	Qty.	Volts	Amps	Present Operation Hrs/Day	Present Operation Days/Yr.	Machine Location is Occupied Hrs/Day	Machine Location is Occupied Days/Yr.
Refrigerated	**5**	**115**	**11.0**	**24**	**365**	**9**	**250**
Non Refrigerated	**2**	**115**	**3.0**	**24**	**365**	**9**	**250**

* Lighting watts is included in the volt / amp data and Total kW

Lighting Savings							
Machine Type	Lighting * Watts/ unit	Lighting Found	Ltg. Watts	Present Hrs/Yr.	Proposed Hrs/Yr.	Present Lighting kWh/yr.	Proposed Lighting kWh/Yr.
Refrigerated	**128**	**On**	640	8,760	3,064	5,606	1,961
Non Refrigerated	**28**	**On**	56	8,760	3,064	491	172
						6,097	2,132

Compressor Savings						
	Duty Cycle		Compressor Hours		Present	Proposed
Compressor kW	Present Normal	Proposed Nite	Present Hrs/Yr.	Proposed Hrs/Yr.	Compressor kWh/yr.	Compressor kWh/Yr.
4.420	**33%**	**12.5%**	2,891	1,556	12,777	6,879
0.496						
					12,777	6,879

CALCULATIONS:

Ltg kWh =Ltg Watts / 1000 x # units x Hrs per Day x Days per Yr
Compressor kWh=(volts x amps x 0.80 pf/ 1000 - ltg watts)x # units x hrs per day x days per yr x duty cycle

Ltg kWh with Control = Ltg watts per unit /1000 x # units x (Occ Hrs per Yr + Unocc Hrs x Nite Duty Cycle)
Prop Compressor Run Hours = Occ Hrs x Existing Duty Cycle + Unocc Hrs x Unocc Duty Cycle)
Compressor kWh with Control=(volts x amps x 0.80 pf -ltg watts)/1000 x # units x prop compressor hrs per y

Electricity Cost Savings = Electricity Savings x Electricity Unit Cost

	Lighting	Compressor	Total	
Existing Annual Electricity Use:	6,097	12,777	18,874	kWh
Proposed Annual Electricity Use:	2,132	6,879	9,011	kWh
Total Annual Savings:	3,965	5,899	9,863	kWh
			52%	reduction

CALCULATIONS TO OPEN BALANCE VALVE
FIM 2.37

Client: Erie County
Address: Holding Center

INPUT DATA:

Fuel:	**Electricity**	
kWh:	$ 0.054	per kWh
Demand:	$ 6.67	per kW
Months of Demand	**12**	per year
Operating Hours	**6,552**	hours per year

Pump Nameplate and Performance Data

	Model		
		77%	Pump Efficiency
Design Pump Flow		**360**	gallons per minute
		75	feet of water
		8.9	BHP at design
Motor Nameplate	HP	**15**	HP
	Efficiency	**93.0%**	

Balance Valve Data

Present Settin	**25%**	Open
Manufacturer	**3ell & Gossett**	
Model Numbe	**3ds-6s**	
Pattern		
Valve Δp at present setting	**7.5**	feet of water
Valve Δp when 100% open	**1.5**	feet of water
Valve Δp Savings	**6.0**	feet of water

CALCULATIONS:

HP = (GPM x Valve Δp) / (3960 x Pump Eff.)
kW = HP x 0.746 / (Motor Efficiency)
kWh = kW x Hours

	Existing	Proposed	Savings		
			Standard	Minimal Data	
Flow GPM	360	360		360	
Pump Efficiency	77%	77%		77%	
Motor Efficiency	93.0%	93.0%		93.0%	
Head	75	69.0			
Head Saved				6.0	
HP	8.9	8.1	0.7	0.7	HP
Monthly kW	7.1	6.5	0.6	0.6	kW
kWh	46,538	42,815	3,723	3,723	kWh

CALCULATIONS FOR EXTEND DDC TO UNCONTROLLED EQUIPMENT/PNEUMATICS

FIM 2.39 **Erie County**

INPUT DATA:

Crack Method	Sq Inches of open Window	Est. # of open Windows	Leakage Rate - cfh		Leakage - net cfh		
			Present	New	Present	New	Savings
Open Windows	480	40	60	5	576,000	48,000	528,000
Total Infiltration Reduction			**Occupied**		**576,000**	**48,000**	**528,000**
			Unoccupied		**576,000**	**48,000**	**528,000**

CALCULATIONS:

Leakage = 1/2 x Crack Length x Leakage Rate ***-or-*** ACH x Building Volume

Energy Savings = (Present Leakage - New Leakage) x Accum Hours x Temp Difference x CF2

Energy Cost Savings = (Energy Savings / CF1) x (Unit cost / Efficiency)

	Occupied	Unoccupied	
T Setpoint:	74		°F
Q internal gains:	1,303,314		Btuh
BLC:	112,217		Btuh/°F
T Balance:	62.4		°F. T Balance = T Setpoint - (Q internal gains / BLC)
Bin Data for Buffalo, 168 hrs./week			
Accumulated Hours	5,708		below balance temp.
Avg. OAT	38.1		°F below balance temp.
(T Set- Avg OAT)	35.9		°F difference

Type:	Natural Gas	
Units:	mcf	
Unit cost:	$ 3.934	/mcf
CF1	1,030,000	Btu/mcf
Efficiency:	87%	
CF2	0.018	Btu/hr-°F-cfh

	Energy Savings - Btu/year			Total Savings	
	Occupied	Unoccupied	Total	mcf / yr	$
Total Infiltration Reduction	1,946,723,300	0	1,946,723,300	2,181	
Cab heaters, unit heaters					

CALCULATIONS FOR EXTEND DDC TO UNCONTROLLED EQUIPMENT/ PNEUMATICS FIM 2.39 Erie County

INPUT DATA: 2% of Building to be Setback

		Current	Proposed	
Heating T Setpoint:	Occupied	74	65	deg. F.
	Unoccupied	74	60	deg. F.
Cooling T Setpoint:	Occupied	74	74	deg. F.
	Unoccupied	80	80	deg. F.
HVAC Schedule	Occupied	60.0	108.0	Hours per week
	Unoccupied	108.0	60.0	Hours per week
Q internal gains:	Occupied	26,066	26,066	Btuh
	Unoccupied	5,076	5,076	Btuh
Q internal gains:	Schedule	60	108	Hours per week
BLC:	Occupied	2,244	2,244	Btuh/deg. F.
	Unoccupied	2,206	2,206	Btuh/deg. F.

Fuel Data	Heating	Cooling		
Type:	Natural Gas	Electricity		
Units:	**mcf**	kwh		
Unit cost:	**$ 3.934**	$ 0.05		
BTU/unit	**1,030,000**	3,412		
Efficiency/ COP:	**86.7%**	4.69	COP, = EER	16.0

CALCULATIONS:

Current Buffalo, 168 hrs./week

Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use mcf	Cooling Energy kwh
(2.5)	1	0	145,626	163,662	0	0
2.5	31	0	134,404	152,633	5	0
7.5	62	0	123,183	141,604	9	0
12.5	219	0	111,961	130,576	27	0
17.5	458	0	100,739	119,547	52	0
22.5	400	0	89,517	108,519	40	0
27.5	386	0	78,296	97,490	34	0
32.5	647	0	67,074	86,462	49	0
37.5	936	0	55,852	75,433	59	0
42.5	794	0	44,631	64,404	40	0
47.5	745	0	33,409	53,376	28	0
52.5	593	0	22,187	42,347	15	0
57.5	702	0	10,965	31,319	9	0
62.5	935	0	(256)	20,290	0	0
67.5	737	0	(11,478)	9,262	0	0
72.5	499	0	(22,700)	(1,767)	0	0
77.5	387	0	(33,921)	(5,076)	0	0
82.5	206	0	(45,143)	(10,590)	0	0
87.5	22	0	(56,365)	(21,618)	0	0
92.5	0	0	(67,587)	(32,647)	0	0
97.5	0	0	(78,808)	(43,676)	0	0
102.5	0	0	(90,030)	(54,704)	0	0
107.5	0	0	(101,252)	(65,733)	0	0
	8,760	hours			365	0

Proposed Buffalo, 168 hrs./week

Bin Mid Pt.	Occupied	Unoccupied Hours	Occ Net Heat Loss	Unocc Net Heat Loss	Heating Fuel Use	Cooling Energy kwh
(2.5)	0	1	125,427	132,782	0	0
2.5	7	24	114,205	121,753	4	0
7.5	20	42	102,983	110,724	8	0
12.5	57	162	91,762	99,696	24	0
17.5	179	279	80,540	88,667	44	0
22.5	142	258	69,318	77,639	33	0
27.5	107	279	58,097	66,610	28	0
32.5	227	420	46,875	55,582	38	0
37.5	278	658	35,653	44,553	44	0
42.5	275	519	24,431	33,524	27	0
47.5	211	534	13,210	22,496	17	0
52.5	164	429	1,988	11,467	6	0
57.5	246	456	(9,234)	439	0	0
62.5	347	588	(20,455)	(5,076)	0	0
67.5	256	481	(26,066)	(5,076)	0	0
72.5	236	263	(26,066)	(5,076)	0	0
77.5	226	161	(33,921)	(5,076)	0	0
82.5	139	67	(45,143)	(10,590)	0	0
87.5	15	7	(56,365)	(21,618)	0	0
92.5	0	0	(67,587)	(32,647)	0	0
97.5	0	0	(78,808)	(43,676)	0	0
102.5	0	0	(90,030)	(54,704)	0	0
107.5	0	0	(101,252)	(65,733)	0	0
	8,760	hours			273	0

		Present	Proposed	Savings
Heating	mcf	365	273	92

CALCULATIONS FOR VARIABLE SPEED DRIVE ON HOT WATER PUMPS

FIM 2.43 Erie County

AHU Glycol Loop pumps (penthouse mechanical room)

Pump Type: **Hot Water**

$ 0.054 per kWh

	Existing	Proposed	
Minimum Flow:	**160**	**64**	GPM = 40% of GPMdes.
Motor Efficiency:	**81.6%**	**89.5%**	
Pump Efficiency:	**74.0%**	2.8	BHP design
		5.0	HP Nameplate
VSD Efficiency:		**97%**	
OA Lockout Temp:		**55**	°F

Design Conditions:

	160	GPMdes
	51	ft Total Head (TH)
-	**15**	ft head minimum (Fixed Minimum Head)
	36	pipe losses (Variable Head)

Bin Data for Buffalo, 168 hrs./week

Periods: **Occupied** **Unocc.**

Approx. Flow Increment: **5%** **5%** per bin

Unocc. flow is = **100%** of Occupied flow at design.

Forumulae:

FMH = Fixed Minimum Head

H2 = FMH + ((TH - FMH) x ((GPM2/GPMdes)^2))

BHP = (GPM2x H2) / (3960 x pump efficiency)

kW = BHP x 0.746 kW / Motor Eff / VFD Eff

Bin	Occupied	Percent	Occupied		New	% Speed	Occupied kW		Occupied kWh	
Temp	Hours	Flow	GPM2	Head H2	BHP	Occupied	Present	Proposed	Present	Proposed
(2.5)	**1.0**	**100%**	**160**	51.0	2.8	**100%**	2.5	2.4	3	2
2.5	**31.0**	**95%**	**152**	47.5	2.5	**96%**	2.5	2.1	79	66
7.5	**62.0**	**90%**	**144**	44.3	2.2	**93%**	2.5	1.9	158	116
12.5	**219.0**	**86%**	**137**	41.5	1.9	**90%**	2.5	1.7	558	365
17.5	**458.0**	**81%**	**130**	38.9	1.7	**87%**	2.5	1.5	1,167	681
22.5	**400.0**	**77%**	**124**	36.6	1.5	**85%**	2.5	1.3	1,019	531
27.5	**386.0**	**74%**	**118**	34.5	1.4	**82%**	2.5	1.2	984	459
32.5	**647.0**	**70%**	**112**	32.6	1.2	**80%**	2.5	1.1	1,649	690
37.5	**925.0**	**66%**	**106**	30.8	1.1	**78%**	2.5	1.0	2,357	888
42.5	**729.0**	**63%**	**101**	29.3	1.0	**76%**	2.5	0.9	1,858	632
47.5	**481.0**	**60%**	**96**	27.9	0.9	**74%**	2.5	0.8	1,226	377
52.5	**338.0**	**57%**	**91**	26.6	0.8	**72%**	2.5	0.7	861	240
57.5	**316.0**	**0%**	**-**	15.0	-	**0%**	2.5	0.0	-	-
62.5	**259.0**	**0%**	**-**	15.0	-	**0%**	2.5	0.0	-	-
67.5	**78.0**	**0%**	**-**	15.0	-	**0%**	2.5	0.0	-	-
72.5	**45.0**	**0%**	**-**	15.0	-	**0%**	2.5	0.0	-	-
77.5	**44.0**	**0%**	**-**	15.0	-	**0%**	2.5	0.0	-	-
82.5	**5.0**	**0%**	**-**	15.0	-	**0%**	2.5	0.0	-	-
87.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
92.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
97.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
102.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
107.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-

5,424	Occupied	Occupied kwh/year	11,919	5,047
5,424	bin hours/year total	Total kWh / year	11,919	5,047
		Savings	6,872	

Summary Table

Unit	Baseline	Proposed	Saving
AHU Glycol Pumps	11,919	5,047	6,872
AHU-6 Pumps	15,590	6,127	9,463
AHU-2 Pumps	14,966	6,124	8,843
	42,475	17,298	25,178

CALCULATIONS FOR VARIABLE SPEED DRIVE ON HOT WATER PUMPS

FIM 2.53 Erie County

HW Loop pumps (penthouse mechanical room)

Pump Type: **Hot Water**

$ 0.054 per kWh

	Existing	Proposed	
Minimum Flow:	**125**	**50**	GPM = 40% of GPMdes.
Motor Efficiency:	**81.6%**	**89.5%**	

Design Conditions:

125	GPMdes	Pump Efficiency:	**65.0%**	3.6	BHP design
75	ft Total Head (TH)			5.0	HP Nameplate
- **15**	ft head minimum (Fixed Minimum Head)	VSD Efficiency:	**97%**		
60	pipe losses (Variable Head)	OA Lockout Temp:	**55**	°F	

Bin Data for Buffalo, 168 hrs./week

Periods: **Occupied** **Unocc.**

Approx. Flow Increment: **5%** **10%** per bin

Unocc. flow is = **100%** of Occupied flow at design.

Forumulae: FMH = Fixed Minimum Head

H2 = FMH + ((TH - FMH) x ((GPM2/GPMdes)^2))

BHP = (GPM2x H2) / (3960 x pump efficiency)

kW = BHP x 0.746 kW / Motor Eff / VFD Eff

Bin	Occupied	Percent	Occupied		New	% Speed	Occupied kW		Occupied kWh	
Temp	Hours	Flow	GPM2	Head H2	BHP	Occupied	Present	Proposed	Present	Proposed
(2.5)	**1.0**	**100%**	**125**	75.0	3.6	**100%**	3.3	3.1	3	3
2.5	**31.0**	**95%**	**119**	69.2	3.2	**96%**	3.3	2.7	103	85
7.5	**62.0**	**90%**	**113**	63.9	2.8	**92%**	3.3	2.4	207	149
12.5	**219.0**	**86%**	**107**	59.1	2.5	**89%**	3.3	2.1	730	463
17.5	**458.0**	**81%**	**102**	54.8	2.2	**85%**	3.3	1.9	1,527	853
22.5	**400.0**	**77%**	**97**	50.9	1.9	**82%**	3.3	1.6	1,333	658
27.5	**386.0**	**74%**	**92**	47.4	1.7	**80%**	3.3	1.5	1,287	562
32.5	**647.0**	**70%**	**87**	44.3	1.5	**77%**	3.3	1.3	2,157	835
37.5	**925.0**	**66%**	**83**	41.4	1.3	**74%**	3.3	1.1	3,083	1,060
42.5	**729.0**	**63%**	**79**	38.8	1.2	**72%**	3.3	1.0	2,430	745
47.5	**481.0**	**60%**	**75**	36.5	1.1	**70%**	3.3	0.9	1,603	439
52.5	**338.0**	**57%**	**71**	34.4	1.0	**68%**	3.3	0.8	1,127	276
57.5	**316.0**	**0%**	**-**	15.0	-	**0%**	3.3	0.0	-	-
62.5	**259.0**	**0%**	**-**	15.0	-	**0%**	3.3	0.0	-	-
67.5	**78.0**	**0%**	**-**	15.0	-	**0%**	3.3	0.0	-	-
72.5	**45.0**	**0%**	**-**	15.0	-	**0%**	3.3	0.0	-	-
77.5	**44.0**	**0%**	**-**	15.0	-	**0%**	3.3	0.0	-	-
82.5	**5.0**	**0%**	**-**	15.0	-	**0%**	3.3	0.0	-	-
87.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
92.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
97.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
102.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
107.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-

5,424	Occupied	Occupied kwh/year	15,590	6,127
5,424	bin hours/year total	Total kWh / year	15,590	6,127
		Savings	9,463	

CALCULATIONS FOR VARIABLE SPEED DRIVE ON HOT WATER PUMPS

FIM 2.43 Erie County

HW Loop pumps (AHU2 mechanical room)

Pump Type: **Hot Water**

$ 0.054 per kWh

	Existing	Proposed	
Minimum Flow:	**150**	**60**	GPM = 40% of GPMdes.
Motor Efficiency:	**81.6%**	**89.5%**	
Pump Efficiency:	**65.0%**	3.5	BHP design
		5.0	HP Nameplate
VSD Efficiency:		**97%**	
OA Lockout Temp:		**55**	°F

Design Conditions:

150	GPMdes	
60	ft Total Head (TH)	
- **15**	ft head minimum (Fixed Minimum Head)	
45	pipe losses (Variable Head)	

Bin Data for Buffalo, 168 hrs./week

Periods: **Occupied** **Unocc.**

Approx. Flow Increment: **5%** **5%** per bin

Unocc. flow is = **100%** of Occupied flow at design.

Forumulae: FMH = Fixed Minimum Head

H2 = FMH + ((TH - FMH) x ((GPM2/GPMdes)^2))

BHP = (GPM2x H2) / (3960 x pump efficiency)

kW = BHP x 0.746 kW / Motor Eff / VFD Eff

Bin	Occupied	Percent	Occupied		New	% Speed	Occupied kW		Occupied kWh	
Temp	Hours	Flow	GPM2	Head H2	BHP	Occupied	Present	Proposed	Present	Proposed
(2.5)	**1.0**	**100%**	**150**	60.0	3.5	**100%**	3.2	3.0	3	3

2.5	**31.0**	**95%**	**143**	55.6	3.1	**96%**	3.2	2.6	99	82
7.5	**62.0**	**90%**	**135**	51.7	2.7	**93%**	3.2	2.3	198	145
12.5	**219.0**	**86%**	**129**	48.1	2.4	**90%**	3.2	2.1	701	452
17.5	**458.0**	**81%**	**122**	44.9	2.1	**86%**	3.2	1.8	1,466	838
22.5	**400.0**	**77%**	**116**	41.9	1.9	**84%**	3.2	1.6	1,280	650
27.5	**386.0**	**74%**	**110**	39.3	1.7	**81%**	3.2	1.4	1,235	559
32.5	**647.0**	**70%**	**105**	36.9	1.5	**78%**	3.2	1.3	2,070	836
37.5	**925.0**	**66%**	**100**	34.8	1.3	**76%**	3.2	1.2	2,960	1,070
42.5	**729.0**	**63%**	**95**	32.9	1.2	**74%**	3.2	1.0	2,333	756
47.5	**481.0**	**60%**	**90**	31.1	1.1	**72%**	3.2	0.9	1,539	449
52.5	**338.0**	**57%**	**85**	29.6	1.0	**70%**	3.2	0.8	1,082	285
57.5	**316.0**	**0%**	**-**	15.0	-	**0%**	3.2	0.0	-	-
62.5	**259.0**	**0%**	**-**	15.0	-	**0%**	3.2	0.0	-	-
67.5	**78.0**	**0%**	**-**	15.0	-	**0%**	3.2	0.0	-	-
72.5	**45.0**	**0%**	**-**	15.0	-	**0%**	3.2	0.0	-	-
77.5	**44.0**	**0%**	**-**	15.0	-	**0%**	3.2	0.0	-	-
82.5	**5.0**	**0%**	**-**	15.0	-	**0%**	3.2	0.0	-	-
87.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
92.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
97.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
102.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
107.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
	5,424	Occupied						Occupied kwh/year	14,966	6,124
	5,424	bin hours/year total						Total kWh / year	14,966	6,124
								Savings	8,843	

CALCULATIONS TO INSTALL VFDS ON SUPPLY/RETURN FANS
FIM 2.46 Erie County

AHU Type **Mixed air VAV**

	Design	Present	Proposed	
Supply Air cfm	24,800	24,800	24,800	cfm @ 100% speed
Minimum OA cfm	**4,720**	**4,720**	**4,720**	cfm @ 100% speed
Estimated Min. OA %	**19%**			
Return Air Temp	**70** °F		**28.0** Btu/lb	
	Present		Proposed	
Discharge Air Temp	**55** °F		**55** °F	
	23.0 Btu/lb		**23.0** Btu/lb	

AHU	Design SA [cfm]	Design OA [cfm]	Actual OA [cfm]	Delta OA [cfm]	End of Duct S.P	Total S.P.
AHU-7	**20,800**	**4,020**	**4,020**	-	1.00	6.70
AHU-3	**4,000**	**700**	**700**	-	1.00	4.50
				-		
				-		
				-		
				-		
				-		
				-		
				-		
	24,800	4,720	4,720	-	1.00	6.35

		Units	$/unit	BTU/unit	Efficiency	EER		
Heating	Natural Gas	**mcf**	**$ 3.934**	**1,030,000**	**87%**			
Cooling	**Electricity**	**kwh**	**$ 0.054**	**3,412**	**4.69**	**16.0**	months /yr. demand	**12**

AHU Energy												Heating		Cooling		
Bin data for Buffalo, NY 24/7 occupied				**Present**				**Proposed**			**Proposed**	Present	Proposed	Present	Proposed	
Bin Mid-Pt.	Enthalpy All Hours	Occupied Hours		Estim. Fan Speed	Net % OA	Mixed Air Temp	Occupied kBtuh	Estim. Fan Speed	Net % OA	Mixed Air Temp	Occupied kBtuh	mmBtu /year	mmBtu /year	mmBtu /year	mmBtu /year	
-2.5	0.0	1		**100%**	21%	55.0	0	**100%**	21%	55.0	0	0.0	0.0	0	0	
2.5	1.8	28		**100%**	22%	55.0	0	**90%**	22%	55.0	0	0.0	0.0	0	0	
7.5	2.8	60		**100%**	24%	55.0	0	**80%**	24%	55.0	0	0.0	0.0	0	0	
12.5	4.0	208		**100%**	26%	55.0	0	**75%**	26%	55.0	0	0.0	0.0	0	0	
17.5	5.6	438		**100%**	29%	55.0	0	**67%**	29%	55.0	0	0.0	0.0	0	0	
22.5	7.5	385		**100%**	32%	55.0	0	**62%**	32%	55.0	0	0.0	0.0	0	0	
27.5	9.0	366		**100%**	35%	55.0	0	**60%**	35%	55.0	0	0.0	0.0	0	0	
32.5	10.8	623		**100%**	40%	55.0	0	**48%**	40%	55.0	0	0.0	0.0	0	0	
37.5	12.9	894		**100%**	46%	55.0	0	**50%**	46%	55.0	0	0.0	0.0	0	0	
42.5	15.1	757		**100%**	55%	55.0	0	**35%**	55%	55.0	0	0.0	0.0	0	0	
47.5	17.5	706		**100%**	67%	55.0	0	**30%**	67%	55.0	0	0.0	0.0	0	0	
52.5	19.6	569		**100%**	86%	55.0	0	**30%**	86%	55.0	0	0.0	0.0	0	0	
57.5	21.5	673		**100%**	100%	57.5	-67	**30%**	100%	57.5	-20	0.0	0.0	-45	-14	
62.5	24.2	883		**100%**	100%	62.5	-138	**30%**	100%	62.5	-41	0.0	0.0	-122	-37	
67.5	27.6	707		**100%**	100%	67.5	-513	**40%**	100%	67.5	-205	0.0	0.0	-363	-145	
72.5	29.5	489		**100%**	19%	70.5	-139	**50%**	38%	71.0	-139	0.0	0.0	-68	-68	
77.5	31.0	382		**100%**	19%	71.4	-171	**70%**	27%	72.0	-171	0.0	0.0	-65	-65	
82.5	33.1	204		**100%**	19%	72.4	-215	**80%**	24%	73.0	-215	0.0	0.0	-44	-44	
87.5	35.5	22		**100%**	19%	73.3	-265	**90%**	21%	73.7	-265	0.0	0.0	-6	-6	
92.5	0.0	0		**100%**	19%	74.3	0	**100%**	19%	74.3	0	0.0	0.0	0	0	
97.5	0.0	0		**100%**	19%	75.2	0	**100%**	19%	75.2	0	0.0	0.0	0	0	
102.5	0.0	0		**100%**	19%	76.2	0	**100%**	19%	76.2	0	0.0	0.0	0	0	
107.5	0.0	0		**100%**	19%	77.1	0	**100%**	19%	77.1	0	0.0	0.0	0	0	
		8,395									mmBtu/yr.	0	0	-712	-378	
											fuel units	0	0	44,525	23,621	kwh/yr.
													0		20,904	

Inputs to calculate savings for closing VAV boxes by occupancy sensors:

Present VAV box minimum position	**20%**	occ.
Percentage of VAV boxes closed based on occ. sensors	**0%**	
Space temperature (reheat coil) setpoint	**68** °F	

Bin Mid-Pt.	Enthalpy All Hours	Occupied Hours		Present SA cfm	VAV cfm Present	VAV cfm Proposed	Reheat kBtuh	Savings mmBtu /year	
-2.5	0.0	1.0	0.0	24,800	-	-	-	-	
2.5	1.8	28.0	0.0	24,800	-	-	-	-	
7.5	2.8	60.0	0.0	24,800	-	-	-	-	
12.5	4.0	208.0	0.0	24,800	-	-	-	-	
17.5	5.6	438.0	0.0	24,800	-	-	-	-	
22.5	7.5	385.0	0.0	24,800	-	-	-	-	
27.5	9.0	366.0	0.0	24,800	-	-	-	-	
32.5	10.8	623.0	0.0	24,800	-	-	-	-	
37.5	12.9	894.0	0.0	24,800	-	-	-	-	
42.5	15.1	757.0	0.0	24,800	-	-	-	-	
47.5	17.5	706.0	0.0	24,800	-	-	-	-	
52.5	19.6	569.0	0.0	24,800	-	-	-	-	
57.5	21.5	673.0	0.0	24,800	-	-	-	-	
62.5	24.2	883.0	0.0	24,800	-	-	-	-	
67.5	27.6	707.0	0.0	24,800	-	-	-	-	
72.5	29.5	489.0	0.0	24,800	-	-	-	-	
77.5	31.0	382.0	0.0	24,800	-	-	-	-	
82.5	33.1	204.0	0.0	24,800	-	-	-	-	
87.5	35.5	22.0	0.0	24,800	-	-	-	-	
92.5	0.0	0.0	0.0	24,800	-	-	-	-	
97.5	0.0	0.0	0.0	24,800	-	-	-	-	
102.5	0.0	0.0	0.0	24,800	-	-	-	-	
107.5	0.0	0.0	0.0	24,800	-	-	-	-	
		8,395	0				mmBtu/yr.	-	
			8,395				fuel units	-	mcf

Summary of Savings for AHU, Reheat and Fan Power

	Heating Present mmBtu /yr.	Heating Proposed mmBtu /yr.	Cooling Present mmBtu /yr.	Cooling Proposed mmBtu /yr.	
mmBtu/yr.	0	0	-712	-378	at AHU
mmBtu/yr.	0	0			at reheat coils
			44,525	23,621	kwh AHU
			284,821	87,793	kwh fan power
fuel units	-	-	329,346	111,414	kwh/year
	Total savings		**0 mcf**	**217,932**	**kwh**

Demand Savings **0.0** **0.0**

0.0 kW

Fan Power Calculations

Bin Mid-Pt.	Occupied Hours	Present SA cfm	Present SF SP	Present SF BHP	Present RF BHP	Present Fan kW	End of Duct SP	Proposed SA cfm	Proposed SF SP	Proposed SF BHP	Proposed RF BHP	Proposed Fan kW
-2.5	1.0	24,800	6	35.4	7.2	33.9	**1.00**	24,800	6	35.4	7.2	33.9
2.5	28.0	24,800	6	35.4	7.2	33.9	**1.00**	24,800	5	29.7	5.1	27.7
7.5	60.0	24,800	6	35.4	7.2	33.9	**1.00**	24,800	4	24.6	3.4	22.3
12.5	208.0	24,800	6	35.4	7.2	33.9	**1.00**	24,800	4	22.3	2.7	19.9
17.5	438.0	24,800	6	35.4	7.2	33.9	**1.00**	24,800	3	18.9	1.8	16.5
22.5	385.0	24,800	6	35.4	7.2	33.9	**1.00**	24,800	3	17.0	1.4	14.6
27.5	366.0	24,800	6	35.4	7.2	33.9	**1.00**	24,800	3	16.3	1.2	13.9
32.5	623.0	24,800	6	35.4	7.2	33.9	**1.00**	24,800	2	12.4	0.5	10.3
37.5	894.0	24,800	6	35.4	7.2	33.9	**1.00**	24,800	2	12.9	0.6	10.7
42.5	757.0	24,800	6	35.4	7.2	33.9	**1.00**	24,800	2	9.2	0.2	7.4
47.5	706.0	24,800	6	35.4	7.2	33.9	**1.00**	24,800	1	8.3	0.1	6.6
52.5	569.0	24,800	6	35.4	7.2	33.9	**1.00**	24,800	1	8.3	0.1	6.6
57.5	673.0	24,800	6	35.4	7.2	33.9	**1.00**	24,800	1	8.3	0.1	6.6
62.5	883.0	24,800	6	35.4	7.2	33.9	**1.00**	24,800	1	8.3	0.1	6.6
67.5	707.0	24,800	6	35.4	7.2	33.9	**1.00**	24,800	2	10.3	0.3	8.4

Inputs for Fan Power Reduction:

Static Pressure Reset?	**N**	**N**	
	Present	Proposed	
Supply Air design cfm	**24,800**	**24,800**	cfm
Min OA for exhaust Fans	**4,720**	**4,720**	cfm
Return Air design cfm	**20,080**	**20,080**	cfm
End of Duct SP Setpoint	**1.00**	**1.00**	in. W.C.
Variable Static Pressure	**5.35**	**5.35**	in. W.C.
Total SF Static Pressure	**6.35**	**6.35**	in. W.C.
Fan efficiency (S&R)	**70%**	**70%**	
SF motor efficiency	**94.1%**	**94.1%**	
RF motor efficiency	**91.7%**	**91.7%**	

72.5	489.0	24,800	6	35.4	7.2	33.9	**1.00**	24,800	2	13.0	0.6	10.8	Total RF Static Pressure	**2.20**	**2.20**	in. W.C.
77.5	382.0	24,800	6	35.4	7.2	33.9	**1.00**	24,800	4	20.2	2.1	17.7	RF BHP	9.9	9.9	
82.5	204.0	24,800	6	35.4	7.2	33.9	**1.00**	24,800	4	24.6	3.4	22.3	SF speed - RF speed	**10%**	**10%**	
87.5	22.0	24,800	6	35.4	7.2	33.9	**1.00**	24,800	5	29.7	5.1	27.7				
92.5	0.0	24,800	6	35.4	7.2	33.9	**1.00**	24,800	6	35.4	7.2	33.9				
97.5	0.0	24,800	6	35.4	7.2	33.9	**1.00**	24,800	6	35.4	7.2	33.9				
102.5	0.0	24,800	6	35.4	7.2	33.9	**1.00**	24,800	6	35.4	7.2	33.9				
107.5	0.0	24,800	6	35.4	7.2	33.9	**1.00**	24,800	6	35.4	7.2	33.9				
					Present kwh/year	284,821					Proposed kwh/year	87,793		197,028	kwh Fan savings per year	

CALCULATIONS FOR VARIABLE SPEED DRIVE ON CHILLED WATER PUMPS

FIM 2.48 Erie County

Air Cooled Chiller

Pump Type: **Chilled Water**

$ 0.054 per kWh

Design Conditions:

	230	GPMdes
	60	ft Total Head (TH)
-	**15**	ft head minimum (Fixed Minimum Head)
	45	pipe losses (Variable Head)

	Existing	Proposed	
Minimum Flow:	**230**	**92**	GPM = 40% of GPMdes.
Motor Efficiency:	**87.5%**	**91.7%**	
Pump Efficiency:	**75.0%**	4.6	BHP design
		7.5	HP Nameplate
VSD Efficiency:		**97%**	
OA Lockout Temp:		**55**	°F

Bin Data for Buffalo, 168 hrs./week

Periods:	**Occupied**	**Unocc.**	
Approx. Flow Increment:	**12.0%**	**12.0%**	per bin
Unocc. flow is =	**80%**	of Occupied flow at design.	

Forumulae: FMH = Fixed Minimum Head

H2 = FMH + ((TH - FMH) x ((GPM2/GPMdes)^2))

BHP = (GPM2x H2) / (3960 x pump efficiency)

kW = BHP x 0.746 kW / Motor Eff / VFD Eff

Bin	Occupied	Percent	Occupied		New	% Speed	Occupied kW		Occupied kWh	
Temp	Hours	Flow	GPM2	Head H2	BHP	Occupied	Present	Proposed	Present	Proposed
(2.5)	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
2.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
7.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
12.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
17.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
22.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
27.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
32.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
37.5	**8.0**	**0%**	**-**	15.0	-	**0%**	4.0	0.0	-	-
42.5	**57.0**	**0%**	**-**	15.0	-	**0%**	4.0	0.0	-	-
47.5	**252.0**	**0%**	**-**	15.0	-	**0%**	4.0	0.0	-	-
52.5	**266.0**	**0%**	**-**	15.0	-	**0%**	4.0	0.0	-	-
57.5	**392.0**	**41%**	**94**	22.5	0.7	**61%**	4.0	0.6	1,555	234
62.5	**705.0**	**46%**	**107**	24.7	0.9	**64%**	4.0	0.7	2,796	525
67.5	**679.0**	**53%**	**121**	27.5	1.1	**68%**	4.0	0.9	2,693	641
72.5	**479.0**	**60%**	**138**	31.2	1.4	**72%**	4.0	1.2	1,900	582
77.5	**366.0**	**68%**	**157**	35.9	1.9	**77%**	4.0	1.6	1,451	582
82.5	**206.0**	**77%**	**178**	42.0	2.5	**84%**	4.0	2.1	817	435
87.5	**22.0**	**88%**	**202**	49.8	3.4	**91%**	4.0	2.8	87	63
92.5	**-**	**100%**	**230**	60.0	4.6	**100%**	0.0	3.9	-	-
	3,432	Occupied						Occupied kwh/year	11,298	3,061
	-	Unocc.						Unocc. kwh/year	-	-
	3,432	bin hours/year total						Total kWh / year	11,298	3,061

Summary Table

Unit	Baseline	Proposed	Saving
Air Cooled System	11,298	3,061	8,237
Water Cooled System	18,897	5,157	13,740
	30,196	8,219	21,977

CALCULATIONS FOR VARIABLE SPEED DRIVE ON CHILLED WATER PUMPS

FIM 24.59 Erie County

Water Cooled Chiller in 134 West Eagle

Pump Type: **Chilled Water**

$ 0.054 per kWh

Design Conditions:

	400	GPMdes
	60	ft Total Head (TH)
-	**15**	ft head minimum (Fixed Minimum Head)
	45	pipe losses (Variable Head)

	Existing	Proposed	
Minimum Flow:	**400**	**160**	GPM = 40% of GPMdes.
Motor Efficiency:	**87.5%**	**91.7%**	
Pump Efficiency:	**75.0%**	8.1	BHP design
		10.0	HP Nameplate
VSD Efficiency:		**97%**	
OA Lockout Temp:		**55**	°F

Bin Data for Buffalo, 168 hrs./week

Forumulae: FMH = Fixed Minimum Head

Periods:	**Occupied**	**Unocc.**	
Approx. Flow Increment:	**12%**	**12%**	per bin
Unocc. flow is =	**80%**	of Occupied flow at design.	

H2 = FMH + ((TH - FMH) x ((GPM2/GPMdes)^2))
BHP = (GPM2x H2) / (3960 x pump efficiency)
kW = BHP x 0.746 kW / Motor Eff / VFD Eff

Bin	Occupied	Percent	Occupied		New	% Speed	Occupied kW		Occupied kWh	
Temp	Hours	Flow	GPM2	Head H2	BHP	Occupied	Present	Proposed	Present	Proposed
(2.5)	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
2.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
7.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
12.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
17.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
22.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
27.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
32.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
37.5	**8.0**	**0%**	**-**	15.0	-	**0%**	6.9	0.0	-	-
42.5	**55.0**	**0%**	**-**	15.0	-	**0%**	6.9	0.0	-	-
47.5	**234.0**	**0%**	**-**	15.0	-	**0%**	6.9	0.0	-	-
52.5	**252.0**	**0%**	**-**	15.0	-	**0%**	6.9	0.0	-	-
57.5	**372.0**	**41%**	**163**	22.5	1.2	**61%**	6.9	1.0	2,566	387
62.5	**663.0**	**46%**	**186**	24.7	1.5	**64%**	6.9	1.3	4,573	859
67.5	**649.0**	**53%**	**211**	27.5	2.0	**68%**	6.9	1.6	4,476	1,065
72.5	**469.0**	**60%**	**240**	31.2	2.5	**72%**	6.9	2.1	3,235	991
77.5	**361.0**	**68%**	**273**	35.9	3.3	**77%**	6.9	2.8	2,490	998
82.5	**204.0**	**77%**	**310**	42.0	4.4	**84%**	6.9	3.7	1,407	749
87.5	**22.0**	**88%**	**352**	49.8	5.9	**91%**	6.9	5.0	152	109
92.5	**-**	**100%**	**400**	60.0	8.1	**100%**	0.0	6.8	-	-
	3,289	Occupied						Occupied kwh/year	18,897	5,157
	-	Unocc.						Unocc. kwh/year	-	-
	3,289	bin hours/year total						Total kWh / year	18,897	5,157

Project: Erie County
Building: Rath Building
Date: 7/3/2019

Heating System Efficiency:	89%
Average Fuel Cost ($/unit):	$0.48
Correction Factor:	100%

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product
Single door sweeps	22	3	3/16	1/12	=	1.03125
Single door perimeters	22	17	1/8	1/12	=	3.895833333
Double door sweeps & astragals	10	20	3/16	1/12	=	3.125
Double door perimeters	10	20	1/8	1/12	=	2.083333333
Garage doors	1	37	1/4	1/12	=	0.770833333
Stairwell doors	27	20	1/8	0	=	0
Door vent	1	2	6	1/12	=	1
Roll up door bottom	1	4.5	6	1/12	=	2.25
					Total =	14.15625 ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot ^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
2038.5	50%	0.25308	72	34.25	0.0197	11.6	3560.759

Occupied Infiltration Savings

Specific Heat of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Occupied (%/week)	Heating Season Bin Hours (Occupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	3560.759	37.75	29.76%	4335	103000	89%	2043.046

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot ^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
2038.5	50%	0.25308	67	34.14	0.0197	11.6	3375.402

Unoccupied Infiltration Savings

Specific Hear of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Unoccupied (%/week)	Heating Season Bin Hours (Unoccupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	3375.402	32.86	70.24%	4301	103000	89%	3947.694

Totals

Units of Fuel per Year (units/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
5990.739	103000	9.708737864	617.0461659

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
5990.74	$0.48	2873.957619

Total Cost Savings: **$2,873.96**
Cost to Retrofit: **$22,333.00**
Simple Payback: **7.77 years**

Project: Erie County
Building: Rath Building
Date: 7/3/2019

Cooling System Efficiency (kW/ton):	0.547
EER:	21.938
Average Fuel Cost ($/unit):	$0.07

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product
Single door sweeps	22	3	3/16	1/12	=	1.03125
Single door perimeters	22	17	1/8	1/12	=	3.895833333
Double door sweeps & astragals	10	20	3/16	1/12	=	3.125
Double door perimeters	10	20	1/8	1/12	=	2.083333333
Garage door weather-stripping	1	37	1/4	1/12	=	0.770833333
Stairwell doors	27	20	1/8	0	=	0
Door vent	1	2	6	1/12	=	1
Roll up door bottom	1	4.5	6	1/12	=	2.25
					Total =	14.15625 ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot ^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
2038.5	50%	0.25308	72	80.14	0.0197	11.6	2212.243

Occupied Infiltration Savings Ref: ASHRAE 2013 Fundamentals 18.13 (8)

Air Total Heat Factor C_t	Flow Rate (cfm) Q_{occ}	Average Outdoor Air Enthalpy h	Cooling Supply Air Enthalpy h	% Building Occupied	Cooling Season Bin Hours	% Building Area Cooled	Btu/hrs per Ton	Cooling (kWh)
4.50	2212.243	32	22.7	29.76%	1,122	100%	21,938	1690.99

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot ^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
2038.5	50%	0.25308	77	74.77	0.0197	11.6	1472.265

Unoccupied Infiltration Savings Ref: ASHRAE 2013 Fundamentals 18.13 (8)

Air Total Heat Factor C_t	Flow Rate (cfm) Q_{occ}	Average Outdoor Air Enthalpy h	Cooling Supply Air Enthalpy h	% Building Occupied	Cooling Season Bin Hours	% Building Area Cooled	Btu/hrs per Ton	Cooling (kWh)
4.50	1472.265	32	22.7	70.24%	449	100%	21,938	1062.917993

Totals

kWh per Year (kWh/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
2753.909	3,412	293.08	9.396338636

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
2753.91	$0.07	201.0353811

Total Cost Savings: **$201.04**
Cost to Retrofit: Cost carried on heating page
Simple Payback: **0.00 years**

CALCULATIONS FOR AH-10 CONTROLS

FIM 3.12 Rath Building

INPUT DATA:

			Coil Info		
Supply Fan	20	HP	Flow	354	gpm
Measured demand	11.8	kW	EAT	61	°F
Fan Eff.	87.5%		LAT	41	°F
			Design Temp. Diff	8	
AH-10 Air Flow	36,970	CFM			
Chilled Water Loop Temp.	55	°F (Heating Season)			
Chilled Water Loop Temp.	45	°F (Cooling Season)			

Fuel Data	Heating	Cooling	
Type:	Natural Gas	Electricity	
Units:	**mcf**	kwh	
Unit cost:	**$ 4.765**	$ 0.05	
BTU/unit	**1,030,000**	3,412	
Efficiency/ COP:	**89.0%**	0.60	kw/ton

Buffalo, NY

						Heating Season		Cooling Season			
Bin Mid-Pt.	Occupied Hours	Entering Water Temp.	Est. Coil Delta T	Leaving Water Temp.	Heat Transfer Rate BTU/hr	Rejected Heat BTUs	Boiler Fuel mcf	Cooling Season Rejected Heat BTUs	Chiller Energy kWh	Present Fan Energy (kWh)	Proposed Fan Energy (kWh)
(2.5)	1	55	8.0	47	1,416,000	1,416,000	2			12	
2.5	12	55	7.2	48	1,278,333	15,340,000	17			142	
7.5	33	55	6.4	49	1,140,667	37,642,000	41			391	
12.5	92	55	5.7	49	1,003,000	92,276,000	101			1,089	
17.5	219	55	4.9	50	865,333	189,508,000	207			2,592	
22.5	164	55	4.1	51	727,667	119,337,333	130			1,941	
27.5	145	55	3.3	52	590,000	85,550,000	93			1,716	
32.5	294	55	2.6	52	452,333	132,986,000	145			3,479	
37.5	366	55	1.8	53	314,667	115,168,000	126			4,331	
42.5	349	55	1.0	54	177,000	61,773,000	67			4,130	
47.5	277	55	0.0	55	0	0	0			3,278	3,278
52.5	236	55	0.0	55	0	0	0			2,793	2,793
57.5	315	45	1.0	46	177,000			55,755,000	2,788	3,728	
62.5	419	45	2.2	47	383,500			160,686,500	8,034	4,958	
67.5	324	45	3.3	48	590,000			191,160,000	9,558	3,834	
72.5	271	45	4.5	50	796,500			215,851,500	10,793	3,207	
77.5	240	45	5.7	51	1,003,000			240,720,000	12,036	2,840	
82.5	143	45	6.8	52	1,209,500			172,958,500	8,648	1,692	
87.5	15	45	8.0	53	1,416,000			21,240,000	1,062	178	
	3,915					850,996,333	928	1,058,371,500	52,919	46,328	6,071

Savings

	Boiler Fuel	Chiller Energy	Fan Energy
	mcf	kWh	kWh
Baseline Energy	928	52,919	46,328
Proposed Energy	-	-	6,071
Savings	928	52,919	40,257

CALCULATIONS FOR SNOW MELT SYSTEM CONTROLS (PUMPING ENERGY)
FIM 3.13 Rath Building

Pump Type: **Process**

$ 0.050 per kWh

Design Conditions:

	2,150	GPMdes
	76	ft Total Head (TH)
-	**15**	ft head minimum (Fixed Minimum Head)
	61	pipe losses (Variable Head)

	Existing	Proposed	
Minimum Flow:	**2,150**	**860**	GPM = 40% of GPMdes.
Motor Efficiency:	**90.3%**	**95.0%**	
Pump Efficiency:	**75.0%**	55.0	BHP design
		60.0	HP Nameplate
VSD Efficiency:		**97%**	
Lookout Temp		**33**	°F

Total Snow Hours For Buffalo, NY from:
Refrence: 2011 ASHRAE Handbook - HVAC Applications, Chapter 51

Forumulae:
FMH = Fixed Minimum Head
H2 = FMH + ((TH - FMH) x ((GPM2/GPMdes)^2))
BHP = (GPM2x H2) / (3960 x pump efficiency)
kW = BHP x 0.746 kW / Motor Eff / VFD Eff

Periods: **Snow Melt**

Bin Temp	% of Hours Snowing	292 Hours	Percent Flow	Snow Melt GPM2	Snow Melt Head H2	New BHP	% Speed Snow Melt	Snow Melt kW Present	Snow Melt kW Proposed	Snow Melt kWh Present	Snow Melt kWh Proposed
1 Zone Heating	**5%**	**14.6**	**30%**	**645**	20.5	4.4	**52%**	45.5	3.6	664	53
2 Zones Heating	**5%**	**14.6**	**33%**	**717**	21.8	5.3	**54%**	45.5	4.3	664	62
3 Zones Heating	**5%**	**14.6**	**50%**	**1,075**	30.3	10.9	**63%**	45.5	8.9	664	129
4 Zones Heating	**10%**	**29.2**	**67%**	**1,433**	42.1	20.3	**74%**	45.5	16.5	1,329	480
5 Zones Heating	**25%**	**73.0**	**83%**	**1,792**	57.4	34.6	**87%**	45.5	28.0	3,322	2,045
6 Zones Heating	**50%**	**146.0**	**100%**	**2,150**	76.0	55.0	**100%**	45.5	44.5	6,643	6,503
System Idling		**1,779.0**	**50%**	**1,075**	30.3	10.9	**63%**	45.5	8.9	80,945	15,769
		2,071							kwh/year	94,231	25,041
										Savings (kWh)	69,190
4.95	82.5%	of the total snow melt surface would be receiving heat at any given time during the snow melt seas								Pump Savings	73.4%

CALCULATIONS FOR SNOW MELT SYSTEM CONTROLS (BOILER ENERGY)
FIM 3.13 Rath Building

INPUT DATA:

Refrence: 2011 ASHRAE Handbook - HVAC Applications, Chapter 51

Melting Snow Hrs:	292		
System Idling Hrs:	1,779		
Total Snow Melting Area (A_t):	23,000	sqft	
Melting Snow (Q_a):	14,735	Btu/sqft	*from table 3*
System Idling (Q_a):	105,521	Btu/sqft	*from table 3*
Back Loss (**B**):	30		
Combustion Efficiency (n_b):	89%		
Energy Distribution Eff. (n_d)	90%		

Type:	**Natural Gas**	
Units:	**mcf**	
Unit cost:	**$ 4.765**	/mcf
Heat Content of Fuel	**1,030,000**	Btu/mcf
Combustion Efficiency:	**89%**	

Melting Snow Energy	604,431,960	BTU/Yr
System Idling Energy	4,328,487,605	BTU/Yr
	4,789	mcf

$$\text{BTU/Yr} = \frac{A_t Q_a}{[1-(B/100)](n_b n_d)}$$

The ASHRAE methodology above was used to establish an estimated baseline for this facility.
The calculation below was trued-up to this estimate.

BASELINE ENERGY CALCULATION:

Snow Melting System: Melting Mode

Bin Mid Pt.	Hours	Accum Hours	Hours of Snow Fall	Glycol Supply Temp (°F)	System Delta T (°F)	Pump Flow (gpm)	Heat Transfer Rate (BTU/hr)	Average % of Slab Receiving Heat	Heat Transferred to Slab (BTUs)	Boiler Fuel (mcf)
-2.5	1	1	0.1	110	10	1,000	5,000,000	100%	662,432	1

2.5	31	32	4.1	110	10	1,000	5,000,000	100%	20,535,390	22
7.5	62	94	8.2	110	10	1,000	5,000,000	100%	41,070,780	45
12.5	219	313	29.0	110	10	1,000	5,000,000	100%	145,072,595	158
17.5	458	771	60.7	110	10	1,000	5,000,000	100%	303,393,829	331
22.5	400	1,171	53.0	110	10	1,000	5,000,000	100%	264,972,777	289
27.5	386	1,557	51.1	110	10	1,000	5,000,000	100%	255,698,730	279
32.5	647	2,204	85.7	110	10	1,000	5,000,000	100%	428,593,466	468
	2,204		292						Melting Energy	1,593

Snow Melting System: Idling Mode

Bin Mid Pt.	Hours	Accum Hours	Hours of Snow Fall	Glycol Supply Temp (°F)	System Delta T (°F)	Pump Flow (gpm)	Heat Transfer Rate (BTU/hr)	Average % of Slab Receiving Heat	Heat Transferred to Slab (BTUs)	Boiler Fuel (mcf)
-2.5	1	1	0.1	110	3	1,000	1,500,000	100%	1,301,270	1
2.5	31	32	4.1	110	3	1,000	1,500,000	100%	40,339,383	44
7.5	62	94	8.2	110	3	1,000	1,500,000	100%	80,678,766	88
12.5	219	313	29.0	110	3	1,000	1,500,000	100%	284,978,221	311
17.5	458	771	60.7	110	3	1,000	1,500,000	100%	595,981,851	650
22.5	400	1,171	53.0	110	3	1,000	1,500,000	100%	520,508,167	568
27.5	386	1,557	51.1	110	3	1,000	1,500,000	100%	502,290,381	548
32.5	647	2,204	85.7	110	3	1,000	1,500,000	100%	841,921,960	918
	2,204		292						Idling Energy	3,129
									Total Baseline Estimated Annual Energy	**4,721**

PROPOSED ENERGY CALCULATION:

Snow Melting System: Melting Mode

Bin Mid Pt.	Hours	Accum Hours	Hours of Snow Fall	Glycol Supply Temp (°F)	System Delta T (°F)	Pump Flow (gpm)	Heat Transfer Rate (BTU/hr)	Average % of Slab Receiving Heat	Heat Transferred to Slab (BTUs)	Boiler Fuel (mcf)
-2.5	1	1	0.1	110	10	1,000	5,000,000	82.5%	546,506	1
2.5	31	32	4.1	106	10	971	4,857,143	82.5%	16,457,648	18
7.5	62	94	8.2	101	10	943	4,714,286	82.5%	31,947,200	35
12.5	219	313	29.0	97	10	914	4,571,429	82.5%	109,426,186	119
17.5	458	771	60.7	93	10	886	4,428,571	82.5%	221,694,205	242
22.5	400	1,171	53.0	89	10	857	4,285,714	82.5%	187,373,606	204
27.5	386	1,557	51.1	84	10	829	4,142,857	82.5%	174,788,346	191
32.5	647	2,204	85.7	80	10	800	4,000,000	82.5%	282,871,688	309
	2,204		292						Melting Energy	1,118

Snow Melting System: Idling Mode

Bin Mid Pt.	Hours	Accum Hours	Hours of Snow Fall	Glycol Supply Temp (°F)	System Delta T (°F)	Pump Flow (gpm)	Heat Transfer Rate (BTU/hr)	Average % of Slab Receiving Heat	Heat Transferred to Slab (BTUs)	Boiler Fuel (mcf)
-2.5	1	1	0.1	110	10	500	2,500,000	82.5%	1,789,247	2
2.5	31	32	4.1	106	10	471	2,357,143	82.5%	52,297,129	57
7.5	62	94	8.2	101	10	443	2,214,286	82.5%	98,255,211	107
12.5	219	313	29.0	97	10	414	2,071,429	82.5%	324,671,617	354
17.5	458	771	60.7	93	10	386	1,928,571	82.5%	632,166,464	690
22.5	400	1,171	53.0	89	10	357	1,785,714	82.5%	511,213,378	558
27.5	386	1,557	51.1	84	10	329	1,642,857	82.5%	453,855,237	495
32.5	647	2,204	85.7	80	10	150	750,000	82.5%	347,292,809	379
	2,204		292						Idling Energy	2,642
									Total Proposed Estimated Annual Energy	**3,760**
									Fuel Savings	961
									% Fuel Savings	20.4%

CALCULATIONS FOR OPTIMAL START
FIM 3.14

AC-3,4,5,6 Rath Building
95 Franklin Street

Fuel Information

	Heating			
Type:	**Natural Gas**	Type:	**Electricity**	
Units:	**mcf**	Units:	**kwh**	
Unit cost:	**$ 4.765**	Unit cost:	**$ 0.050**	/kwh
Heat Content of Fuel	**########**			
Heating Efficiency	**89%**			

Building Balance Temperature **58** °F.
Current operating schedule begins **180** minutes before occupancy
5 days per week
15 hours per week
12.8% of unoccupied bin hours

On a design day optimal start requires **90** minutes before occupancy

Heating Schedules 51 hours per week

Fan HP impacted by Optimal Start:

	Supply	Return	
	420	**65**	HP
Motor	**20%**	**81%**	Loading
	95%	**93%**	Efficiency
	66.58	42.13	kW
Present Warmup	On	On	
Proposed Warmup	On	Off	

Ventilation CFM impacted by Optimal Star **52,925** cfm OA

Envelope Loads impacted by Optimal Star 90,047 btu/hr./°F.
Occupied Setpoint **70** °F.
Unoccupied Setpoint **65** °F.

All Bin	Occ. Hours	Unocc. Hours	Hours of warm-up Present	Hours of warm-up Proposed		Ventilation MBH	Ventilation Mbtu Present	Ventilation Mbtu Proposed	Envelope Mbtu Present	Envelope Mbtu Proposed	Motor kWh Present	Motor kWh Proposed
(2.5)	1.0	0.0	0.0	50%	0.0	4,144,028	0.0	0.0	0.0	0.0	0	0
2.5	12.0	19.0	2.4	47%	1.1	3,858,233	9.4	0.0	14.8	14.3	265	76
7.5	33.0	29.0	3.7	44%	1.6	3,572,438	13.3	0.0	21.0	20.0	405	109
12.5	92.0	127.0	16.3	41%	6.7	3,286,643	53.6	0.0	84.5	80.2	1,774	447
17.5	219.0	239.0	30.7	38%	11.7	3,000,848	92.1	0.0	145.2	136.6	3,338	782
22.5	164.0	236.0	30.3	35%	10.7	2,715,053	82.3	0.0	129.7	120.9	3,296	712
27.5	145.0	241.0	31.0	32%	10.0	2,429,258	75.2	0.0	118.5	109.1	3,366	667
32.5	294.0	353.0	45.4	29%	13.3	2,143,463	97.2	0.0	153.1	138.7	4,930	888
37.5	363.0	562.0	72.2	26%	19.1	1,857,668	134.1	0.0	211.3	187.4	7,849	1,272
42.5	335.0	394.0	50.6	24%	11.9	1,571,873	79.6	0.0	125.4	107.9	5,503	793
47.5	209.0	272.0	34.9	21%	7.2	1,286,078	44.9	0.0	70.8	58.3	3,799	479
52.5	142.0	196.0	25.2	18%	4.4	1,000,283	25.2	0.0	39.7	30.3	2,737	296
57.5	150.0	166.0	21.3	15%	3.1	714,488	15.2	0.0	24.0	15.8	2,318	209
62.5	143.0	116.0	14.9	12%	1.8	428,693	6.4	0.0	10.1	4.1	1,620	117
67.5	50.0	28.0	3.6	9%	0.3	142,898	0.5	0.0	0.8	(0.7)	391	21
72.5	36.0	9.0	1.2	6%	0.1	(142,898)	(0.2)	0.0	(0.3)	(0.8)	126	5
77.5	27.0	17.0	2.2	3%	0.1	(428,693)	(0.9)	0.0	(1.5)	(2.4)	237	4
82.5	0.0	5.0	0.6	0%	0.0	(714,488)	(0.5)	0.0	(0.7)	(1.0)	70	0
87.5	0.0	0.0	0.0	0%	0.0	(1,000,283)	0.0	0.0	0.0	0.0	0	0
92.5	0.0	0.0	0.0	0%	0.0	(1,286,078)	0.0	0.0	0.0	0.0	0	0
97.5	0.0	0.0	0.0	0%	0.0	(1,571,873)	0.0	0.0	0.0	0.0	0	0
102.5	0.0	0.0	0.0	0%	0.0	(1,857,668)	0.0	0.0	0.0	0.0	0	0
107.5	0.0	0.0	0.0	0%	0.0	(2,143,463)	0.0	0.0	0.0	0.0	0	0
	2,415	3,009	387		103		727.7	0.0	1,146	1,019	42,024	6,878

	Present	Proposed		Savings	
BTU at point of use	1,874.0	1,018.8	Mbtu	855.2	Mbtu sav.
Fuel	2,044.3	1,111.4	mcf	932.9	mcf
Electricity	42,024	6,878	kWh	35,146	kwh

Summary	Existing	Proposed	Savings	
AC-3,4,5,6	2,044	1,111	933	mcf
	42,024	6,878	35,146	kwh
AC-1,2 / AH-1,3,5,6,7,8	1,146	758	388	mcf
	41,757	14,306	27,450	kwh

CALCULATIONS FOR OPTIMAL START
FIM 3.14

AC-1,2 / AH-1,3,5,6,7,8 Rath Building 95 Franklin Street

Fuel Information

	Heating			
Type:	**Natural Gas**	Type:	**Electricity**	
Units:	**mcf**	Units:	**kwh**	
Unit cost:	**$ 4.765**	Unit cost:	**$ 0.050**	/kwh
Heat Content of Fuel	**########**			
Heating Efficiency	**89%**			

Building Balance Temperature	**58**	°F.
Current operating schedule begins	**120**	minutes before occupancy
	5	days per week
	10	hours per week
	8.6%	of unoccupied bin hours
On a design day optimal start requires	**90**	minutes before occupancy
Heating Schedules	51	hours per week

Fan HP impacted by Optimal Start:

	Supply	Return	
	235	**30**	HP
Motor	**72%**	**98%**	Loading
	91%	**93%**	Efficiency
	138.47	23.54	kW
Present Warmup	On	On	
Proposed Warmup	On	Off	

Ventilation CFM impacted by Optimal Star	**31,250**	cfm OA
Envelope Loads impacted by Optimal Star	90,047	btu/hr./°F.
Occupied Setpoint	**70**	°F.
Unoccupied Setpoint	**65**	°F.

All Bin	Occ. Hours	Unocc. Hours	urs of warm-up Present	Proposed		Ventilation MBH	ntilation Mbtu Present	Proposed	Envelope Mbtu Present	Proposed	Motor kWh Present	Proposed
(2.5)	1.0	0.0	0.0	75%	0.0	2,446,875	0.0	0.0	0.0	0.0	0	0
2.5	12.0	19.0	1.6	71%	1.1	2,278,125	3.7	0.0	9.9	9.7	264	159
7.5	33.0	29.0	2.5	66%	1.6	2,109,375	5.2	0.0	14.0	13.6	402	228
12.5	92.0	127.0	10.9	62%	6.7	1,940,625	21.1	0.0	56.3	54.5	1,762	930
17.5	219.0	239.0	20.5	57%	11.7	1,771,875	36.3	0.0	96.8	92.8	3,317	1,626
22.5	164.0	236.0	20.2	53%	10.7	1,603,125	32.4	0.0	86.5	82.2	3,275	1,482
27.5	145.0	241.0	20.6	49%	10.0	1,434,375	29.6	0.0	79.0	74.2	3,344	1,387
32.5	294.0	353.0	30.2	44%	13.3	1,265,625	38.3	0.0	102.1	94.5	4,899	1,847
37.5	363.0	562.0	48.1	40%	19.1	1,096,875	52.8	0.0	140.9	127.8	7,799	2,647
42.5	335.0	394.0	33.7	35%	11.9	928,125	31.3	0.0	83.6	73.7	5,468	1,649
47.5	209.0	272.0	23.3	31%	7.2	759,375	17.7	0.0	47.2	40.0	3,775	996
52.5	142.0	196.0	16.8	26%	4.4	590,625	9.9	0.0	26.5	20.9	2,720	615
57.5	150.0	166.0	14.2	22%	3.1	421,875	6.0	0.0	16.0	11.0	2,304	434
62.5	143.0	116.0	9.9	18%	1.8	253,125	2.5	0.0	6.7	3.0	1,610	243
67.5	50.0	28.0	2.4	13%	0.3	84,375	0.2	0.0	0.5	(0.4)	389	44
72.5	36.0	9.0	0.8	9%	0.1	(84,375)	(0.1)	0.0	(0.2)	(0.5)	125	9
77.5	27.0	17.0	1.5	4%	0.1	(253,125)	(0.4)	0.0	(1.0)	(1.6)	236	9
82.5	0.0	5.0	0.4	0%	0.0	(421,875)	(0.2)	0.0	(0.5)	(0.7)	69	0
87.5	0.0	0.0	0.0	0%	0.0	(590,625)	0.0	0.0	0.0	0.0	0	0
92.5	0.0	0.0	0.0	0%	0.0	(759,375)	0.0	0.0	0.0	0.0	0	0
97.5	0.0	0.0	0.0	0%	0.0	(928,125)	0.0	0.0	0.0	0.0	0	0
102.5	0.0	0.0	0.0	0%	0.0	(1,096,875)	0.0	0.0	0.0	0.0	0	0
107.5	0.0	0.0	0.0	0%	0.0	(1,265,625)	0.0	0.0	0.0	0.0	0	0
	2,415	3,009	258		103		286.4	0.0	764	695	41,757	14,306

	Present	Proposed		Savings	
BTU at point of use	1,050.7	694.7	Mbtu	356.0	Mbtu sav.
Fuel	1,146.2	757.8	mcf	388.3	mcf
Electricity	41,757	14,306	kWh	27,450	kwh

CALCULATIONS FOR HEATING SEASON CHILLED WATER PUMP CONTROLS

FIM 3.15 **Rath Building**

Pump Type: **Process**

$ 0.050 per kWh

Design Conditions:

	4,832	GPMdes
	85	ft Total Head (TH)
-	**15**	ft head minimum (Fixed Minimum Head)
	70	pipe losses (Variable Head)

	Existing	Proposed	
Minimum Flow:	**4,832**	**1,933**	GPM = 40% of GPMdes.
Motor Efficiency:	**95.8%**	**95.8%**	
Pump Efficiency:	**75.0%**	138.3	BHP design
		150.0	HP Nameplate
VSD Efficiency:		**97%**	
		55	°F

Forumulae: FMH = Fixed Minimum Head

H2 = FMH + ((TH - FMH) x ((GPM2/GPMdes)^2))

BHP = (GPM2x H2) / (3960 x pump efficiency)

kW = BHP x 0.746 kW / Motor Eff / VFD Eff

Periods:

Approx. Flow Increment: **5%** **5%** per bin

flow is = **80%** of flow at design.

Bin	0	Percent	0		New	% Speed	Pump Energy	
Temp	Hours	Flow	GPM2	Head H2	BHP	0	kW	kWh
Present Heating Season	**5,424**	**60%**	**2,899**	40.2	39.2	**69%**	31.5	170,871
Proposed unooc hours	**3,009**	**0%**	**-**	15.0	-	**0%**	0.0	-
Proposed ooc hours	**2,415**	**25%**	**1,208**	19.4	7.9	**48%**	6.3	15,278
							kwh/year	155,593
							Total Savings kWh / year	155,593

CALCULATIONS FOR REDUCING SPEED OF AC-1 & AC-2 UNIT

FANS FIM 3.16 Rath Building

kWh:	$ 0.050	per kWh
Demand:	$ 10.30	per kW

Data:

AC-1 Unit Operation (hrs/yr)	**3,750**
VFD Efficiency	**98%**
Current Max Speed Setpoint	75%

Calculation:

Design Data

	Motor HP	Design BHP	Efficiency	KW	Operating Hours	
Supply Fan	**50**	**37.0**	**94.5%**	29.80	3750	
Supply Fan	**50**	**37.0**	**94.5%**	29.80	3750	
Existing Return Fan	**15**	**12.4**	**86.5%**	10.69	3750	
Proposed Return Fan	**15**	**12.4**	**93.0%**	9.95		

exp.= 2.5

Supply Fans kW @ 60Hz = 59.6 kW

Baseline Fans Operation

Operation	Hours	% speed	kW	kWh	
Supply Fan	3,750	75%	14.5	54,446	
Supply Fan	3,750	75%	14.5	54,446	
Existing Return Fan	3,750	100%	9.9	37,300	
Fan Operating Hours	11,250			146,192	KWH/yr

Proposed Supply Fans Operation — 90% of Existing Max Speed

Operation	Hours	% speed	kW	kWh	
Morning Start-up	500	75%	29.0	14,519	
Near Design Heating	638	75%	29.0	18,524	
Near Design Cooling	151	75%	29.0	4,395	
Normal Operation	2,461	68%	22.3	54,908	
Fan Operating Hours	3,750			92,346	KWH/yr

Proposed Return Fan Motor Efficiency **93.0%**

Return Fan kW (w/EE motor)@ 60Hz w/o VFD= 9.95 kW

Operate Return Fan @ 10% Less Then Supply Fan Speed

Proposed Return Fan Operation

Operation	Hours	% speed	kW	kWh	
Full Speed	0	100%	10.1	-	
Morning Start-up	500	68%	3.8	1,900	
Near Design Heating	638	68%	3.8	2,424	
Near Design Cooling	151	68%	3.8	575	
Normal Operation	2,461	61%	2.9	7,184	
Fan Operating Hours	3,750			12,083	KWH/yr

Savings

Baseline Energy	146,192	kWh
Proposed Energy	104,428	kWh
Savings	41,764	kWh

Summary

Unit	Baseline Energy (kWh	Proposed Energy (kWh	Savings (kWh)
AC-1	146,192	104,428	41,764
AC-2	185,699	140,273	45,426
	331,892	244,702	87,190

CALCULATIONS FOR REDUCING SPEED OF AC-1 & AC-2 UNIT FANS FIM 3.16 Rath Building

kWh:	$ 0.050	per kWh
Demand:	$ 10.30	per kW

Data:

AC-2 Unit Operation (hrs/yr)	**3,750**
VFD Efficiency	**98%**
Current Max Speed Setpoint	75%

Calculation:

Design Data

	Motor HP	Design BHP	Efficiency	KW	Operating Hours
Supply Fan	**50**	**38.0**	**94.5%**	30.61	3750
Supply Fan	**50**	**38.0**	**94.5%**	30.61	3750
Existing Return Fan	**15**	**13.4**	**86.5%**	11.56	3750
Proposed Return Fan	**15**	**13.4**	**93.0%**	10.75	

exp.= 2.5

Baseline Fans Operation

Operation	Hours	% speed	kW	kWh
Supply Fan	3,750	83%	19.4	72,696
Supply Fan	3,750	83%	19.4	72,696
Existing Return Fan	3,750	100%	10.7	40,308
Fan Operating Hours	11,250			185,699 KWH/yr

Proposed Supply Fans Operation — 90% of Existing Max Speed

Operation	Hours	% speed	kW	kWh
Morning Start-up	500	83%	38.8	19,386
Near Design Heating	638	83%	38.8	24,733
Near Design Cooling	151	83%	38.8	5,868
Normal Operation	2,461	75%	29.8	73,312
Fan Operating Hours	3,750			123,299 KWH/yr

Proposed Return Fan Motor Efficiency	**93.0%**	
Return Fan kW (w/EE motor)@ 60Hz w/o VFD=	10.75	kW

Operate Return Fan @ 10% Less Then Supply Fan Speed

Proposed Return Fan Operation

Operation	Hours	% speed	kW	kWh
Full Speed	0	100%	11.0	-
Morning Start-up	500	75%	5.3	2,669
Near Design Heating	638	75%	5.3	3,405
Near Design Cooling	151	75%	5.3	808
Normal Operation	2,461	67%	4.1	10,093
Fan Operating Hours	3,750			16,975 KWH/yr

Savings

Baseline Energy	185,699	kWh
Proposed Energy	140,273	kWh
Savings	45,426	kWh

CALCULATIONS TO ADD CONTROLS TO VESTIBULE ELECTRIC HEATERS

FIM 3.17 Rath Building

INPUT DATA:

Equipment	Qty	Capacity [kW]
DMV Entrance	**2**	**18**
Franklin St	**2**	**24**

Occupied		Unoccupied	
% loaded	**Total load [kW]**	**% loaded**	**Total load [kW]**
50%	**42**	**50%**	**42**

	Existing	Proposed
Percent time units on during occupied	**75%**	**50%**
Percent time units on during unoccupied	**50%**	**33%**

CALCULATIONS:

Buffalo, 75 hrs./week						
Bin Mid Pt.	Occupied Hours Heating	Unoccupied Hours Heating	Existing All heating hour usage kWh	Proposed All heating hour usage kWh	Energy Savings kWh	
(2.5)	1	0	32	21	11	
2.5	12	19	777	515	262	
7.5	33	29	1,649	1,095	554	
12.5	92	127	5,565	3,692	1,873	
17.5	219	239	11,918	7,912	4,006	
22.5	164	236	10,122	6,715	3,407	
27.5	145	241	9,629	6,385	3,243	
32.5	294	353	16,674	11,067	5,607	
37.5	363	562	23,237	15,412	7,824	
42.5	335	394	18,827	12,496	6,331	
47.5	209	272	12,296	8,159	4,137	
52.5	142	196	8,589	5,699	2,890	
57.5	150	166	8,211	5,451	2,760	
62.5	143	116	6,941	4,611	2,330	
67.5	50	28	2,163	1,438	725	
72.5	36	9	1,323	881	442	
77.5	27	17	1,208	803	405	
82.5	0	5	105	69	36	
87.5	0	0	0	0	0	
92.5	0	0	0	0	0	
97.5	0	0	0	0	0	
102.5	0	0	0	0	0	
107.5	0	0	0	0	0	
	5,424	hours	139,262	92,420	46,842	kWh

CALCULATIONS TO ADD VFD TO ELECTRIC VAULT FAN

FIM 3.18 Rath Building

	Electricity	
Unit cost:	**$ 0.050**	/kwh
kW demand	**$ 10.30**	
months /yr. demand	**12**	

Calculation:

	HP	Motor Efficiency	Estimated Loading	KW	Operating Hours	KWH
before VFD	**5**	**83.1%**	**80.0%**	3.59	4081	14,654
				3.59		14,654 KWH/yr

w/ VFD added	Motor Efficiency	**89.5%**
	VFD Efficiency	**98%**
	exp.=	2.5
	Estimated kW @ 60Hz w/o VFD=	3.33

Buffalo OA Temp Bin	Hours	speed/Hz	kW	kWh
32.5	647	0	0.0	-
37.5	936	0	0.0	-
42.5	794	0	0.0	-
47.5	745	0	0.0	-
52.5	593	30.0	0.6	357
57.5	702	34.3	0.8	590
62.5	935	39.3	1.2	1,103
67.5	737	44.3	1.6	1,174
72.5	499	49.3	2.1	1,038
77.5	387	54.3	2.6	1,025
82.5	206	59.3	3.3	680
87.5	22	60.0	3.4	75
92.5	0	60.0	3.4	-
Fan Operating Hours	4,081			6,042 KWH/yr

Savings

Baseline Energy	14,654	kWh
Proposed Energy	6,042	kWh
Savings	8,613	kWh

CALCULATIONS TO INSTALL VENTILATION CONTROLS AHU-11

FIM 3.20 Rath Building

INPUT DATA:

Exhaust Fans to be controlled

	Present	Proposed	
Occ Ventilation	14,650	14,650	
Unocc % reduction	30%	30%	
Unocc Ventilation	10,255	10,255	cfm
Ventilation	118	0	hrs./week
Heat Recovery	0%	0%	
HP	10.00	10.00	BHP
T Setpoint:	70	70	degrees F
	28.2	28.2	btu/Lb enthalpy

FUEL DATA:

Type:	Natural Gas	Electricity
Units:	mcf	kwh
Unit cost:	$ 4.765	$ 0.050
Heat Content:	1,030,000	3,412
Efficiency:	89.0%	2.93
		10.0

CALCULATIONS:

Bin Mid-Pt.	Enthalpy	Present Hours	Proposed Hours	Present kBtu	Proposed kBtu	Present Fan kWh
(2.5)	0.0	1	0	564	0	5
2.5	1.8	22	0	16,278	0	162
7.5	2.8	44	0	30,144	0	325
12.5	4.0	154	0	97,959	0	1,148
17.5	5.6	322	0	187,050	0	2,400
22.5	7.5	281	0	147,804	0	2,096
27.5	9.0	271	0	127,617	0	2,023
32.5	10.8	454	0	188,742	0	3,390
37.5	12.9	657	0	236,642	0	4,904
42.5	15.1	558	0	169,858	0	4,160
47.5	17.5	523	0	130,398	0	3,904
52.5	19.6	417	0	80,728	0	3,107
57.5	21.5	493	0	68,262	0	3,678
62.5	24.2	657	0	54,551	0	4,899
67.5	27.6	518	0	14,333	0	3,862
72.5	29.5	350	0	-21,524	0	2,615
77.5	31.0	272	0	-35,623	0	2,028
82.5	33.1	145	0	-32,967	0	1,079
87.5	35.5	15	0	-5,176	0	115
92.5	0.0	0	0	0	0	0
97.5	0.0	0	0	0	0	0
102.5	0.0	0	0	0	0	0
107.5	0.0	0	0	0	0	0
		6,153	0	Present	Proposed	
	Heating Energy	kBtu		1,550,929	0	
	Cooling energy	kBtu		(95,289)	0	Savings
	Heating Fuel		mcf	1,692	0	1,692
	Cooling energy		kwh	9,529	0	9,529
	Fan energy		kwh	45,900	0	45,900
			kwh	55,429	0	55,429

IMPLEMENTATION COST:

Item	Total

CALCULATIONS TO INSTALL PREMIUM EFFICIENCY MOTORS
FIM 3.32 Rath Building

DATA AND CALCULATIONS:

kWh:	$ 0.050	per kWh
Demand:	$ 10.30	per kW

Formula:

Demand kW = (Qty x HP x 0.746 kW/HP x % Load) / % Efficiency
Annual kWh = Demand kW x Annual Hours
Demand $ Savings = (Present kW - New kW) x months of demand x Monthly demand charge
kWh $ Savings = (Present kWh - New kWh) x Cost per kWh

		Motor				Motor Efficiency		Annual Motor Run Hours		Months of Demand
#	Description	Nominal HP	Qty	Measurement kW	Loading vs. Nom.	Present	New	Existing	New	Savings
1	Air Compressor	20	1		75%	87.5%	93.0%	1,745	1,745	12
2	AH-16	5	1		75%	83.1%	89.5%	3,750	3,750	12
3	AH-15	7 1/2	1	3.48	52%	83.8%	91.7%	3,750	3,750	12
4	AH-12	7 1/2	1	3.59	54%	83.8%	91.7%	3,750	3,750	12
5	AH-11	10	1	5.79	66%	85.0%	91.7%	3,750	3,750	12
6	AH-9	5	1		75%	83.1%	89.5%	3,750	3,750	12
7	AH-1	5	1	3.94	88%	83.1%	89.5%	3,750	3,750	12

		Total	Demand kW		Annual kWh		Motor	Demand kW	Annual kWh
#	Description	BHP/	Present	New	Present	New	Type	Savings	Savings
1	Air Compressor	15.0	12.79	12.03	22,321	21,001	ODP	0.76	1,320
2	AH-16	3.8	3.37	3.13	12,624	11,721	ODP	0.24	903
3	AH-15	3.9	3.47	3.17	13,019	11,898	ODP	0.30	1,122
4	AH-12	4.0	3.59	3.28	13,445	12,287	ODP	0.31	1,158
5	AH-11	6.6	5.79	5.37	21,722	20,135	ODP	0.42	1,587
6	AH-9	3.8	3.37	3.13	12,624	11,721	ODP	0.24	903
7	AH-1	4.4	3.94	3.65	14,762	13,706	ODP	0.28	1,056
		41.4	36.3	33.8	110,517	102,469			

ODP = open drip-proof
TEFC = totally enclosed fan-cooled

Peak KW Demand Savings:	2.6	kW
Annual KW Demand Savings:	30.6	kW
Annual kWh Savings:	8,048	kWh

PROPOSED RUN-AROUND HEAT RECOVERY SYSTEM for AC - 1

FIM 3.35

Client: Rath Building
Address: 95 Franklin Street

INPUT DATA:

Exhaust Operating Hours: **75** hours per week during the Heating Season
% of time operating: 100%

AHU Discharge Air Temperature: **60** °F

Proposed Heat Recovery Efficiency: **65%**
Additional Fan Static Pressure: **0.50** inches w.c.
Fan Efficiency: **65%**

	Outdoor Air	AH-11 Exhaust Air	
	CFM	CFM	Temp
Air Flows:	**12,850**	**14,650**	**72**
Motor Efficiency	**94.5%**	**85.0%**	
	1		

Type: **Natural Gas**
Units: **mcf**
Unit cost: **$ 4.765** per mcf
Heat Content of Fuel **1,030,000** Btu per mcf
Combustion Efficiency: **89%**

Electricity Cost
Fuel Cost: $ 0.050 per kwh
$ 10.30 $/kW
Cooling Energy Use: **0.60** kw per ton

Heat recovery system is not used if outdoor air temperature
a) is within **2** degrees of discharge air setpoint or
b) is above **100** degrees

Additonal Electrical Power Required:

Fans
Supply air: 1.56 HP
Exhaust air: HP
1.2 kW
12 months/yr. fans will run

Pump Data
12 months/yr. pump will run
109 GPM
45 ft. head
55% Pump eff.
2.25 BHP
89.5% Motor Eff.
1.88 kW

Bin Data for **Buffalo**

Bin Data 24 hrs./day x 7		Req'd	Make-up Air Unit Operating Costs - Present				Heat Recovery Unit		Future Operating Costs - w/ Heat Recovery Unit				Add'l. Energy	
			Energy Required		Heating	Cooling	Potential	Actual			Heating	Cooling	Fan	Pump
Temp.	Hours	SAT	Btuh	Btu/yr	mcf	kwh	ΔT	LAT	Btuh	Btu/yr	mcf	kwh	kwh	kwh
(2.5)	**1**	**100**	1,429,081	1,429,081	2	0	48.4	45.9	753,927	753,927	1	0	1	2
2.5	**12**	**98**	1,331,485	15,977,819	17	0	45.2	47.7	701,644	8,419,725	9	0	15	23
7.5	**33**	**96**	1,233,889	40,718,341	44	0	41.9	49.4	649,360	21,428,890	23	0	41	62
12.5	**92**	**93**	1,122,351	103,256,304	113	0	38.7	51.2	583,135	53,648,384	59	0	113	173
17.5	**219**	**91**	1,024,755	224,421,427	245	0	35.4	52.9	530,851	116,256,406	127	0	269	411
22.5	**164**	**89**	927,160	152,054,179	166	0	32.2	54.7	478,568	78,485,108	86	0	201	308
27.5	**145**	**87**	829,564	120,286,762	131	0	28.9	56.4	426,284	61,811,223	67	0	178	272
32.5	**294**	**85**	731,968	215,198,629	235	0	25.7	58.2	374,001	109,956,252	120	0	361	552
37.5	**366**	**83**	634,372	232,180,289	253	0	22.4	59.9	321,717	117,748,575	128	0	449	688
42.5	**349**	**80**	522,834	182,469,197	199	0	19.2	61.7	255,492	89,166,614	97	0	428	656
47.5	**277**	**78**	425,239	117,791,099	128	0	15.9	63.4	203,208	56,288,697	61	0	340	520
52.5	**236**	**76**	327,643	77,323,719	84	0	12.7	65.2	150,925	35,618,266	39	0	290	443
57.5	**315**	**74**	230,047	72,464,844	79	0	9.4	66.9	98,641	31,072,047	34	0	387	592
62.5	**419**												514	
67.5	**324**												398	
72.5	**271**												333	
77.5	**240**												295	
82.5	**143**												176	
87.5	**15**												18	
	3,915	Total Hours			1,697	0					852	0	4,806	4,702

	mcfs	Heat $	kwh	kW/year	Elec $	Total $
Present Heating & Cooling Cost:	1,697		0		$ 0	$ 0
Proposed Heating & Cooling Cost:	852		0		$ 0	$ 0
Annual Thermal Savings:	845		0		$ 0	$ 0
Additional Snow Melt Savings	762					
Additional Fan Electricity			(4,806)			$ 0
Additional Pump Electricity			(4,702)			$ 0
Aditional Demand Costs				(37.3)		$ 0
Annual Net Savings:	**1,607**	**$ 0**	**(9,508)**	**kwh**	**$ 0**	**$ 0**

ABANDON AH-11 SNOW MELT HEAT RECOVERY

FIM 3.45 Rath Building

INPUT DATA:

AH-11 Fan 10 HP
Measured demand 5.8 kW
Fan Eff. 87.5%
AH-11 Air Flow 14,650 CFM
Snow Melt Return Temp. 85 °F

Coil Info
Flow 125 gpm
EAT 61.0 °F
LAT 48.5 °F
Design Temp. Diff 13

Fuel Data	Heating	
Type:	Natural Gas	Electricity
Units:	**mcf**	kwh
Unit cost:	**$ 4.765**	$ 0.05
BTU/unit	**1,030,000**	3,412
Efficiency/ COP:	**89.0%**	

Buffalo, NY

Bin Mid-Pt.	Occupied Hours	Entering Water Temp.	Est. Coil Delta T	Leaving Water Temp.	Heat Transfer Rate BTU/hr	Snow Melt Season: Rejected Heat BTUs	Snow Melt Season: Boiler Fuel mcf	Present Fan Energy (kWh)	Proposed Fan Energy (kWh)
(2.5)	1	85	13.0	72	812,500	812,500	1	6	6
2.5	12	85	12.4	73	777,778	9,333,333	10	70	70
7.5	33	85	11.9	73	743,056	24,520,833	27	191	191
12.5	92	85	11.3	74	708,333	65,166,667	71	533	533
17.5	219	85	10.8	74	673,611	147,520,833	161	1,269	1,269
22.5	164	85	10.2	75	638,889	104,777,778	114	950	950
27.5	145	85	9.7	75	604,167	87,604,167	96	840	840
32.5	294	85	9.1	76	569,444	167,416,667	183	1,703	1,703
35.0	183	85	8.0	77	500,000	91,500,000	100	1,060	1,060
	1,143					698,652,778	762	6,622	6,622

Savings

	Boiler Fuel mcf	Fan Energy kWh
Baseline Energy	762	6,622
Proposed Energy	-	6,622
Savings	762	-

CALCULATIONS FOR VENDING MACHINE OCCUPANCY CONTROL
FIM 3.36 Rath Building

Electricity
Unit cost: **$ 0.050** /kwh

INPUT DATA:

Machine Type	Qty.	Volts	Amps	Present Operation Hrs/Day	Present Operation Days/Yr.	Machine Location is Occupied Hrs/Day	Machine Location is Occupied Days/Yr.
Refrigerated	**2**	**115**	**11.0**	**24**	**365**	**8**	**250**
Non Refrigerated	**2**	**115**	**3.0**	**24**	**365**	**8**	**250**

* Lighting watts is included in the volt / amp data and Total kW

Lighting Savings						Present	Proposed
Machine Type	Lighting * Watts/ unit	Lighting Found	Ltg. Watts	Present Hrs/Yr.	Proposed Hrs/Yr.	Lighting kWh/yr.	Lighting kWh/Yr.
Refrigerated	**128**	**On**	256	8,760	2,845	2,243	728
Non Refrigerated	**28**	**On**	56	8,760	2,845	491	159
						2,733	888

Compressor Savings						
	Duty Cycle		Compressor Hours		Present	Proposed
Compressor kW	Present Normal	Proposed Nite	Present Hrs/Yr.	Proposed Hrs/Yr.	Compressor kWh/yr.	Compressor kWh/Yr.
1.768	**33%**	**12.5%**	2,891	1,505	5,111	2,661
					5,111	2,661

CALCULATIONS:

Ltg kWh =Ltg Watts / 1000 x # units x Hrs per Day x Days per Yr
Compressor kWh=(volts x amps x 0.80 pf/ 1000 - ltg watts)x # units x hrs per day x days per yr x duty cycle

Ltg kWh with Control = Ltg watts per unit /1000 x # units x (Occ Hrs per Yr + Unocc Hrs x Nite Duty Cycle)
Prop Compressor Run Hours = Occ Hrs x Existing Duty Cycle + Unocc Hrs x Unocc Duty Cycle)
Compressor kWh with Control=(volts x amps x 0.80 pf -ltg watts)/1000 x # units x prop compressor hrs per y

Electricity Cost Savings = Electricity Savings x Electricity Unit Cost

	Lighting	Compressor	Total	
Existing Annual Electricity Use:	2,733	5,111	7,844	kWh
Proposed Annual Electricity Use:	888	2,661	3,548	kWh
Total Annual Savings:	1,845	2,450	4,296	kWh

CALCULATIONS TO EXTEND DDC TO DHW PUMPS

FIM 3.40 Rath Building

	DHW Fuel		Pump	
Type:	**Natural Gas**		**Electricity**	
Units:	**mcf**		**kwh**	
Unit cost:	$ 4.765	/mcf	**$ 0.050**	$/kWh
Heat Content of Fuel:	1,030,000	Btu/mcf		
Combustion Efficiency:	**89.0%**			

INPUT

Building Conditioned Floor Area	Schedule	hrs/week	Wks/yr	Hrs/yr.
513,924 sq.ft.	Heating	**75**	**42**	3,150
	Non-heating	**75**	**10**	750
				3,900

Electricity Savings for DHW Recirculation Pumps

Formula:

kwh = HP x % Loading x 0.746 kw per HP / motor efficiency x Qty. x Hours

Motor Description	Motor HP	Qty	Motor Loading	Motor Type	Motor y	Annual Hours Present	Annual Hours Proposed	Annual kWh Present	Annual kWh Proposed
DHW recircs	**1/6**	**2**	70%	Std.	45.0%	8,760	3,900	3,388	1,509
								3,388	1,509

Thermal Savings for DHW Recirculation Pumps

Motor Description	Motor GPM	Recirc ΔT	DHW Eff.	DHW Losses Btuh	Annual Hours Present	Annual Hours Proposed	Annual mcf Present	Annual mcf Proposed
DHW recircs	**5**	3.0	89%	7,497	8,760	3,900	72	32
							72	32

Formulae:

DHW Losses = GPM x Recirc ΔT x 60 min per hour x 8.33 lbs per gallon

Annual MMBtu = DHW Losses / DHW Efficiency x Annual Hours / heat content of fuel

Recirc ΔT = temperature drop between DHW leaving boiler room and returning recirculation DHW

Pump Power Savings	1,880	kwh
DHW Fuel Savings	40	mcf

CALCULATIONS FOR HOLIDAY SCHEDULING
FIM 3.41

Client: Rath Building
Address: 95 Franklin Street

Type:	**Natural Gas**	
Units:	**mcf**	
Unit cost:	**$ 4.765**	/mcf
Heat Content of Fuel	**1,030,000**	Btu/mcf
Boiler Combustion Efficiency:	**89.0%**	

DATA:

Percentage of Building to be Setback: **95%**

	Present Holiday Unoccupied	Proposed Holiday Unoccupied	
T Setpoint:	70	**65**	degrees F
Q internal gains:	**743,296**	**743,296**	Btuh
BLC:	**95,050**	**95,050**	Btuh/degree F
T Balance:	62.2	57.2	degrees F

T Balance = T Setpoint - (Q internal gains / BLC)

Average Occupied Hours/Day **15**

Occupied Hours

Mid-pts	DB (F)	Total Hrs	January Hrs	February Hrs	March Hrs	April Hrs	May Hrs	June Hrs	July Hrs	August Hrs	September Hrs	October Hrs	November Hrs	December Hrs
93	90 to 95	4							4					
88	85 to 90	12					3		6	2	1			
83	80 to 85	121					15	25	42	28	11			
78	75 to 80	207					15	41	59	62	22	8		
73	70 to 75	258			2	3	22	45	70	53	41	21	1	
68	65 to 70	197			5	3	25	35	17	51	34	23	4	
63	60 to 65	247			12	4	63	50	9	25	55	17	11	1
58	55 to 60	149			7	15	31	17	2	9	27	30	6	5
53	50 to 55	211	3		21	36	31	6	1		17	50	33	13
48	45 to 50	132	8		22	25	22	1			1	34	18	1
43	40 to 45	136	12		21	33	3				1	17	32	17
38	35 to 40	211	17	9	35	50						20	46	34
33	30 to 35	216	33	32	35	22							46	48
28	25 to 30	173	31	53	32	8							16	33
23	20 to 25	115	41	38	18	1							4	13
18	15 to 20	111	46	19	12								3	31
13	10 to 15	52	26	14	4									8
8	5 to 10	44	3	31	4									6
3	0 to 5	2		2										
-3	-5 to 0	2		2										
-8	-10 to -5	0		5										

Average Monthly Temp (°F)	26	21	38	44	63	70	76	72	66	55	41	31
Holidays / Days Off During Year	2	1	0	0	1	0	0	0	1	1	1	1
Present Unoccupied Energy (BTU)	103,620,689	58,103,715	0	0	(1,014,224)	0	0	0	(5,989,586)	9,621,132	29,516,813	44,352,936
Proposed Unoccupied Energy (BTU)	89,363,198	50,974,970	0	0	(8,142,969)	0	0	0	#########	2,492,387	22,388,067	37,224,191
Holiday Setback Energy Savings (BTU)	14,257,491	7,128,746	0	0	7,128,746	0	0	0	7,128,746	7,128,746	7,128,746	7,128,746

CALCULATIONS:

Heat Loss = (T Balance - T Avg O.A.) x BLC * # Hours
Energy Cost = (Heat Loss / Conversion Factor) x (Unit cost / Efficiency)

Winter	Heat Loss (Btu/year)	Fuel Use (mcf/year)
Present Unoccupied	238,211,476	260
Proposed Unoccupied	181,181,511	198
Annual Savings:	57,029,965	62

CALCULATIONS FOR VARIABLE SPEED DRIVE ON HOT WATER PUMPS
FIM 3.43 Rath Building

Pump Type: **Hot Water**

$ 0.050 per kWh

	Existing	Proposed	
Minimum Flow:	**2,828**	**1,131**	GPM = 40% of GPMdes.
Motor Efficiency:	**91.6%**	**95.4%**	
Pump Efficiency:	**75.0%**	76.2	BHP design
		100.0	HP Nameplate
VSD Efficiency:		**97%**	
OA Lockout Temp:		**60**	°F

Design Conditions:

2,828	GPMdes	
80	ft Total Head (TH)	
- **15**	ft head minimum (Fixed Minimum Head)	
65	pipe losses (Variable Head)	

Bin Data for Buffalo, 75 hrs./week

Periods:	**Occupied**	**Unocc.**	
Approx. Flow Increment:	**5%**	**5%**	per bin
Unocc. flow is =	**80%**	of Occupied flow at design.	

Forumulae:
FMH = Fixed Minimum Head
H2 = FMH + ((TH - FMH) x ((GPM2/GPMdes)^2))
BHP = (GPM2x H2) / (3960 x pump efficiency)
kW = BHP x 0.746 kW / Motor Eff / VFD Eff

Bin	Occupied	Percent	Occupied		New	% Speed	Occupied kW		Occupied kWh	
Temp	Hours	Flow	GPM2	Head H2	BHP	Occupied	Present	Proposed	Present	Proposed
(2.5)	**1.0**	**100%**	**2,828**	80.0	76.2	**100%**	62.1	61.4	62	61
2.5	**12.0**	**95%**	**2,687**	73.7	66.6	**96%**	62.1	53.7	745	645
7.5	**33.0**	**90%**	**2,552**	67.9	58.4	**92%**	62.1	47.1	2,049	1,553
12.5	**92.0**	**86%**	**2,425**	62.8	51.3	**89%**	62.1	41.3	5,714	3,801
17.5	**219.0**	**81%**	**2,303**	58.1	45.1	**85%**	62.1	36.3	13,601	7,958
22.5	**164.0**	**77%**	**2,188**	53.9	39.7	**82%**	62.1	32.0	10,185	5,252
27.5	**145.0**	**74%**	**2,079**	50.1	35.1	**79%**	62.1	28.3	9,005	4,101
32.5	**294.0**	**70%**	**1,975**	46.7	31.1	**76%**	62.1	25.0	18,259	7,360
37.5	**363.0**	**66%**	**1,876**	43.6	27.5	**74%**	62.1	22.2	22,544	8,061
42.5	**335.0**	**63%**	**1,782**	40.8	24.5	**71%**	62.1	19.7	20,805	6,615
47.5	**209.0**	**60%**	**1,693**	38.3	21.8	**69%**	62.1	17.6	12,980	3,679
52.5	**142.0**	**57%**	**1,609**	36.0	19.5	**67%**	62.1	15.7	8,819	2,234
57.5	**150.0**	**54%**	**1,528**	34.0	17.5	**65%**	62.1	14.1	9,316	2,114
62.5	**143.0**	**0%**	**-**	15.0	-	**0%**	62.1	0.0	-	-
67.5	**50.0**	**0%**	**-**	15.0	-	**0%**	62.1	0.0	-	-
72.5	**36.0**	**0%**	**-**	15.0	-	**0%**	62.1	0.0	-	-
77.5	**27.0**	**0%**	**-**	15.0	-	**0%**	62.1	0.0	-	-
82.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
87.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
92.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
97.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
102.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
107.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
	2,415	Occupied						Occupied kwh/year	134,083	53,436

Bin	Unocc.	Percent	Unocc.		New	% Speed	Unocc. kW		Unocc. kWh	
Temp	Hours	Flow	GPM2	Head H2	BHP	Unocc.	Present	Proposed	Present	Proposed
(2.5)	**-**	**80%**	**2,262**	56.6	43.1	**84%**	0.0	34.8	-	-
2.5	**19.0**	**76%**	**2,149**	52.5	38.0	**81%**	62.1	30.7	1,180	582
7.5	**29.0**	**72%**	**2,042**	48.9	33.6	**78%**	62.1	27.1	1,801	786
12.5	**127.0**	**69%**	**1,940**	45.6	29.8	**75%**	62.1	24.0	7,887	3,048
17.5	**239.0**	**65%**	**1,843**	42.6	26.4	**73%**	62.1	21.3	14,843	5,092
22.5	**236.0**	**62%**	**1,751**	39.9	23.5	**71%**	62.1	19.0	14,657	4,475
27.5	**241.0**	**59%**	**1,663**	37.5	21.0	**68%**	62.1	16.9	14,967	4,077
32.5	**353.0**	**56%**	**1,580**	35.3	18.8	**66%**	62.1	15.1	21,923	5,342
37.5	**562.0**	**53%**	**1,501**	33.3	16.8	**65%**	62.1	13.6	34,903	7,626
42.5	**394.0**	**50%**	**1,426**	31.5	15.1	**63%**	62.1	12.2	24,469	4,807
47.5	**272.0**	**48%**	**1,355**	29.9	13.6	**61%**	62.1	11.0	16,892	2,992
52.5	**196.0**	**46%**	**1,287**	28.5	12.3	**60%**	62.1	9.9	12,172	1,948
57.5	**166.0**	**43%**	**1,223**	27.1	11.2	**58%**	62.1	9.0	10,309	1,495
62.5	**116.0**	**0%**	**-**	15.0	-	**0%**	62.1	0.0	-	-
67.5	**28.0**	**0%**	**-**	15.0	-	**0%**	62.1	0.0	-	-
72.5	**9.0**	**0%**	**-**	15.0	-	**0%**	62.1	0.0	-	-
77.5	**17.0**	**0%**	**-**	15.0	-	**0%**	62.1	0.0	-	-
82.5	**5.0**	**0%**	**-**	15.0	-	**0%**	62.1	0.0	-	-
87.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
92.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
97.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
102.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
107.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
	3,009	Unocc.						Unocc. kwh/year	176,004	42,271
	5,424	bin hours/year total						Total kWh / year	310,087	95,707

CALCULATIONS TO ADD AC UNIT RETURN FAN VFDs

FIM 3.46 Rath Building

kWh:	$ 0.050	per kWh
Demand:	$ 10.30	per kW

Data:

AC-3 Unit Operation (hrs/yr)	**3,750**
VFD Efficiency	**98%**

Calculation:

Baseline Fan Operation

	Motor HP	Design BHP	Efficiency	KW	Operating Hours	KWH	
Existing Return Fan	**20**	**15.1**	**87.5%**	13.14	3750	49,262	
Proposed Return Fan	**20**	**15.1**	**93.0%**	12.11			
						-	
				25.2		49,262	KWH/yr

exp.=	2.5	
Proposed Return Fan Motor Efficiency	**93.0%**	
Return Fan kW (w/EE motor)@ 60Hz w/o VFD=	12.1	kW

Proposed Supply Fans Operation

10% Less Then Supply Fan Speed

Supply Fan % spee	turn Fan % spe	% Time at sp	Hours	kW	kWh	
100%	90.0%	15%	563	9.5	5,342	
90%	81.0%	25%	938	7.3	6,842	
80%	72.0%	30%	1,125	5.4	6,116	
70%	63.0%	20%	750	3.9	2,920	
60%	54.0%	10%	375	2.6	993	
		100%	3,750		22,214	KWH/yr

Savings

Baseline Energy	49,262	kWh
Proposed Energy	22,214	kWh
Savings	27,048	kWh

Summary

Unit	Baseline Energy (	Proposed Ener	Savings (kWh)
AC-3	49,262	22,214	27,048
AC-4	49,588	22,361	27,227
AC-5	31,233	13,876	17,357
AC-6	39,436	17,580	21,856
	169,519	76,031	93,488

CALCULATIONS TO ADD AC UNIT RETURN FAN VFDs

FIM 3.57 Rath Building

kWh:	$ 0.050	per kWh
Demand:	$ 10.30	per kW

Data:

AC-4 Unit Operation (hrs/yr)	**3,750**
VFD Efficiency	**98%**

Calculation:

Baseline Fan Operation

	Motor HP	Design BHP	Efficiency	KW	Operating Hours	KWH	
Existing Return Fan	**20**	**15.2**	**87.5%**	13.22	3750	49,588	
Proposed Return Fan	**20**	**15.2**	**93.0%**	12.19			
						-	
				25.4		49,588	KWH/yr

exp.= 2.5
Proposed Return Fan Motor Efficiency **93.0%**
Return Fan kW (w/EE motor)@ 60Hz w/o VFD= 12.2 kW

Proposed Supply Fans Operation 10% Less Then Supply Fan Speed

Supply Fan % spee	turn Fan % spe	% Time at sp	Hours	kW	kWh	
100%	90.0%	15%	563	9.6	5,378	
90%	81.0%	25%	938	7.3	6,887	
80%	72.0%	30%	1,125	5.5	6,157	
70%	63.0%	20%	750	3.9	2,940	
60%	54.0%	10%	375	2.7	1,000	
		100%	3,750		22,361	KWH/yr

Savings

Baseline Energy	49,588	kWh
Proposed Energy	22,361	kWh
Savings	27,227	kWh

CALCULATIONS TO ADD AC UNIT RETURN FAN VFDs

FIM 3.46 Rath Building

kWh: $ 0.050 per kWh
Demand: $ 10.30 per kW

Data:

AC-5 Unit Operation (hrs/yr) 3,750
VFD Efficiency **98%**

Calculation:

Baseline Fan Operation

	Motor HP	Design BHP	Efficiency	KW	Operating Hours	KWH	
Existing Return Fan	**10**	**9.3**	**85.0%**	8.33	3750	31,233	
Proposed Return Fan	**10**	**9.3**	**91.7%**	7.57			
						-	
				15.9		31,233	KWH/yr

exp.= 2.5
Proposed Return Fan Motor Efficiency **91.7%**
Return Fan kW (w/EE motor)@ 60Hz w/o VFD= 7.6 kW

Proposed Supply Fans Operation 10% Less Then Supply Fan Speed

Supply Fan % spee	turn Fan % spe	% Time at sp	Hours	kW	kWh
100%	90.0%	15%	563	5.9	3,337
90%	81.0%	25%	938	4.6	4,274
80%	72.0%	30%	1,125	3.4	3,820
70%	63.0%	20%	750	2.4	1,824
60%	54.0%	10%	375	1.7	620

100%	3,750	13,876	KWH/yr

Savings

Baseline Energy	31,233	kWh
Proposed Energy	13,876	kWh
Savings	17,357	kWh

CALCULATIONS TO ADD AC UNIT RETURN FAN VFDs

FIM 3.46 Rath Building

kWh:	$ 0.050	per kWh
Demand:	$ 10.30	per kW

Data:

AC-6 Unit Operation (hrs/yr)	**3,750**
VFD Efficiency	**98%**

Calculation:

Baseline Fan Operation

	Motor HP	Design BHP	Efficiency	KW	Operating Hours	KWH
Existing Return Fan	**15**	**12.0**	**86.5%**	10.5	3750	39,436
Proposed Return Fan	**15**	**12.0**	**93.0%**	9.6		
						-
				20.1		39,436 KWH/yr

exp.=	2.5	
Proposed Return Fan Motor Efficiency	**93.0%**	
Return Fan kW (w/EE motor)@ 60Hz w/o VFD=	9.6	kW

Proposed Supply Fans Operation 10% Less Then Supply Fan Speed

Supply Fan % spee	Return Fan % spe	% Time at sp	Hours	kW	kWh
100%	90.0%	15%	563	7.5	4,228
90%	81.0%	25%	938	5.8	5,415
80%	72.0%	30%	1,125	4.3	4,840
70%	63.0%	20%	750	3.1	2,311
60%	54.0%	10%	375	2.1	786
		100%	3,750		17,580 KWH/yr

Savings

Baseline Energy	39,436	kWh
Proposed Energy	17,580	kWh
Savings	21,856	kWh

CALCULATIONS FOR IMPACT OF REDUCED LIGHTING ON HEATING AND AIR CONDITIONING

FIM 4.1

Client: Fire Training
Address: 3359 Broadway St.

INPUT DATA:

	Heating Energy		Cooling Energy	
Fuel:	**Natural Gas**		**Electric**	
Units:	**mcf**		**kWh**	
Fuel Cost:	**$ 5.442**	per mcf	**$ 0.051**	per kWh
Fuel Conversion Factor:	**1,030,000**	Btu per mcf	**3,412**	Btu per kWh
Efficiency:	**80.0%**		**1.10**	kW/Ton
			49%	of building is air conditioned

	107,512	Lighting Retrofit
	2,231	Installing Sensors
Annual Lighting Savings:	**109,744**	kWh per Year
	12	months per year of lighting operation
	9,145	kwh/month

For **8** months/year the lighting retrofit will impact heating costs
20% of light fixtures are within 10 feet of an exterior wall
For **4** months/year the lighting retrofit will impact cooling costs

CALCULATIONS:

Replacement Natural Gas because of Reduced Lighting Energy

Useful Heat from Lights during the heating season that is no longer available is:

= kwh Lighting Savings per month x No. Months of Heating impact x % of fixtures located near exterior walls

= **14,632 kWh =** 49,926,081 BTU = 61 mcf

Replacement Natural Gas usage

Useful Heat from Lights in kwh x 3412 BTU/kwh / Heating Fuel Conversion Factor / Heating Fuel Efficiency

Replacement Natural Gas Cost = mcf x $per mcf

	Fuel Usage		Fuel Cost	
Useful Heat from Lights	14,632	kWh	n/a	
Replacement Gas	**(61)**	**mcf**		**per year**

Reduced Air Conditioning because of Reduced Lighting

Reduced Air Conditioning Lighting Load during the cooling season from Lighting that is no longer present is:

= kwh Lighting Savings per month x No. Months Lighting Retrofit will impact cooling costs x % of building cooled

= **18,083 kWh =** 61,698,424 BTU

Reduced Air Conditioning Energy Requirements [kWh] =

Reduce Air Conditioning Lighting Load x (3412 Btu / kWh) x (1 ton-hr / 12,000 Btu) x (1.1 kW / ton)

Reduced Air Conditioning Cost = Reduced Air Conditioning Energy Requirements x Cost per kWh

Reduced Air Conditioning Energy Requirements = 5,656 kWh per year
Reduced Air Conditioning Cost = per year

Net Impact on Heating and Air Conditioning Costs because of Lighting Retrofit

Heating Fuel	**(60.6)**	**mcf**	**$ 0**
Cooling	**5,656**	**kWh per year**	**$ 0**

Project: Erie County
Building: Fire Training
Date: 7/3/2019

Heating System Efficiency:	80%
Average Fuel Cost ($/unit):	$0.55
Correction Factor:	100%

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product	
Single door sweeps	14	3	3/16	1/12	=	0.65625	
Single door perimeters	14	17	1/16	1/12	=	1.239583333	
Double door sweeps & astragals	1	20	3/16	1/12	=	0.3125	
Double door perimeters	1	20	1/16	1/12	=	0.104166667	
Garage doors	15	775	1/4	1/12	=	16.14583333	
Roof top ventilators	2	8	1/6	1/12	=	0.111111111	*assume roof fans open during occupied hours
Roof/wall joint	1	674	3/16	1/12	=	10.53125	
Bulkhead	4	34	3/16	1/12	=	0.53125	
					Total =	29.63194444	ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
4251	50%	0.015	72	34.25	0.0092	11.6	2854.984

Occupied Infiltration Savings

Specific Heat of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Occupied (%/week)	Heating Season Bin Hours (Occupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	2854.984	37.75	29.76%	4335	103000	80%	1822.381

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
4267	50%	0.015	67	34.14	0.0092	11.6	2806.872

Unoccupied Infiltration Savings

Specific Hear of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Unoccupied (%/week)	Heating Season Bin Hours (Unoccupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	2806.872	32.86	70.24%	4301	103000	80%	3652.083

Totals

Units of Fuel per Year (units/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
5474.464	103000	9.708737864	563.8698292

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
5474.46	$0.55	2986.134477

Total Cost Savings: **$2,986.13**
Cost to Retrofit: **$41,506.00**
Simple Payback: **13.90 years**

Project: Erie County
Building: Fire Training
Date: 7/3/2019

Cooling System Efficiency (kW/ton):	1.09
EER:	11.009
Average Fuel Cost ($/unit):	$0.08

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product	
Single door sweeps	14	3	3/16	1/12	=	0.65625	
Single door perimeters	14	17	1/16	1/12	=	1.239583333	
Double door sweeps & astragals	1	20	3/16	1/12	=	0.3125	
Double door perimeters	1	20	1/16	1/12	=	0.104166667	
Garage door weather-stripping	15	775	1/4	1/12	=	16.14583333	
Roof top ventilator sealing	2	8	1/6	1/12	=	0.111111111	*assume roof fans open during occupied hours
Roof/wall joint sealing	1	674	3/16	1/12	=	10.53125	
Bulkhead	4	34	3/16	1/12	=	0.53125	
					Total =	29.63194444	ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
4251	50%	0.015	72	80.14	0.0092	11.6	2478.785

Occupied Infiltration Savings Ref: ASHRAE 2013 Fundamentals 18.13 (8)

Air Total Heat Factor C_t	Flow Rate (cfm) Q_{occ}	Average Outdoor Air Enthalpy h	Cooling Supply Air Enthalpy h	% Building Occupied	Cooling Season Bin Hours	% Building Area Cooled	Btu/hrs per Ton	Cooling (kWh)
4.50	2478.785	32	22.7	29.76%	1,122	100%	11,009	3775.61

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
4267	50%	0.015	77	74.77	0.0092	11.6	2341.512

Unoccupied Infiltration Savings Ref: ASHRAE 2013 Fundamentals 18.13 (8)

Air Total Heat Factor C_t	Flow Rate (cfm) Q_{occ}	Average Outdoor Air Enthalpy h	Cooling Supply Air Enthalpy h	% Building Occupied	Cooling Season Bin Hours	% Building Area Cooled	Btu/hrs per Ton	Cooling (kWh)
4.50	2341.512	32	22.7	70.24%	449	100%	11,009	3368.598214

Totals

kWh per Year (kWh/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
7144.204	3,412	293.08	24.37602307

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
7144.20	$0.08	550.103686

Total Cost Savings: **$550.10**
Cost to Retrofit: Cost carried on heating page
Simple Payback: **0.00 years**

CALCULATIONS TO INSTALL VENTILATION CONTROLS

FIM 4.6 Fire Training

INPUT DATA:

Exhaust Fans to be controlled

	Present	Proposed	
Occupied	1,500	1,500	cfm
Occupied	126	60	hrs./week
Unoccupied	42	0	hrs./week
Heat Recovery	0%	0%	
HP	0.63	0.63	BHP
T Setpoint:	68	68	degrees F
	28.2	28.2	btu/Lb enthalpy

FUEL DATA:

Type:	Natural Gas	Electricity	
Units:	mcf	kwh	
Unit cost:	$ 5.442	$ 0.051	/unit
Heat Content:	1,030,000	3,412	Btu/unit
Efficiency:	80.0%	2.93	
		10.0	EER

CALCULATIONS:

Bin Mid-Pt.	Enthalpy	Present Hours	Proposed Hours	Present kBtu	Proposed kBtu	Present Fan kWh	Proposed Fan kWh
(2.5)	0.0	1	0	86	41	0	0
2.5	1.8	23	11	2,484	1,183	11	5
7.5	2.8	47	22	4,592	2,187	22	10
12.5	4.0	164	78	14,889	7,090	77	36
17.5	5.6	344	164	28,356	13,503	160	76
22.5	7.5	300	143	22,335	10,636	140	67
27.5	9.0	290	138	19,208	9,147	135	64
32.5	10.8	485	231	28,266	13,460	226	108
37.5	12.9	702	334	35,206	16,765	327	156
42.5	15.1	596	284	25,041	11,924	278	132
47.5	17.5	559	266	18,970	9,033	261	124
52.5	19.6	445	212	11,497	5,475	207	99
57.5	21.5	527	251	9,346	4,450	245	117
62.5	24.2	701	334	6,767	3,223	327	156
67.5	27.6	553	263	857	408	258	123
72.5	29.5	374	178	-3,362	-1,601	174	83
77.5	31.0	290	138	-5,564	-2,649	135	64
82.5	33.1	155	74	-5,149	-2,452	72	34
87.5	35.5	17	8	-808	-385	8	4
92.5	0.0	0	0	0	0	0	0
97.5	0.0	0	0	0	0	0	0
102.5	0.0	0	0	0	0	0	0
107.5	0.0	0	0	0	0	0	0
		6,570	3,129	Present	Proposed		
	Heating Energy	kBtu		227,900	108,524		
	Cooling energy	kBtu		(14,883)	(7,087)	Savings	Savings
	Heating Fuel		mcf	277	132	145	
	Cooling energy		kwh	1,488	709	780	
	Fan energy		kwh	3,063	1,459	1,605	
			kwh	4,552	2,167	2,384	

CALCULATIONS TO REPLACE ROOFTOP UNITS

FIM 4.21 Fire Training

kWh:	$ 0.051	per kWh
Demand:	$ 9.26	per kW
months /yr. demand:	5	

INPUT DATA

Select City Closest to Site	Select Closest Facility Type:
Buffalo	Small Office

Location or Area Served

Unit Tag	Trane 3 ton	Trane 6 ton	York 10 ton		
tons/unit	3	6	10		
# of Units	5	1	2		
Unit Type (AC or HP)	AC	AC	AC	AC	AC
Present Efficiency SEER *	11.0	11.0	11.0	13.0	13.0
Air Side Economizer?	N	N	N	N	N
Proposed Efficiency SEER ***	15.0	15.0	15.0	15.0	15.0
Air Side Economizer?	Y	Y	Y	N	N
Equivalent Full Load Hours/yr.	990	hrs/yr			
Economizer savings kwh/ton	195	195	195	-	-
Coincidence Factor CF **	0.80				

CALCULATIONS:

						Sum
Present kwh/year	16,200	6,480	21,600	-	-	44,280
Proposed kwh/year	11,880	4,752	15,840	-	-	32,472
Efficiency ΔkWh =	4,320	1,728	5,760	0	0	11,808
Economizer ΔkWh =	2,925	1,170	3,900	-	-	7,995
Demand Savings						
Present kW (peak)	13.0	5.2	17.5	-	-	35.7
Proposed kW (peak)	-	4.4	14.7	-	-	19.1
ΔkW =	13.0	0.8	2.7	-	-	16.5

FORMULAE:

New York Standard Approach for Estimating Energy Savings-Residential, Multi-Family and Commercial/Industrial Measures:

ΔkWh eff = units x tons/unit x (12/SEERbase-12/SEERee) x EFLHcooling

ΔkWh econ = units x tons/unit x kwh economizer savings per ton (from Tech Manual Appendix J)

ΔkW = units x tons/unit x (12/EERbase-12/EERee) x CF

EFLHcool = Annual kWhcooling/kWpeak cooling without economizer (from Appendix G)

** Present EER and SEER are based on Tech Manual Baseline assumptions*

***CF Assumes all HVAC systems will not be operating at the same time*

**** Proposed EER and SEER are based on Existing Facilities Program requirements as of 4/1/2014*

Existing Energy Consumption	44,280	kwh/yr	35.7	kW peak
Proposed Energy Consumption	24,477	kwh/yr	19.1	kW peak
Annual Energy Savings	19,803	kwh/yr	16.5	kW peak

CALCULATIONS FOR INSTALLING CONDENSING UNIT HEATERS
FIM 4.22

Client: Fire Training
Address: 3359 Broadway St.

Type: **Natural Gas**
Units: **mcf**
Unit cost: **$ 5.442** /mcf
Heat Content of Fuel **1,030,000** Btu/mcf

INPUT DATA:

Present Annual Fuel Consumption:

	2,633	mcf	Total heating fuel use
	5.7%	of building served by theseUnit Heaters	
	150	mcf	Unit Heaters fuel use

Efficiencies

Present:	**80.0%**	thermal efficiency
Proposed:	**93.0%**	thermal efficiency
Number of Unit Heaters:	**4**	

CALCULATIONS:

Proposed Annual Fuel Consumption =
(Present Annual Fuel Consumption x Present Efficiency) / Proposed Efficiency

	Annual Fuel Consumption (mcf)
Present:	150
Proposed:	129

Annual Savings: 21

CALCULATIONS TO REPLACE AIR ROTATION UNIT

FIM 4.23 Fire Training

INPUT DATA:

Select Closest Facility Type:			Type:	Natural Gas	
Other			Units:	mcf	
Select City Closest to Site	EFLH heat		Unit cost:	$ 5.442	/mcf
Buffalo	440		BTU/unit	1,030,000	Btu/mcf
			Electricity:	$ 0.051	/kwh
Firing Rate	# Furnaces				
840,000	1				
Totals	1	840,000	Btu/hour total		
Present annual fuel use:	359	mcf			
Total heating fuel use:	2,633	mcf			
	13.6%	of building served by these furnaces			
	276	mcf	Furnace fuel use		
Present AFUE	80.0%	Non-condensing furnace			
Proposed AFUE	94.0%	Condensing furnace with variable speed BPM motor			

CALCULATIONS:

Present Fuel Use = Total Firing Rate x EFLHheat / Btu per unit fuel
Proposed Annual Fuel Use =
(Present Annual Fuel Use x Present Efficiency) / Proposed Efficiency
Furnace Output in MBtu/year = Fuel consumption x AFUE x BTU per unit fuel / 1,000,000
Furnace Electricity = Furnace output in MBtu per year x kwh per MBtu
where Mbtu = one million BTUs

	Annual Fuel Consumption (mcf)	Furnace Output in MBtu/year	Furnace Electricity kWh/MBtu	kWh	Annual Cost
Present Conumption:	276	228	6	1,367	
Proposed Conumption:	235	228	5	1,139	
Annual Savings:	41			228	

CALCULATIONS FOR VENDING MACHINE OCCUPANCY CONTROL
FIM 4.36 Fire Training

Electricity
Unit cost: **$ 0.051** /kwh

INPUT DATA:

Machine Type	Qty.	Volts	Amps	Present Operation Hrs/Day	Present Operation Days/Yr.	Machine Location is Occupied Hrs/Day	Machine Location is Occupied Days/Yr.
Refrigerated	**1**	**115**	**11.0**	**24**	**365**	**12**	**250**
Non Refrigerated	**1**	**120**	**3.0**	**24**	**365**	**12**	**250**

* Lighting watts is included in the volt / amp data and Total kW

Lighting Savings						Present	Proposed
Machine Type	Lighting * Watts/ unit	Lighting Found	Ltg. Watts	Present Hrs/Yr.	Proposed Hrs/Yr.	Lighting kWh/yr.	Lighting kWh/Yr.
Refrigerated	**128**	**On**	128	8,760	3,720	1,121	476
Non Refrigerated	**28**	**On**	28	8,760	3,720	245	104
						1,367	580

Compressor Savings						
	Duty Cycle		Compressor Hours		Present	Proposed
Compressor kW	Present Normal	Proposed Nite	Present Hrs/Yr.	Proposed Hrs/Yr.	Compressor kWh/yr.	Compressor kWh/Yr.
0.884	**33%**	**12.5%**	2,891	1,710	2,555	1,512
					2,555	1,512

CALCULATIONS:

Ltg kWh =Ltg Watts / 1000 x # units x Hrs per Day x Days per Yr
Compressor kWh=(volts x amps x 0.80 pf/ 1000 - ltg watts)x # units x hrs per day x days per yr x duty cycle

Ltg kWh with Control = Ltg watts per unit /1000 x # units x (Occ Hrs per Yr + Unocc Hrs x Nite Duty Cycle)
Prop Compressor Run Hours = Occ Hrs x Existing Duty Cycle + Unocc Hrs x Unocc Duty Cycle)
Compressor kWh with Control=(volts x amps x 0.80 pf -ltg watts)/1000 x # units x prop compressor hrs per yr

Electricity Cost Savings = Electricity Savings x Electricity Unit Cost

	Lighting	Compressor	Total	
Existing Annual Electricity Use:	1,367	2,555	3,922	kWh
Proposed Annual Electricity Use:	580	1,512	2,092	kWh
Total Annual Savings:	786	1,044	1,830	kWh
			47%	reduction

CALCULATIONS TO IMPROVE TEMPERATURE CONTROL

FIM 4.38 Fire Training

INPUT DATA: 100% of Building to be Setback

		Current	Proposed	
Heating T Setpoint:	Occupied	68	68	deg. F.
	Unoccupied	65	63	deg. F.
Cooling T Setpoint:	Occupied	77	77	deg. F.
	Unoccupied	80	80	deg. F.
HVAC Schedule	Occupied	60.0	60.0	Hours per week
	Unoccupied	108.0	108.0	Hours per week
Q internal gains:	Occupied	227,843	227,843	Btuh
	Unoccupied	72,096	72,096	Btuh
Q internal gains:	Schedule	60	60	Hours per week
BLC:	Occupied	17,152	17,152	Btuh/deg. F.
	Unoccupied	15,758	15,758	Btuh/deg. F.

Fuel Data	Heating	Cooling		
Type:	Natural Gas	Electricity		
Units:	**mcf**	kwh		
Unit cost:	**$ 5.442**	$ 0.05		
BTU/unit	**1,030,000**	3,412		
Efficiency/ COP:	**80.0%**	2.93	COP, = EER	10.0

CALCULATIONS:

Current — Buffalo, 60 hrs./week

Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use mcf	Cooling Energy kwh
(2.5)	0	1	989,210	991,552	1	
2.5	9	22	903,450	912,764	34	
7.5	23	39	817,690	833,975	62	
12.5	65	154	731,930	755,186	199	
17.5	172	286	646,170	676,397	370	
22.5	138	262	560,410	597,608	284	
27.5	114	272	474,650	518,820	237	
32.5	228	419	388,890	440,031	331	
37.5	276	660	303,130	361,242	391	
42.5	282	512	217,370	282,453	250	
47.5	219	526	131,610	203,664	165	
52.5	170	423	45,850	124,876	74	
57.5	248	454	(39,909)	46,087	25	
62.5	349	586	(125,669)	(32,702)	0	
67.5	256	481	(211,429)	(72,096)	0	
72.5	227	272	(227,843)	(72,096)	0	
77.5	205	182	(236,419)	(72,096)	0	
82.5	136	70	(322,179)	(111,491)	0	
87.5	15	7	(407,939)	(190,280)	0	
92.5	0	0	(493,699)	(269,068)	0	
97.5	0	0	(579,459)	(347,857)	0	
102.5	0	0	(665,219)	(426,646)	0	
107.5	0	0	(750,979)	(505,435)	0	
	8,760	hours			2,423	0

Proposed		Buffalo, 60 hrs./week				
Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use	Cooling Energy kwh
(2.5)	0	1	989,210	960,037	1	
2.5	9	22	903,450	881,248	33	
7.5	23	39	817,690	802,459	61	
12.5	65	154	731,930	723,670	193	
17.5	172	286	646,170	644,882	359	
22.5	138	262	560,410	566,093	274	
27.5	114	272	474,650	487,304	227	
32.5	228	419	388,890	408,515	315	
37.5	276	660	303,130	329,726	366	
42.5	282	512	217,370	250,938	230	
47.5	219	526	131,610	172,149	145	
52.5	170	423	45,850	93,360	57	
57.5	248	454	(39,909)	14,571	8	
62.5	349	586	(125,669)	(64,218)	0	
67.5	256	481	(211,429)	(72,096)	0	
72.5	227	272	(227,843)	(72,096)	0	
77.5	205	182	(236,419)	(72,096)	0	
82.5	136	70	(322,179)	(111,491)	0	
87.5	15	7	(407,939)	(190,280)	0	
92.5	0	0	(493,699)	(269,068)	0	
97.5	0	0	(579,459)	(347,857)	0	
102.5	0	0	(665,219)	(426,646)	0	
107.5	0	0	(750,979)	(505,435)	0	
	8,760	hours			2,269	0

		Present	Proposed	Savings
Heating	mcf	2,423	2,269	154
Cooling	kwh	0	0	0
Annual Energy $				

	Present	Proposed	Savings
Academy	1,551	1,452	99
Hazmat	459	430	29
New Storage	413	387	26

CALCULATIONS TO IMPROVE TEMPERATURE CONTROL

FIM 4.38 Fire Training

INPUT DATA: 100% of Building to be Setback

		Current	Proposed	
Heating T Setpoint:	Occupied	68	68	deg. F.
	Unoccupied	65	65	deg. F.
Cooling T Setpoint:	Occupied	77	77	deg. F.
	Unoccupied	80	90	deg. F.
HVAC Schedule	Occupied	60.0	70.0	Hours per week
	Unoccupied	108.0	98.0	Hours per week
Q internal gains:	Occupied	227,843	227,843	Btuh
	Unoccupied	72,096	72,096	Btuh
Q internal gains:	Schedule	60	60	Hours per week
BLC:	Occupied	17,152	17,152	Btuh/deg. F.
	Unoccupied	15,758	15,758	Btuh/deg. F.

Fuel Data	Heating	Cooling		
Type:	Natural Gas	Electricity		
Units:	**mcf**	kwh		
Unit cost:	**$ 5.442**	$ 0.05		
BTU/unit	**1,030,000**	3,412		
Efficiency/ COP:	**80.0%**	2.93	COP, = EER	10.0

CALCULATIONS:

Current — Buffalo, 60 hrs./week

Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use mcf	Cooling Energy kwh
(2.5)	0	1	989,210	991,552		0
2.5	9	22	903,450	912,764		0
7.5	23	39	817,690	833,975		0
12.5	65	154	731,930	755,186		0
17.5	172	286	646,170	676,397		0
22.5	138	262	560,410	597,608		0
27.5	114	272	474,650	518,820		0
32.5	228	419	388,890	440,031		0
37.5	276	660	303,130	361,242		0
42.5	282	512	217,370	282,453		0
47.5	219	526	131,610	203,664		0
52.5	170	423	45,850	124,876		0
57.5	248	454	(39,909)	46,087		990
62.5	349	586	(125,669)	(32,702)		6,302
67.5	256	481	(211,429)	(72,096)		8,880
72.5	227	272	(227,843)	(72,096)		7,133
77.5	205	182	(236,419)	(72,096)		6,159
82.5	136	70	(322,179)	(111,491)		5,162
87.5	15	7	(407,939)	(190,280)		745
92.5	0	0	(493,699)	(269,068)		0
97.5	0	0	(579,459)	(347,857)		0
102.5	0	0	(665,219)	(426,646)		0
107.5	0	0	(750,979)	(505,435)		0
	8,760	hours			0	35,371

Proposed		Buffalo, 60 hrs./week				
Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss	Heating Fuel Use	Cooling Energy
(2.5)	0	1	1,011,459	991,552		0
2.5	9	22	925,699	912,764		0
7.5	23	39	839,939	833,975		0
12.5	65	154	754,179	755,186		0
17.5	172	286	668,419	676,397		0
22.5	138	262	582,660	597,608		0
27.5	114	272	496,900	518,820		0
32.5	228	419	411,140	440,031		0
37.5	276	660	325,380	361,242		0
42.5	282	512	239,620	282,453		0
47.5	219	526	153,860	203,664		0
52.5	170	423	68,100	124,876		0
57.5	248	454	(17,660)	46,087		438
62.5	349	586	(103,420)	(32,702)		5,526
67.5	256	481	(189,180)	(72,096)		8,311
72.5	227	272	(205,594)	(72,096)		6,628
77.5	205	182	(214,170)	(72,096)		5,703
82.5	136	70	(299,930)	(72,096)		4,584
87.5	15	7	(385,690)	(72,096)		629
92.5	0	0	(471,450)	(111,491)		0
97.5	0	0	(557,210)	(190,280)		0
102.5	0	0	(642,969)	(269,068)		0
107.5	0	0	(728,729)	(347,857)		0
	8,760	hours			0	31,818

		Present	Proposed	Savings
Heating	mcf	0	0	0
Cooling	kwh	35,371	31,818	3,554

CALCULATIONS TO EXTEND DDC TO DHW PUMPS

FIM 4.40 Fire Training

	DHW Fuel		Pump	
Type:	**Natural Gas**		**Electricity**	
Units:	**mcf**		**kwh**	
Unit cost:	$ 5.442	/mcf	**$ 0.051**	$/kWh
Heat Content of Fuel:	1,030,000	Btu/mcf		
Combustion Efficiency:	**80.0%**			

INPUT

Building Conditioned Floor Area	Schedule	hrs/week	Wks/yr	Hrs/yr.
35,200 sq.ft.	Heating	**60**	**42**	2,520
	Non-heating	**60**	**10**	600
				3,120

Electricity Savings for DHW Recirculation Pumps

Formula:

kwh = HP x % Loading x 0.746 kw per HP / motor efficiency x Qty. x Hours

Motor Description	Motor HP	Qty	Motor Loading	Motor Type	Motor y	Annual Hours Present	Annual Hours Proposed	Annual kWh Present	Annual kWh Proposed
Fire Training	**1/8**	**1**	70%	Std.	45.0%	8,760	3,120	1,271	453
New Storage	**1/8**	**1**	70%	Std.	45.0%	8,760	3,120	1,271	453
								2,541	905

Thermal Savings for DHW Recirculation Pumps

Motor Description	Motor GPM	Recirc ΔT	DHW Eff.	DHW Losses Btuh	Annual Hours Present	Annual Hours Proposed	Annual mcf Present	Annual mcf Proposed
Fire Training	**5**	2.0	80%	4,998	8,760	3,120	53	19
New Storage	**3**	2.0	80%	2,999	8,760	3,120	32	11
							85	30

Formulae:

DHW Losses = GPM x Recirc ΔT x 60 min per hour x 8.33 lbs per gallon

Annual MMBtu = DHW Losses / DHW Efficiency x Annual Hours / heat content of fuel

Recirc ΔT = temperature drop between DHW leaving boiler room and returning recirculation DHW

Pump Power Savings	1,636	kwh
DHW Fuel Savings	55	mcf

CALCULATIONS TO VENTILATE BASED ON OCCUPANCY

FIM 4.45

Client: Fire Training
Address: 3359 Broadway St.

DATA:

	Occupied	Unoccupied	
T Setpoint:	**68**	**65**	degrees F
Q internal gains:	**227,843**	**72,096**	Btuh
BLC:	**17,152**	**15,758**	Btuh/degree F
T Balance:	55.2	60.4	degrees F

T Balance = T Setpoint - (Q internal gains / BLC)

Fuel Information

Type:	**Natural Gas**	
Units:	**mcf**	
Unit cost:	**$ 5.442**	/mcf
CF1:	**1,030,000**	Btu/mcf
Efficiency:	**80%**	
CF2	1.085	Btu/hr-deg F-cfm

Ventilation Information *Percentage of Hours*

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
100% Occupied	**0%**	**0%**	**0%**	**100%**	**100%**	**100%**
80% Occupied	**10%**	**10%**	**10%**	**0%**	**0%**	**0%**
60% Occupied	**30%**	**30%**	**20%**	**0%**	**0%**	**0%**
40% Occupied	**20%**	**20%**	**30%**	**0%**	**0%**	**0%**
20% Occupied	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**
Unoccupied	**40%**	**40%**	**40%**	**0%**	**0%**	**0%**
Average Occupancy	**34%**	**34%**	**32%**	**100%**	**100%**	**100%**

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	**Totals**
Tag:	**Blue Class**	**Red Class**	**Lobby**				
Supply Air Flow:	**1,333**	**1,999**	**1,333**				
Existing Outdoor Air Flow:	**533**	**800**	**533**				
Proposed Outdoor Air Flow:	181	272	171	0	0	0	
# Units	**1**	**1**	**1**	**0**	**0**	**0**	
Existing OA Flow:	533	800	533	0	0	0	**1,866**
Proposed OA Flow:	181	272	171	0	0	0	**624**
Net Change in OA:	352	528	362	0	0	0	**1,242**

Current Hours of Ventilation **60** occupied hours per week or **100%** of Occupied Bin Hours
and **0%** of Unoccupied Bin Hours

Bin Data for Buffalo, 60 hrs./week

Bin Data is based on 60 occupied hours per week

Winter	T Setpoint	T Balance	Accum Hours	Average O.A. Temp below T Balance	Temp Difference (T Set- Avg OAT)
Occupied	68	55.2	**1,696**	**35.0**	33.5
Unoccupied	65	60.4	**4,030**	**38.2**	26.8

CALCULATIONS:

Energy Usage = (CFM Present - CFM Proposed) x Accumulated Hours x Duty Cycle x Temp Diff x CF2
Energy Cost = (Energy Usage / CF1) x (Unit cost / Efficiency)

Winter	Energy Savings (Btu/year)	Fuel Savings (mcf/year)	Fuel Savings ($/year)
Occupied	76,498,868	93	
Unoccupied	0	0	
Annual Savings:	76,498,868	93	

CALCULATIONS FOR IMPACT OF REDUCED LIGHTING ON HEATING AND AIR CONDITIONING

FIM 5.1

Client: Youth Detention
Address: 810 East Ferry Street

INPUT DATA:

	Heating Energy		Cooling Energy	
Fuel:	**Natural Gas**		**Electric**	
Units:	**mcf**		**kWh**	
Fuel Cost:	**$ 4.449**	per mcf	**$ 0.050**	per kWh
Fuel Conversion Factor:	**1,030,000**	Btu per mcf	**3,412**	Btu per kWh
Efficiency:	**85.0%**		**1.10**	kW/Ton
			75%	of building is air conditioned

	156,689	Lighting Retrofit
	11,489	Installing Sensors
Annual Lighting Savings:	**168,179**	kWh per Year
	12	months per year of lighting operation
	14,015	kwh/month

For **8** months/year the lighting retrofit will impact heating costs
20% of light fixtures are within 10 feet of an exterior wall
For **4** months/year the lighting retrofit will impact cooling costs

CALCULATIONS:

Replacement Natural Gas because of Reduced Lighting Energy

Useful Heat from Lights during the heating season that is no longer available is:

= kwh Lighting Savings per month x No. Months of Heating impact x % of fixtures located near exterior walls

= **22,424 kWh =** 76,510,071 BTU = 87 mcf

Replacement Natural Gas usage

Useful Heat from Lights in kwh x 3412 BTU/kwh / Heating Fuel Conversion Factor / Heating Fuel Efficiency

Replacement Natural Gas Cost = mcf x $per mcf

	Fuel Usage		Fuel Cost	
Useful Heat from Lights	22,424	kWh	n/a	
Replacement Gas	**(87)**	**mcf**		**per year**

Reduced Air Conditioning because of Reduced Lighting

Reduced Air Conditioning Lighting Load during the cooling season from Lighting that is no longer present is:

= kwh Lighting Savings per month x No. Months Lighting Retrofit will impact cooling costs x % of building cooled

= **42,045 kWh =** 143,456,383 BTU

Reduced Air Conditioning Energy Requirements [kWh] =

Reduce Air Conditioning Lighting Load x (3412 Btu / kWh) x (1 ton-hr / 12,000 Btu) x (1.1 kW / ton)

Reduced Air Conditioning Cost = Reduced Air Conditioning Energy Requirements x Cost per kWh

Reduced Air Conditioning Energy Requirements = 13,150 kWh per year
Reduced Air Conditioning Cost = per year

Net Impact on Heating and Air Conditioning Costs because of Lighting Retrofit

Heating Fuel	**(87.4)**	**mcf**
Cooling	**13,150**	**kWh per year**

Project: Erie County
Building: Youth Detention Center
Date: 7/3/2019

Heating System Efficiency:	85%
Average Fuel Cost ($/unit):	$0.49
Correction Factor:	100%

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product
Single door sweeps	22	3	3/16	1/12	=	1.03125
Single door perimeters	22	17	1/8	1/12	=	3.895833333
Double door sweeps & astragals	1	20	3/16	1/12	=	0.3125
Double door perimeters	1	20	1/8	1/12	=	0.208333333
Garage doors	5	160	1/4	1/12	=	3.333333333
					Total =	8.78125 ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (°F)	Average Outdoor Air Temperature (°F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
1264.5	50%	0.015	72	34.25	0.0092	11.6	849.242

Occupied Infiltration Savings

Specific Heat of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Occupied (%/week)	Heating Season Bin Hours (Occupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	849.242	37.75	29.76%	4335	103000	85%	510.197

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (°F)	Average Outdoor Air Temperature (°F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
1264.5	50%	0.015	67	34.14	0.0065	11.6	739.365

Unoccupied Infiltration Savings

Specific Hear of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Unoccupied (%/week)	Heating Season Bin Hours (Unoccupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	739.365	32.86	70.24%	4301	103000	85%	905.416

Totals

Units of Fuel per Year (units/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
1415.613	103000	9.708737864	145.8081094

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
1415.61	$0.49	690.627505

Total Cost Savings: **$690.63**
Cost to Retrofit: **$16,106.00**
Simple Payback: **23.32 years**

Project: Erie County
Building: Youth Detention Center
Date: 7/3/2019

Cooling System Efficiency (kW/ton):	1.040
EER:	11.538
Average Fuel Cost ($/unit):	$0.08

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product
Single door sweeps	22	3	3/16	1/12	=	1.03125
Single door perimeters	22	17	1/8	1/12	=	3.895833333
Double door sweeps & astragals	1	20	3/16	1/12	=	0.3125
Double door perimeters	1	20	1/8	1/12	=	0.208333333
Garage door weather-stripping	5	160	1/4	1/12	=	3.333333333
					Total =	8.78125 ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot ^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
1264.5	50%	0.015	72	80.14	0.0065	11.6	631.219

Occupied Infiltration Savings Ref: ASHRAE 2013 Fundamentals 18.13 (8)

Air Total Heat Factor C_t	Flow Rate (cfm) Q_{occ}	Average Outdoor Air Enthalpy h	Cooling Supply Air Enthalpy h	% Building Occupied	Cooling Season Bin Hours	% Building Area Cooled	Btu/hrs per Ton	Cooling (kWh)
4.50	631.219	32	22.7	29.76%	1,122	100%	11,538	917.35

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot ^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
1264.5	50%	0.015	77	74.77	0.0065	11.6	579.877

Unoccupied Infiltration Savings Ref: ASHRAE 2013 Fundamentals 18.13 (8)

Air Total Heat Factor C_t	Flow Rate (cfm) Q_{occ}	Average Outdoor Air Enthalpy h	Cooling Supply Air Enthalpy h	% Building Occupied	Cooling Season Bin Hours	% Building Area Cooled	Btu/hrs per Ton	Cooling (kWh)
4.50	579.877	32	22.7	70.24%	449	100%	11,538	795.9678641

Totals

kWh per Year (kWh/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
1713.316	3,412	293.08	5.84583552

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
1713.32	$0.08	131.0687303

Total Cost Savings: **$131.07**
Cost to Retrofit: Cost carried on heating page
Simple Payback: **0.00 years**

CALCULATIONS TO INSTALL VENTILATION CONTROLS

FIM 5.6 Youth Detention

INPUT DATA:

Exhaust Fans to be controlled

	Present	Proposed	
Ventilation	2,300	2,300	cfm
Ventilation	168	60	hrs./week
Heat Recovery	0%	0%	
HP	0.36	0.36	BHP
T Setpoint:	66	66	degrees F
	28.2	28.2	btu/Lb enthalpy

FUEL DATA:

Type:	Natural Gas	Electricity	
Units:	mcf	kwh	
Unit cost:	$ 4.449	$ 0.050	/unit
Heat Content:	1,030,000	3,412	Btu/unit
Efficiency:	85.0%	3.22	
		11.0	EER

CALCULATIONS:

Bin Mid-Pt.	Enthalpy	Present Hours	Proposed Hours	Present kBtu	Proposed kBtu	Present Fan kWh	Proposed Fan kWh
(2.5)	0.0	1	0	170	61	0	0
2.5	1.8	31	11	4,886	1,746	8	3
7.5	2.8	62	22	9,003	3,218	17	6
12.5	4.0	219	78	29,084	10,394	58	21
17.5	5.6	458	164	55,139	19,706	122	44
22.5	7.5	400	143	43,192	15,436	107	38
27.5	9.0	386	138	36,889	13,184	103	37
32.5	10.8	647	231	53,802	19,228	172	62
37.5	12.9	935	334	66,217	23,665	249	89
42.5	15.1	793	284	46,317	16,553	211	76
47.5	17.5	744	266	34,212	12,227	198	71
52.5	19.6	593	212	19,872	7,102	158	56
57.5	21.5	702	251	14,812	5,294	187	67
62.5	24.2	934	334	8,123	2,903	249	89
67.5	27.6	736	263	-2,744	-981	196	70
72.5	29.5	499	178	-6,868	-2,455	133	47
77.5	31.0	387	138	-11,367	-4,062	103	37
82.5	33.1	206	74	-10,519	-3,760	55	20
87.5	35.5	22	8	-1,652	-590	6	2
92.5	0.0	0	0	0	0	0	0
97.5	0.0	0	0	0	0	0	0
102.5	0.0	0	0	0	0	0	0
107.5	0.0	0	0	0	0	0	0
		8,754	3,129	Present	Proposed		
	Heating Energy	kBtu		421,717	150,718		
	Cooling energy	kBtu		(33,150)	(11,848)	Savings	Savings
	Heating Fuel		mcf	482	172	310	
	Cooling energy		kwh	3,014	1,077	1,937	
	Fan energy		kwh	2,333	834	1,499	
			kwh	5,347	1,911	3,436	$ 0

CALCULATIONS FOR KITCHEN BOOSTER HEATER
FIM 5.11

Client: Youth Detention
Address: 810 East Ferry Street

INPUT DATA:

	Present Fuel		Proposed Fuel	
Fuel:	**Electric**		**Natural Gas**	
Units:	**kWh**		**MCF**	
Average Cost:		per kWh		per MCF
kw Demand cost:		per kW		
Connected Load:	**12**	kW		
Load Diversity:	**25%**			
Average kw demand:	**2.7**	kW per month		
Months of demand:	**12**	per year		
Fuel Conversion Factor:	**3,412**	Btu per kWh	**1,030,000**	Btu per MCF
Efficiency:	**100%**		**88%**	

Present Annual Fuel Consumption:

Energy:	Volts	Amps	PF	Phase
	208	**37.5**	**80%**	**3**

kW	**hours**	**kWh**
2.7	1,040	**2,810**

CALCULATIONS:

Present Annual Fuel Consumption (kwh):

Annual kWh = kW x Annual Hours

Proposed Annual Fuel Consumption =
{(Present Annual Fuel Consumption x Present Efficiency) / Proposed Efficiency)} x
(Present Fuel Conversion Factor / Proposed Fuel Conversion Factor)

Electric kWh Cost = (Annual kwh x Average Cost/kwh without Demand Charges)
Electric Demand Cost = (Avg monthly kw demand x Months of Demand x kw Demand cost)

Natural Gas Fuel Cost = Annual Fuel Consumption x $/MCF

	Annual Fuel Consumption		Annual Fuel Cost	
Present:	2,810	kWh	$ 0	kWh Usage
	32	kW	$ 0	kW Demand
		Present Total:	**$ 0**	
Proposed:	11	MCF	**$ 0**	
	Total Savings with Demand:		**$ 0**	**per year**

CALCULATIONS TO PIPE INSULATION

FIM 5.30 Youth Detention

Fuel Information

	Heating System		DHW System
Type:	**Natural Gas**		**Natural Gas**
Units:	mcf		mcf
Unit cost:	$ 4.449	/mcf	$ 4.449
Conversion Factor:	1,030,000	Btu/mcf	1,030,000
Efficiency:	85%	Heating	90%

Basic Inputs

	Type #1	Type #2	Type #3	Type #4	Type #5
Fluid	**DHW**	**Hot Water**	**Steam**	**DHW**	**Hot Water**
Pipe Material	**Dull Copper**	**Dull Copper**	**Steel**	**Steel**	**Steel**
O.D., inches (d)	**2.00**	**1.00**	**1.00**	**2.00**	**2.00**
Total Length, ft	**75**	**0**	**0**	**0**	**0**
Fluid Temperature Inside Pipe, °F (Ts)	**120**	**160**	**215**	**110**	**160**
Ambient Temperature, °F (Ta)	**65**	**65**	**65**	**65**	**65**
Annual Operating Hours	**8,760**	**2,187**	**2,187**	**2,187**	**2,187**
New Insulation Thickness, inches	**1.5**	**2.0**	**2.0**	**2.0**	**2.0**
Thermal Conductivity - "k" (Btu-in/hr-sq ft	**0.250**	**0.250**	**0.250**	**0.250**	**0.250**
Heat Loss - Bare Pipe					
C factor	**1.016**	**1.016**	**1.016**	**1.016**	**1.016**
emissivity based on pipe material	0.440	0.440	0.940	0.940	0.940
Outside Radius Pipe, inches (Ri)	1	1	1	1	1
Outside Radius Insulation, inches (Rs)	2.5	2.5	2.5	3.0	3.0
h convection, Btu/hr - s.f. pipe surface area -°	1.13	1.45	1.58	1.08	1.26
h radiation, Btu/hr - s.f. pipe surface area - °F	0.51	0.57	1.41	1.06	1.22
h total	1.64	2.02	2.99	2.14	2.48
Pipe area, sq ft/lin ft of pipe	0.523	0.262	0.262	0.523	0.523
Q bare, Btu/hr-lin ft	**47**	**50**	**117**	**50**	**123**
Heat Loss - Insulated Pipe					
Q i, Btu/hr-sq ft of outer area of insulation	6.0	5.9	9.3	3.4	7.2
Insulation Area - sq ft/lin ft of pipe	1.3	1.3	1.3	1.6	1.6
Q insul, Btu/hr-lin ft	**7.9**	**7.7**	**12.2**	**5.4**	**11.3**
Avoided Energy Loss					
Existing Loss - MBtu/year	31.0	0.0	0.0	0.0	0.0
Proposed Loss - MBtu/year	5.2	0.0	0.0	0.0	0.0
Avoided Loss - MBtu/year	25.9	0.0	0.0	0.0	0.0
Total Avoided Fuel Consumption					
28 Units Saved	28	0	0	0	0
Natural Gas Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
$ 0 $/year		**$ 0**	**$ 0**	**$ 0**	**$ 0**

Formulas:

Based on ASHRAE 1993 Fundamentals Handbook pages 20.9 and 22.17

h convection = C x {(1 / d) ^ 0.2} x { (1 / ((Ts + Ta)/2)) ^ 0.181 } x { (Ts - Ta) ^ 0.266 }

h radiation = { emissivity x 0.1713 x 10 ^ -8 x [(Ta + 460) ^ 4 - (Ts +460) ^ 4]} / (Ta - Ts)

Q bare = h total x Pipe Area x (Ts - Ta)

Q i = (Ts - Ta) / { [Rs x (ln (Rs / Ri)] / k }

Q insul = Q i x Insul Area

Total Avoided Consumption = (Q bare - Q insul) x Total length of pipe x Annual Operating Hours

CALCULATIONS TO INSTALL MORE EFFICIENT BOILERS

FIM 5.31 Youth Detention

INPUT DATA:

Fuel Data	**Present**	**Proposed**		**Adjustments for Other Measures:**	
Type:	Natural Gas	Natural Gas		Fuel Savings	
Units:	**mcf**	**mcf**		**142**	mcf
Unit cost:	**$ 4.449**	**$ 4.449**	/ unit	**(87)**	mcf
BTU/unit:	**1,030,000**	**1,030,000**	BTU/ unit	**0**	mcf
				0	mcf
Present Annual Fuel Consumption:				**0**	mcf
Present Heating Fuel Use:	6,447	mcf		54	mcf
% of Bldg. Heated by Boiler:	45%				
Present Boiler Fuel Use:	**2,901**	**mcf**			

1,945	MMBtu Useful Heat Output (present)
47	MMBTU Saved Other Measures (at Old CE)
1,897	MMBTU Req'd from New Boilers

	Present Boilers			**Proposed**		
	Cleaver-Brooks	Cleaver-Brooks		Cleaver-Brooks	Condensing	
% of Boiler Fuel Use	50%	50%		50%	50%	of useful output
2901 mcf =	1,451	1,451	**mcf**			
Boiler Firing Rate	3,000	3,000	kBtuh Input	3,000	2,000	kBtuh Input
Combustion Efficiency	85.0%	85.0%		85.0%	90.0%	
Jacket Losses	1.50%	1.50%	of capacity	1.50%	1.00%	of capacity
Combustion Tested?	No	No				
Avg.Firing rate is =	40%	40%		40%	70%	Avg. Firing Rate
Boiler Capacity	2,505	2,505	kBtuh Output	2,505	1,780	kBtuh Output
Boiler is hot when OAT<	65	65	°F.	45	65	°F.
Hours/ Yr. Unit is Hot	5,252	5,252	hrs.	3,858	5,252	hrs.
Off-Cycle Flue Losses	1.00%	1.00%	of capacity	1.00%	0.50%	of capacity
Off-Cycle Hours/Year	4,007	4,007	hrs.	2,697	4,384	hrs.
Jacket Losses	197	197	MBtu/yr.	145	93	MBtu/yr.
Off-Cycle Flue Losses	100	100	MBtu/yr.	68	39	MBtu/yr.
Useful Heat Output	972	972	MBtu/yr.	949	949	MBtu/yr.
	1,945	MBtu/yr.		1,897	MBtu/yr.	
28,150 sq.ft. served by boilers	213	btu input/sq.ft.		178	btu input/sq.ft.	
	65.1%	AFUE		1,326	1,166	mcf
				74%	AFUE	

CALCULATIONS:

Off-Cycle Flue Losses = Boiler kBtuh Output x 1000 x % Off-Cycle Flue Losses x Hrs Off-Cycle per Year / 1,000,000

Jacket Losses = Boiler kBtuh Output x 1000 x % Jacket Losses x Hrs Hot per Year / 1,000,000

Useful Heat Output = Htg Fuel Use x BTU per Unit x Present Efficiency / 1,000,000 - Off Cycle Losses - Jacket Losses

Proposed Annual Fuel Consumption =

(Proposed Off-Cycle & Jacket Losses + Useful Heat Output) / Proposed Efficiency x 1,000,000 / BTU per Unit

	Annual Fuel Consumption	units	Annual Cost
Present:	2,901	mcf	
- Fuel Saved by Other FIMs	54	mcf	
Proposed:	2,493	mcf	
Annual Savings:	**355**	mcf	**$ 0**
	0	mcf	

CALCULATIONS TO INSTALL CONDENSING DOMESTIC HOT WATER HEATER

FIM 5.34 Youth Detention

INPUT DATA:

	Present Fuel		Proposed Fuel	
Fuel:	**Natural Gas**		Natural Gas	
Units:	mcf		mcf	
Fuel Cost:	$ 4.45	per mcf	$ 4.45	per mcf
Fuel Conversion Factor:	1,030,000	Btu per mcf	1,030,000	Btu per mcf

Annual DHW Consumption:	Present		Proposed	
Hot Water Usage:	**2.4**	Gallons/person	2.4	Gallons/person
Number of persons:	**90**	(estimate)	90	(estimate)
Days of Usage:	**365**	per year	365	per year
Hours of Usage per Day:	8	hours	8	hours
Average inlet water Temp	50	degrees F	50	degrees F
Average hot water temp:	130	degrees F	130	degrees F

Storage Tank Losses:	Present Tank		Proposed Tank	
Tank U factor:	0.15	Btu/SF/Hour	0.12	Btu/SF/Hour
Height of Tank:	62.0	inches	62.0	inches
Diameter of Tank:	24.0	inches	24.0	inches
	100	gallons/tank	100	gallons/tank
# of Tanks	1	Qty.	1	Qty.
Hours Tank is Hot:	8,760	Hours	8,760	
Water Temperature:	130	Deg. F.	130	
Ambient Temperature:	65	Deg. F.	65	

Recirculation Losses:				
	0.0%	of boiler capacity =	0	BTUh
	8,760	hours/year	8,760	hours/year

Boiler Jacket & Flue Losses:				
Burner Input	199,000	BTUH	199,000	BTUH
Efficiency:	**80.0%**		92.0%	
Boiler Output Capacity	159,200	BTU output	183,080	BTU output
Jacket & Flue Losses:	0.5%	of boiler capacity	0.5%	of boiler capacity
Boiler is Hot:	8,760	hours/year	8,760	hours/year

CALCULATIONS:

	Present		Proposed	
Consumption Energy:	52,538,976	BTU output rqd/yr	52,538,976	BTU output rqd/yr
Tank Energy Losses:	3,302,094	BTU/year	2,646,958	BTU/year
Recirculation Losses:	0	BTU/year	0	BTU/year
Boiler Jacket Losses:	6,972,960	BTU/year	8,018,904	BTU/year
Output BTU/Year	62,814,030		63,204,838	
Annual Fuel Consumption	76	mcf	67	mcf
Demand	0	billed kW /yr.	0	kW
Annual Fuel Cost				
Annual Savings:	**10**	**mcf**	**$ 0**	**per year**
	0			
	0	billed kW /yr.		

CALCULATIONS TO OPEN ISOLATION VALVE

FIM 5.37

Client: Youth Detention
Address: 810 East Ferry Street

INPUT DATA:

Fuel:	**Electricity**	
Average Fuel Cost:	**$ 0.050**	per kWh
	$10.23	per kW Demand
Months of Demand	**12**	

Triple Duty Valve Data

Present Setting	**50%**	**Open**
Manufacturer	**Taco**	
Model Number		
Pattern		

Motor Nameplate Data

Efficiency	**89.5%**
HP	**5**

Pump Nameplate and Performance Data

Model	**Taco**
Installed Impellor Size	**7.000**
Minimum Impellor Size	
Pump Efficiency	**77%**

CALCULATIONS:

Design Pump Flow	**180**	gallons per minute

Triple Duty Valve

Valve Δp at present setting	**10.0**	Feet of Water
Valve Δp when 100% open	**4.8**	Feet of Water
Valve Δp Savings	**5.2**	**Feet of Water**

System Operations

Annual Operating Hours	**3,276**

CALCULATIONS TO IMPLEMENT NIGHT SETBACK

FIM 5.38 Youth Detention

INPUT DATA: 100% of Building to be Setback

		Current	Proposed	
Heating T Setpoint:	Occupied	66	66	deg. F.
	Unoccupied	66	66	deg. F.
Cooling T Setpoint:	Occupied	70	70	deg. F.
	Unoccupied	70	70	deg. F.
HVAC Schedule	Occupied	167.9	167.9	Hours per week
	Unoccupied	0.1	0.1	Hours per week
Q internal gains:	Occupied	487,843	487,843	Btuh
	Unoccupied	74,821	74,821	Btuh
Q internal gains:	Schedule	111	111	Hours per week
BLC:	Occupied	33,434	33,434	Btuh/deg. F.
	Unoccupied	35,187	35,187	Btuh/deg. F.

Fuel Data	Heating	Cooling		
Type:	Natural Gas	Electricity		
Units:	**mcf**	kwh		
Unit cost:	**$ 4.449**	$ 0.05		
BTU/unit	**1,030,000**	3,412		
Efficiency/ COP:	**85.0%**	3.22	COP, = EER	11.0

CALCULATIONS:

Current Buffalo, 168 hrs./week

Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use mcf	Cooling Energy kwh
(2.5)	1	0	1,942,327	2,335,498	2	0
2.5	28	3	1,775,157	2,159,562	64	0
7.5	60	2	1,607,987	1,983,626	115	0
12.5	208	11	1,440,818	1,807,691	365	0
17.5	438	20	1,273,648	1,631,755	674	0
22.5	385	15	1,106,478	1,455,819	512	0
27.5	366	20	939,308	1,279,884	422	0
32.5	623	24	772,138	1,103,948	580	0
37.5	894	42	604,968	928,012	662	0
42.5	757	37	437,798	752,076	410	0
47.5	706	39	270,628	576,141	244	0
52.5	569	24	103,458	400,205	78	0
57.5	673	29	(63,711)	224,269	7	3,898
62.5	883	52	(230,881)	48,334	3	18,533
67.5	707	30	(347,900)	(74,821)	0	22,565
72.5	489	10	(431,485)	(162,789)	0	19,329
77.5	382	5	(598,655)	(338,725)	0	20,944
82.5	204	2	(765,825)	(514,661)	0	14,296
87.5	22	0	(932,995)	(690,596)	0	1,866
92.5	0	0	(1,100,165)	(866,532)	0	0
97.5	0	0	(1,267,335)	(1,042,468)	0	0
102.5	0	0	(1,434,505)	(1,218,403)	0	0
107.5	0	0	(1,601,674)	(1,394,339)	0	0
	8,760	hours			4,139	101,431

Proposed		Buffalo, 168 hrs./week				
Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use	Cooling Energy kwh
(2.5)	1	0	1,942,327	2,335,498	2	0
2.5	28	3	1,775,157	2,159,562	64	0
7.5	60	2	1,607,987	1,983,626	115	0
12.5	208	11	1,440,818	1,807,691	365	0
17.5	438	20	1,273,648	1,631,755	674	0
22.5	385	15	1,106,478	1,455,819	512	0
27.5	366	20	939,308	1,279,884	422	0
32.5	623	24	772,138	1,103,948	580	0
37.5	894	42	604,968	928,012	662	0
42.5	757	37	437,798	752,076	410	0
47.5	706	39	270,628	576,141	244	0
52.5	569	24	103,458	400,205	78	0
57.5	673	29	(63,711)	224,269	7	3,898
62.5	883	52	(230,881)	48,334	3	18,533
67.5	707	30	(347,900)	(74,821)	0	22,565
72.5	489	10	(431,485)	(162,789)	0	19,329
77.5	382	5	(598,655)	(338,725)	0	20,944
82.5	204	2	(765,825)	(514,661)	0	14,296
87.5	22	0	(932,995)	(690,596)	0	1,866
92.5	0	0	(1,100,165)	(866,532)	0	0
97.5	0	0	(1,267,335)	(1,042,468)	0	0
102.5	0	0	(1,434,505)	(1,218,403)	0	0
107.5	0	0	(1,601,674)	(1,394,339)	0	0
	8,760	hours			4,139	101,431

		Present	Proposed	Savings
Heating	mcf	4,139	4,139	0
Cooling	kwh	101,431	101,431	0

CALCULATIONS TO VENTILATE BASED ON OCCUPANCY

FIM 5.45

Client: Youth Detention
Address: 810 East Ferry Street

DATA:

	Occupied	Unoccupied				
T Setpoint:	**66**	**66**	degrees F	**Fuel Information**		
Q internal gains:	**487,843**	**74,821**	Btuh	Type:	**Natural Gas**	
BLC:	**33,434**	**35,187**	Btuh/degree F	Units:	**mcf**	
T Balance:	51.4	63.9	degrees F	Unit cost:	**$ 4.449**	/mcf
T Balance = T Setpoint - (Q internal gains / BLC)				CF1:	**1,030,000**	Btu/mcf
				Efficiency:	**80%**	

Percentage Heat Recovery **40%** CF2 1.085 Btu/hr-deg F-cfm

Ventilation Information *Percentage of Hours*

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
100% Occupied	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**
80% Occupied	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**
60% Occupied	**10%**	**0%**	**0%**	**0%**	**0%**	**0%**
40% Occupied	**20%**	**0%**	**0%**	**0%**	**0%**	**0%**
20% Occupied	**30%**	**0%**	**0%**	**0%**	**0%**	**0%**
Unoccupied	**40%**	**100%**	**100%**	**100%**	**100%**	**100%**
Average Occupancy	**20%**	**0%**	**0%**	**0%**	**0%**	**0%**

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	**Totals**
Tag:	**Gym**						
Supply Air Flow:	**6,000**	**0**	**0**	**0**	**0**	**0**	
Existing Outdoor Air Flow:	**1,800**	**0**	**0**	**0**	**0**	**0**	
Proposed Outdoor Air Flow:	360	0	0	0	0	0	
# Units	**1**	**0**	**0**	**0**	**0**	**0**	
Existing OA Flow:	1,800	0	0	0	0	0	**1,800**
Proposed OA Flow:	360	0	0	0	0	0	**360**
Net Change in OA:	1,440	0	0	0	0	0	**1,440**

Current Hours of Ventilation **168** occupied hours per week or **100%** of Occupied Bin Hours
and **100%** of Unoccupied Bin Hours

Bin Data for Buffalo, 168 hrs./week

Bin Data is based on 168 occupied hours per week

Winter	T Setpoint	T Balance	Accum Hours	Average O.A. Temp below T Balance	Temp Difference (T Set- Avg OAT)
Occupied	66	51.4	**4,466**	**33.4**	32.6
Unoccupied	66	63.9	**318**	**42.0**	24.0

CALCULATIONS:

Energy Usage = (CFM Present - CFM Proposed) x Accumulated Hours x Duty Cycle x Temp Diff x CF2
Energy Cost = (Energy Usage / CF1) x (Unit cost / Efficiency)

Winter	Energy Savings (Btu/year)	Fuel Savings (mcf/year)	Fuel Savings ($/year)
Occupied	136,646,879	166	
Unoccupied	7,155,480	9	
Annual Savings:	143,802,359	175	$ 0

Project: Erie County
Building: Family Court
Date: 7/3/2019

Heating System Efficiency:	89%
Average Fuel Cost ($/unit):	$0.47
Correction Factor:	100%

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product	
Single door sweeps	11	3	1/4	1/12	=	0.6875	
Single door perimeters	11	17	1/8	1/12	=	1.947916667	
Double door sweeps & astragals	2	22	1/2	1/12	=	1.833333333	
Double door perimeters	2	22	1/4	1/12	=	0.916666667	
Garage doors	2	92	1/2	1/12	=	3.833333333	
Roof top ventilators	3	12	1/6	1/12	=	0.166666667	*assume roof fans open during occupied hours
Stairwell doors	24	20	1/8	0	=	0	
					Total =	9.385416667	ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (°F)	Average Outdoor Air Temperature (°F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
1327.5	50%	0.12583	72	34.25	0.0113	11.6	1662.109

Occupied Infiltration Savings

Specific Heat of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Occupied (%/week)	Heating Season Bin Hours (Occupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	1662.109	37.75	29.76%	4335	103000	89%	953.663

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (°F)	Average Outdoor Air Temperature (°F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
1351.5	50%	0.12583	67	34.14	0.0113	11.6	1606.993

Unoccupied Infiltration Savings

Specific Hear of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Unoccupied (%/week)	Heating Season Bin Hours (Unoccupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	1606.993	32.86	70.24%	4301	103000	89%	1879.455

Totals

Units of Fuel per Year (units/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
2833.118	103000	9.708737864	291.8111788

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
2833.12	$0.47	1325.564898

Total Cost Savings: **$1,325.56**
Cost to Retrofit: **$15,110.00**
Simple Payback: **11.40 years**

Project: Erie County
Building: Family Court
Date: 7/3/2019

Cooling System Efficiency (kW/ton):	0.547
EER:	21.938
Average Fuel Cost ($/unit):	$0.08

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product	
Single door sweeps	11	3	1/4	1/12	=	0.6875	
Single door perimeters	11	17	1/8	1/12	=	1.947916667	
Double door sweeps & astragals	2	22	1/2	1/12	=	1.833333333	
Double door perimeters	2	22	1/4	1/12	=	0.916666667	
Garage door weather-stripping	2	92	1/2	1/12	=	3.833333333	
Roof top ventilator sealing	3	12	1/6	1/12	=	0.166666667	*assume roof fans open during occupied hours
Stairwell doors	24	20	1/8	0	=	0	
					Total =	9.385416667	ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (°F)	Average Outdoor Air Temperature (°F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
1327.5	50%	0.12583	72	80.14	0.0113	11.6	1058.839

Occupied Infiltration Savings Ref: ASHRAE 2013 Fundamentals 18.13 (8)

Air Total Heat Factor C_t	Flow Rate (cfm) Q_{occ}	Average Outdoor Air Enthalpy h	Cooling Supply Air Enthalpy h	% Building Occupied	Cooling Season Bin Hours	% Building Area Cooled	Btu/hrs per Ton	Cooling (kWh)
4.50	1058.839	32	22.7	29.76%	1,122	100%	21,938	809.35

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (°F)	Average Outdoor Air Temperature (°F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
1351.5	50%	0.12583	77	74.77	0.0113	11.6	752.461

Unoccupied Infiltration Savings Ref: ASHRAE 2013 Fundamentals 18.13 (8)

Air Total Heat Factor C_t	Flow Rate (cfm) Q_{occ}	Average Outdoor Air Enthalpy h	Cooling Supply Air Enthalpy h	% Building Occupied	Cooling Season Bin Hours	% Building Area Cooled	Btu/hrs per Ton	Cooling (kWh)
4.50	752.461	32	22.7	70.24%	449	100%	21,938	543.2475333

Totals

kWh per Year (kWh/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
1352.602	3,412	293.08	4.61507687

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
1352.60	$0.08	108.2081329

Total Cost Savings: **$108.21**
Cost to Retrofit: Cost carried on heating page
Simple Payback: **0.00 years**

CALCULATIONS FOR OPTIMAL START
FIM 6.14

Family Court
1 Niagara Square

Fuel Information

	Heating			
Type:	**Natural Gas**	Type:	**Electricity**	
Units:	**mcf**	Units:	**kwh**	
Unit cost:	**$ 4.788**	Unit cost:	**$ 0.050**	/kwh

Heat Content of Fuel **1,030,000**
Heating Efficiency **89%**

Building Balance Temperature **63** °F.
Current operating schedule begins **150** minutes before occupancy
5 days per week
13 hours per week
10.7% of unoccupied bin hours

On a design day optimal start requires **60** minutes before occupancy

Heating Schedules 51 hours per week
BUFFALO INT'L AR, NY 8am-5pm M-F, Sep 25-May 15

Fan HP impacted by Optimal Start:

	HVAC	Exhaust	
	240	**140**	HP
Motor	**50%**	**81%**	Loading
	94%	**94%**	Efficiency
	95.13	90.38	kW
Present Warmup	On	On	
Proposed Warmup	On	Off	

Ventilation CFM impacted by Optimal Star **26,400** cfm OA

Envelope Loads impacted by Optimal Star 28,840 btu/hr./°F.
Occupied Setpoint **70** °F.
Unoccupied Setpoint **63** °F.

All Bin	Occ. Hours	Unocc. Hours	Hours of warm-up Present	Hours of warm-up Proposed		Ventilation MBH	Ventilation Mbtu Present	Ventilation Mbtu Proposed	Envelope Mbtu Present	Envelope Mbtu Proposed	Motor kWh Present	Motor kWh Proposed
(12.5)	0.0	0.0	0.0	40%	0.0	2,352,240	0.0	0.0	0.0	0.0	0	0
(7.5)	0.0	0.0	0.0	37%	0.0	2,209,680	0.0	0.0	0.0	0.0	0	0
(2.5)	0.0	0.0	0.0	35%	0.0	2,067,120	0.0	0.0	0.0	0.0	0	0
2.5	0.0	0.0	0.0	32%	0.0	1,924,560	0.0	0.0	0.0	0.0	0	0
7.5	0.0	9.0	1.0	29%	0.3	1,782,000	1.7	0.0	1.7	1.6	179	27
12.5	2.0	19.0	2.0	27%	0.5	1,639,440	3.3	0.0	3.4	3.1	377	52
17.5	20.0	92.0	9.9	24%	2.4	1,496,880	14.7	0.0	14.9	13.4	1,827	225
22.5	55.0	168.0	18.0	21%	3.8	1,354,320	24.4	0.0	24.6	21.8	3,337	365
27.5	63.0	203.0	21.7	19%	4.1	1,211,760	26.3	0.0	26.6	23.1	4,032	386
32.5	136.0	390.0	41.8	16%	6.7	1,069,200	44.6	0.0	45.2	38.1	7,746	636
37.5	320.0	725.0	77.6	13%	10.3	926,640	71.9	0.0	72.8	59.2	14,400	985
42.5	299.0	631.0	67.6	11%	7.2	784,080	53.0	0.0	53.6	41.4	12,533	686
47.5	199.0	338.0	36.2	8%	2.9	641,520	23.2	0.0	23.5	16.8	6,713	275
52.5	169.0	479.0	51.3	5%	2.7	498,960	25.6	0.0	25.9	16.1	9,514	260
57.5	206.0	379.0	40.6	3%	1.1	356,400	14.5	0.0	14.6	6.7	7,528	103
62.5	161.0	231.0	24.7	0%	0.0	213,840	5.3	0.0	5.3	0.4	4,588	0
67.5	104.0	83.0	8.9	0%	0.0	71,280	0.6	0.0	0.6	(1.2)	1,649	0
72.5	54.0	16.0	1.7	0%	0.0	(71,280)	(0.1)	0.0	(0.1)	(0.5)	318	0
77.5	15.0	1.0	0.1	0%	0.0	(213,840)	(0.0)	0.0	(0.0)	(0.0)	20	0
82.5	1.0	0.0	0.0	0%	0.0	(356,400)	0.0	0.0	0.0	0.0	0	0
87.5	0.0	0.0	0.0	0%	0.0	(498,960)	0.0	0.0	0.0	0.0	0	0
92.5	0.0	0.0	0.0	0%	0.0	(641,520)	0.0	0.0	0.0	0.0	0	0
97.5	0.0	0.0	0.0	0%	0.0	(784,080)	0.0	0.0	0.0	0.0	0	0
	1,804	3,764	403		42		309.1	0.0	313	240	74,762	3,999

	Present	Proposed		Savings	
BTU at point of use	621.7	239.8	Mbtu	382.0	Mbtu sav.
Fuel	678.2	261.6	mcf	416.7	mcf
Electricity	74,762	3,999	kWh	70,763	kwh

CALCULATIONS TO REPLACE SNOW MELT SLAB SENSORS
FIM 6.24

Client: Family Court
Address: 1 Niagara Square

INPUT DATA:

Snow Melt Operates Below	**40.0**	°F	Type:	**Natural Gas**	
Delta T =	**9.0**	°F	Units:	**mcf**	
Annual Snow Fall =	**86.0**	Inches	Unit cost:	**$ 4.788**	/mcf
Estimated Snow Fall Rate =	**0.25**	Inches/Hour	BTU/Unit	**1,030,000**	Btu/mcf
Pump Flow Rate =	**129.0**	GPM	Boiler Eff.	**89.0%**	
Density of Propylene Glycol	**965**	kg/m3	kWh:	$ 0.050	per kWh
	60.26	lb/ft3			
Density of Water	62	lb/ft3			
Blend Density % =	**40%**				
Fluid Density	**61.51**	*lb/ft^3*			
Volume	**7**	*gal/ft^3*			
Specific Heat of Fluid- C_P	**0.850**	*Btu/lbm.^{o}F*			
Time Conversion	60	*min/h*			
Flow Rate Conversion	419				

CALCULATIONS:

Fuel Savings

Bin Data for: BUFFALO

Bin Temp (°F)	Total Hours	Present Energy Use Annual BTU's	Accum Hours	Snow Fall (inches)	Hours Of Snow/Ice	Hours Of Idling	Proposed Energy Use Annual BTU's
(7.5)	**5**	2,434,486	5	0	1	4	1,710,720
(2.5)	**21**	10,224,840	26	1	2	19	7,185,023
2.5	**13**	6,329,663	39	0	1	12	4,447,871
7.5	**90**	43,820,744	129	2	10	80	30,792,955
12.5	**219**	106,630,476	348	6	24	195	74,929,524
17.5	**446**	217,156,130	794	12	48	398	152,596,199
22.5	**342**	166,518,826	1,136	9	37	305	117,013,229
27.5	**601**	292,625,188	1,737	16	65	536	205,628,511
32.5	**755**	367,607,350	2,492	20	82	673	258,318,678
37.5	**690**	335,959,035	3,182	19	75	615	236,079,322
	3,182	###########	3,182	86	344	2,838	1,088,702,032

Motor Savings

Description	Motor Nominal HP	Qty	% Loading	% Eff.	Annual Motor Run Hours Present	Annual Motor Run Hours Proposed	Annual kWh Present	Annual kWh New
SM2A,SM2B	**7 3/5**	**1**	**65%**	**86%**	3,500	3,182	15,086	13,715
							15,086	13,715

	Annual Fuel Consumption mcf	Annual Elec. Consumption kWh
Present:	1,690	15,086
Proposed:	1,188	13,715
Annual Savings:	502	1,371

CALCULATIONS TO CLOSE VAV BY OCCUPANCY & SP RESET

FIM 6.25 Family Court

AHU Type **Mixed air VAV**

	Design	Present	Proposed	
Supply Air cfm	176,000	176,000	176,000	cfm @ 100% speed
Minimum OA cfm	**34,955**	**34,955**	**34,955**	cfm @ 100% speed
Estimated Min. OA %	**20%**			
Return Air Temp	**70** °F		**28.0** Btu/lb	
	Present		Proposed	
Discharge Air Temp	**55** °F		**55** °F	
	23.0 Btu/lb		**23.0** Btu/lb	

AHU	Design SA [cfm]	Design OA [cfm]	Actual OA [cfm]	Delta OA [cfm]	End of Duct S.P	Total S.P.
AHU GR	**22,000**	**4,205**	**4,205**	-	1.00	5.46
AHU 1	**22,000**	**4,112**	**4,112**	-	1.00	6.12
AHU 2	**22,000**	**4,187**	**4,187**	-	1.0	5.69
AHU 3	**22,000**	**4,088**	**4,088**	-	1.0	5.86
AHU 4	**22,000**	**4,038**	**4,038**	-	1.0	6.49
AHU 5	**22,000**	**4,347**	**4,347**	-	1.0	5.99
AHU 6	**22,000**	**4,988**	**4,988**	-	1.0	6.64
AHU 7	**22,000**	**4,990**	**4,990**	-	1.0	6.69
				-		
	176,000	34,955	34,955	-	1.00	6.12

		Units	$/unit		BTU/unit	Efficiency	EER		
Heating	Natural Gas	**mcf**	**$**	**4.788**	**1,030,000**	**89%**			
Cooling	**Electricity**	**kwh**	**$**	**0.050**	**3,412**	**5.86**	**20.0**	months /yr. demand	**12**

AHU Energy												Heating		Cooling		
Bin data for Buffalo, NY 24/7 occupied				**Present**				**Proposed**			**Proposed**	Present	Proposed	Present	Proposed	
Bin Mid-Pt.	Enthalpy All Hours	Occupied Hours		Estim. Fan Speed	Net % OA	Mixed Air Temp	Occupied kBtuh	Estim. Fan Speed	Net % OA	Mixed Air Temp	Occupied kBtuh	mmBtu /year	mmBtu /year	mmBtu /year	mmBtu /year	
-2.5	0.0	1		**60%**	33%	46.0	1,026	**58%**	34%	45.0	1,095	1	1	0	0	
2.5	1.8	13		**61%**	33%	47.9	820	**58%**	34%	47.0	890	11	12	0	0	
7.5	2.8	36		**61%**	32%	49.7	614	**59%**	34%	48.9	684	22	25	0	0	
12.5	4.0	97		**62%**	32%	51.5	408	**59%**	33%	50.8	479	40	46	0	0	
17.5	5.6	214		**62%**	32%	53.3	202	**60%**	33%	52.6	273	43	58	0	0	
22.5	7.5	161		**63%**	32%	55.0	0	**61%**	33%	54.4	67	0	11	0	0	
27.5	9.0	149		**64%**	35%	55.0	0	**61%**	35%	55.0	0	0	0	0	0	
32.5	10.8	300		**64%**	40%	55.0	0	**62%**	40%	55.0	0	0	0	0	0	
37.5	12.9	368		**65%**	46%	55.0	0	**62%**	46%	55.0	0	0	0	0	0	
42.5	15.1	359		**66%**	55%	55.0	0	**63%**	55%	55.0	0	0	0	0	0	
47.5	17.5	276		**66%**	67%	55.0	0	**64%**	67%	55.0	0	0	0	0	0	
52.5	19.6	244		**67%**	86%	55.0	0	**64%**	86%	55.0	0	0	0	0	0	
57.5	21.5	315		**68%**	100%	57.5	-321	**65%**	100%	57.5	-308	0	0	-101	-97	
62.5	24.2	423		**72%**	100%	62.5	-707	**69%**	100%	62.5	-679	0	0	-299	-287	
67.5	27.6	313		**75%**	100%	67.5	-2,735	**72%**	100%	67.5	-2,625	0	0	-856	-822	
72.5	29.5	262		**78%**	25%	70.6	-1,027	**75%**	26%	70.7	-1,027	0	0	-269	-269	
77.5	31.0	227		**82%**	24%	71.8	-1,265	**78%**	25%	71.9	-1,265	0	0	-287	-287	
82.5	33.1	142		**85%**	23%	72.9	-1,595	**82%**	24%	73.0	-1,595	0	0	-226	-226	
87.5	35.5	15		**88%**	22%	73.9	-1,960	**85%**	23%	74.1	-1,960	0	0	-29	-29	
92.5	0.0	0		**92%**	22%	74.8	0	**88%**	22%	75.1	0	0	0	0	0	
97.5	0.0	0		**96%**	21%	75.7	0	**92%**	22%	75.9	0	0	0	0	0	
102.5	0.0	0		**100%**	20%	76.5	0	**96%**	21%	76.7	0	0	0	0	0	
107.5	0.0	0		**100%**	20%	77.4	0	**96%**	21%	77.8	0	0	0	0	0	
		3,915									mmBtu/yr.	117	153	-2,068	-2,018	
											fuel units	127	167	103,419	100,906	kwh/yr.
													-40		2,513	

Inputs to calculate savings for closing VAV boxes by occupancy sensors:

Present VAV box minimum position	**20%**	occ.
Percentage of VAV boxes closed based on occ. sensors	**20%**	
Space temperature (reheat coil) setpoint	**68** °F	

				Present	VAV cfm		Reheat	Savings
Bin Mid-Pt.	Enthalpy All Hours	Occupied Hours		SA cfm	Present	Proposed	kBtuh	mmBtu /year
-2.5	0.0	1.0	0.0	105,600	4,224	-	59	0
2.5	1.8	13.0	0.0	106,656	4,266	-	60	1
7.5	2.8	36.0	0.0	107,723	4,309	-	60	2
12.5	4.0	97.0	0.0	108,800	4,352	-	61	6
17.5	5.6	214.0	0.0	109,888	4,396	-	62	13

22.5	7.5	161.0	0.0	110,987	4,439	-	62	10
27.5	9.0	149.0	0.0	112,097	4,484	-	63	9
32.5	10.8	300.0	0.0	113,217	4,529	-	64	19
37.5	12.9	368.0	0.0	114,350	4,574	-	64	24
42.5	15.1	359.0	0.0	115,493	4,620	-	65	23
47.5	17.5	276.0	0.0	116,648	4,666	-	66	18
52.5	19.6	244.0	0.0	117,815	4,713	-	66	16
57.5	21.5	315.0	0.0	118,993	4,760	-	67	21
62.5	24.2	423.0	0.0	126,965	5,079	-	71	30
67.5	27.6	313.0	0.0	132,255	5,290	-	74	23
72.5	29.5	262.0	0.0	137,765	5,511	-	77	20
77.5	31.0	227.0	0.0	143,506	5,740	-	81	18
82.5	33.1	142.0	0.0	149,485	5,979	-	84	12
87.5	35.5	15.0	0.0	155,714	6,229	-	87	1
92.5	0.0	0.0	0.0	162,202	6,488	-	91	-
97.5	0.0	0.0	0.0	168,960	6,758	-	95	-
102.5	0.0	0.0	0.0	176,000	7,040	-	99	-
107.5	0.0	0.0	0.0	176,000	7,040	-	99	-
		3,915	0				mmBtu/yr.	268
			3,915				fuel units	292.40 mcf

Summary of Savings for AHU, Reheat and Fan Power

	Heating		Cooling		
	Present	Proposed	Present	Proposed	
	mmBtu /yr.	mmBtu /yr.	mmBtu /yr.	mmBtu /yr.	
mmBtu/yr.	117	153	-2,068	-2,018	at AHU
mmBtu/yr.	268	0			at reheat coils
			103,419	100,906	kwh AHU
			422,087	365,092	kwh fan power
fuel units	419.6	166.8	525,506	465,998	kwh/year
	Total savings	**253 mcf**		**59,508 kwh**	

Demand Savings **0.0** **0.0**

0.0 kW

Fan Power Calculations

		Present						Proposed				
Bin Mid-Pt.	Occupied Hours	SA cfm	SF SP	SF BHP	RF BHP	Fan kW	End of Duct SP	SA cfm	SF SP	SF BHP	RF BHP	Fan kW
-2.5	1.0	105,600	3	78.7	11.6	73.4	**0.70**	101,376	3	67.7	10.0	63.2
2.5	13.0	106,656	3	80.5	12.0	75.3	**0.71**	102,390	3	69.3	10.3	64.8
7.5	36.0	107,723	3	82.4	12.4	77.1	**0.73**	103,414	3	70.9	10.7	66.4
12.5	97.0	108,800	3	84.3	12.9	79.1	**0.74**	104,448	3	72.6	11.1	68.1
17.5	214.0	109,888	3	86.3	13.3	81.1	**0.76**	105,492	3	74.3	11.5	69.8
22.5	161.0	110,987	3	88.3	13.8	83.1	**0.77**	106,547	3	76.1	11.9	71.6
27.5	149.0	112,097	3	90.4	14.3	85.2	**0.79**	107,613	3	77.9	12.4	73.4
32.5	300.0	113,217	3	92.6	14.8	87.4	**0.80**	108,689	3	79.8	12.8	75.3
37.5	368.0	114,350	3	94.8	15.4	89.6	**0.81**	109,776	3	81.7	13.3	77.3
42.5	359.0	115,493	3	97.0	15.9	91.9	**0.83**	110,873	3	83.7	13.8	79.3
47.5	276.0	116,648	3	99.3	16.5	94.2	**0.84**	111,982	3	85.7	14.3	81.3
52.5	244.0	117,815	3	101.7	17.1	96.7	**0.86**	113,102	3	87.8	14.8	83.5
57.5	315.0	118,993	3	104.2	17.7	99.1	**0.87**	114,233	3	90.0	15.3	85.6
62.5	423.0	126,965	4	122.0	22.2	117.3	**0.89**	121,886	3	105.5	19.2	101.5
67.5	313.0	132,255	4	134.9	25.6	130.5	**0.90**	126,965	4	116.9	22.2	113.1
72.5	262.0	137,765	4	149.4	29.4	145.5	**0.91**	132,255	4	129.6	25.6	126.2
77.5	227.0	143,506	4	165.7	33.9	162.3	**0.93**	137,765	4	143.9	29.4	141.0
82.5	142.0	149,485	5	183.9	38.9	181.3	**0.94**	143,506	4	159.9	33.9	157.7
87.5	15.0	155,714	5	204.4	44.7	202.6	**0.96**	149,485	5	177.9	38.9	176.4
92.5	0.0	162,202	5	227.4	51.3	226.7	**0.97**	155,714	5	198.2	44.7	197.6
97.5	0.0	168,960	6	253.3	58.8	253.9	**0.99**	162,202	5	220.9	51.3	221.5
102.5	0.0	176,000	6	282.3	67.4	284.5	**1.00**	168,960	6	246.5	58.8	248.4
107.5	0.0	176,000	6	282.3	67.4	284.5	**1.00**	168,960	6	246.5	58.8	248.4
					Present kwh/year	422,087					Proposed kwh/year	365,092

Inputs for Fan Power Reduction:

Static Pressure Reset?	**N**	**Y**	
	Present	Proposed	
Supply Air design cfm	**176,000**	**176,000**	cfm
Min OA for exhaust Fans	**34,955**	**34,955**	cfm
Return Air design cfm	**141,045**	**141,045**	cfm
End of Duct SP Setpoint	**1.00**	**0.85**	in. W.C.
Variable Static Pressure	**5.12**	**5.12**	in. W.C.
Total SF Static Pressure	**6.12**	**5.97**	in. W.C.
Fan efficiency (S&R)	**60%**	**60%**	
SF motor efficiency	**91.7%**	**91.7%**	
RF motor efficiency	**91.7%**	**91.7%**	
Total RF Static Pressure	**2.50**	**2.50**	in. W.C.
RF BHP	92.5	92.5	
SF speed - RF speed	**10%**	**10%**	

56,996 kwh Fan savings per year

PIPE INSULATION FIM
6.30 Family Court

Fuel Information

	Heating System		DHW System
Type:	**Natural Gas**		**Natural Gas**
Units:	mcf		mcf
Unit cost:	$ 4.788	/mcf	$ 4.788
Conversion Factor:	1,030,000	Btu/mcf	1,030,000
Efficiency:	89%	Heating	78%

Basic Inputs

	Type #1	Type #2	Type #3	Type #4	Type #5
Fluid	**DHW**	**Hot Water**	**Steam**	**DHW**	**Hot Water**
Pipe Material	**Dull Copper**	**Steel**	**Steel**	**Steel**	**Steel**
O.D., inches (d)	**1.50**	**4.00**	**1.00**	**2.00**	**2.00**
Total Length, ft	**20**	**36**	**0**	**0**	**0**
Fluid Temperature Inside Pipe, °F (Ts)	**120**	**160**	**215**	**110**	**160**
Ambient Temperature, °F (Ta)	**65**	**65**	**65**	**65**	**65**
Annual Operating Hours	**8,760**	**6,552**	**2,187**	**2,187**	**2,187**
New Insulation Thickness, inches	**1.0**	**1.5**	**2.0**	**2.0**	**2.0**
Thermal Conductivity - "k" (Btu-in/hr-sq ft	**0.25**	**0.25**	**0**	**0**	**0**
Heat Loss - Bare Pipe					
C factor	**1.016**	**1.016**	**1.016**	**1.016**	**1.016**
emissivity based on pipe material	0.440	0.940	0.940	0.940	0.940
Outside Radius Pipe, inches (Ri)	1	2	1	1	1
Outside Radius Insulation, inches (Rs)	1.8	3.5	2.5	3.0	3.0
h convection, Btu/hr - s.f. pipe surface area -°	1.20	1.10	1.58	1.08	1.26
h radiation, Btu/hr - s.f. pipe surface area - °F	0.51	1.22	1.41	1.06	1.22
h total	1.71	2.32	2.99	2.14	2.48
Pipe area, sq ft/lin ft of pipe	0.393	1.047	0.262	0.523	0.523
Q bare, Btu/hr-lin ft	**37**	**230**	**117**	**50**	**123**
Heat Loss - Insulated Pipe					
Q i, Btu/hr-sq ft of outer area of insulation	9.3	12.1	9.3	3.4	7.2
Insulation Area - sq ft/lin ft of pipe	0.9	1.8	1.3	1.6	1.6
Q insul, Btu/hr-lin ft	**8.5**	**22.2**	**12.2**	**5.4**	**11.3**
Avoided Energy Loss					
Existing Loss - MBtu/year	6.5	54.3	0.0	0.0	0.0
Proposed Loss - MBtu/year	1.5	5.2	0.0	0.0	0.0
Avoided Loss - MBtu/year	5.0	49.1	0.0	0.0	0.0
Total Avoided Fuel Consumption					
60 Units Saved	6	54	0	0	0
Natural Gas Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
$ 286 $/year	**$ 30**	**$ 256**	**$ 0**	**$ 0**	**$ 0**

Formulas:

Based on ASHRAE 1993 Fundamentals Handbook pages 20.9 and 22.17

h convection = C x {(1 / d) ^ 0.2} x { (1 / ((Ts + Ta)/2)) ^ 0.181 } x { (Ts - Ta) ^ 0.266 }

h radiation = { emissivity x 0.1713 x 10 ^ -8 x [(Ta + 460) ^ 4 - (Ts +460) ^ 4]} / (Ta - Ts)

Q bare = h total x Pipe Area x (Ts - Ta)

Q i = (Ts - Ta) / { [Rs x (ln (Rs / Ri)] / k }

Q insul = Q i x Insul Area

Total Avoided Consumption = (Q bare - Q insul) x Total length of pipe x Annual Operating Hours

CALCULATIONS TO INSTALL CONDENSING DOMESTIC HOT WATER HEATER

FIM 6.34 Family Court

INPUT DATA:

	Present Fuel		Proposed Fuel	
Fuel:	**Natural Gas**		Natural Gas	
Units:	mcf		mcf	
Fuel Cost:	$ 4.79	per mcf	$ 4.79	per mcf
Fuel Conversion Factor:	1,030,000	Btu per mcf	1,030,000	Btu per mcf

Annual DHW Consumption:	Present		Proposed	
Hot Water Usage:	**2.0**	Gallons/person	2.0	Gallons/person
Number of persons:	**350**	(estimate)	350	(estimate)
Days of Usage:	**260**	per year	260	per year
Hours of Usage per Day:	8	hours	8	hours
Average inlet water Temp	50	degrees F	50	degrees F
Average hot water temp:	125	degrees F	125	degrees F

Storage Tank Losses:	Present Tank		Proposed Tank	
Tank U factor:	0.15	Btu/SF/Hour	0.12	Btu/SF/Hour
Height of Tank:	96.0	inches	96.0	inches
Diameter of Tank:	48.0	inches	48.0	inches
	679	gallons/tank	679	gallons/tank
# of Tanks	1	Qty.	1	Qty.
Hours Tank is Hot:	8,760	Hours	8,760	
Water Temperature:	140	Deg. F.	140	
Ambient Temperature:	70	Deg. F.	70	

Boiler Jacket & Flue Losses:				
Burner Input	199,000	BTUH	199,000	BTUH
Efficiency:	**78.0%**		92.0%	
Boiler Output Capacity	155,220	BTU output	183,080	BTU output
Jacket & Flue Losses:	3.5%	of boiler capacity	0.4%	of boiler capacity
Boiler is Hot:	8,760	hours/year	8,760	hours/year

CALCULATIONS:

	Present		Proposed	
Consumption Energy:	113,704,500	BTU output rqd/yr	113,704,500	BTU output rqd/yr
Tank Energy Losses:	11,533,301	BTU/year	9,245,094	BTU/year
Recirculation Losses:	0	BTU/year	0	BTU/year
Boiler Jacket Losses:	47,590,452	BTU/year	6,415,123	BTU/year
Output BTU/Year	172,828,253		129,364,717	
Annual Fuel Consumption	215	mcf	137	mcf
Demand	0	billed kW /yr.	0	kW

CALCULATIONS TO OPEN BALANCE VALVE
FIM 6.37

Client: Family Court
Address: 1 Niagara Square

INPUT DATA:

Fuel:	**Electricity**	
kWh:	$ 0.050	per kWh
Demand:	$ 10.59	per kW
Months of Demand	**5**	per year
Operating Hours	**3,432**	hours per year

Pump Nameplate and Performance Data

	Model		
		80%	Pump Efficiency
Design Pump Flow		**1,100**	gallons per minute
		70	feet of water
		24.3	BHP at design
Motor Nameplate	HP	**25**	HP
	Efficiency	**94.1%**	

Balance Valve Data

Present Setting	**80%**	Open
Manufacturer	**Bell & Gossett**	
Model Number	**3ds-8s**	
Pattern		
Valve Δp at present setting	**5.0**	feet of water
Valve Δp when 100% open	**1.5**	feet of water
Valve Δp Savings	**3.5**	feet of water

CALCULATIONS:

HP = (GPM x Valve Δp) / (3960 x Pump Eff.)
kW = HP x 0.746 / (Motor Efficiency)
kWh = kW x Hours

	Existing	Proposed	Savings Standard	Savings Minimal Data	
Flow GPM	1,100	1,100		1,100	
Pump Efficiency	80%	80%		80%	
Motor Efficiency	94.1%	94.1%		94.1%	
Head	70	66.5			
Head Saved				3.5	
HP	24.3	23.1	1.2	1.2	HP
Monthly kW	19.3	18.3	1.0	1.0	kW
kWh	66,131	62,824	3,307	3,307	kWh

CALCULATIONS TO EXTEND DDC TO DHW PUMPS

FIM 6.40 Family Court

	DHW Fuel		Pump	
Type:	**Natural Gas**		**Electricity**	
Units:	**mcf**		**kwh**	
Unit cost:	$ 4.788	/mcf	**$ 0.050**	$/kWh
Heat Content of Fuel:	1,030,000	Btu/mcf		
Combustion Efficiency:	**78.0%**			

INPUT

Building Conditioned Floor Area	Schedule	hrs/week	Wks/yr	Hrs/yr.
170,000 sq.ft.	Heating	**76**	**42**	3,203
	Non-heating	**76**	**10**	763
				3,965

Electricity Savings for DHW Recirculation Pumps

Formula:

kwh = HP x % Loading x 0.746 kw per HP / motor efficiency x Qty. x Hours

Motor Description	Motor HP	Qty	Motor Loading	Motor Type	Motor y	Annual Hours Present	Annual Hours Proposed	Annual kWh Present	Annual kWh Proposed
Taco	**1/6**	**1**	70%	Std.	45.0%	8,760	3,965	1,694	767
								1,694	767

Thermal Savings for DHW Recirculation Pumps

Motor Description	Motor GPM	Recirc ΔT	DHW Eff.	DHW Losses Btuh	Annual Hours Present	Annual Hours Proposed	Annual mcf Present	Annual mcf Proposed
Taco	**5**	2.0	78%	4,998	8,760	3,965	54	25
							54	25

Formulae:

DHW Losses = GPM x Recirc ΔT x 60 min per hour x 8.33 lbs per gallon

Annual MMBtu = DHW Losses / DHW Efficiency x Annual Hours / heat content of fuel

Recirc ΔT = temperature drop between DHW leaving boiler room and returning recirculation DHW

Pump Power Savings	927	kwh
DHW Fuel Savings	30	mcf
Total Savings		

CALCULATIONS FOR HOLIDAY SCHEDULING
FIM 6.41

Client: Family Court
Address: 1 Niagara Square

Type: **Natural Gas**
Units: **mcf**
Unit cost: **$ 4.788** /mcf
Heat Content of Fuel **1,030,000** Btu/mcf
Boiler Combustion Efficiency: **89.0%**

DATA:

Percentage of Building to be Setback: **95%**

	Present Holiday Unoccupied	Proposed Holiday Unoccupied	
T Setpoint:	70	**63**	degrees F
Q internal gains:	**234,863**	**234,863**	Btuh
BLC:	**30,442**	**30,442**	Btuh/degree F
T Balance:	62.3	55.3	degrees F

T Balance = T Setpoint - (Q internal gains / BLC)

Average Occupied Hours/Day **15**

Occupied Hours

Mid-pts	DB (F)	Total Hrs	January Hrs	February Hrs	March Hrs	April Hrs	May Hrs	June Hrs	July Hrs	August Hrs	September Hrs	October Hrs	November Hrs	December Hrs
93	90 to 95	4							4					
88	85 to 90	12					3		6	2	1			
83	80 to 85	121					15	25	42	28	11			
78	75 to 80	207					15	41	59	62	22	8		
73	70 to 75	258			2	3	22	45	70	53	41	21	1	
68	65 to 70	197			5	3	25	35	17	51	34	23	4	
63	60 to 65	247			12	4	63	50	9	25	55	17	11	1
58	55 to 60	149			7	15	31	17	2	9	27	30	6	5
53	50 to 55	211	3		21	36	31	6	1		17	50	33	13
48	45 to 50	132	8		22	25	22	1			1	34	18	1
43	40 to 45	136	12		21	33	3				1	17	32	17
38	35 to 40	211	17	9	35	50						20	46	34
33	30 to 35	216	33	32	35	22							46	48
28	25 to 30	173	31	53	32	8							16	33
23	20 to 25	115	41	38	18	1							4	13
18	15 to 20	111	46	19	12								3	31
13	10 to 15	52	26	14	4									8
8	5 to 10	44	3	31	4									6
3	0 to 5	2		2										
-3	-5 to 0	2		2										
-8	-10 to -5	0		5										

Average Monthly Temp (°F)	26	21	38	44	63	70	76	72	66	55	41	31
Holidays / Days Off During Year	2	1	0	0	1	0	0	0	1	1	1	1
Present Unoccupied Energy (BTU)	33,838,023	18,968,229	0	0	(281,479)	0	0	0	(1,901,534)	3,181,556	9,659,895	14,490,765
Proposed Unoccupied Energy (BTU)	27,338,581	15,718,509	0	0	(3,531,200)	0	0	0	(5,151,254)	(68,165)	6,410,175	11,241,044
Holiday Setback Energy Savings (BTU)	6,499,441	3,249,721	0	0	3,249,721	0	0	0	3,249,721	3,249,721	3,249,721	3,249,721

CALCULATIONS:

Heat Loss = (T Balance - T Avg O.A.) x BLC * # Hours
Energy Cost = (Heat Loss / Conversion Factor) x (Unit cost / Efficiency)

Winter	Heat Loss (Btu/year)	Fuel Use (mcf/year)
Present Unoccupied	77,955,455	85
Proposed Unoccupied	51,957,690	57
Annual Savings:	25,997,765	28

CALCULATIONS FOR VARIABLE SPEED DRIVE ON HOT WATER PUMPS — 6A-6B VAV Loop

FIM 6.43 Family Court

Pump Type: **Hot Water**

$ 0.050 per kWh

Design Conditions:

	64	GPMdes
	59	ft Total Head (TH)
-	**15**	ft head minimum (Fixed Minimum Head)
	44	pipe losses (Variable Head)

	Existing	Proposed	
Minimum Flow:	**64**	**26**	GPM = 40% of GPMdes.
Motor Efficiency:	**89.5%**	**89.5%**	
Pump Efficiency:	**75.0%**	1.3	BHP design
		3.0	HP Nameplate
VSD Efficiency:		**97%**	
OA Lockout Temp:		**55**	°F

Bin Data for Buffalo, 76 hrs./week

Periods: **Occupied** **Unocc.**

Approx. Flow Increment: **5%** **5%** per bin

Unocc. flow is = **80%** of Occupied flow at design.

Forumulae:

FMH = Fixed Minimum Head

H2 = FMH + ((TH - FMH) x ((GPM2/GPMdes)^2))

BHP = (GPM2x H2) / (3960 x pump efficiency)

kW = BHP x 0.746 kW / Motor Eff / VFD Eff

Bin	Occupied	Percent	Occupied		New	% Speed	Occupied kW		Occupied kWh	
Temp	Hours	Flow	GPM2	Head H2	BHP	Occupied	Present	Proposed	Present	Proposed
(2.5)	**1.0**	**100%**	**64**	59.0	1.3	**100%**	1.8	1.9	2	2
2.5	**13.0**	**95%**	**61**	54.7	1.1	**96%**	1.8	1.7	23	22
7.5	**36.0**	**90%**	**58**	50.8	1.0	**93%**	1.8	1.5	65	54
12.5	**97.0**	**86%**	**55**	47.3	0.9	**90%**	1.8	1.4	175	132
17.5	**214.0**	**81%**	**52**	44.2	0.8	**87%**	1.8	1.2	385	263
22.5	**161.0**	**77%**	**50**	41.3	0.7	**84%**	1.8	1.1	290	179
27.5	**149.0**	**74%**	**47**	38.8	0.6	**81%**	1.8	1.0	268	149
32.5	**300.0**	**70%**	**45**	36.5	0.5	**79%**	1.8	0.9	540	271
37.5	**362.0**	**66%**	**42**	34.4	0.5	**76%**	1.8	0.8	652	296
42.5	**336.0**	**63%**	**40**	32.5	0.4	**74%**	1.8	0.7	605	248
47.5	**201.0**	**60%**	**38**	30.8	0.4	**72%**	1.8	0.7	362	134
52.5	**144.0**	**57%**	**36**	29.2	0.4	**70%**	1.8	0.6	259	86
57.5	**152.0**	**0%**	**-**	15.0	-	**0%**	1.8	0.0	-	-
62.5	**138.0**	**0%**	**-**	15.0	-	**0%**	1.8	0.0	-	-
67.5	**47.0**	**0%**	**-**	15.0	-	**0%**	1.8	0.0	-	-
72.5	**37.0**	**0%**	**-**	15.0	-	**0%**	1.8	0.0	-	-
77.5	**27.0**	**0%**	**-**	15.0	-	**0%**	1.8	0.0	-	-
82.5	**-**	**0%**	**-**	15.0	-	**0%**	1.8	0.0	-	-
87.5	**-**	**0%**	**-**	15.0	-	**0%**	1.8	0.0	-	-
92.5	**-**	**0%**	**-**	15.0	-	**0%**	1.8	0.0	-	-
97.5	**-**	**0%**	**-**	15.0	-	**0%**	1.8	0.0	-	-
102.5	**-**	**0%**	**-**	15.0	-	**0%**	1.8	0.0	-	-
107.5	**-**	**0%**	**-**	15.0	-	**0%**	1.8	0.0	-	-
	2,415	Occupied					Occupied kwh/year		3,625	1,837

Bin	Unocc.	Percent	Unocc.		New	% Speed	Unocc. kW		Unocc. kWh	
Temp	Hours	Flow	GPM2	Head H2	BHP	Unocc.	Present	Proposed	Present	Proposed
(2.5)	**-**	**80%**	**51**	43.2	0.7	**86%**	1.8	1.2	-	-
2.5	**18.0**	**76%**	**49**	40.4	0.7	**83%**	1.8	1.1	32	19
7.5	**26.0**	**72%**	**46**	37.9	0.6	**80%**	1.8	1.0	47	25
12.5	**122.0**	**69%**	**44**	35.7	0.5	**78%**	1.8	0.9	220	107
17.5	**244.0**	**65%**	**42**	33.7	0.5	**76%**	1.8	0.8	439	192
22.5	**239.0**	**62%**	**40**	31.9	0.4	**73%**	1.8	0.7	430	170
27.5	**237.0**	**59%**	**38**	30.2	0.4	**72%**	1.8	0.6	427	152
32.5	**347.0**	**56%**	**36**	28.7	0.3	**70%**	1.8	0.6	625	201
37.5	**563.0**	**53%**	**34**	27.4	0.3	**68%**	1.8	0.5	1,013	294
42.5	**393.0**	**50%**	**32**	26.2	0.3	**67%**	1.8	0.5	707	185
47.5	**280.0**	**48%**	**31**	25.1	0.3	**65%**	1.8	0.4	504	119
52.5	**194.0**	**46%**	**29**	24.1	0.2	**64%**	1.8	0.4	349	75
57.5	**164.0**	**0%**	**-**	15.0	-	**0%**	1.8	0.0	-	-
62.5	**121.0**	**0%**	**-**	15.0	-	**0%**	1.8	0.0	-	-
67.5	**31.0**	**0%**	**-**	15.0	-	**0%**	1.8	0.0	-	-
72.5	**8.0**	**0%**	**-**	15.0	-	**0%**	1.8	0.0	-	-
77.5	**17.0**	**0%**	**-**	15.0	-	**0%**	1.8	0.0	-	-
82.5	**5.0**	**0%**	**-**	15.0	-	**0%**	1.8	0.0	-	-
87.5	**-**	**0%**	**-**	15.0	-	**0%**	1.8	0.0	-	-

92.5	**-**	**0%**	**-**	15.0	-	**0%**	1.8	0.0	-	-
97.5	**-**	**0%**	**-**	15.0	-	**0%**	1.8	0.0	-	-
102.5	**-**	**0%**	**-**	15.0	-	**0%**	1.8	0.0	-	-
107.5	**-**	**0%**	**-**	15.0	-	**0%**	1.8	0.0	-	-
	3,009	Unocc.						Unocc. kwh/year	4,793	1,540
	5,424	bin hours/year total						Total kWh / year	8,419	3,377
								Savings	5,042	kWh

Summary

Unit	Baseline Energy (kWh)	Proposed Energy (kWh)	Savings (kWh)
6A-6B VAV Loop	8,419	3,377	5,042
7A-7B Fin Rad Loop	29,964	12,019	17,945
4A-4B AHU Loop	67,972	27,264	40,709
3A-3B Primary Loop	30,341	11,400	18,941
5A-5B Glycol Hx Pumps	22,496	9,023	13,473
2A-2B HW Hx Pumps	0	1,478	-1,478
SMP-1,2 HW Snow Mel	9,926	1,934	7,992
	159,192	64,560	94,632

CALCULATIONS FOR VARIABLE SPEED DRIVE ON HOT WATER PUMPS — 7A-7B Fin Rad Loop

FIM 6.43 Family Court

Pump Type: **Hot Water**

$ 0.050 per kWh

Design Conditions:

211 GPMdes
69 ft Total Head (TH)
- **15** ft head minimum (Fixed Minimum Head)
54 pipe losses (Variable Head)

	Existing	Proposed	
Minimum Flow:	**211**	**84**	GPM = 40% of GPMdes.
Motor Efficiency:	**91.7%**	**91.7%**	
Pump Efficiency:	**75.0%**	4.9	BHP design
		7.5	HP Nameplate
VSD Efficiency:		**97%**	
OA Lockout Temp:		**55**	°F

Bin Data for Buffalo, 76 hrs./week

Periods: **Occupied** **Unocc.**
Approx. Flow Increment: **5%** **5%** per bin
Unocc. flow is = **80%** of Occupied flow at design.

Forumulae:
FMH = Fixed Minimum Head
H2 = FMH + ((TH - FMH) x ((GPM2/GPMdes)^2))
BHP = (GPM2x H2) / (3960 x pump efficiency)
kW = BHP x 0.746 kW / Motor Eff / VFD Eff

Bin Temp	Occupied Hours	Percent Flow	Occupied GPM2	Occupied Head H2	New BHP	% Speed Occupied	Occupied kW Present	Occupied kW Proposed	Occupied kWh Present	Occupied kWh Proposed
(2.5)	**1.0**	**100%**	**211**	69.0	4.9	**100%**	6.4	6.6	6	7
2.5	**13.0**	**95%**	**200**	63.7	4.3	**96%**	6.4	6.0	83	77
7.5	**36.0**	**90%**	**190**	59.0	3.8	**92%**	6.4	5.4	231	194
12.5	**97.0**	**86%**	**181**	54.7	3.3	**89%**	6.4	4.9	621	471
17.5	**214.0**	**81%**	**172**	50.8	2.9	**86%**	6.4	4.4	1,371	938
22.5	**161.0**	**77%**	**163**	47.3	2.6	**83%**	6.4	4.0	1,031	637
27.5	**149.0**	**74%**	**155**	44.2	2.3	**80%**	6.4	3.6	955	532
32.5	**300.0**	**70%**	**147**	41.3	2.1	**77%**	6.4	3.2	1,922	966
37.5	**362.0**	**66%**	**140**	38.8	1.8	**75%**	6.4	2.9	2,319	1,052
42.5	**336.0**	**63%**	**133**	36.4	1.6	**73%**	6.4	2.6	2,153	882
47.5	**201.0**	**60%**	**126**	34.4	1.5	**71%**	6.4	2.4	1,288	476
52.5	**144.0**	**57%**	**120**	32.5	1.3	**69%**	6.4	2.1	923	308
57.5	**152.0**	**0%**	**-**	15.0	-	**0%**	6.4	0.0	-	-
62.5	**138.0**	**0%**	**-**	15.0	-	**0%**	6.4	0.0	-	-
67.5	**47.0**	**0%**	**-**	15.0	-	**0%**	6.4	0.0	-	-
72.5	**37.0**	**0%**	**-**	15.0	-	**0%**	6.4	0.0	-	-
77.5	**27.0**	**0%**	**-**	15.0	-	**0%**	6.4	0.0	-	-
82.5	**-**	**0%**	**-**	15.0	-	**0%**	6.4	0.0	-	-
87.5	**-**	**0%**	**-**	15.0	-	**0%**	6.4	0.0	-	-
92.5	**-**	**0%**	**-**	15.0	-	**0%**	6.4	0.0	-	-
97.5	**-**	**0%**	**-**	15.0	-	**0%**	6.4	0.0	-	-
102.5	**-**	**0%**	**-**	15.0	-	**0%**	6.4	0.0	-	-
107.5	**-**	**0%**	**-**	15.0	-	**0%**	6.4	0.0	-	-
	2,415	Occupied						Occupied kwh/year	12,903	6,539

Bin Temp	Unocc. Hours	Percent Flow	Unocc. GPM2	Unocc. Head H2	New BHP	% Speed Unocc.	Unocc. kW Present	Unocc. kW Proposed	Unocc. kWh Present	Unocc. kWh Proposed
(2.5)	**-**	**80%**	**169**	49.6	2.8	**85%**	6.4	4.2	-	-
2.5	**18.0**	**76%**	**160**	46.2	2.5	**82%**	6.4	3.8	115	69
7.5	**26.0**	**72%**	**152**	43.1	2.2	**79%**	6.4	3.4	167	90
12.5	**122.0**	**69%**	**145**	40.4	2.0	**77%**	6.4	3.1	782	379
17.5	**244.0**	**65%**	**137**	37.9	1.8	**74%**	6.4	2.8	1,563	684
22.5	**239.0**	**62%**	**131**	35.7	1.6	**72%**	6.4	2.5	1,531	605
27.5	**237.0**	**59%**	**124**	33.7	1.4	**70%**	6.4	2.3	1,518	541
32.5	**347.0**	**56%**	**118**	31.9	1.3	**68%**	6.4	2.1	2,223	715
37.5	**563.0**	**53%**	**112**	30.2	1.1	**66%**	6.4	1.9	3,607	1,047
42.5	**393.0**	**50%**	**106**	28.7	1.0	**65%**	6.4	1.7	2,518	660
47.5	**280.0**	**48%**	**101**	27.4	0.9	**63%**	6.4	1.5	1,794	424
52.5	**194.0**	**46%**	**96**	26.2	0.8	**62%**	6.4	1.4	1,243	265
57.5	**164.0**	**0%**	**-**	15.0	-	**0%**	6.4	0.0	-	-
62.5	**121.0**	**0%**	**-**	15.0	-	**0%**	6.4	0.0	-	-
67.5	**31.0**	**0%**	**-**	15.0	-	**0%**	6.4	0.0	-	-
72.5	**8.0**	**0%**	**-**	15.0	-	**0%**	6.4	0.0	-	-
77.5	**17.0**	**0%**	**-**	15.0	-	**0%**	6.4	0.0	-	-
82.5	**5.0**	**0%**	**-**	15.0	-	**0%**	6.4	0.0	-	-
87.5	**-**	**0%**	**-**	15.0	-	**0%**	6.4	0.0	-	-
92.5	**-**	**0%**	**-**	15.0	-	**0%**	6.4	0.0	-	-
97.5	**-**	**0%**	**-**	15.0	-	**0%**	6.4	0.0	-	-
102.5	**-**	**0%**	**-**	15.0	-	**0%**	6.4	0.0	-	-
107.5	**-**	**0%**	**-**	15.0	-	**0%**	6.4	0.0	-	-
	3,009	Unocc.						Unocc. kwh/year	17,061	5,480
	5,424	bin hours/year total						Total kWh / year	29,964	12,019
								Savings	17,945	kWh

CALCULATIONS FOR VARIABLE SPEED DRIVE ON HOT WATER PUMPS — 4A-4B AHU Loop

FIM 6.43 Family Court

Pump Type: **Hot Water**

$ 0.050 per kWh

Design Conditions:

	371	GPMdes
	121	ft Total Head (TH)
-	**15**	ft head minimum (Fixed Minimum Head)
	106	pipe losses (Variable Head)

	Existing	Proposed	
Minimum Flow:	**371**	**148**	GPM = 40% of GPMdes.
Motor Efficiency:	**93.0%**	**93.0%**	
Pump Efficiency:	**75.0%**	15.1	BHP design
		20.0	HP Nameplate
VSD Efficiency:		**97%**	
OA Lockout Temp:		**55**	°F

Bin Data for Buffalo, 76 hrs./week

Periods: **Occupied** **Unocc.**

Approx. Flow Increment: **5%** **5%** per bin

Unocc. flow is = **80%** of Occupied flow at design.

Forumulae: FMH = Fixed Minimum Head

H2 = FMH + ((TH - FMH) x ((GPM2/GPMdes)^2))

BHP = (GPM2x H2) / (3960 x pump efficiency)

kW = BHP x 0.746 kW / Motor Eff / VFD Eff

Bin Temp	Occupied Hours	Percent Flow	Occupied GPM2	Occupied Head H2	New BHP	% Speed Occupied	Occupied kW Present	Occupied kW Proposed	Occupied kWh Present	Occupied kWh Proposed
(2.5)	**1.0**	**100%**	**371**	121.0	15.1	**100%**	14.5	15.0	15	15
2.5	**13.0**	**95%**	**352**	110.7	13.1	**96%**	14.5	13.5	189	176
7.5	**36.0**	**90%**	**335**	101.3	11.4	**92%**	14.5	12.2	523	439
12.5	**97.0**	**86%**	**318**	92.9	10.0	**88%**	14.5	11.0	1,410	1,068
17.5	**214.0**	**81%**	**302**	85.3	8.7	**84%**	14.5	9.9	3,110	2,127
22.5	**161.0**	**77%**	**287**	78.5	7.6	**81%**	14.5	9.0	2,340	1,444
27.5	**149.0**	**74%**	**273**	72.3	6.6	**77%**	14.5	8.1	2,165	1,206
32.5	**300.0**	**70%**	**259**	66.7	5.8	**74%**	14.5	7.3	4,360	2,192
37.5	**362.0**	**66%**	**246**	61.7	5.1	**71%**	14.5	6.6	5,261	2,387
42.5	**336.0**	**63%**	**234**	57.1	4.5	**69%**	14.5	6.0	4,883	2,000
47.5	**201.0**	**60%**	**222**	53.0	4.0	**66%**	14.5	5.4	2,921	1,080
52.5	**144.0**	**57%**	**211**	49.3	3.5	**64%**	14.5	4.8	2,093	698
57.5	**152.0**	**0%**	**-**	15.0	-	**0%**	14.5	0.0	-	-
62.5	**138.0**	**0%**	**-**	15.0	-	**0%**	14.5	0.0	-	-
67.5	**47.0**	**0%**	**-**	15.0	-	**0%**	14.5	0.0	-	-

72.5	**37.0**	**0%**	**-**	15.0	-	**0%**	14.5	0.0	-	-
77.5	**27.0**	**0%**	**-**	15.0	-	**0%**	14.5	0.0	-	-
82.5	**-**	**0%**	**-**	15.0	-	**0%**	14.5	0.0	-	-
87.5	**-**	**0%**	**-**	15.0	-	**0%**	14.5	0.0	-	-
92.5	**-**	**0%**	**-**	15.0	-	**0%**	14.5	0.0	-	-
97.5	**-**	**0%**	**-**	15.0	-	**0%**	14.5	0.0	-	-
102.5	**-**	**0%**	**-**	15.0	-	**0%**	14.5	0.0	-	-
107.5	**-**	**0%**	**-**	15.0	-	**0%**	14.5	0.0	-	-
	2,415	Occupied						Occupied kwh/year	29,270	14,833

Bin	Unocc.	Percent	Unocc.		New	% Speed	Unocc. kW		Unocc. kWh	
Temp	Hours	Flow	GPM2	Head H2	BHP	Unocc.	Present	Proposed	Present	Proposed
(2.5)	**-**	**80%**	**297**	82.8	8.3	**83%**	14.5	9.6	-	-
2.5	**18.0**	**76%**	**282**	76.2	7.2	**79%**	14.5	8.7	262	156
7.5	**26.0**	**72%**	**268**	70.3	6.3	**76%**	14.5	7.8	378	203
12.5	**122.0**	**69%**	**254**	64.9	5.6	**73%**	14.5	7.0	1,773	860
17.5	**244.0**	**65%**	**242**	60.0	4.9	**70%**	14.5	6.4	3,546	1,552
22.5	**239.0**	**62%**	**230**	55.6	4.3	**68%**	14.5	5.7	3,473	1,372
27.5	**237.0**	**59%**	**218**	51.7	3.8	**65%**	14.5	5.2	3,444	1,228
32.5	**347.0**	**56%**	**207**	48.1	3.4	**63%**	14.5	4.7	5,043	1,623
37.5	**563.0**	**53%**	**197**	44.9	3.0	**61%**	14.5	4.2	8,182	2,376
42.5	**393.0**	**50%**	**187**	41.9	2.6	**59%**	14.5	3.8	5,712	1,497
47.5	**280.0**	**48%**	**178**	39.3	2.4	**57%**	14.5	3.4	4,069	963
52.5	**194.0**	**46%**	**169**	36.9	2.1	**55%**	14.5	3.1	2,819	602
57.5	**164.0**	**0%**	**-**	15.0	-	**0%**	14.5	0.0	-	-
62.5	**121.0**	**0%**	**-**	15.0	-	**0%**	14.5	0.0	-	-
67.5	**31.0**	**0%**	**-**	15.0	-	**0%**	14.5	0.0	-	-
72.5	**8.0**	**0%**	**-**	15.0	-	**0%**	14.5	0.0	-	-
77.5	**17.0**	**0%**	**-**	15.0	-	**0%**	14.5	0.0	-	-
82.5	**5.0**	**0%**	**-**	15.0	-	**0%**	14.5	0.0	-	-
87.5	**-**	**0%**	**-**	15.0	-	**0%**	14.5	0.0	-	-
92.5	**-**	**0%**	**-**	15.0	-	**0%**	14.5	0.0	-	-
97.5	**-**	**0%**	**-**	15.0	-	**0%**	14.5	0.0	-	-
102.5	**-**	**0%**	**-**	15.0	-	**0%**	14.5	0.0	-	-
107.5	**-**	**0%**	**-**	15.0	-	**0%**	14.5	0.0	-	-
	3,009	Unocc.						Unocc. kwh/year	38,702	12,431
	5,424	bin hours/year total						Total kWh / year	67,972	27,264
								Savings	40,709	kWh

CALCULATIONS FOR IMPACT OF REDUCED LIGHTING ON HEATING AND AIR CONDITIONING

FIM 7.1

Client: Public Safety Campus
Address: 45 Elm Street

INPUT DATA:

	Heating Energy		Cooling Energy	
Fuel:	**Natural Gas**		**Electric**	
Units:	**mcf**		**kWh**	
Fuel Cost:	**$ 4.487**	per mcf	**$ 0.050**	per kWh
Fuel Conversion Factor:	**1,030,000**	Btu per mcf	**3,412**	Btu per kWh
Efficiency:	**80.0%**		**0.895**	kW/Ton
			90%	of building is air conditioned

	267,524	Lighting Retrofit
		Installing Sensors
Annual Lighting Savings:	**267,524**	kWh per Year
	12	months per year of lighting operation
	22,294	kwh/month

For **8** months/year the lighting retrofit will impact heating costs
20% of light fixtures are within 10 feet of an exterior wall
For **4** months/year the lighting retrofit will impact cooling costs

CALCULATIONS:

Replacement Natural Gas because of Reduced Lighting Energy

Useful Heat from Lights during the heating season that is no longer available is:

= kwh Lighting Savings per month x No. Months of Heating impact x % of fixtures located near exterior walls

= **35,670 kWh =** 121,705,585 BTU = 148 mcf

Replacement Natural Gas usage

Useful Heat from Lights in kwh x 3412 BTU/kwh / Heating Fuel Conversion Factor / Heating Fuel Efficiency

Replacement Natural Gas Cost = mcf x $per mcf

	Fuel Usage		Fuel Cost	
Useful Heat from Lights	35,670	kWh	n/a	
Replacement Gas	**(148)**	**mcf**		**per year**

Reduced Air Conditioning because of Reduced Lighting

Reduced Air Conditioning Lighting Load during the cooling season from Lighting that is no longer present is:

= kwh Lighting Savings per month x No. Months Lighting Retrofit will impact cooling costs x % of building cooled

= **80,257 kWh =** 273,837,566 BTU

Reduced Air Conditioning Energy Requirements [kWh] =

Reduce Air Conditioning Lighting Load x (3412 Btu / kWh) x (1 ton-hr / 12,000 Btu) x (0.895 kW / ton)

Reduced Air Conditioning Cost = Reduced Air Conditioning Energy Requirements x Cost per kWh

Reduced Air Conditioning Energy Requirements = 20,424 kWh per year
Reduced Air Conditioning Cost = per year

Net Impact on Heating and Air Conditioning Costs because of Lighting Retrofit

Heating Fuel	**(147.7)**	**mcf**
Cooling	**20,424**	**kWh per year**

Project: Erie County
Building: Public Safety Campus
Date: 7/3/2019

Heating System Efficiency:	82%
Average Fuel Cost ($/unit):	$0.46
Correction Factor:	100%

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product
Single door sweeps	6	3	1/8	1/12	=	0.1875
Single door perimeters	6	17	1/16	1/12	=	0.53125
Double door sweeps & astragals	2	20	1/2	1/12	=	1.666666667
Double door perimeters	2	20	1/4	1/12	=	0.833333333
Garage doors	5	180	1/4	1/12	=	3.75
					Total =	6.96875 ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
1003.5	50%	0.07858	72	34.25	0.0138	11.6	1101.947

Occupied Infiltration Savings

Specific Heat of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Occupied (%/week)	Heating Season Bin Hours (Occupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	1101.947	37.75	29.76%	4335	103000	82%	686.234

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
1003.5	50%	0.07858	67	34.14	0.0138	11.6	1057.142

Unoccupied Infiltration Savings

Specific Hear of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Unoccupied (%/week)	Heating Season Bin Hours (Unoccupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	1057.142	32.86	70.24%	4301	103000	82%	1341.922

Totals

Units of Fuel per Year (units/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
2028.156	103000	9.708737864	208.9001074

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
2028.16	$0.46	935.9664265

Total Cost Savings: **$935.97**
Cost to Retrofit: **$9,280.00**
Simple Payback: **9.91 years**

Project: Erie County
Building: Public Safety Campus
Date: 7/3/2019

Cooling System Efficiency (kW/ton):	0.895
EER:	13.408
Average Fuel Cost ($/unit):	$0.07

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product
Single door sweeps	6	3	1/8	1/12	=	0.1875
Single door perimeters	6	17	1/16	1/12	=	0.53125
Double door sweeps & astragals	2	20	1/2	1/12	=	1.666666667
Double door perimeters	2	20	1/4	1/12	=	0.833333333
Garage door weather-stripping	5	180	1/4	1/12	=	3.75
					Total =	6.96875 ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
1003.5	50%	0.07858	72	80.14	0.0138	11.6	792.792

Occupied Infiltration Savings Ref: ASHRAE 2013 Fundamentals 18.13 (8)

Air Total Heat Factor C_t	Flow Rate (cfm) Q_{occ}	Average Outdoor Air Enthalpy h	Cooling Supply Air Enthalpy h	% Building Occupied	Cooling Season Bin Hours	% Building Area Cooled	Btu/hrs per Ton	Cooling (kWh)
4.50	792.792	32	22.7	29.76%	1,122	100%	13,408	991.52

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
1003.5	50%	0.07858	77	74.77	0.0138	11.6	650.670

Unoccupied Infiltration Savings Ref: ASHRAE 2013 Fundamentals 18.13 (8)

Air Total Heat Factor C_t	Flow Rate (cfm) Q_{occ}	Average Outdoor Air Enthalpy h	Cooling Supply Air Enthalpy h	% Building Occupied	Cooling Season Bin Hours	% Building Area Cooled	Btu/hrs per Ton	Cooling (kWh)
4.50	650.670	32	22.7	70.24%	449	100%	13,408	768.617534

Totals

kWh per Year (kWh/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
1760.142	3,412	293.08	6.005604752

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
1760.14	$0.07	128.4903713

Total Cost Savings: **$128.49**
Cost to Retrofit: Cost carried on heating page
Simple Payback: **0.00 years**

CALCULATIONS TO REPLACE CHILLER with air cooled efficient

FIM 7.33 Public Safety Campus

						$ 0.050	per kWh	
Chiller Serves:	Comfort Cooling					$ 10.125	per kW	
Process load:	0	hours per week						
Process load:	0	tons occupied	Chiller Data					
Process load:	0	tons unoccupied				Tons	kW/ton	
Comfort Cooling	360	tons peak	Existing	air cooled existing		360	1.176	summer
Unocc. load is =		of peak tons		air cooled existing		0	1.176	winter
	360	tons total summer peak	Proposed	air cooled efficient		360	1.107	summer
				air cooled efficient		0	1.107	winter
Bin Data Based on:		May 1 - Sep 30			60	°F changeover from winter to summer chiller		
		70 hours per week						
	Periods:	Occupied Unocc.				44%	savings	
	AC Load Increment:	12% 12% for comfort cooling				$ 9,763	savings	
	No Comfort Cooling below:	55 °F			Existing Chiller Deration		10%	

Bin	Occupied	Load	Existing		Proposed		Occupied kW/ton		Occupied kWh		Peak kW	
Temp	Hours	Tons	% load	tons online	% load	tons online	Present	Proposed	Present	Proposed	Present	Proposed
57.5	**272.0**	**70**	20%	360	20%	360	0.89	0.33	16,970	6,233	62	23
62.5	**374.0**	**112**	31%	360	31%	360	0.91	0.43	38,160	17,952	102	48
67.5	**272.0**	**153**	43%	360	43%	360	0.95	0.53	39,410	22,214	145	82
72.5	**236.0**	**194**	54%	360	54%	360	0.99	0.64	45,318	29,246	192	124
77.5	**205.0**	**236**	66%	360	66%	360	1.04	0.74	50,153	35,826	245	175
82.5	**137.0**	**277**	77%	360	77%	360	1.10	0.84	41,664	32,084	304	234
87.5	**15.0**	**319**	89%	360	89%	360	1.17	0.95	5,579	4,533	372	302
92.5	**-**	**360**	100%	360	100%	360	1.25	1.05	-	-	-	-
	1,511	Occupied					Occupied kwh/year		237,253	148,087		

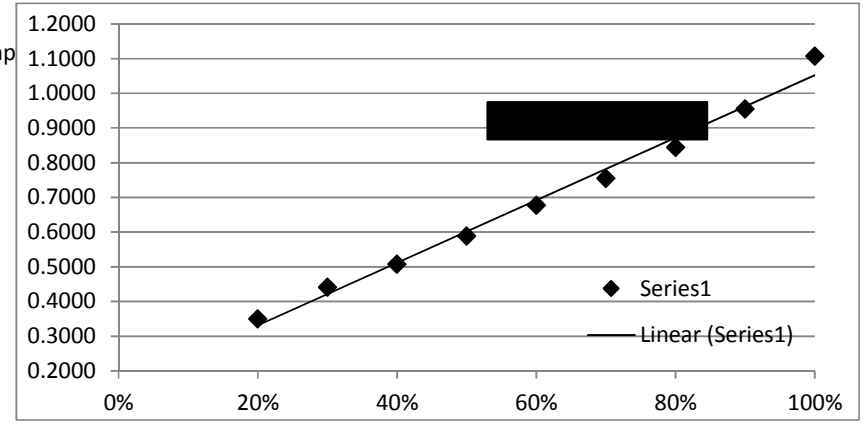
Unocc Load is 75% of Occ load

Bin	Unocc.	Load	Existing		Proposed		Unocc. kW/ton		Unocc. kWh	
Temp	Hours	Tons	% load	tons online	% load	tons online	Present	Proposed	Present	Proposed
57.5	**430.0**	**53**	15%	360	15%	360	0.89	0.28	20,120	6,395
62.5	**561.0**	**84**	23%	360	23%	360	0.91	0.36	42,930	16,914

67.5	**465.0**	**115**	32%	360	32%	360	0.95	0.44	50,530	23,370	
72.5	**263.0**	**146**	41%	360	41%	360	0.99	0.52	37,877	19,777	
77.5	**182.0**	**177**	49%	360	49%	360	1.04	0.59	33,395	19,103	
82.5	**69.0**	**208**	58%	360	58%	360	1.10	0.67	15,738	9,629	
87.5	**7.0**	**239**	66%	360	66%	360	1.17	0.75	1,953	1,253	
92.5	**-**	**270**	75%	360	75%	360	1.25	0.83	-	-	
	1,977	Unocc.						Unocc. kwh/year	202,542	96,442	Peak Demand
	3,488	bin hours/year total						Total kWh / year	439,795	244,528	371.9 302.2
									195,266	kwh/yr sav.	69.7 kW sav.
									44% savings		

360 Ton Smardt Chiller

%load	Cap	kW/ton	Ambient Temp
100%	360	1.1070	95.0
90%	324	0.9547	90.6
80%	288	0.8440	86.1
70%	252	0.7543	81.7
60%	216	0.6775	77.2
50%	180	0.5883	72.8
40%	144	0.5076	68.3
30%	108	0.4413	63.9
20%	72	0.3494	59.4
10%	36	0.2907	55.0



CALCULATIONS FOR REPLACE DX WITH CHILLED WATER

FIM 7.26 **Public Safety Campus**

INPUT DATA:

Total Bldg area	114,000	sq ft		
AHU1/2 area served	30,000	sq ft		
% of total bldg AHU 1/2	22%			
Annual Total Bldg Cooling	647,017	kwh	Existing Chiller Deration	5%
Annex Cooling	139,156	kWh		
% cycled	**75%**			
EFLH	**4,624**			

Tag	Tons cooling	DX EER	Chiller kw/ton
ACCU-2	**49**	**13.9**	**0.416**

CALCULATIONS:

Tag	DX kw/ton	DX kw	Chiller kw	DX kwh	Chiller kwh
ACCU-2	0.87	31.69	15.24	146,521	70,451
		32	15	146,521	70,451

DX to chiller savings	76,070	kWh
additional pumping	-2,423	kWh
total system savings	73,648	kWh
demand savings	16.5	kW

CALCULATIONS FOR VARIABLE SPEED DRIVE ON CHILLED WATER PUMPS

FIM 7.48 Public Safety Campus **Pump Operation without ACCU-2 load**

Pump Type: **Chilled Water**

$ 0.050 per kWh

Design Conditions:

	883	GPMdes
	60	ft Total Head (TH)
-	**15**	ft head minimum (Fixed Minimum Head)
	45	pipe losses (Variable Head)

	Existing	Proposed	
Minimum Flow:	**883**	**353**	GPM = 40% of GPMde
Motor Efficiency:	**93.0%**	**93.0%**	
Pump Efficiency:	**76.0%**	17.6	BHP design
		25.0	HP Nameplate
VSD Efficiency:		**97%**	
OA Lockout Temp:		**55**	°F

Bin Data for Buffalo, 65 hrs./week

Periods:	**Occupied**	**Unocc.**	
Approx. Flow Increment:	**9%**	**9%**	per bin
Unocc. flow is =	**100%**	of Occupied flow at design.	

Forumulae: FMH = Fixed Minimum Head

H2 = FMH + ((TH - FMH) x ((GPM2/GPMdes)^2))

BHP = (GPM2x H2) / (3960 x pump efficiency)

kW = BHP x 0.746 kW / Motor Eff / VFD Eff

Bin	Occupied	Percent	Occupied		New	% Speed	Occupied kW		Occupied kWh	
Temp	Hours	Flow	GPM2	Head H2	BHP	Occupied	Present	Proposed	Present	Proposed
(2.5)	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0		-
2.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0		-
7.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0		-
12.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0		-
17.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0		-
22.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0		-
27.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0		-
32.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0		-
37.5	**8.0**	**0%**	**-**	15.0	-	**0%**	14.1	0.0		-
42.5	**57.0**	**0%**	**-**	15.0	-	**0%**	14.1	0.0		-
47.5	**252.0**	**0%**	**-**	15.0	-	**0%**	14.1	0.0		-
52.5	**266.0**	**0%**	**-**	15.0	-	**0%**	14.1	0.0		-
57.5	**392.0**	**40%**	**353**	22.2	2.6	**61%**	14.1	2.2		845
62.5	**705.0**	**43%**	**378**	23.2	2.9	**62%**	14.1	2.4		1,701
67.5	**679.0**	**47%**	**415**	25.0	3.4	**64%**	14.1	2.8		1,933
72.5	**479.0**	**52%**	**456**	27.0	4.1	**67%**	14.1	3.4		1,623
77.5	**366.0**	**57%**	**501**	29.5	4.9	**70%**	14.1	4.1		1,488

82.5	**206.0**	**62%**	**551**	32.5	6.0	**74%**	14.1	4.9		1,014
87.5	**22.0**	**69%**	**606**	36.2	7.3	**78%**	14.1	6.0		132
92.5	**-**	**75%**	**665**	40.6	9.0	**82%**	0.0	7.4		-
97.5	**-**	**83%**	**731**	45.9	11.1	**87%**	0.0	9.2		-
102.5	**-**	**91%**	**804**	52.3	14.0	**93%**	0.0	11.5		-
107.5	**-**	**100%**	**883**	60.0	17.6	**100%**	0.0	14.6		-
	3,432	Occupied						Occupied kwh/year	-	8,736

Bin	Unocc.	Percent	Unocc.		New	% Speed	Unocc. kW		Unocc. kWh	
Temp	Hours	Flow	GPM2	Head H2	BHP	Unocc.	Present	Proposed	Present	Proposed
(2.5)	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0		-
2.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0		-
7.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0		-
12.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0		-
17.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0		-
22.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0		-
27.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0		-
32.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0		-
37.5	**6.0**	**0%**	**-**	15.0	-	**0%**	14.1	0.0		-
42.5	**46.0**	**0%**	**-**	15.0	-	**0%**	14.1	0.0		-
47.5	**193.0**	**0%**	**-**	15.0	-	**0%**	14.1	0.0		-
52.5	**185.0**	**0%**	**-**	15.0	-	**0%**	14.1	0.0		-
57.5	**270.0**	**40%**	**353**	22.2	2.6	**61%**	14.1	2.2		582
62.5	**441.0**	**43%**	**378**	23.2	2.9	**62%**	14.1	2.4		1,064
67.5	**438.0**	**47%**	**415**	25.0	3.4	**64%**	14.1	2.8		1,247
72.5	**259.0**	**52%**	**456**	27.0	4.1	**67%**	14.1	3.4		877
77.5	**179.0**	**57%**	**501**	29.5	4.9	**70%**	14.1	4.1		728
82.5	**69.0**	**62%**	**551**	32.5	6.0	**74%**	14.1	4.9		340
87.5	**7.0**	**69%**	**606**	36.2	7.3	**78%**	14.1	6.0		42
92.5	**-**	**75%**	**665**	40.6	9.0	**82%**	0.0	7.4		-
97.5	**-**	**83%**	**731**	45.9	11.1	**87%**	0.0	9.2		-
102.5	**-**	**91%**	**804**	52.3	14.0	**93%**	0.0	11.5		-
107.5	**-**	**100%**	**883**	60.0	17.6	**100%**	0.0	14.6		-
	2,093	Unocc.						Unocc. kwh/year		4,880
	5,525	bin hours/year total						Total kWh / year		13,616

Pump Operation with ACCU-2 load

Pump Type: **Chilled Water**

$ 0.050 per kWh

Design Conditions:

	993	GPMdes
	68	ft Total Head (TH)
-	**15**	ft head minimum (Fixed Minimum Head)
	53	pipe losses (Variable Head)

	Existing	Proposed	
Minimum Flow:	**993**	**397**	GPM = 40% of GPMde
Motor Efficiency:	**93.0%**	**93.0%**	
Pump Efficiency:	**78.0%**	21.9	BHP design
		25.0	HP Nameplate
VSD Efficiency:		**97%**	
OA Lockout Temp:		**55**	°F

Bin Data for Buffalo, 65 hrs./week

Periods:	**Occupied**	**Unocc.**	
Approx. Flow Increment:	**9%**	**9%**	per bin
Unocc. flow is =	**100%**	of Occupied flow at design.	

Forumulae: FMH = Fixed Minimum Head

H2 = FMH + ((TH - FMH) x ((GPM2/GPMdes)^2))

BHP = (GPM2x H2) / (3960 x pump efficiency)

kW = BHP x 0.746 kW / Motor Eff / VFD Eff

Bin	Occupied	Percent	Occupied		New	% Speed	Occupied kW		Occupied kWh	
Temp	Hours	Flow	GPM2	Head H2	BHP	Occupied	Present	Proposed	Present	Proposed
(2.5)	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0		-
2.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0		-
7.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0		-
12.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0		-
17.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0		-
22.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0		-
27.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0		-
32.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0		-
37.5	**8.0**	**0%**	**-**	15.0	-	**0%**	17.6	0.0		-
42.5	**57.0**	**0%**	**-**	15.0	-	**0%**	17.6	0.0		-
47.5	**252.0**	**0%**	**-**	15.0	-	**0%**	17.6	0.0		-
52.5	**266.0**	**0%**	**-**	15.0	-	**0%**	17.6	0.0		-
57.5	**392.0**	**40%**	**397**	23.5	3.0	**59%**	17.6	2.5		979
62.5	**705.0**	**43%**	**425**	24.7	3.4	**60%**	17.6	2.8		1,982
67.5	**679.0**	**47%**	**467**	26.7	4.0	**63%**	17.6	3.3		2,268
72.5	**479.0**	**52%**	**513**	29.2	4.8	**65%**	17.6	4.0		1,918
77.5	**366.0**	**57%**	**564**	32.1	5.9	**69%**	17.6	4.8		1,773

82.5	**206.0**	**62%**	**620**	35.6	7.1	**72%**	17.6	5.9		1,218
87.5	**22.0**	**69%**	**681**	39.9	8.8	**77%**	17.6	7.3		160
92.5	**-**	**75%**	**748**	45.1	10.9	**81%**	0.0	9.0		-
97.5	**-**	**83%**	**822**	51.3	13.7	**87%**	0.0	11.3		-
102.5	**-**	**91%**	**904**	58.9	17.2	**93%**	0.0	14.2		-
107.5	**-**	**100%**	**993**	68.0	21.9	**100%**	0.0	18.1		-
	3,432	Occupied						Occupied kwh/year	-	10,298

Bin	Unocc.	Percent	Unocc.		New	% Speed	Unocc. kW		Unocc. kWh	
Temp	Hours	Flow	GPM2	Head H2	BHP	Unocc.	Present	Proposed	Present	Proposed
(2.5)	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0		-
2.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0		-
7.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0		-
12.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0		-
17.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0		-
22.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0		-
27.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0		-
32.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0		-
37.5	**6.0**	**0%**	**-**	15.0	-	**0%**	17.6	0.0		-
42.5	**46.0**	**0%**	**-**	15.0	-	**0%**	17.6	0.0		-
47.5	**193.0**	**0%**	**-**	15.0	-	**0%**	17.6	0.0		-
52.5	**185.0**	**0%**	**-**	15.0	-	**0%**	17.6	0.0		-
57.5	**270.0**	**40%**	**397**	23.5	3.0	**59%**	17.6	2.5		674
62.5	**441.0**	**43%**	**425**	24.7	3.4	**60%**	17.6	2.8		1,240
67.5	**438.0**	**47%**	**467**	26.7	4.0	**63%**	17.6	3.3		1,463
72.5	**259.0**	**52%**	**513**	29.2	4.8	**65%**	17.6	4.0		1,037
77.5	**179.0**	**57%**	**564**	32.1	5.9	**69%**	17.6	4.8		867
82.5	**69.0**	**62%**	**620**	35.6	7.1	**72%**	17.6	5.9		408
87.5	**7.0**	**69%**	**681**	39.9	8.8	**77%**	17.6	7.3		51
92.5	**-**	**75%**	**748**	45.1	10.9	**81%**	0.0	9.0		-
97.5	**-**	**83%**	**822**	51.3	13.7	**87%**	0.0	11.3		-
102.5	**-**	**91%**	**904**	58.9	17.2	**93%**	0.0	14.2		-
107.5	**-**	**100%**	**993**	68.0	21.9	**100%**	0.0	18.1		-
	2,093	Unocc.						Unocc. kwh/year	-	5,740
	5,525	bin hours/year total						Total kWh / year	-	16,039

CALCULATIONS FOR VENDING MACHINE OCCUPANCY CONTROL
FIM 7.36 Public Safety Campus

Electricity
Unit cost: **$ 0.050** /kwh

INPUT DATA:

Machine Type	Qty.	Volts	Amps	Present Operation Hrs/Day	Present Operation Days/Yr.	Machine Location is Occupied Hrs/Day	Machine Location is Occupied Days/Yr.
Refrigerated	**3**	**115**	**10.5**	**24**	**365**	**8**	**250**

* Lighting watts is included in the volt / amp data and Total kW

Lighting Savings						Present	Proposed
Machine Type	Lighting * Watts/ unit	Lighting Found	Ltg. Watts	Present Hrs/Yr.	Proposed Hrs/Yr.	Lighting kWh/yr.	Lighting kWh/Yr.
Refrigerated	**128**	**On**	384	8,760	2,845	3,364	1,092
						3,364	1,092

Compressor Savings						
	Duty Cycle		Compressor Hours		Present	Proposed
Compressor kW	Present Normal	Proposed Nite	Present Hrs/Yr.	Proposed Hrs/Yr.	Compressor kWh/yr.	Compressor kWh/Yr.
2.514	**33%**	**12.5%**	2,891	1,505	7,267	3,784
					7,267	3,784

CALCULATIONS:

Ltg kWh =Ltg Watts / 1000 x # units x Hrs per Day x Days per Yr
Compressor kWh=(volts x amps x 0.80 pf/ 1000 - ltg watts)x # units x hrs per day x days per yr x duty cycle

Ltg kWh with Control = Ltg watts per unit /1000 x # units x (Occ Hrs per Yr + Unocc Hrs x Nite Duty Cycle)
Prop Compressor Run Hours = Occ Hrs x Existing Duty Cycle + Unocc Hrs x Unocc Duty Cycle)
Compressor kWh with Control=(volts x amps x 0.80 pf -ltg watts)/1000 x # units x prop compressor hrs per yr

Electricity Cost Savings = Electricity Savings x Electricity Unit Cost

	Lighting	Compressor	Total	
Existing Annual Electricity Use:	3,364	7,267	10,631	kWh
Proposed Annual Electricity Use:	1,092	3,784	4,876	kWh
Total Annual Savings:	2,271	3,484	5,755	kWh
			54%	reduction

CALCULATIONS FOR IMPACT OF REDUCED LIGHTING ON HEATING AND AIR CONDITIONING

FIM 8.1

Client: Correctional Facility
Address: 11581 Walden Ave.

INPUT DATA:

	Heating Energy		Cooling Energy	
Fuel:	**Natural Gas**		**Electric**	
Units:	**mcf**		**kWh**	
Fuel Cost:	**$ 8.060**	per mcf	**$ 0.048**	per kWh
Fuel Conversion Factor:	**1,030,000**	Btu per mcf	**3,412**	Btu per kWh
Efficiency:	**89.0%**		**0.80**	kW/Ton
			90%	of building is air conditioned

	601,618	Lighting Retrofit
	55	Installing Sensors
Annual Lighting Savings:	**601,673**	kWh per Year
	12	months per year of lighting operation
	50,139	kwh/month

For **8** months/year the lighting retrofit will impact heating costs
20% of light fixtures are within 10 feet of an exterior wall
For **4** months/year the lighting retrofit will impact cooling costs

CALCULATIONS:

Replacement Natural Gas because of Reduced Lighting Energy

Useful Heat from Lights during the heating season that is no longer available is:

= kwh Lighting Savings per month x No. Months of Heating impact x % of fixtures located near exterior walls

= **80,223 kWh =** 273,720,921 BTU = 299 mcf

Replacement Natural Gas usage

Useful Heat from Lights in kwh x 3412 BTU/kwh / Heating Fuel Conversion Factor / Heating Fuel Efficiency

Replacement Natural Gas Cost = mcf x $per mcf

	Fuel Usage		Fuel Cost	
Useful Heat from Lights	80,223	kWh	n/a	
Replacement Gas	**(299)**	**mcf**		**per year**

Reduced Air Conditioning because of Reduced Lighting

Reduced Air Conditioning Lighting Load during the cooling season from Lighting that is no longer present is:

= kwh Lighting Savings per month x No. Months Lighting Retrofit will impact cooling costs x % of building cooled

= **180,502 kWh =** 615,872,073 BTU

Reduced Air Conditioning Energy Requirements [kWh] =

Reduce Air Conditioning Lighting Load x (3412 Btu / kWh) x (1 ton-hr / 12,000 Btu) x (0.8 kW / ton)

Reduced Air Conditioning Cost = Reduced Air Conditioning Energy Requirements x Cost per kWh

Reduced Air Conditioning Energy Requirements = 41,058 kWh per year
Reduced Air Conditioning Cost = per year

Net Impact on Heating and Air Conditioning Costs because of Lighting Retrofit

Heating Fuel	**(298.6)**	**mcf**
Cooling	**41,058**	**kWh per year**

Project: Erie County
Building: Correctional Facility
Date: 7/3/2019

Heating System Efficiency:	89%
Average Fuel Cost ($/unit):	$0.79
Correction Factor:	100%

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product
Single door sweeps	40	3	3/16	1/12	=	1.875
Single door perimeters	40	17	1/8	1/12	=	7.083333333
Double door sweeps & astragals	6	20	1/8	1/12	=	1.25
Double door perimeters	6	20	1/16	1/12	=	0.625
Garage doors	5	200	1/4	1/12	=	4.166666667
					Total =	15 ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
2160	50%	0.0299	72	34.25	0.0157	11.6	1944.395

Occupied Infiltration Savings

Specific Heat of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Occupied (%/week)	Heating Season Bin Hours (Occupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	1944.395	37.75	29.76%	4335	103000	89%	1115.630

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
2160	50%	0.0299	67	34.14	0.0157	11.6	1900.035

Unoccupied Infiltration Savings

Specific Hear of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Unoccupied (%/week)	Heating Season Bin Hours (Unoccupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	1900.035	32.86	70.24%	4301	103000	89%	2222.182

Totals

Units of Fuel per Year (units/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
3337.811	103000	9.708737864	343.794551

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
3337.81	$0.79	2620.645974

Total Cost Savings: **$2,620.65**
Cost to Retrofit: **$30,644.00**
Simple Payback: **11.69 years**

Project: Erie County
Building: Correctional Facility
Date: 7/3/2019

Cooling System Efficiency (kW/ton):	0.547
EER:	21.938
Average Fuel Cost ($/unit):	$0.06

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product
Single door sweeps	40	3	3/16	1/12	=	1.875
Single door perimeters	40	17	1/8	1/12	=	7.083333333
Double door sweeps & astragals	6	20	1/8	1/12	=	1.25
Double door perimeters	6	20	1/16	1/12	=	0.625
Garage door weather-stripping	5	200	1/4	1/12	=	4.166666667
					Total =	15 ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (°F)	Average Outdoor Air Temperature (°F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
2160	50%	0.0299	72	80.14	0.0157	11.6	1657.713

Occupied Infiltration Savings Ref: ASHRAE 2013 Fundamentals 18.13 (8)

Air Total Heat Factor C_t	Flow Rate (cfm) Q_{occ}	Average Outdoor Air Enthalpy h	Cooling Supply Air Enthalpy h	% Building Occupied	Cooling Season Bin Hours	% Building Area Cooled	Btu/hrs per Ton	Cooling (kWh)
4.50	1657.713	32	22.7	29.76%	1,122	100%	21,938	1267.12

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (°F)	Average Outdoor Air Temperature (°F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
2160	50%	0.0299	77	74.77	0.0157	11.6	1544.783

Unoccupied Infiltration Savings Ref: ASHRAE 2013 Fundamentals 18.13 (8)

Air Total Heat Factor C_t	Flow Rate (cfm) Q_{occ}	Average Outdoor Air Enthalpy h	Cooling Supply Air Enthalpy h	% Building Occupied	Cooling Season Bin Hours	% Building Area Cooled	Btu/hrs per Ton	Cooling (kWh)
4.50	1544.783	32	22.7	70.24%	449	100%	21,938	1115.272982

Totals

kWh per Year (kWh/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
2382.394	3,412	293.08	8.12872682

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
2382.39	$0.06	151.5098591

Total Cost Savings: **$151.51**
Cost to Retrofit: Cost carried on heating page
Simple Payback: **0.00 years**

CALCULATIONS FOR KITCHEN BOOSTER HEATER
FIM 8.11

Client: Correctional Facility
Address: 11581 Walden Ave.

INPUT DATA:

	Present Fuel		Proposed Fuel	
Fuel:	**Electric**		**Natural Gas**	
Units:	**kWh**		**MCF**	
Average Cost:		per kWh		per MCF
kw Demand cost:		per kW		
Connected Load:	**24**	kW		
Load Diversity:	**25%**			
Average kw dem	**5.4**	kW per month		
Months of demar	**12**	per year		
Fuel Conversion	**3,412**	Btu per kWh	**1,030,000**	Btu per MCF
Efficiency:	**100%**		**88%**	

Present Annual Fuel Consumption:

Energy:	Volts	Amps	PF	Phase
	208	**75.0**	**80%**	**3**

kW	**hours**	**kWh**
5.4	1,040	**5,620**

CALCULATIONS:

Present Annual Fuel Consumption (kwh):

Annual kWh = kW x Annual Hours

Proposed Annual Fuel Consumption =
{(Present Annual Fuel Consumption x Present Efficiency) / Proposed Efficiency)} x
(Present Fuel Conversion Factor / Proposed Fuel Conversion Factor)

Electric kWh Cost = (Annual kwh x Average Cost/kwh without Demand Charges)
Electric Demand Cost = (Avg monthly kw demand x Months of Demand x kw Demand cost)

Natural Gas Fuel Cost = Annual Fuel Consumption x $/MCF

	Annual Fuel Consumption		Annual Fuel Cost	
Present:	5,620	kWh	$ 0	kWh Usage
	65	kW	$ 0	kW Demand
		Present Total:	**$ 0**	
Proposed:	21	MCF	**$ 0**	
	Total Savings with Demand:		**$ 0**	**per year**

CALCULATIONS TO CLOSE VAV BY OCCUPANCY & SP RESET AHU 5&6

FIM 8.25 Correctional Facility

AHU Type **Mixed air VAV**

	Design	Present	Proposed	
Supply Air cfm	24,100	24,100	24,100	cfm @ 100% speed
Minimum OA cfm	**3,925**	**3,925**	**3,925**	cfm @ 100% speed
Estimated Min. OA %	**16%**			
Return Air Temp	**70** °F		**28.0** Btu/lb	
	Present		Proposed	
Discharge Air Temp	**55** °F		**55** °F	
	23.0 Btu/lb		**23.0** Btu/lb	

AHU	Design SA [cfm]	Design OA [cfm]	Actual OA [cfm]	Delta OA [cfm]	End of Duct S.P	Total S.P.
AHU 5	**9,450**	**1,150**	**1,150**	-	1.65	3.75
AHU 6	**14,650**	**2,775**	**2,775**	-	1.70	4.00
				-		
				-		
				-		
				-		
				-		
				-		
	24,100	3,925	3,925	-	1.68	3.90

		Units	$/unit	BTU/unit	Efficiency	EER		
Heating	Natural Gas	**mcf**	**$ 8.060**	**1,030,000**	**89%**			
Cooling	**Electricity**	**kwh**	**$ 0.048**	**3,412**	**3.52**	**12.0**	months /yr. demand	**12**

AHU Energy												Heating		Cooling	
Bin data for Buffalo, NY 24/7 occupied				**Present**				**Proposed**			**Proposed**	Present	Proposed	Present	Proposed
Bin Mid-Pt.	Enthalpy All Hours	Occupied Hours		Estim. Fan Speed	Net % OA	Mixed Air Temp	Occupied kBtuh	Estim. Fan Speed	Net % OA	Mixed Air Temp	Occupied kBtuh	mmBtu /year	mmBtu /year	mmBtu /year	mmBtu /year
-2.5	0.0	1		**60%**	27%	50.3	73	**58%**	28%	49.5	82	0	0	0	0
2.5	1.8	28		**61%**	27%	51.9	50	**58%**	28%	51.1	59	1	2	0	0
7.5	2.8	60		**61%**	27%	53.4	26	**59%**	28%	52.7	36	2	2	0	0
12.5	4.0	208		**62%**	26%	54.9	2	**59%**	27%	54.2	12	0	3	0	0
17.5	5.6	438		**62%**	29%	55.0	0	**60%**	29%	55.0	0	0	0	0	0
22.5	7.5	385		**63%**	32%	55.0	0	**61%**	32%	55.0	0	0	0	0	0
27.5	9.0	366		**64%**	35%	55.0	0	**61%**	35%	55.0	0	0	0	0	0
32.5	10.8	623		**64%**	40%	55.0	0	**62%**	40%	55.0	0	0	0	0	0
37.5	12.9	894		**65%**	46%	55.0	0	**62%**	46%	55.0	0	0	0	0	0
42.5	15.1	757		**66%**	55%	55.0	0	**63%**	55%	55.0	0	0	0	0	0
47.5	17.5	706		**66%**	67%	55.0	0	**64%**	67%	55.0	0	0	0	0	0
52.5	19.6	569		**67%**	86%	55.0	0	**64%**	86%	55.0	0	0	0	0	0
57.5	21.5	673		**68%**	100%	57.5	-44	**65%**	100%	57.5	-42	0	0	-30	-28
62.5	24.2	883		**72%**	100%	62.5	-97	**69%**	100%	62.5	-93	0	0	-86	-82
67.5	27.6	707		**75%**	100%	67.5	-374	**72%**	100%	67.5	-359	0	0	-265	-254
72.5	29.5	489		**78%**	21%	70.5	-115	**75%**	22%	70.5	-115	0	0	-56	-56
77.5	31.0	382		**82%**	20%	71.5	-142	**78%**	21%	71.6	-142	0	0	-54	-54
82.5	33.1	204		**85%**	19%	72.4	-179	**82%**	20%	72.5	-179	0	0	-37	-37
87.5	35.5	22		**88%**	18%	73.2	-220	**85%**	19%	73.4	-220	0	0	-5	-5
92.5	0.0	0		**92%**	18%	74.0	0	**88%**	18%	74.1	0	0	0	0	0
97.5	0.0	0		**96%**	17%	74.7	0	**92%**	18%	74.9	0	0	0	0	0
102.5	0.0	0		**100%**	16%	75.3	0	**96%**	17%	75.5	0	0	0	0	0
107.5	0.0	0		**100%**	16%	76.1	0	**96%**	17%	76.4	0	0	0	0	0
		8,395									mmBtu/yr.	4	6	-532	-517
											fuel units	4	7	44,324	43,058 kwh/yr.
													-3		1,266

Inputs to calculate savings for closing VAV boxes by occupancy sensors:

Present VAV box minimum position	**20%**	occ.
Percentage of VAV boxes closed based on occ. sensors		**20%**
Space temperature (reheat coil) setpoint		**68** °F

Bin Mid-Pt.	Enthalpy All Hours	Occupied Hours		Present SA cfm	VAV cfm Present	VAV cfm Proposed	Reheat kBtuh	Savings mmBtu /year
-2.5	0.0	1.0	0.0	14,460	578	-	8	0
2.5	1.8	28.0	0.0	14,605	584	-	8	0
7.5	2.8	60.0	0.0	14,751	590	-	8	0
12.5	4.0	208.0	0.0	14,898	596	-	8	2
17.5	5.6	438.0	0.0	15,047	602	-	8	4
22.5	7.5	385.0	0.0	15,198	608	-	9	3
27.5	9.0	366.0	0.0	15,350	614	-	9	3
32.5	10.8	623.0	0.0	15,503	620	-	9	5
37.5	12.9	894.0	0.0	15,658	626	-	9	8
42.5	15.1	757.0	0.0	15,815	633	-	9	7
47.5	17.5	706.0	0.0	15,973	639	-	9	6
52.5	19.6	569.0	0.0	16,133	645	-	9	5
57.5	21.5	673.0	0.0	16,294	652	-	9	6
62.5	24.2	883.0	0.0	17,385	695	-	10	9
67.5	27.6	707.0	0.0	18,110	724	-	10	7
72.5	29.5	489.0	0.0	18,864	755	-	11	5
77.5	31.0	382.0	0.0	19,650	786	-	11	4
82.5	33.1	204.0	0.0	20,469	819	-	11	2
87.5	35.5	22.0	0.0	21,322	853	-	12	0
92.5	0.0	0.0	0.0	22,211	888	-	12	-
97.5	0.0	0.0	0.0	23,136	925	-	13	-
102.5	0.0	0.0	0.0	24,100	964	-	14	-
107.5	0.0	0.0	0.0	24,100	964	-	14	-
		8,395	0				mmBtu/yr.	78
			8,395				fuel units	85.19 mcf

Summary of Savings for AHU, Reheat and Fan Power

	Heating Present mmBtu /yr.	Heating Proposed mmBtu /yr.	Cooling Present mmBtu /yr.	Cooling Proposed mmBtu /yr.	
mmBtu/yr.	4	6	-532	-517	at AHU
mmBtu/yr.	78	0			at reheat coils
			44,324	43,058	kwh AHU
			96,815	83,524	kwh fan power
fuel units	89.0	7.0	141,139	126,582	kwh/year
Total savings		**82 mcf**		**14,557 kwh**	
		$ 661		$ 699	**$ 1,360**
Demand Savings			**0.0**	**0.0**	
				0.0 kW	

Fan Power Calculations

Bin Mid-Pt.	Occupied Hours	Present SA cfm	Present SF SP	Present SF BHP	Present RF BHP	Present Fan kW	End of Duct SP	Proposed SA cfm	Proposed SF SP	Proposed SF BHP	Proposed RF BHP	Proposed Fan kW
-2.5	1.0	14,460	2	9.4	1.3	8.7	**1.30**	13,882	2	8.1	1.1	7.5
2.5	28.0	14,605	2	9.6	1.4	8.9	**1.32**	14,020	2	8.2	1.2	7.6
7.5	60.0	14,751	3	9.7	1.4	9.1	**1.34**	14,161	2	8.4	1.2	7.8
12.5	208.0	14,898	3	9.9	1.5	9.2	**1.35**	14,302	2	8.5	1.3	7.9
17.5	438.0	15,047	3	10.0	1.5	9.4	**1.37**	14,445	2	8.6	1.3	8.1
22.5	385.0	15,198	3	10.2	1.6	9.6	**1.39**	14,590	2	8.8	1.4	8.3
27.5	366.0	15,350	3	10.4	1.6	9.8	**1.41**	14,736	2	8.9	1.4	8.4
32.5	623.0	15,503	3	10.6	1.7	10.0	**1.43**	14,883	2	9.1	1.5	8.6
37.5	894.0	15,658	3	10.7	1.8	10.2	**1.44**	15,032	2	9.3	1.5	8.8
42.5	757.0	15,815	3	10.9	1.8	10.4	**1.46**	15,182	2	9.4	1.6	8.9
47.5	706.0	15,973	3	11.1	1.9	10.6	**1.48**	15,334	2	9.6	1.6	9.1
52.5	569.0	16,133	3	11.3	2.0	10.8	**1.50**	15,487	2	9.8	1.7	9.3
57.5	673.0	16,294	3	11.5	2.0	11.0	**1.52**	15,642	2	9.9	1.8	9.5

Inputs for Fan Power Reduction:

Static Pressure Reset?	**N**	**Y**	
	Present	Proposed	
Supply Air design cfm	**24,100**	**24,100**	cfm
Min OA for exhaust Fa	**3,925**	**3,925**	cfm
Return Air design cfm	**20,175**	**20,175**	cfm
End of Duct SP Setpoi	**1.68**	**1.48**	in. W.C.
Variable Static Pressu	**2.22**	**2.22**	in. W.C.
Total SF Static Pressu	**3.90**	**3.71**	in. W.C.
Fan efficiency (S&R)	**60%**	**60%**	

62.5	883.0	17,385	3	12.9	2.5	12.6	**1.54**	16,690	3	11.2	2.2	10.9	SF motor efficiency	**91.7%**	**91.7%**	
67.5	707.0	18,110	3	13.9	2.9	13.7	**1.55**	17,385	3	12.0	2.5	11.9	RF motor efficiency	**91.7%**	**91.7%**	
72.5	489.0	18,864	3	15.0	3.4	15.0	**1.57**	18,110	3	13.0	2.9	13.0	Total RF Static Pressu	**2.00**	**2.00**	in. W.C.
77.5	382.0	19,650	3	16.3	3.9	16.4	**1.59**	18,864	3	14.1	3.4	14.2	RF BHP	10.6	10.6	
82.5	204.0	20,469	3	17.6	4.5	18.0	**1.61**	19,650	3	15.3	3.9	15.6	SF speed - RF speed	**10%**	**10%**	
87.5	22.0	21,322	3	19.1	5.1	19.7	**1.63**	20,469	3	16.6	4.5	17.1				
92.5	0.0	22,211	4	20.8	5.9	21.7	**1.64**	21,322	3	18.0	5.1	18.8				
97.5	0.0	23,136	4	22.6	6.7	23.9	**1.66**	22,211	3	19.6	5.9	20.7				
102.5	0.0	24,100	4	24.7	7.7	26.3	**1.68**	23,136	4	21.4	6.7	22.9				
107.5	0.0	24,100	4	24.7	7.7	26.3	**1.68**	23,136	4	21.4	6.7	22.9				
					Present kwh/year	96,815					Proposed kwh/year	83,524		13,290	kwh Fan savings per year	

CALCULATIONS TO INSTALL PREMIUM EFFICIENCY MOTORS

FIM 8.32 Correctional Facility

DATA AND CALCULATIONS:

kWh:	$ 0.048	per kWh
Demand:	$ 6.75	per kW

Formula:

Demand kW = (Qty x HP x 0.746 kW/HP x % Load) / % Efficiency
Annual kWh = Demand kW x Annual Hours
Demand $ Savings = (Present kW - New kW) x months of demand x Monthly demand charge
kWh $ Savings = (Present kWh - New kWh) x Cost per kWh

		Motor			Motor Efficiency		Annual Motor Run Hours		Months of Demand
#	Description	Nominal HP	Qty	Loading vs. Nom.	Present	New	Existing	New	Savings
1	CHW Pumps P1/P2	15	1	75%	85.6%	91.7%	3,432	3,432	4
2	Compressor Lead/Lag	3	1	89%	82.5%	88.5%	1,752	1,752	12

		Total	Demand kW		Annual kWh		Motor	$ Savings	Cost
#	Description	BHP/	Present	New	Present	New	Type	Total	$
1	CHW Pumps P1/P2	11.3	9.80	9.15	33,648	31,410	TEFC		
2	Compressor Lead/Lag	2.7	2.41	2.25	4,230	3,943	TEFC		
		13.9	12.2	11.4	37,878	35,353			

ODP = open drip-proof
TEFC = totally enclosed fan-cooled

Peak KW Demand Savings:	0.8	kW
Annual KW Demand Savings:	4.6	kW
Annual kWh Savings:	2,525	kWh

CALCULATIONS FOR VENDING MACHINE OCCUPANCY CONTROL
FIM 8.36 Correctional Facility

Electricity
Unit cost: **$ 0.048** /kwh

INPUT DATA:

Machine Type	Qty.	Volts	Amps	Present Operation Hrs/Day	Present Operation Days/Yr.	Machine Location is Occupied Hrs/Day	Machine Location is Occupied Days/Yr.
Refrigerated	**1**	**120**	**11.5**	**24**	**365**	**8**	**365**
Refrigerated	**1**	**115**	**11.0**	**24**	**365**	**8**	**365**
Non Refrigerated	**1**	**115**	**3.0**	**24**	**365**	**8**	**365**

* Lighting watts is included in the volt / amp data and Total kW

Lighting Savings						Present	Proposed
Machine Type	Lighting * Watts/ unit	Lighting Found	Ltg. Watts	Present Hrs/Yr.	Proposed Hrs/Yr.	Lighting kWh/yr.	Lighting kWh/Yr.
Refrigerated	**64**	**On**	64	8,760	3,650	561	234
Refrigerated	**64**	**On**	64	8,760	3,650	561	234
Non Refrigerated	**28**	**On**	28	8,760	3,650	245	102
						1,367	569

Compressor Savings						
	Duty Cycle		Compressor Hours		Present	Proposed
Compressor kW	Present Normal	Proposed Nite	Present Hrs/Yr.	Proposed Hrs/Yr.	Compressor kWh/yr.	Compressor kWh/Yr.
1.040	**33%**	**12.5%**	2,891	1,694	3,006	1,761
0.948	**33%**	**12.5%**	2,891	1,694	2,740	1,606
					5,747	3,367

CALCULATIONS:

Ltg kWh =Ltg Watts / 1000 x # units x Hrs per Day x Days per Yr
Compressor kWh=(volts x amps x 0.80 pf/ 1000 - ltg watts)x # units x hrs per day x days per yr x duty cycle

Ltg kWh with Control = Ltg watts per unit /1000 x # units x (Occ Hrs per Yr + Unocc Hrs x Nite Duty Cycle)
Prop Compressor Run Hours = Occ Hrs x Existing Duty Cycle + Unocc Hrs x Unocc Duty Cycle)
Compressor kWh with Control=(volts x amps x 0.80 pf -ltg watts)/1000 x # units x prop compressor hrs per yr

Electricity Cost Savings = Electricity Savings x Electricity Unit Cost

	Lighting	Compressor	Total	
Existing Annual Electricity Use:	1,367	5,747	7,113	kWh
Proposed Annual Electricity Use:	569	3,367	3,936	kWh
Total Annual Savings:	797	2,380	3,177	kWh
			45%	reduction

CALCULATIONS TO OPEN TRIPLE DUTY VALVE
FIM 8.37

Client: Correctional Facility
Address: 11581 Walden Ave.

INPUT DATA:

Fuel:	**Electricity**	
kWh:	$ 0.048	per kWh
Demand:	$ 6.75	per kW
Months of Demand	**12**	per year
Operating Hours	**3,432**	hours per year

Pump Nameplate and Performance Data

	Model		
		77%	Pump Efficiency
Design Pump Flow		**1,704**	gallons per minute
		85	feet of water
		47.5	BHP at design
Motor Nameplate	HP	**50**	HP
	Efficiency	**94.5%**	

Balance Valve Data

Present Settir	**65%**	Open
Manufacturer	**Bell & Gossett**	
Model Numbe	**3DS-8S**	
Pattern		
Valve Δp at present setting	**11.0**	feet of water
Valve Δp when 100% open	**5.5**	feet of water
Valve Δp Savings	**5.5**	feet of water

CALCULATIONS:

HP = (GPM x Valve Δp) / (3960 x Pump Eff.)
kW = HP x 0.746 / (Motor Efficiency)
kWh = kW x Hours

	Existing	Proposed	Savings		
			Standard	Minimal Data	
Flow GPM	1,704	1,704		1,704	
Pump Efficiency	77%	77%		77%	
Motor Efficiency	94.5%	94.5%		94.5%	
Head	85	79.5			
Head Saved				5.5	
HP	47.5	44.4	3.1	3.1	HP
Monthly kW	37.5	35.1	2.43	2.43	kW
kWh	128,694	120,366	8,327	8,327	kWh

CALCULATIONS TO IMPROVE TEMP CONTROL 2ND FLOOR FIN

FIM 8.38 Correctional Facility

INPUT DATA: 3% of Building to be Setback

		Current	Proposed	
Heating T Setpoint:	Occupied	76	68	deg. F.
	Unoccupied	76	68	deg. F.
Cooling T Setpoint:	Occupied	76	80	deg. F.
	Unoccupied	76	80	deg. F.
HVAC Schedule	Occupied	168.0	168.0	Hours per week
	Unoccupied	0.0	0.0	Hours per week
Q internal gains:	Occupied	58,610	58,610	Btuh
	Unoccupied	11,310	11,310	Btuh
Q internal gains:	Schedule	126	126	Hours per week
BLC:	Occupied	2,875	2,875	Btuh/deg. F.
	Unoccupied	3,085	3,085	Btuh/deg. F.

Fuel Data	Heating	Cooling		
Type:	Natural Gas	Electricity		
Units:	**mcf**	kwh		
Unit cost:	**$ 8.060**	$ 0.05		
BTU/unit	**1,030,000**	3,412		
Efficiency/ COP:	**89.0%**	3.52	COP, = EER	12.0

CALCULATIONS:

Current — Buffalo, 168 hrs./week

Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use mcf	Cooling Energy kwh
(2.5)	1	0	178,868	230,843	0	
2.5	28	3	164,495	215,419	6	
7.5	60	2	150,122	199,995	10	
12.5	208	11	135,749	184,572	33	
17.5	438	20	121,377	169,148	62	
22.5	385	15	107,004	153,724	47	
27.5	366	20	92,631	138,300	40	
32.5	623	24	78,258	122,877	56	
37.5	894	42	63,885	107,453	67	
42.5	757	37	49,512	92,029	45	
47.5	706	39	35,140	76,605	30	
52.5	569	24	20,767	61,182	14	
57.5	673	29	6,394	45,758	6	
62.5	883	52	(7,979)	30,334	2	
67.5	707	30	(22,352)	14,910	0	
72.5	489	10	(36,725)	(513)	0	
77.5	382	5	(51,097)	(15,937)	0	
82.5	204	2	(65,470)	(31,361)	0	
87.5	22	0	(79,843)	(46,785)	0	
92.5	0	0	(94,216)	(62,208)	0	
97.5	0	0	(108,589)	(77,632)	0	
102.5	0	0	(122,961)	(93,056)	0	
107.5	0	0	(137,334)	(108,480)	0	
	8,760	hours			420	0

Proposed		Buffalo, 168 hrs./week				
Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use	Cooling Energy kwh
(2.5)	1	0	155,871	206,165	0	
2.5	28	3	141,499	190,741	5	
7.5	60	2	127,126	175,317	9	
12.5	208	11	112,753	159,894	28	
17.5	438	20	98,380	144,470	50	
22.5	385	15	84,007	129,046	37	
27.5	366	20	69,634	113,622	30	
32.5	623	24	55,262	98,199	40	
37.5	894	42	40,889	82,775	44	
42.5	757	37	26,516	67,351	25	
47.5	706	39	12,143	51,927	12	
52.5	569	24	(2,230)	36,504	1	
57.5	673	29	(16,603)	21,080	1	
62.5	883	52	(30,975)	5,656	0	
67.5	707	30	(45,348)	(9,768)	0	
72.5	489	10	(46,785)	(11,310)	0	
77.5	382	5	(46,785)	(11,310)	0	
82.5	204	2	(53,972)	(19,022)	0	
87.5	22	0	(68,345)	(34,446)	0	
92.5	0	0	(82,718)	(49,869)	0	
97.5	0	0	(97,090)	(65,293)	0	
102.5	0	0	(111,463)	(80,717)	0	
107.5	0	0	(125,836)	(96,141)	0	
	8,760	hours			281	0

		Present	Proposed	Savings
Heating	mcf	420	281	139
Cooling	kwh	0	0	0

CALCULATIONS TO EXTEND DDC TO DHW PUMPS

FIM 8.40 Correctional Facility

	DHW Fuel		Pump	
Type:	**Natural Gas**		**Electricity**	
Units:	**mcf**		**kwh**	
Unit cost:	$ 8.060	/mcf	**$ 0.048**	$/kWh
Heat Content of Fuel:	1,030,000	Btu/mcf		
Combustion Efficiency:	**89.0%**			

INPUT

Building Conditioned Floor Area	Schedule	hrs/week	Wks/yr	Hrs/yr.
208,280 sq.ft.	Heating	**112**	**42**	4,704
	Non-heating	**112**	**10**	1,120
				5,824

Electricity Savings for DHW Recirculation Pumps

Formula:

kwh = HP x % Loading x 0.746 kw per HP / motor efficiency x Qty. x Hours

Motor Description	Motor HP	Qty	Motor Loading	Motor Type	Motor y	Annual Hours Present	Annual Hours Proposed	Annual kWh Present	Annual kWh Proposed
Kitchen	**1/6**	**1**	70%	Std.	45.0%	8,760	5,824	1,694	1,126
Rest of bldg	**1 1/2**	**1**	70%	Std.	78.5%	8,760	5,824	8,741	5,811
								10,435	6,938

Thermal Savings for DHW Recirculation Pumps

Motor Description	Motor GPM	Recirc ΔT	DHW Eff.	DHW Losses Btuh	Annual Hours Present	Annual Hours Proposed	Annual mcf Present	Annual mcf Proposed
Kitchen	**5**	1.0	89%	2,499	8,760	5,824	24	16
Rest of bldg	**45**	1.0	89%	22,491	8,760	5,824	215	143
							239	159

Formulae:

DHW Losses = GPM x Recirc ΔT x 60 min per hour x 8.33 lbs per gallon

Annual MMBtu = DHW Losses / DHW Efficiency x Annual Hours / heat content of fuel

Recirc ΔT = temperature drop between DHW leaving boiler room and returning recirculation DHW

Pump Power Savings	3,498	kwh
DHW Fuel Savings	80	mcf

CALCULATIONS FOR VARIABLE SPEED DRIVE ON HOT WATER PUMPS
FIM 8.43 Correctional Facility

Pump Type: **Hot Water**

$ 0.048 per kWh

	Existing	Proposed	
Minimum Flow:	**85**	**34**	GPM = 40% of GPMdes
Motor Efficiency:	**87.5%**	**89.5%**	
Pump Efficiency:	**60.0%**	2.0	BHP design
		5.0	HP Nameplate
VSD Efficiency:		**97%**	
OA Lockout Temp:		**55**	°F

Design Conditions:

85 GPMdes
56 ft Total Head (TH)
- **15** ft head minimum (Fixed Minimum Head)
41 pipe losses (Variable Head)

Bin Data for Buffalo, 168 hrs./week

Periods: **Occupied** **Unocc.**
Approx. Flow Increment: **8%** **8%** per bin
Unocc. flow is = **100%** of Occupied flow at design.

Forumulae:
FMH = Fixed Minimum Head
H2 = FMH + ((TH - FMH) x ((GPM2/GPMdes)^2))
BHP = (GPM2x H2) / (3960 x pump efficiency)
kW = BHP x 0.746 kW / Motor Eff / VFD Eff

Bin	Occupied	Percent	Occupied		New	% Speed	Occupied kW		Occupied kWh	
Temp	Hours	Flow	GPM2	Head H2	BHP	Occupied	Present	Proposed	Present	Proposed
(2.5)	**1.0**	**100%**	**85**	56.0	2.0	**100%**	1.7	1.7	2	2
2.5	**31.0**	**92%**	**78**	49.7	1.6	**94%**	1.7	1.4	53	44
7.5	**62.0**	**85%**	**72**	44.4	1.3	**89%**	1.7	1.2	106	72
12.5	**219.0**	**78%**	**66**	39.9	1.1	**84%**	1.7	1.0	374	209
17.5	**458.0**	**72%**	**61**	36.0	0.9	**80%**	1.7	0.8	783	364
22.5	**400.0**	**66%**	**56**	32.8	0.8	**77%**	1.7	0.7	684	266
27.5	**386.0**	**61%**	**52**	30.1	0.7	**73%**	1.7	0.6	660	216
32.5	**647.0**	**56%**	**47**	27.8	0.6	**70%**	1.7	0.5	1,106	308
37.5	**925.0**	**51%**	**44**	25.8	0.5	**68%**	1.7	0.4	1,582	377
42.5	**729.0**	**47%**	**40**	24.1	0.4	**66%**	1.7	0.4	1,246	255
47.5	**481.0**	**43%**	**37**	22.7	0.4	**64%**	1.7	0.3	822	146
52.5	**338.0**	**40%**	**34**	21.6	0.3	**62%**	1.7	0.3	578	90
57.5	**316.0**	**0%**	**-**	15.0	-	**0%**	1.7	0.0	-	-
62.5	**259.0**	**0%**	**-**	15.0	-	**0%**	1.7	0.0	-	-
67.5	**78.0**	**0%**	**-**	15.0	-	**0%**	1.7	0.0	-	-
72.5	**45.0**	**0%**	**-**	15.0	-	**0%**	1.7	0.0	-	-
77.5	**44.0**	**0%**	**-**	15.0	-	**0%**	1.7	0.0	-	-
82.5	**5.0**	**0%**	**-**	15.0	-	**0%**	1.7	0.0	-	-
87.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
92.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
97.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
102.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
107.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
	5,424	Occupied						Occupied kwh/year	7,997	2,347

Bin	Unocc.	Percent	Unocc.		New	% Speed	Unocc. kW		Unocc. kWh	
Temp	Hours	Flow	GPM2	Head H2	BHP	Unocc.	Present	Proposed	Present	Proposed
(2.5)	**-**	**100%**	**85**	56.0	2.0	**100%**	0.0	1.7	-	-
2.5	**3.0**	**92%**	**78**	49.7	1.6	**94%**	1.7	1.4	5	4
7.5	**2.0**	**85%**	**72**	44.4	1.3	**89%**	1.7	1.2	3	2
12.5	**11.0**	**78%**	**66**	39.9	1.1	**84%**	1.7	1.0	19	10
17.5	**20.0**	**72%**	**61**	36.0	0.9	**80%**	1.7	0.8	34	16
22.5	**15.0**	**66%**	**56**	32.8	0.8	**77%**	1.7	0.7	26	10
27.5	**20.0**	**61%**	**52**	30.1	0.7	**73%**	1.7	0.6	34	11
32.5	**24.0**	**56%**	**47**	27.8	0.6	**70%**	1.7	0.5	41	11
37.5	**42.0**	**51%**	**44**	25.8	0.5	**68%**	1.7	0.4	72	17
42.5	**34.0**	**47%**	**40**	24.1	0.4	**66%**	1.7	0.4	58	12
47.5	**20.0**	**43%**	**37**	22.7	0.4	**64%**	1.7	0.3	34	6
52.5	**10.0**	**40%**	**34**	21.6	0.3	**62%**	1.7	0.3	17	3
57.5	**14.0**	**0%**	**-**	15.0	-	**0%**	1.7	0.0	-	-
62.5	**10.0**	**0%**	**-**	15.0	-	**0%**	1.7	0.0	-	-
67.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
72.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
77.5	**1.0**	**0%**	**-**	15.0	-	**0%**	1.7	0.0	-	-
82.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
87.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
92.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
97.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
102.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
107.5	**-**	**0%**	**-**	15.0	-	**0%**	0.0	0.0	-	-
	226	Unocc.						Unocc. kwh/year	344	103
	5,650	bin hours/year total						Total kWh / year	8,341	2,450

5,890 kWh savings

CALCULATIONS TO VENTILATE BASED ON OCCUPANCY AHU 7

FIM 8.45

Client: Correctional Facility
Address: 11581 Walden Ave.

DATA:

	Occupied	Unoccupied	
T Setpoint:	**70**	**70**	degrees F
Q internal gains:	**1,743,902**	**336,520**	Btuh
BLC:	**85,531**	**91,784**	Btuh/degree F
T Balance:	49.6	66.3	degrees F

T Balance = T Setpoint - (Q internal gains / BLC)

Fuel Information

Type:	**Natural Gas**	
Units:	**mcf**	
Unit cost:	**$ 8.060**	/mcf
CF1:	**1,030,000**	Btu/mcf
Efficiency:	**89%**	
CF2	1.085	Btu/hr-deg F-cfm

Ventilation Information *Percentage of Hours*

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
100% Occupied	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**
80% Occupied	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**
60% Occupied	**20%**	**0%**	**0%**	**0%**	**0%**	**0%**
40% Occupied	**20%**	**0%**	**0%**	**0%**	**0%**	**0%**
20% Occupied	**20%**	**0%**	**0%**	**0%**	**0%**	**0%**
Unoccupied	**40%**	**100%**	**100%**	**100%**	**100%**	**100%**
Average Occupancy	**24%**	**0%**	**0%**	**0%**	**0%**	**0%**

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	**Totals**
Tag:	**AHU-7**						
Supply Air Flow:	**16,250**						
Existing Outdoor Air Flow:	**1,950**						
Proposed Outdoor Air Flow:	468	0	0	0	0	0	
# Units	**1**	**0**	**0**	**0**	**0**	**0**	
Existing OA Flow:	1,950	0	0	0	0	0	**1,950**
Proposed OA Flow:	468	0	0	0	0	0	**468**
Net Change in OA:	1,482	0	0	0	0	0	**1,482**

Current Hours of Ventilation **168** occupied hours per week or **100%** of Occupied Bin Hours
and **100%** of Unoccupied Bin Hours

Bin Data for Buffalo, 168 hrs./week

Bin Data is based on 168 occupied hours per week

Winter	T Setpoint	T Balance	Accum Hours	Average O.A. Temp below T Balance	Temp Difference (T Set- Avg OAT)
Occupied	70	49.6	**4,466**	**33.4**	36.6
Unoccupied	70	66.3	**318**	**42.0**	28.0

CALCULATIONS:

Energy Usage = (CFM Present - CFM Proposed) x Accumulated Hours x Duty Cycle x Temp Diff x CF2
Energy Cost = (Energy Usage / CF1) x (Unit cost / Efficiency)

Winter	Energy Savings (Btu/year)	Fuel Savings (mcf/year)	Fuel Savings ($/year)
Occupied	263,112,131	287	
Unoccupied	14,318,973	16	
Annual Savings:	277,431,104	303	

CALCULATIONS FOR IMPACT OF REDUCED LIGHTING ON HEATING AND AIR CONDITIONING

FIM 9.1

Client: Law Library
Address: 77 West Eagle

INPUT DATA:

	Heating Energy		Cooling Energy	
Fuel:	**Natural Gas**		**Electric**	
Units:	**mcf**		**kWh**	
Fuel Cost:	**$ 5.692**	per mcf	**$ 0.049**	per kWh
Fuel Conversion Factor:	**1,030,000**	Btu per mcf	**3,412**	Btu per kWh
Efficiency:	**81.6%**		**1.15**	kW/Ton
			90%	of building is air conditioned

	53,524	Lighting Retrofit
	212	Installing Sensors
Annual Lighting Savings:	**53,736**	kWh per Year
	12	months per year of lighting operation
	4,478	kwh/month

For **8** months/year the lighting retrofit will impact heating costs
20% of light fixtures are within 10 feet of an exterior wall
For **4** months/year the lighting retrofit will impact cooling costs

CALCULATIONS:

Replacement Natural Gas because of Reduced Lighting Energy

Useful Heat from Lights during the heating season that is no longer available is:

= kwh Lighting Savings per month x No. Months of Heating impact x % of fixtures located near exterior walls

= **7,165 kWh =** 24,446,298 BTU = 29 mcf

Replacement Natural Gas usage

Useful Heat from Lights in kwh x 3412 BTU/kwh / Heating Fuel Conversion Factor / Heating Fuel Efficiency

Replacement Natural Gas Cost = mcf x $per mcf

	Fuel Usage		Fuel Cost
Useful Heat from Lights	7,165	kWh	n/a
Replacement Gas	**(29)**	**mcf**	

Reduced Air Conditioning because of Reduced Lighting

Reduced Air Conditioning Lighting Load during the cooling season from Lighting that is no longer present is:

= kwh Lighting Savings per month x No. Months Lighting Retrofit will impact cooling costs x % of building cooled

= **16,121 kWh =** 55,004,170 BTU

Reduced Air Conditioning Energy Requirements [kWh] =

Reduce Air Conditioning Lighting Load x (3412 Btu / kWh) x (1 ton-hr / 12,000 Btu) x (1.14649681528662 kW / ton)

Reduced Air Conditioning Cost = Reduced Air Conditioning Energy Requirements x Cost per kWh

Reduced Air Conditioning Energy Requirements = 5,255 kWh per year
Reduced Air Conditioning Cost =

Net Impact on Heating and Air Conditioning Costs because of Lighting Retrofit

Heating Fuel	**(29.1)**	**mcf**
Cooling	**5,255**	**kWh per year**

Project: Erie County
Building: Law Library
Date: 7/3/2019

Heating System Efficiency:	82%
Average Fuel Cost ($/unit):	$0.55
Correction Factor:	100%

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product
Single door sweeps	4	3	3/16	1/12	=	0.1875
Single door perimeters	4	17	1/8	1/12	=	0.708333333
Double door sweeps & astragals	1	20	3/16	1/12	=	0.3125
Double door perimeters	1	20	1/16	1/12	=	0.104166667
Roof top ventilators	2	8	1/6	1/12	=	0.111111111
Window caulking	59	1734	1/32	1/12	=	4.515625
					Total =	5.939236111

*assume roof fans open during occupied hours

ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
839.25	50%	0.0449	72	34.25	0.006	11.6	663.795

Occupied Infiltration Savings

Specific Heat of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Occupied (%/week)	Heating Season Bin Hours (Occupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	663.795	37.75	29.76%	4335	103000	82%	415.403

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
855.25	50%	0.0449	67	34.14	0.006	11.6	646.092

Unoccupied Infiltration Savings

Specific Hear of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Unoccupied (%/week)	Heating Season Bin Hours (Unoccupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	646.092	32.86	70.24%	4301	103000	82%	824.162

Totals

Units of Fuel per Year (units/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
1239.565	103000	9.708737864	127.675144

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
1239.56	$0.55	684.9613719

Total Cost Savings: **$684.96**
Cost to Retrofit: **$7,255.00**
Simple Payback: **10.59 years**

Project: Erie County
Building: Law Library
Date: 7/3/2019

Cooling System Efficiency (kW/ton):	1.160
EFF:	10.345
Average Fuel Cost ($/unit):	$0.10

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product	
Single door sweeps	4	3	3/16	1/12	=	0.1875	
Single door perimeters	4	17	1/8	1/12	=	0.708333333	
Double door sweeps & astragals	1	20	3/16	1/12	=	0.3125	
Double door perimeters	1	20	1/16	1/12	=	0.104166667	
Roof top ventilator sealing	2	8	1/6	1/12	=	0.111111111	*assume roof fans open during occupied hours
Window caulking	59	1734	1/32	1/12	=	4.515625	
					Total =	5.939236111	ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot °F)$) C_s	Indoor Air Temperature (°F)	Average Outdoor Air Temperature (°F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
839.25	50%	0.0449	72	80.14	0.006	11.6	454.446

Occupied Infiltration Savings Ref: ASHRAE 2013 Fundamentals 18.13 (8)

Air Total Heat Factor C_t	Flow Rate (cfm) Q_{occ}	Average Outdoor Air Enthalpy h	Cooling Supply Air Enthalpy h	% Building Occupied	Cooling Season Bin Hours	% Building Area Cooled	Btu/hrs per Ton	Cooling (kWh)
4.50	454.446	32	22.7	29.76%	1,122	100%	10,345	736.65

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot °F)$) C_s	Indoor Air Temperature (°F)	Average Outdoor Air Temperature (°F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
855.25	50%	0.0449	77	74.77	0.006	11.6	359.620

Unoccupied Infiltration Savings Ref: ASHRAE 2013 Fundamentals 18.13 (8)

Air Total Heat Factor C_t	Flow Rate (cfm) Q_{occ}	Average Outdoor Air Enthalpy h	Cooling Supply Air Enthalpy h	% Building Occupied	Cooling Season Bin Hours	% Building Area Cooled	Btu/hrs per Ton	Cooling (kWh)
4.50	359.620	32	22.7	70.24%	449	100%	10,345	550.590408

Totals

kWh per Year (kWh/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
1287.240	3,412	293.08	4.392063647

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
1287.24	$0.10	126.149542

Total Cost Savings: **$126.15**
Cost to Retrofit: Cost carried on heating page
Simple Payback: **0.00 years**

CALCULATIONS TO INSTALL MORE EFFICIENT BOILER

FIM 9.31 Law Library

INPUT DATA:

Present Annual Fuel Consumption	1,031	mcfs
Adjusted Annual Heating Fuel Consumption:	936	mcfs
% of Building Served by Boiler	11%	
Boiler Fuel Use	105	mcfs

Adjustments for Other Measures:

Fuel Savings	
124	Weatherization
(29)	Lighting Interaction
0	
0	
0	
95	0

Fuel Data	**Present**		**Proposed**	
Type:	Natural Gas		Natural Gas	
Units:	mcf		mcf	
Unit cost:	$ 5.692	/mcf	$ 5.692	/mcf
BTU/Unit	1,030,000	Btu/mcf	1,030,000	Btu/mcf

Boiler Type	**Present**		**Proposed**	
Boiler Firing Rate	1,000	kBtuh Input	300	kBtuh Input
Combustion Efficiency	81.6%		90.0%	
Jacket Losses	1.0%	of capacity	0.5%	of capacity
Boiler Capacity	**806**	kBtuh Output	**269**	kBtuh Output
Off-cycle Flue Losses	0.9%	of capacity	0.5%	of capacity
Boiler is hot when OAT<	65	°F.	65	°F.
Hours/ Yr. Unit is Hot	5,252	hrs.	5,252	hrs.
Off-Cycle Hours/Year	5,144	hrs.	5,193	hrs.
Standby Losses	42	MBtu	7	MBtu
Off-Cycle Flue Losses	37	MBtu	7	MBtu
Useful Heat Output	9	MBtu	9	MBtu

CALCULATIONS:

Off-Cycle Flue Losses = Boiler kBtuh Output x 1000 x % Off-Cycle Flue Losses x Hrs Off-Cycle per Year / 1,000,000
Jacket Losses = Boiler kBtuh Output x 1000 x % Jacket Losses x Hrs Hot per Year / 1,000,000
Useful Heat Output = Htg Fuel Use x BTU per Unit x Present Efficiency / 1,000,000 - Off Cycle Losses - Jacket Losses
Proposed Annual Fuel Consumption =
(Proposed Standby Losses + Useful Heat Output) / Proposed Efficiency x 1,000,000 / BTU per Unit

	Annual Fuel Consumption		Annual Cost
Present:	105	mcf	
Proposed:	25	mcf	
Annual Savings:	81	mcf	$ 0

CALCULATIONS TO REPLACE ROOFTOP UNITS

FIM 9.25 Law Library

kWh:	$ 0.049	per kWh
Demand:	$ 11.89	per kW
months /yr. demand:	5	

INPUT DATA

Select City Closest to Site	Select Closest Facility Type:
Buffalo	Small Office

Location or Area Served

Unit Tag	RTU-1	RTU-2	RTU-3	RTU-4	
tons/unit	**15**	**15**	**25**	**10**	
# of Units	**1**	**1**	**1**	**1**	
Unit Type (AC or HP)	HP	AC	AC	AC	AC
Present Efficiency EER *	10.4	10.8	9.8	11.0	11.1
Present Efficiency SEER *	10.5	11.0	9.9	11.2	13.0
Air Side Economizer?	N	N	N	N	N

Proposed Efficiency EER ***	12.1	12.1	10.6	12.4	0.0
Proposed Efficiency SEER ***	14.0	14.0	12.4	14.7	15.0
Air Side Economizer?	Y	Y	Y	Y	N
Equivalent Full Load Hours/yr.	522	hrs/yr			
Economizer savings kwh/ton	195	195	195	195	-
Coincidence Factor CF **	0.80				

CALCULATIONS:

						Sum
Present kwh/year	8,949	8,542	15,818	5,593	-	38,901
Proposed kwh/year	6,711	6,711	12,629	4,261	-	30,313
Efficiency ΔkWh =	2,237	1,830	3,189	1,332	0	8,588
Economizer ΔkWh =	2,925	2,925	4,875	1,950	-	12,675
Demand Savings						
Present kW (peak)	13.8	13.3	24.5	8.7	-	60.4
Proposed kW (peak)	11.9	11.9	22.6	7.7	-	54.2
ΔkW =	1.9	1.4	1.8	1.0	-	6.2

FORMULAE:

New York Standard Approach for Estimating Energy Savings-Residential, Multi-Family and Commercial/Industrial Measures:

ΔkWh eff = units x tons/unit x (12/SEERbase-12/SEERee) x EFLHcooling

ΔkWh econ = units x tons/unit x kwh economizer savings per ton (from Tech Manual Appendix J)

ΔkW = units x tons/unit x (12/EERbase-12/EERee) x CF

EFLHcool = Annual kWhcooling/kWpeak cooling without economizer (from Appendix G)

** Present EER and SEER are based on Tech Manual Baseline assumptions*

***CF Assumes all HVAC systems will not be operating at the same time*

**** Proposed EER and SEER are based on Existing Facilities Program requirements as of 4/1/2014*

Existing Energy Consumption	38,901	kwh/yr	60.4	kW peak
Proposed Energy Consumption	17,638	kwh/yr	54.2	kW peak
Annual Energy Savings	21,263	kwh/yr	6.2	kW peak

CALCULATIONS TO VENTILATE BASED ON OCCUPANCY

FIM 9.45

Client: Law Library
Address: 77 West Eagle

DATA:

	Occupied	Unoccupied				
T Setpoint:	**65**	**60**	degrees F	**Fuel Information**		
Q internal gains:	**245,291**	**10,859**	Btuh	Type:	**Natural Gas**	
BLC:	**12,663**	**8,323**	Btuh/degree F	Units:	**mcf**	
T Balance:	45.6	58.7	degrees F	Unit cost:	**$ 5.692**	/mcf
T Balance = T Setpoint - (Q internal gains / BLC)				CF1:	**1,030,000**	Btu/mcf
				Efficiency:	**81.6%**	
				CF2	1.085	Btu/hr-deg F-cfm

Ventilation Information *Percentage of Hours*

	RTU-1	RTU-2	RTU-3	RTU-4		
100% Occupied	**20%**	**0%**	**0%**	**0%**	**100%**	**100%**
80% Occupied	**30%**	**0%**	**0%**	**0%**	**0%**	**0%**
60% Occupied	**20%**	**10%**	**10%**	**10%**	**0%**	**0%**
40% Occupied	**20%**	**30%**	**30%**	**30%**	**0%**	**0%**
20% Occupied	**0%**	**40%**	**40%**	**40%**	**0%**	**0%**
Unoccupied	**10%**	**20%**	**20%**	**20%**	**0%**	**0%**
Average Occupancy	**64%**	**26%**	**26%**	**26%**	**100%**	**100%**

	RTU-1	RTU-2	RTU-3	RTU-4			**Totals**
Tag:	**Basement**	**First Floor**	**2nd/3rd Floor**	**3rd Flr. Library**			
Supply Air Flow:	**6,025**	**6,000**	**9,600**	**4,000**			
Existing Outdoor Air Flow:	**1,500**	**1,500**	**2,400**	**1,000**			
Proposed Outdoor Air Flow:	960	390	624	260	0	0	
# Units	**1**	**1**	**1**	**1**	**0**	**0**	
Existing OA Flow:	1,500	1,500	2,400	1,000	0	0	**6,400**
Proposed OA Flow:	960	390	624	260	0	0	**2,234**
Net Change in OA:	540	1,110	1,776	740	0	0	**4,166**

Current Hours of Ventilation **40** occupied hours per week or **80%** of Occupied Bin Hours
and **0%** of Unoccupied Bin Hours

Bin Data for Buffalo, 50 hrs./week

Bin Data is based on 50 occupied hours per week

Winter	T Setpoint	T Balance	Accum Hours	Average O.A. Temp below T Balance	Temp Difference (T Set- Avg OAT)
Occupied	65	45.6	**1,066**	**30.7**	34.3
Unoccupied	60	58.7	**4,397**	**38.2**	21.8

CALCULATIONS:

Energy Usage = (CFM Present - CFM Proposed) x Accumulated Hours x Duty Cycle x Temp Diff x CF2
Energy Cost = (Energy Usage / CF1) x (Unit cost / Efficiency)

Winter	Energy Savings (Btu/year)	Fuel Savings (mcf/year)	Fuel Savings ($/year)
Occupied	132,204,177	157	
Unoccupied	0	0	
Annual Savings:	132,204,177	157	

CALCULATIONS TO EXTEND DDC TO DHW PUMPS

FIM 9.40 Law Library

	DHW Fuel		Pump	
Type:	**Natural Gas**		**Electricity**	
Units:	**mcf**		**kwh**	
Unit cost:	$ 5.692	/mcf	**$ 0.049**	$/kWh
Heat Content of Fuel:	1,030,000	Btu/mcf		
Combustion Efficiency:	**81.6%**			

INPUT

Building Conditioned Floor Area	Schedule	hrs/week	Wks/yr	Hrs/yr.
29,338 sq.ft.	Heating	**50**	**42**	2,100
	Non-heating	**50**	**10**	500
				2,600

Electricity Savings for DHW Recirculation Pumps

Formula:

kwh = HP x % Loading x 0.746 kw per HP / motor efficiency x Qty. x Hours

Motor Description	Motor HP	Qty	Motor Loading	Motor Type	Motor y	Annual Hours Present	Annual Hours Proposed	Annual kWh Present	Annual kWh Proposed
DHW Recirc	**1/6**	**1**	70%	Std.	45.0%	8,760	2,600	1,694	503
								1,694	503

Thermal Savings for DHW Recirculation Pumps

Motor Description	Motor GPM	Recirc ΔT	DHW Eff.	DHW Losses Btuh	Annual Hours Present	Annual Hours Proposed	Annual mcf Present	Annual mcf Proposed
DHW Recirc	**5**	1.0	82%	2,499	8,760	2,600	26	8
							26	8

Formulae:

DHW Losses = GPM x Recirc ΔT x 60 min per hour x 8.33 lbs per gallon

Annual MMBtu = DHW Losses / DHW Efficiency x Annual Hours / heat content of fuel

Recirc ΔT = temperature drop between DHW leaving boiler room and returning recirculation DHW

Pump Power Savings	1,191	kwh
DHW Fuel Savings	18	mcf

CALCULATIONS FOR IMPACT OF REDUCED LIGHTING ON HEATING AND AIR CONDITIONING

FIM 10.1

Client: Aurora Highway
Address: 119 Ellicott Road

INPUT DATA:

	Heating Energy		Cooling Energy	
Fuel:	**Natural Gas**		**Electric**	
Units:	**mcf**		**kWh**	
Fuel Cost:	**$ 5.438**	per mcf	**$ 0.047**	per kWh
Fuel Conversion Factor:	**1,030,000**	Btu per mcf	**3,412**	Btu per kWh
Efficiency:	**80.0%**		**1.10**	kW/Ton
			10%	of building is air conditioned

	72,921	Lighting Retrofit
	14,025	Installing Sensors
Annual Lighting Savings:	**86,946**	kWh per Year
	12	months per year of lighting operation
	7,245	kwh/month

For **8** months/year the lighting retrofit will impact heating costs
20% of light fixtures are within 10 feet of an exterior wall
For **4** months/year the lighting retrofit will impact cooling costs

CALCULATIONS:

Replacement Natural Gas because of Reduced Lighting Energy

Useful Heat from Lights during the heating season that is no longer available is:

= kwh Lighting Savings per month x No. Months of Heating impact x % of fixtures located near exterior walls

= **11,593 kWh =** 39,554,543 BTU = 48 mcf

Replacement Natural Gas usage

Useful Heat from Lights in kwh x 3412 BTU/kwh / Heating Fuel Conversion Factor / Heating Fuel Efficiency

Replacement Natural Gas Cost = mcf x $per mcf

	Fuel Usage		Fuel Cost
Useful Heat from Lights	11,593	kWh	n/a
Replacement Gas	**(48)**	**mcf**	

Reduced Air Conditioning because of Reduced Lighting

Reduced Air Conditioning Lighting Load during the cooling season from Lighting that is no longer present is:

= kwh Lighting Savings per month x No. Months Lighting Retrofit will impact cooling costs x % of building coole

= **2,867 kWh =** 9,783,295 BTU

Reduced Air Conditioning Energy Requirements [kWh] =

Reduce Air Conditioning Lighting Load x (3412 Btu / kWh) x (1 ton-hr / 12,000 Btu) x (1.1 kW / ton)

Reduced Air Conditioning Cost = Reduced Air Conditioning Energy Requirements x Cost per kWh

Reduced Air Conditioning Energy Requiremer **897 kWh per year**
Reduced Air Conditioning Cost =

Net Impact on Heating and Air Conditioning Costs because of Lighting Retrofit

Heating Fuel	**(48.0)**	**mcf**
Cooling	**897**	**Wh per year**

Project: Erie County
Building: Aurora Barn
Date: 7/3/2019

Heating System Efficiency:	80%
Average Fuel Cost ($/unit):	$0.53
Correction Factor:	100%

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product
Single door sweeps	8	3	3/16	1/12	=	0.375
Single door perimeters	8	17	1/8	1/12	=	1.416666667
Double door sweeps & astragals	2	20	3/16	1/12	=	0.625
Double door perimeters	2	20	1/8	1/12	=	0.416666667
Garage doors	9	507	1/4	1/12	=	10.5625
Roof top ventilators	14	104	1/6	1/12	=	1.444444444
Roof/wall joint	1	1042	1/8	1/12	=	10.85416667
Bulkhead	2	15	3/16	1/12	=	0.234375
Vertical wall joint	1	5	3/16	1/12	=	0.078125
Block wall opening	1	4	12	1/12	=	4
					Total =	30.00694444

*assume roof fans open during occupied hours

ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
4113	50%	0.015	72	34.25	0.0092	11.6	2762.303

Occupied Infiltration Savings

Specific Heat of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Occupied (%/week)	Heating Season Bin Hours (Occupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	2762.303	37.75	29.76%	4335	103000	80%	1763.221

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
4321	50%	0.015	67	34.14	0.0092	11.6	2842.394

Unoccupied Infiltration Savings

Specific Hear of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Unoccupied (%/week)	Heating Season Bin Hours (Unoccupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	2842.394	32.86	70.24%	4301	103000	80%	3698.301

Totals

Units of Fuel per Year (units/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
5461.523	103000	9.708737864	562.5368237

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
5461.52	$0.53	2883.575471

Total Cost Savings: **$2,883.58**
Cost to Retrofit: **$40,177.00**
Simple Payback: **13.93 years**

CALCULATIONS TO INSTALL VENTILATION CONTROLS

FIM 10.6 Aurora Highway

INPUT DATA:

Exhaust Fans to be controlled

	Present	Proposed	
Occupied	250	250	cfm
Occupied	84	40	hrs./week
Unoccupied	84	128	hrs./week
Heat Recovery	0%	0%	
HP	0.50	0.50	BHP
T Setpoint:	61	61	degrees F
	28.2	28.2	btu/Lb enthalpy

FUEL DATA:

Type:	Natural Gas	Electricity	
Units:	mcf	kwh	
Unit cost:	$ 5.438	$ 0.047	/unit
Heat Content:	1,030,000	3,412	Btu/unit
Efficiency:	80.0%	3.81	
		13.0	EER

CALCULATIONS:

Bin Mid-Pt.	Enthalpy	Present Hours	Proposed Hours	Present kBtu	Proposed kBtu	Present Fan kWh	Proposed Fan kWh
(2.5)	0.0	1	0	9	4	0	0
2.5	1.8	16	7	246	117	6	3
7.5	2.8	31	15	449	214	12	6
12.5	4.0	110	52	1,440	685	41	19
17.5	5.6	229	109	2,701	1,286	85	41
22.5	7.5	200	95	2,089	995	75	36
27.5	9.0	193	92	1,756	836	72	34
32.5	10.8	324	154	2,506	1,193	121	57
37.5	12.9	468	223	2,994	1,425	175	83
42.5	15.1	397	189	2,003	954	148	71
47.5	17.5	373	177	1,377	656	139	66
52.5	19.6	297	141	696	331	111	53
57.5	21.5	351	167	350	167	131	62
62.5	24.2	468	223	-165	-79	174	83
67.5	27.6	369	175	-628	-299	137	65
72.5	29.5	250	119	-374	-178	93	44
77.5	31.0	194	92	-618	-294	72	34
82.5	33.1	103	49	-572	-272	38	18
87.5	35.5	11	5	-90	-43	4	2
92.5	0.0	0	0	0	0	0	0
97.5	0.0	0	0	0	0	0	0
102.5	0.0	0	0	0	0	0	0
107.5	0.0	0	0	0	0	0	0
		4,380	2,086	Present	Proposed		
	Heating Energy	kBtu		18,615	8,864		
	Cooling energy	kBtu		(2,447)	(1,165)	Savings	Savings
	Heating Fuel		mcf	23	11	12	
	Cooling energy		kwh	188	90	99	
	Fan energy		kwh	1,634	778	856	
			kwh	1,822	868	954	

CALCULATIONS FOR INSTALLING CONDENSING UNIT HEATERS
FIM 10.26

Client: Aurora Highway
Address: 119 Ellicott Road

Type: **Natural Gas**
Units: **mcf**
Unit cost: **$ 5.438** /mcf
Heat Content of Fuel **1,030,000** Btu/mcf

INPUT DATA:

Present Annual Fuel Consumption:

	1,603	mcf	Total heating fuel use
	6.4%	of building served by theseUnit Heaters	
	103	mcf	Unit Heaters fuel use

Efficiencies

Present:	**80.0%**	thermal efficiency
Proposed:	**93.0%**	thermal efficiency
Number of Unit Heaters:	**2**	

CALCULATIONS:

Proposed Annual Fuel Consumption =
(Present Annual Fuel Consumption x Present Efficiency) / Proposed Efficiency

	Annual Fuel Consumption (mcf)
Present:	103
Proposed:	89

Annual Savings: 14

CALCULATIONS FOR VENDING MACHINE OCCUPANCY CONTROL
FIM 10.36 Aurora Highway

Electricity
Unit cost: **$ 0.047** /kwh

INPUT DATA:

Machine Type	Qty.	Volts	Amps	Present Operation Hrs/Day	Present Operation Days/Yr.	Machine Location is Occupied Hrs/Day	Machine Location is Occupied Days/Yr.
Refrigerated	**1**	**115**	**11.0**	**24**	**365**	**6**	**260**
Non Refrigerated	**1**	**120**	**3.0**	**24**	**365**	**6**	**260**

* Lighting watts is included in the volt / amp data and Total kW

Lighting Savings							
Machine Type	Lighting * Watts/ unit	Lighting Found	Ltg. Watts	Present Hrs/Yr.	Proposed Hrs/Yr.	Present Lighting kWh/yr.	Proposed Lighting kWh/Yr.
Refrigerated	**128**	**Off**	0	0	0	0	0
Non Refrigerated	**14**	**On**	14	8,760	2,460	123	34
						123	34

Compressor Savings						
Compressor kW	Duty Cycle Present Normal	Duty Cycle Proposed Nite	Compressor Hours Present Hrs/Yr.	Compressor Hours Proposed Hrs/Yr.	Present Compressor kWh/yr.	Proposed Compressor kWh/Yr.
0.884	**33%**	**12.5%**	2,891	1,415	2,555	1,251
					2,555	1,251

CALCULATIONS:

Ltg kWh =Ltg Watts / 1000 x # units x Hrs per Day x Days per Yr
Compressor kWh=(volts x amps x 0.80 pf/ 1000 - ltg watts)x # units x hrs per day x days per yr x duty cycle

Ltg kWh with Control = Ltg watts per unit /1000 x # units x (Occ Hrs per Yr + Unocc Hrs x Nite Duty Cycle)
Prop Compressor Run Hours = Occ Hrs x Existing Duty Cycle + Unocc Hrs x Unocc Duty Cycle)
Compressor kWh with Control=(volts x amps x 0.80 pf -ltg watts)/1000 x # units x prop compressor hrs per yr

Electricity Cost Savings = Electricity Savings x Electricity Unit Cost

	Lighting	Compressor	Total	
Existing Annual Electricity Use:	123	2,555	2,678	kWh
Proposed Annual Electricity Use:	34	1,251	1,285	kWh
Total Annual Savings:	88	1,305	1,393	kWh
			52%	reduction

CALCULATIONS TO IMPROVE TEMPERATURE CONTROL

FIM 10.38 Aurora Highway

INPUT DATA: 91% of Building to be Setback

		Current	Proposed	
Heating T Setpoint:	Occupied	60	55	deg. F.
	Unoccupied	60	55	deg. F.
Cooling T Setpoint:	Occupied	89	89	deg. F.
	Unoccupied	89	89	deg. F.
HVAC Schedule	Occupied	40.0	40.0	Hours per week
	Unoccupied	128.0	128.0	Hours per week
Q internal gains:	Occupied	157,345	157,345	Btuh
	Unoccupied	27,168	27,168	Btuh
Q internal gains:	Schedule	56	56	Hours per week
BLC:	Occupied	10,610	10,610	Btuh/deg. F.
	Unoccupied	11,734	11,734	Btuh/deg. F.

Fuel Data	Heating	Cooling		
Type:	Natural Gas	Electricity		
Units:	**mcf**	kwh		
Unit cost:	**$ 5.438**	$ 0.05		
BTU/unit	**1,030,000**	3,412		
Efficiency/ COP:	**80.0%**	3.81	COP, = EER	13.0

CALCULATIONS:

Current — Buffalo, 40 hrs./week

Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use mcf	Cooling Energy kwh
(2.5)	0	1	505,756	689,932	1	
2.5	7	24	452,708	631,262	22	
7.5	13	49	399,660	572,592	40	
12.5	41	178	346,612	513,923	128	
17.5	117	341	293,564	455,253	230	
22.5	94	306	240,516	396,583	175	
27.5	75	311	187,468	337,913	145	
32.5	142	505	134,420	279,244	194	
37.5	185	751	81,371	220,574	219	
42.5	187	607	28,323	161,904	126	
47.5	141	604	(24,725)	103,234	76	
52.5	110	483	(77,773)	44,564	26	
57.5	152	550	(130,821)	(14,105)	0	
62.5	243	692	(157,345)	(43,440)	0	
67.5	184	553	(157,345)	(43,440)	0	
72.5	154	345	(157,345)	(43,440)	0	
77.5	145	242	(157,345)	(43,440)	0	
82.5	85	121	(157,345)	(43,440)	0	
87.5	13	9	(157,345)	(43,440)	0	
92.5	0	0	(195,528)	(85,669)	0	
97.5	0	0	(248,576)	(144,339)	0	
102.5	0	0	(301,624)	(203,009)	0	
107.5	0	0	(354,672)	(261,679)	0	
	8,760	hours			1,382	0

Proposed		Buffalo, 40 hrs./week				
Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use	Cooling Energy kwh
(2.5)	0	1	452,708	631,262	1	
2.5	7	24	399,660	572,592	20	
7.5	13	49	346,612	513,923	36	
12.5	41	178	293,564	455,253	113	
17.5	117	341	240,516	396,583	198	
22.5	94	306	187,468	337,913	147	
27.5	75	311	134,420	279,244	118	
32.5	142	505	81,371	220,574	149	
37.5	185	751	28,323	161,904	154	
42.5	187	607	(24,725)	103,234	76	
47.5	141	604	(77,773)	44,564	33	
52.5	110	483	(130,821)	(14,105)	0	
57.5	152	550	(157,345)	(43,440)	0	
62.5	243	692	(157,345)	(43,440)	0	
67.5	184	553	(157,345)	(43,440)	0	
72.5	154	345	(157,345)	(43,440)	0	
77.5	145	242	(157,345)	(43,440)	0	
82.5	85	121	(157,345)	(43,440)	0	
87.5	13	9	(157,345)	(43,440)	0	
92.5	0	0	(195,528)	(85,669)	0	
97.5	0	0	(248,576)	(144,339)	0	
102.5	0	0	(301,624)	(203,009)	0	
107.5	0	0	(354,672)	(261,679)	0	
	8,760	hours			1,044	0

		Present	Proposed	Savings
Heating	mcf	1,382	1,044	338
Cooling	kwh	0	0	0
Annual Energy $				

CALCULATIONS FOR IMPACT OF REDUCED LIGHTING ON HEATING AND AIR CONDITIONING

FIM 12/14.1

Client: County Court & Old County Hall
Address: 25 Delaware & 92 Franklin

INPUT DATA:

	Heating Energy		Cooling Energy	
Fuel:	**Natural Gas**		**Electric**	
Units:	**mcf**		**kWh**	
Fuel Cost:	**$ 3.736**	per mcf	**$ 0.053**	per kWh
Fuel Conversion Factor:	**1,030,000**	Btu per mcf	**3,412**	Btu per kWh
Efficiency:	**85.0%**		**0.595**	kW/Ton
			90%	of building is air conditioned

	667,990	Lighting Retrofit
	35,826	Installing Sensors
Annual Lighting Savings:	**703,816**	kWh per Year
	12	months per year of lighting operation
	58,651	kwh/month

For **8** months/year the lighting retrofit will impact heating costs
20% of light fixtures are within 10 feet of an exterior wall
For **4** months/year the lighting retrofit will impact cooling costs

CALCULATIONS:

Replacement Natural Gas because of Reduced Lighting Energy

Useful Heat from Lights during the heating season that is no longer available is:

= kwh Lighting Savings per month x No. Months of Heating impact x % of fixtures located near exterior walls

= **93,842 kWh =** 320,189,503 BTU = 366 mcf

Replacement Natural Gas usage

Useful Heat from Lights in kwh x 3412 BTU/kwh / Heating Fuel Conversion Factor / Heating Fuel Efficiency

Replacement Natural Gas Cost = mcf x $per mcf

	Fuel Usage		Fuel Cost	
Useful Heat from Lights	93,842	kWh	n/a	
Replacement Electricity	**(366)**	**mcf**		**per year**

Reduced Air Conditioning because of Reduced Lighting

Reduced Air Conditioning Lighting Load during the cooling season from Lighting that is no longer present is:

= kwh Lighting Savings per month x No. Months Lighting Retrofit will impact cooling costs x % of building cooled

= **211,145 kWh =** 720,426,381 BTU

Reduced Air Conditioning Energy Requirements [kWh] =

Reduce Air Conditioning Lighting Load x (3412 Btu / kWh) x (1 ton-hr / 12,000 Btu) x (0.595 kW / ton)

Reduced Air Conditioning Cost = Reduced Air Conditioning Energy Requirements x Cost per kWh

Reduced Air Conditioning Energy Requirements = 35,721 kWh per year
Reduced Air Conditioning Cost = per year

Net Impact on Heating and Air Conditioning Costs because of Lighting Retrofit

Heating Fuel	**(365.7)**	**mcf**
Cooling	**35,721**	**kWh per year**

Project: Erie County
Building: Old County Hall/County Court (Annex)
Date: 7/3/2019

Heating System Efficiency:	80%
Average Fuel Cost ($/unit):	$0.45
Correction Factor:	100%

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product
Single door sweeps	9	3	1/4	1/12	=	0.5625
Single door perimeters	9	17	1/8	1/12	=	1.59375
Double door sweeps & astragals	3	20	1/4	1/12	=	1.25
Double door perimeters	3	20	1/8	1/12	=	0.625
Garage doors	2	50	1/2	1/12	=	4.166666667
Stairwell doors	16	20	1/8	0	=	0
Turbine roof vents	4	2	6	1/12	=	4
					Total =	12.19791667 ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
1756.5	50%	0.11008	72	34.25	0.01025	11.6	2066.177

Occupied Infiltration Savings

Specific Heat of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Occupied (%/week)	Heating Season Bin Hours (Occupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	2066.177	37.75	29.76%	4335	103000	80%	1318.873

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
1756.5	50%	0.11008	67	34.14	0.01025	11.6	1963.133

Unoccupied Infiltration Savings

Specific Hear of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Unoccupied (%/week)	Heating Season Bin Hours (Unoccupied)	Fuel Heating Value Btu's/therm	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	1963.133	32.86	70.24%	4301	103000	80%	2554.276

Totals

Units of Fuel per Year (units/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
3873.149	103000	9.708737864	398.9343645

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
3873.15	$0.45	1730.227595

Total Cost Savings: **$1,730.23**
Cost to Retrofit: **$11,960.00**
Simple Payback: **6.91 years**

Project: Erie County
Building: Old County Hall/County Court (Annex)
Date: 7/3/2019

Cooling System Efficiency (kW/ton):	0.595
EFF:	20.168
Average Fuel Cost ($/unit):	$0.08

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product
Single door sweeps	9	3	1/4	1/12	=	0.5625
Single door perimeters	9	17	1/8	1/12	=	1.59375
Double door sweeps & astragals	3	20	1/4	1/12	=	1.25
Double door perimeters	3	20	1/8	1/12	=	0.625
Garage doors	2	50	1/2	1/12	=	4.166666667
Stairwell doors	16	20	1/8	0	=	0
Turbine roof vents	4	2	6	1/12	=	4
					Total =	12.19791667 ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
1756.5	50%	0.11008	72	80.14	0.01025	11.6	1324.758

Occupied Infiltration Savings Ref: ASHRAE 2013 Fundamentals 18.13 (8)

Air Total Heat Factor C_t	Flow Rate (cfm) Q_{occ}	Average Outdoor Air Enthalpy h	Cooling Supply Air Enthalpy h	% Building Occupied	Cooling Season Bin Hours	% Building Area Cooled	Btu/hrs per Ton	Cooling (kWh)
4.50	1324.758	32	22.7	29.76%	1,122	100%	20,168	1101.48

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
1756.5	50%	0.11008	77	74.77	0.01025	11.6	935.145

Unoccupied Infiltration Savings Ref: ASHRAE 2013 Fundamentals 18.13 (8)

Air Total Heat Factor C_t	Flow Rate (cfm) Q_{occ}	Average Outdoor Air Enthalpy h	Cooling Supply Air Enthalpy h	% Building Occupied	Cooling Season Bin Hours	% Building Area Cooled	Btu/hrs per Ton	Cooling (kWh)
4.50	935.145	32	22.7	70.24%	449	100%	20,168	734.3824711

Totals

kWh per Year (kWh/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
1835.858	3,412	293.08	6.26394759

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
1835.86	$0.08	152.3762163

Total Cost Savings: **$152.38**
Cost to Retrofit: Cost carried on heating page
Simple Payback: **0.00 years**

CALCULATIONS FOR OPTIMAL START
FIM 12/14.14

County Court & Old County Hall
25 Delaware & 92 Franklin

Fuel Information

	Heating			
Type:	**Natural Gas**	Type:	**Electricity**	
Units:	**mcf**	Units:	**kwh**	
Unit cost:	**$ 3.736**	Unit cost:	**$ 0.053**	/kwh
Heat Content of Fuel	**1,030,000**			
Heating Efficiency	**85%**			

Building Balance Temperature	**62**	°F.
Current operating schedule begins	**75**	minutes before occupancy
	5	days per week
	6	hours per week
	5.4%	of unoccupied bin hours
On a design day optimal start requires	**75**	minutes before occupancy
Heating Schedules	51	hours per week

BUFFALO INT'L AR, NY 8am-5pm M-F, Sep 25-May 15

Fan HP impacted by Optimal Start:

	HVAC	Exhaust	
	3	**1**	HP
Motor	**80%**	**80%**	Loading
	82%	**70%**	Efficiency
	2.18	0.75	kW
Present Warmup	On	On	
Proposed Warmup	On	Off	

Ventilation CFM impacted by Optimal Star	**1,500**	cfm OA
Envelope Loads impacted by Optimal Star	76,225	btu/hr./°F.
Occupied Setpoint	**70**	°F.
Unoccupied Setpoint	**60**	°F.

All Bin	Occ. Hours	Unocc. Hours	Hours of warm-up Present	Hours of warm-up Proposed		Ventilation MBH	Ventilation Mbtu Present	Ventilation Mbtu Proposed	Envelope Mbtu Present	Envelope Mbtu Proposed	Motor kWh Present	Motor kWh Proposed
(12.5)	0.0	0.0	0.0	100%	0.0	133,650	0.0	0.0	0.0	0.0	0	0
(7.5)	0.0	0.0	0.0	93%	0.0	125,550	0.0	0.0	0.0	0.0	0	0
(2.5)	0.0	0.0	0.0	87%	0.0	117,450	0.0	0.0	0.0	0.0	0	0
2.5	0.0	0.0	0.0	80%	0.0	109,350	0.0	0.0	0.0	0.0	0	0
7.5	0.0	9.0	0.5	73%	0.4	101,250	0.0	0.0	2.3	2.2	1	1
12.5	2.0	19.0	1.0	67%	0.7	93,150	0.1	0.0	4.5	4.2	3	1
17.5	20.0	92.0	4.9	60%	3.0	85,050	0.4	0.0	19.7	18.2	14	6
22.5	55.0	168.0	9.0	53%	4.8	76,950	0.7	0.0	32.6	29.4	26	10
27.5	63.0	203.0	10.9	47%	5.1	68,850	0.7	0.0	35.2	30.8	32	11
32.5	136.0	390.0	20.9	40%	8.4	60,750	1.3	0.0	59.7	50.1	61	18
37.5	320.0	725.0	38.8	33%	12.9	52,650	2.0	0.0	96.1	76.4	114	28
42.5	299.0	631.0	33.8	27%	9.0	44,550	1.5	0.0	70.8	51.9	99	20
47.5	199.0	338.0	18.1	20%	3.6	36,450	0.7	0.0	31.0	20.0	53	8
52.5	169.0	479.0	25.6	13%	3.4	28,350	0.7	0.0	34.2	17.3	75	7
57.5	206.0	379.0	20.3	7%	1.4	20,250	0.4	0.0	19.3	4.9	59	3
62.5	161.0	231.0	12.4	0%	0.0	12,150	0.2	0.0	7.1	(2.4)	36	0
67.5	104.0	83.0	4.4	0%	0.0	4,050	0.0	0.0	0.8	(2.5)	13	0
72.5	54.0	16.0	0.9	0%	0.0	(4,050)	(0.0)	0.0	(0.2)	(0.8)	3	0
77.5	15.0	1.0	0.1	0%	0.0	(12,150)	(0.0)	0.0	(0.0)	(0.1)	0	0
82.5	1.0	0.0	0.0	0%	0.0	(20,250)	0.0	0.0	0.0	0.0	0	0
87.5	0.0	0.0	0.0	0%	0.0	(28,350)	0.0	0.0	0.0	0.0	0	0
92.5	0.0	0.0	0.0	0%	0.0	(36,450)	0.0	0.0	0.0	0.0	0	0
97.5	0.0	0.0	0.0	0%	0.0	(44,550)	0.0	0.0	0.0	0.0	0	0
	1,804	3,764	201		53		8.8	0.0	413	300	590	115

	Present	Proposed		Savings	
BTU at point of use	421.9	299.6	Mbtu	122.3	Mbtu sav.
Fuel	481.9	342.2	mcf	139.7	mcf
Electricity	590	115	kWh	476	kwh

CALCULATIONS TO OLD COUNTY HALL CLOSE VAV BY OCCUPANCY & SP RESET

FIM 12.25 County Court & Old County Hall

AHU Type **Mixed air VAV**

	Design	Present	Proposed	
Supply Air cfm	131,031	131,031	131,031	cfm @ 100% speed
Minimum OA cfm	**32,758**	**23,562**	**23,562**	cfm @ 100% speed
Estimated Min. OA %	**25%**			
Return Air Temp	**70** °F		**28.0** Btu/lb	
	Present		Proposed	
Discharge Air Temp	**55** °F		**55** °F	
	23.0 Btu/lb		**23.0** Btu/lb	

AHU	Design SA [cfm]	Design OA [cfm]	Actual OA [cfm]	Delta OA [cfm]	End of Duct S.P	Total S.P.
1st East	**14,299**	**3,575**	**3,575**		2.5	5.63
1st West	**16,585**	**4,146**	**4,146**		2.0	4.50
2nd East	**13,681**	**3,420**	**3,420**		2.0	4.50
2nd West	**15,390**	**3,848**	**3,848**		2.0	4.50
3rd NE	**5,587**	**1,397**	**1,397**		2.0	4.50
3rd NW	**6,891**	**1,723**	**1,723**		1.7	3.83
3rd SE	**9,073**	**2,268**	**2,268**		1.0	2.25
3rd SW	**7,639**	**1,910**	**1,910**		2.0	4.50
4th NE	**5,104**	**1,276**	**1,276**		2.0	4.50
4th NW	**8,645**	**2,161**	**2,161**		1.8	3.94
4th SE	**5,173**	**1,293**	**1,293**		2.0	4.50
4th SW	**6,730**	**1,683**	**1,683**		2.0	4.50
Ground N	**6,395**	**1,599**	**1,599**		1.5	3.38
Ground S	**9,840**	**2,460**	**2,460**		2.0	4.50
	131,031	32,758	32,758	-	1.93	4.34

		Units	$/unit	BTU/unit	Efficiency	EER		
Heating	Natural Gas	**mcf**	**$ 3.736**	**1,030,000**	**85%**			
Cooling	**Electricity**	**kwh**	**$ 0.053**	**3,412**	**5.91**	**20.2**	months /yr. demand	**12**

AHU Energy												Heating		Cooling	
Bin data for Buffalo, NY 24/7 occupied				**Present**				**Proposed**			**Proposed**	Present	Proposed	Present	Proposed
Bin Mid-Pt.	Enthalpy All Hours	Occupied Hours		Estim. Fan Speed	Net % OA	Mixed Air Temp	Occupied kBtuh	Estim. Fan Speed	Net % OA	Mixed Air Temp	Occupied kBtuh	mmBtu /year	mmBtu /year	mmBtu /year	mmBtu /year
-2.5	0.0	0		**60%**	30%	48.3	0	**58%**	31%	47.4	0	0	0	0	0
2.5	1.8	7		**61%**	30%	50.0	431	**58%**	31%	49.1	483	3	3	0	0
7.5	2.8	15		**61%**	29%	51.6	291	**59%**	31%	50.9	343	4	5	0	0
12.5	4.0	47		**62%**	29%	53.3	151	**59%**	30%	52.6	203	7	10	0	0
17.5	5.6	145		**62%**	29%	54.9	11	**60%**	30%	54.2	64	2	9	0	0
22.5	7.5	121		**63%**	32%	55.0	0	**61%**	32%	55.0	0	0	0	0	0
27.5	9.0	92		**64%**	35%	55.0	0	**61%**	35%	55.0	0	0	0	0	0
32.5	10.8	179		**64%**	40%	55.0	0	**62%**	40%	55.0	0	0	0	0	0
37.5	12.9	229		**65%**	46%	55.0	0	**62%**	46%	55.0	0	0	0	0	0
42.5	15.1	231		**66%**	55%	55.0	0	**63%**	55%	55.0	0	0	0	0	0
47.5	17.5	181		**66%**	67%	55.0	0	**64%**	67%	55.0	0	0	0	0	0
52.5	19.6	129		**67%**	86%	55.0	0	**64%**	86%	55.0	0	0	0	0	0
57.5	21.5	201		**68%**	100%	57.5	-239	**65%**	100%	57.5	-230	0	0	-48	-46
62.5	24.2	297		**72%**	100%	62.5	-527	**69%**	100%	62.5	-506	0	0	-156	-150
67.5	27.6	218		**75%**	100%	67.5	-2,036	**72%**	100%	67.5	-1,954	0	0	-444	-426
72.5	29.5	195		**78%**	23%	70.6	-692	**75%**	24%	70.6	-692	0	0	-135	-135
77.5	31.0	185		**82%**	22%	71.7	-852	**78%**	23%	71.7	-852	0	0	-158	-158
82.5	33.1	123		**85%**	21%	72.6	-1,075	**82%**	22%	72.8	-1,075	0	0	-132	-132
87.5	35.5	15		**88%**	20%	73.6	-1,321	**85%**	21%	73.7	-1,321	0	0	-20	-20

92.5	0.0	0		**92%**	20%	74.4	0	**88%**	20%	74.6	0	0	0	0	0	
97.5	0.0	0		**96%**	19%	75.2	0	**92%**	20%	75.4	0	0	0	0	0	
102.5	0.0	0		**100%**	18%	75.8	0	**96%**	19%	76.1	0	0	0	0	0	
107.5	0.0	0		**100%**	18%	76.7	0	**96%**	19%	77.0	0	0	0	0	0	
		2,610									mmBtu/yr.	16	27	-1,093	-1,067	
											fuel units	18	31	54,197	52,911	kwh/yr.
													-13		1,286	

Inputs to calculate savings for closing VAV boxes by occupancy sensors:

Present VAV box minimum position	**20%**	occ.
Percentage of VAV boxes closed based on occ. sensors	**20%**	
Space temperature (reheat coil) setpoint	**68**	°F

				Present	VAV cfm		Reheat	Savings
Bin Mid-Pt.	Enthalpy All Hours	Occupied Hours		SA cfm	Present	Proposed	kBtuh	mmBtu /year
-2.5	0.0	0.0	0.0	78,618	3,145	-	44	-
2.5	1.8	7.0	0.0	79,405	3,176	-	45	0
7.5	2.8	15.0	0.0	80,199	3,208	-	45	1
12.5	4.0	47.0	0.0	81,001	3,240	-	45	2
17.5	5.6	145.0	0.0	81,811	3,272	-	46	7
22.5	7.5	121.0	0.0	82,629	3,305	-	46	6
27.5	9.0	92.0	0.0	83,455	3,338	-	47	4
32.5	10.8	179.0	0.0	84,290	3,372	-	47	8
37.5	12.9	229.0	0.0	85,133	3,405	-	48	11
42.5	15.1	231.0	0.0	85,984	3,439	-	48	11
47.5	17.5	181.0	0.0	86,844	3,474	-	49	9
52.5	19.6	129.0	0.0	87,712	3,508	-	49	6
57.5	21.5	201.0	0.0	88,589	3,544	-	50	10
62.5	24.2	297.0	0.0	94,524	3,781	-	53	16
67.5	27.6	218.0	0.0	98,463	3,939	-	55	12
72.5	29.5	195.0	0.0	102,565	4,103	-	58	11
77.5	31.0	185.0	0.0	106,839	4,274	-	60	11
82.5	33.1	123.0	0.0	111,291	4,452	-	63	8
87.5	35.5	15.0	0.0	115,928	4,637	-	65	1
92.5	0.0	0.0	0.0	120,758	4,830	-	68	-
97.5	0.0	0.0	0.0	125,790	5,032	-	71	-
102.5	0.0	0.0	0.0	131,031	5,241	-	74	-
107.5	0.0	0.0	0.0	131,031	5,241	-	74	-
		2,610	0				mmBtu/yr.	134
			2,610				fuel units	153.39 mcf

Summary of Savings for AHU, Reheat and Fan Power

	Heating		Cooling		
	Present	Proposed	Present	Proposed	
	mmBtu /yr.	mmBtu /yr.	mmBtu /yr.	mmBtu /yr.	
mmBtu/yr.	16	27	-1,093	-1,067	at AHU
mmBtu/yr.	134	0			at reheat coils
			54,197	52,911	kwh AHU
			174,996	139,623	kwh fan power
fuel units	171.7	31.2	229,193	192,534	kwh/year
Total savings		**140 mcf**		**36,659 kwh**	
	$	525		$ 1,943	**$ 2,468**

Demand Savings **0.0** **0.0**

0.0 kW

Fan Power Calculations

Present	Proposed

Bin Mid-Pt.	Occupied Hours	SA cfm	SF SP	SF BHP	RF BHP	Fan kW	End of Duct SP	SA cfm	SF SP	SF BHP	RF BHP	Fan kW
-2.5	0.0	78,618	3	57.7	3.9	50.1	**1.00**	75,474	2	45.0	3.3	39.3
2.5	7.0	79,405	3	58.6	4.0	50.9	**1.04**	76,228	2	45.8	3.5	40.0
7.5	15.0	80,199	3	59.6	4.2	51.8	**1.09**	76,991	2	46.5	3.6	40.8
12.5	47.0	81,001	3	60.5	4.3	52.8	**1.13**	77,761	2	47.3	3.7	41.5
17.5	145.0	81,811	3	61.5	4.5	53.7	**1.18**	78,538	2	48.2	3.9	42.3
22.5	121.0	82,629	3	62.6	4.6	54.7	**1.22**	79,324	2	49.0	4.0	43.1
27.5	92.0	83,455	3	63.6	4.8	55.7	**1.27**	80,117	2	49.9	4.1	43.9
32.5	179.0	84,290	3	64.7	5.0	56.7	**1.31**	80,918	2	50.8	4.3	44.8
37.5	229.0	85,133	3	65.8	5.1	57.7	**1.35**	81,727	2	51.7	4.4	45.6
42.5	231.0	85,984	3	66.9	5.3	58.8	**1.40**	82,545	2	52.6	4.6	46.5
47.5	181.0	86,844	3	68.1	5.5	59.8	**1.44**	83,370	2	53.5	4.8	47.4
52.5	129.0	87,712	3	69.2	5.7	61.0	**1.49**	84,204	2	54.5	4.9	48.4
57.5	201.0	88,589	3	70.4	5.9	62.1	**1.53**	85,046	2	55.5	5.1	49.3
62.5	297.0	94,524	3	78.9	7.4	70.2	**1.57**	90,743	3	62.6	6.4	56.1
67.5	218.0	98,463	3	85.0	8.5	76.1	**1.62**	94,524	3	67.6	7.4	61.0
72.5	195.0	102,565	3	91.6	9.8	82.5	**1.66**	98,463	3	73.2	8.5	66.5
77.5	185.0	106,839	4	99.0	11.3	89.7	**1.71**	102,565	3	79.4	9.8	72.6
82.5	123.0	111,291	4	107.1	13.0	97.7	**1.75**	106,839	3	86.2	11.3	79.3
87.5	15.0	115,928	4	116.0	14.9	106.6	**1.80**	111,291	3	93.8	13.0	86.9
92.5	0.0	120,758	4	126.0	17.1	116.4	**1.84**	115,928	3	102.2	14.9	95.3
97.5	0.0	125,790	4	137.0	19.7	127.4	**1.88**	120,758	4	111.5	17.1	104.7
102.5	0.0	131,031	4	149.2	22.5	139.7	**1.93**	125,790	4	121.9	19.7	115.2
107.5	0.0	131,031	4	149.2	22.5	139.7	**1.93**	125,790	4	121.9	19.7	115.2
					Present kwh/year	174,996					Proposed kwh/year	139,623

Inputs for Fan Power Reduction:

Static Pressure Reset?	**N**	**Y**	
	Present	Proposed	
Supply Air design cfm	**131,031**	**131,031**	cfm
Min OA for exhaust Fa	**32,758**	**32,758**	cfm
Return Air design cfm	**98,273**	**98,273**	cfm
End of Duct SP Setpoi	**1.93**	**1.47**	in. W.C.
Variable Static Pressu	**2.41**	**2.41**	in. W.C.
Total SF Static Pressu	**4.34**	**3.88**	in. W.C.
Fan efficiency (S&R)	**60%**	**60%**	
SF motor efficiency	**91.7%**	**91.7%**	
RF motor efficiency	**91.7%**	**91.7%**	
Total RF Static Pressu	**1.20**	**1.20**	in. W.C.
RF BHP	30.9	30.9	
SF speed - RF speed	**10%**	**10%**	

35,373 kwh Fan savings per year

CALCULATIONS TO ANNEX CLOSE VAV BY OCCUPANCY & SP RESET

FIM 14.25 County Court & Old County Hall

AHU Type **Mixed air VAV**

	Design	Present	Proposed	
Supply Air cfm	232,875	232,875	232,875	cfm @ 100% speed
Minimum OA cfm	**58,210**	**58,210**	**58,210**	cfm @ 100% speed
Estimated Min. OA %	**25%**			
Return Air Temp	**70** °F		**28.0** Btu/lb	
	Present		Proposed	
Discharge Air Temp	**55** °F		**55** °F	
	23.0 Btu/lb		**23.0** Btu/lb	

AHU	Design SA [cfm]	Design OA [cfm]	Actual OA [cfm]	Delta OA [cfm]	End of Duct S.P	Total S.P.
AHU-GB	**52,800**	**13,200**	**13,200**	-	2.5	4.31
AHU-15S	**26,425**	**6,600**	**6,600**	-	1.5	4.38
AHU-12N	**33,900**	**8,475**	**8,475**	-	2.5	4.28
AHU-24S	**27,950**	**6,990**	**6,990**	-	1.5	4.78
AHU-35N	**43,925**	**10,980**	**10,980**	-	2.0	4.25
AHU-6	**27,050**	**6,765**	**6,765**	-	2.0	4.18
AHU-7	**20,825**	**5,200**	**5,200**	-	1.5	4.25
				-		
				-		
	232,875	58,210	58,210	-	2.02	4.34

		Units	$/unit	BTU/unit	Efficiency	EER		
Heating	Natural Gas	**mcf**	**$ 3.736**	**1,030,000**	**85%**			
Cooling	**Electricity**	**kwh**	**$ 0.053**	**3,412**	**5.91**	**20.2**	onths /yr. demand	**12**

AHU Energy												Heating		Cooling	
Bin data for Buffalo, NY 24/7 occupied				**Present**				**Proposed**			**Proposed**	Present	Proposed	Present	Proposed
Bin Mid-Pt.	Enthalpy All Hours	Occupied Hours		Estim. Fan Speed	Net % OA	Mixed Air Temp	Occupied kBtuh	Estim. Fan Speed	Net % OA	Mixed Air Temp	Occupied kBtuh	mmBtu /year	mmBtu /year	mmBtu /year	mmBtu /year
-2.5	0.0	0		**60%**	42%	39.8	0	**58%**	43%	38.5	0	0	0	0	0
2.5	1.8	7		**61%**	41%	42.2	1,957	**58%**	43%	41.0	2,049	14	14	0	0
7.5	2.8	15		**61%**	41%	44.5	1,620	**59%**	43%	43.4	1,712	24	26	0	0
12.5	4.0	47		**62%**	40%	46.7	1,283	**59%**	42%	45.8	1,376	60	65	0	0
17.5	5.6	145		**62%**	40%	49.0	945	**60%**	42%	48.1	1,039	137	151	0	0
22.5	7.5	121		**63%**	40%	51.2	607	**61%**	41%	50.4	702	73	85	0	0
27.5	9.0	92		**64%**	39%	53.3	269	**61%**	41%	52.6	365	25	34	0	0
32.5	10.8	179		**64%**	40%	55.0	0	**62%**	40%	54.8	28	0	5	0	0
37.5	12.9	229		**65%**	46%	55.0	0	**62%**	46%	55.0	0	0	0	0	0
42.5	15.1	231		**66%**	55%	55.0	0	**63%**	55%	55.0	0	0	0	0	0
47.5	17.5	181		**66%**	67%	55.0	0	**64%**	67%	55.0	0	0	0	0	0
52.5	19.6	129		**67%**	86%	55.0	0	**64%**	86%	55.0	0	0	0	0	0
57.5	21.5	201		**68%**	100%	57.5	-425	**65%**	100%	57.5	-408	0	0	-85	-82
62.5	24.2	297		**72%**	100%	62.5	-936	**69%**	100%	62.5	-898	0	0	-278	-267
67.5	27.6	218		**75%**	100%	67.5	-3,618	**72%**	100%	67.5	-3,474	0	0	-789	-757
72.5	29.5	195		**78%**	32%	70.8	-1,711	**75%**	33%	70.8	-1,711	0	0	-334	-334
77.5	31.0	185		**82%**	31%	72.3	-2,106	**78%**	32%	72.4	-2,106	0	0	-390	-390
82.5	33.1	123		**85%**	29%	73.7	-2,655	**82%**	31%	73.8	-2,655	0	0	-327	-327
87.5	35.5	15		**88%**	28%	74.9	-3,263	**85%**	29%	75.2	-3,263	0	0	-49	-49
92.5	0.0	0		**92%**	27%	76.1	0	**88%**	28%	76.4	0	0	0	0	0
97.5	0.0	0		**96%**	26%	77.2	0	**92%**	27%	77.5	0	0	0	0	0
102.5	0.0	0		**100%**	25%	78.1	0	**96%**	26%	78.5	0	0	0	0	0
107.5	0.0	0		**100%**	25%	79.4	0	**96%**	26%	79.8	0	0	0	0	0
		2,610									mmBtu/yr.	334	379	-2,251	-2,205
											fuel units	381	433	111,610	109,325 kwh/yr.
													-52		2,285

Inputs to calculate savings for closing VAV boxes by occupancy sensors:

Present VAV box minimum position	**20%**	occ.
Percentage of VAV boxes closed based on occ. sensors	**20%**	
Space temperature (reheat coil) setpoint	**68** °F	

Bin Mid-Pt.	Enthalpy All Hours	Occupied Hours		Present SA cfm	VAV cfm Present	VAV cfm Proposed	Reheat kBtuh	Savings mmBtu /year
-2.5	0.0	0.0	0.0	139,725	5,589	-	78	-
2.5	1.8	7.0	0.0	141,122	5,645	-	79	1
7.5	2.8	15.0	0.0	142,533	5,701	-	80	1
12.5	4.0	47.0	0.0	143,959	5,758	-	81	4
17.5	5.6	145.0	0.0	145,398	5,816	-	82	12
22.5	7.5	121.0	0.0	146,852	5,874	-	82	10
27.5	9.0	92.0	0.0	148,321	5,933	-	83	8
32.5	10.8	179.0	0.0	149,804	5,992	-	84	15
37.5	12.9	229.0	0.0	151,302	6,052	-	85	19
42.5	15.1	231.0	0.0	152,815	6,113	-	86	20
47.5	17.5	181.0	0.0	154,343	6,174	-	87	16
52.5	19.6	129.0	0.0	155,887	6,235	-	88	11
57.5	21.5	201.0	0.0	157,446	6,298	-	88	18
62.5	24.2	297.0	0.0	167,994	6,720	-	94	28
67.5	27.6	218.0	0.0	174,993	7,000	-	98	21
72.5	29.5	195.0	0.0	182,285	7,291	-	102	20
77.5	31.0	185.0	0.0	189,880	7,595	-	107	20
82.5	33.1	123.0	0.0	197,792	7,912	-	111	14
87.5	35.5	15.0	0.0	206,033	8,241	-	116	2
92.5	0.0	0.0	0.0	214,618	8,585	-	121	-
97.5	0.0	0.0	0.0	223,560	8,942	-	126	-
102.5	0.0	0.0	0.0	232,875	9,315	-	131	-
107.5	0.0	0.0	0.0	232,875	9,315	-	131	-
		2,610	0				mmBtu/yr.	239
			2,610				fuel units	272.61 mcf

Summary of Savings for AHU, Reheat and Fan Power

	Heating Present mmBtu /yr.	Heating Proposed mmBtu /yr.	Cooling Present mmBtu /yr.	Cooling Proposed mmBtu /yr.	
mmBtu/yr.	334	379	-2,251	-2,205	at AHU
mmBtu/yr.	239	0			at reheat coils
			111,610	109,325	kwh AHU
			315,204	269,784	kwh fan power
fuel units	653.6	432.8	426,814	379,109	kwh/year
Total savings		**221 mcf**		**47,705 kwh**	
		$ 825		$ 2,528	**$ 3,353**
Demand Savings			**0.0**	**0.0**	
				0.0 kW	

Fan Power Calculations

Bin Mid-Pt.	Occupied Hours	Present SA cfm	Present SF SP	Present SF BHP	Present RF BHP	Present Fan kW	Proposed End of Duct SP	Proposed SA cfm	Proposed SF SP	Proposed SF BHP	Proposed RF BHP	Proposed Fan kW
-2.5	0.0	139,725	3	104.7	6.9	90.8	**1.50**	134,136	3	89.1	5.9	77.3
2.5	7.0	141,122	3	106.4	7.1	92.3	**1.52**	135,477	3	90.6	6.1	78.7
7.5	15.0	142,533	3	108.1	7.4	93.9	**1.55**	136,832	3	92.1	6.4	80.1
12.5	47.0	143,959	3	109.8	7.6	95.5	**1.57**	138,200	3	93.6	6.6	81.5
17.5	145.0	145,398	3	111.6	7.9	97.2	**1.60**	139,582	3	95.1	6.8	82.9
22.5	121.0	146,852	3	113.4	8.2	98.9	**1.62**	140,978	3	96.7	7.1	84.4
27.5	92.0	148,321	3	115.2	8.5	100.7	**1.65**	142,388	3	98.3	7.4	85.9
32.5	179.0	149,804	3	117.1	8.8	102.5	**1.67**	143,812	3	99.9	7.6	87.5
37.5	229.0	151,302	3	119.1	9.1	104.3	**1.70**	145,250	3	101.6	7.9	89.1
42.5	231.0	152,815	3	121.1	9.5	106.2	**1.72**	146,703	3	103.3	8.2	90.7
47.5	181.0	154,343	3	123.1	9.8	108.1	**1.75**	148,170	3	105.0	8.5	92.3
52.5	129.0	155,887	3	125.1	10.1	110.1	**1.77**	149,651	3	106.8	8.8	94.0
57.5	201.0	157,446	3	127.2	10.5	112.1	**1.80**	151,148	3	108.7	9.1	95.8

Inputs for Fan Power Reduction:

Static Pressure Reset?	**N**	**Y**	
	Present	Proposed	
Supply Air design cfm	**232,875**	**232,875**	cfm
Min OA for exhaust Fa	**58,210**	**58,210**	cfm
Return Air design cfm	**174,665**	**174,665**	cfm
End of Duct SP Setpoi	**2.02**	**1.77**	in. W.C.
Variable Static Pressu	**2.31**	**2.31**	in. W.C.
Total SF Static Pressu	**4.34**	**4.08**	in. W.C.
Fan efficiency (S&R)	**60%**	**60%**	

62.5	297.0	167,994	3	142.2	13.2	126.4	**1.82**	161,274	3	121.6	11.4	108.3	SF motor efficiency	**91.7%**	**91.7%**	
67.5	218.0	174,993	3	152.9	15.2	136.7	**1.85**	167,994	3	130.9	13.2	117.2	RF motor efficiency	**91.7%**	**91.7%**	
72.5	195.0	182,285	3	164.5	17.5	148.1	**1.87**	174,993	3	141.0	15.2	127.1	Total RF Static Pressur	**1.20**	**1.20**	in. W.C.
77.5	185.0	189,880	4	177.4	20.1	160.7	**1.90**	182,285	3	152.2	17.5	138.1	RF BHP	55.0	55.0	
82.5	123.0	197,792	4	191.6	23.1	174.7	**1.92**	189,880	3	164.6	20.1	150.2	SF speed - RF speed	**10%**	**10%**	
87.5	15.0	206,033	4	207.2	26.6	190.2	**1.95**	197,792	3	178.2	23.1	163.8				
92.5	0.0	214,618	4	224.5	30.5	207.5	**1.97**	206,033	4	193.3	26.6	178.9				
97.5	0.0	223,560	4	243.7	35.0	226.7	**2.00**	214,618	4	210.0	30.5	195.7				
102.5	0.0	232,875	4	264.9	40.1	248.1	**2.02**	223,560	4	228.6	35.0	214.4				
107.5	0.0	232,875	4	264.9	40.1	248.1	**2.02**	223,560	4	228.6	35.0	214.4				
				Present kwh/year		315,204				Proposed kwh/year		269,784		45,420	kwh Fan savings per year

CALCULATIONS TO ADD HW HEAT EXCHANGER TO ELECTRIC DHW HEATER

FIM 12.27 County Court & Old County Hall

INPUT DATA:

	Present Fuel		Proposed Fuel	
Fuel:	**Electricity**		Natural Gas	
Units:	kwh		mcf	
Fuel Cost:	$ 0.05	per kwh	$ 3.74	per mcf
Fuel Conversion Factor:	3,412	Btu per kwh	1,030,000	Btu per mcf
kW Demand cost:	$ 10.12	per kW	$ 0.00	per kW
Average kW demand:	**4.9**	kW	**0.0**	kW

Annual DHW Consumption:	Present		Proposed	
Hot Water Usage:	**1.5**	Gallons/perso	1.5	Gallons/person
Number of persons:	**167**	(estimate)	167	(estimate)
Days of Usage:	**200**	per year	200	per year
Hours of Usage per Day:	10	hours	10	hours
Average inlet water Temp:	50	degrees F	50	degrees F
Average hot water temp:	125	degrees F	125	degrees F

Storage Tank Losses:	Present Tank		Proposed Tank	
Tank U factor:	0.15	Btu/SF/Hour	0.15	Btu/SF/Hour
Height of Tank:	63.0	inches	63.0	inches
Diameter of Tank:	22.0	inches	22.0	inches
	84	gallons/tank	84	gallons/tank
# of Tanks	1	Qty.	1	Qty.
Hours Tank is Hot:	6,552	Hours	6,552	
Water Temperature:	125	Deg. F.	125	
Ambient Temperature:	65	Deg. F.	65	

Recirculation Losses:					
	0.0%	of boiler capa	0	BTUh	
	8,760	hours/year	8,760	hours/year	100%

Boiler Jacket & Flue Losses:					
Burner Input	61,416	BTUH	61,416	BTUH	
Efficiency:	**98.0%**		85.0%		
Boiler Output Capacity	60,188	BTU output	52,204	BTU output	
Jacket & Flue Losses:	0.5%	of boiler capa	0.5%	of boiler capacity	
Boiler is Hot:	6,552	hours/year	6,552	hours/year	100%

CALCULATIONS:

	Present		Proposed	
Consumption Energy:	31,237,500	BTU output rq	31,237,500	BTU output rqd/yr
Tank Energy Losses:	2,089,818	BTU/year	2,089,818	BTU/year
Recirculation Losses:	0	BTU/year	0	BTU/year
Boiler Jacket Losses:	1,971,748	BTU/year	1,710,190	BTU/year
Output BTU/Year	35,299,067		35,037,508	
Annual Fuel Consumption	10,557	kwh	40	mcf
Demand	13	billed kW /yr.	0	kW
Annual Fuel Cost				
Annual Savings:	**10,557**	**kwh**	**$ 0**	**per year**
	(40)	**mcf**		
	13	billed kW /yr.		

CALCULATIONS TO INSTALL GRAVITY RELIEF DAMPERS
FIM 12.28

Client: County Court & Old County Hall
Address: 25 Delaware & 92 Franklin

INPUT DATA:

Occupied Temp	**72** °F		Type:	**Natural Gas**	
	532 °R		Units:	**mcf**	
Unoccupied Temp	**68** °F		Unit cost:	**$ 3.736**	/mcf
	528 °R		BTU/Unit	**1,030,000**	Btu/mcf
Height of Area:	**20** ft.		Boiler Eff.	**85.0%**	
(g) Gravitational Acceleration:	**32.17** ft/s^2		CF2	1.085	Btu/hr-deg F-cfm
(c) Discharge coefficient (.65 to .70):	**0.65**				
Proposed Air Flow Reduction:	**100%**		Calculate Occupied Savings?	**Yes**	
			Calculate Unoccupied Savings?	**Yes**	

Calculated Free Area of Rectangular Gravity Vents

Item #	Vent Qty.	Length (inch)	Width (inch)	Gross Area (sqft)	Percent Open	Net Area (sqft)			Net Area (sqft)	
Turbine Vents	**4**	**24**	**24**	4.0	**100%**	4.0			4.0	
								Total Net Free Area:	4.00	sq.ft.

CALCULATIONS:

Bin Data for Buffalo, 50 hrs./week

Bin Temp (°F)	Total Hours	Occupied Hours	Unoccupied Hours	Bin Temp (°R)	Flow Q (ft^3/s)	Flow Q (CFM)	Occupied Present Losses (MBTU/yr)	Occupied Proposed Losses (MBTU/yr)	Unoccupied Present Losses (MBTU/yr)	Unoccupied Proposed Losses (MBTU/yr)
(2.5)	**1**	**-**	**1**	457	35	2,095	-	-	0	-
2.5	**31**	**7**	**24**	462	34	2,023	1	-	4	-
7.5	**62**	**15**	**47**	467	32	1,949	2	-	6	-
12.5	**219**	**47**	**172**	472	31	1,872	6	-	21	-
17.5	**458**	**145**	**313**	477	30	1,792	15	-	33	-
22.5	**400**	**121**	**279**	482	28	1,708	11	-	26	-
27.5	**386**	**92**	**294**	487	27	1,619	7	-	23	-
32.5	**647**	**179**	**468**	492	25	1,525	12	-	31	-
37.5	**936**	**229**	**707**	497	24	1,426	12	-	38	-
42.5	**794**	**231**	**563**	502	22	1,318	10	-	24	-
47.5	**745**	**181**	**564**	507	20	1,201	6	-	18	-
52.5	**593**	**129**	**464**	512	18	1,072	3	-	11	-
57.5	**702**	**201**	**501**	517	15	924	3	-	7	-
62.5	**935**	**297**	**638**	522	12	748	2	-	5	-
67.5	**737**	**218**	**519**	527	9	515	1	-	1	-
72.5	**499**	**195**	**304**	532						
77.5	**387**	**185**	**202**	537						
82.5	**206**	**123**	**83**	542						
87.5	**22**	**15**	**7**	547						
92.5	**-**	**-**	**-**	552						
97.5	**-**	**-**	**-**	557						
	8,760	2,610	6,150				91	-	247	-

Formulas:

Q = discharge coefficient x flow area x SQRT(2 x gravitational acceleration x Height x $(T_i - T_0 / T_i)$)
Proposed Annual Fuel Consumption = Losses MBTU x 1,000,000 / Fuel Heat Content / Boiler Eff.

	Annual Losses MBTU	Annual Fuel Consumption		Annual Cost
Present:	337	385	mcf	
Proposed:	0	-	mcf	
Annual Savings:	337	385	mcf	

CALCULATIONS FOR PIPE INSULATION

FIM 12/14.30 County Court & Old County Hall

Fuel Information

	Heating System		DHW System
Type:	**Natural Gas**		**Natural Gas**
Units:	mcf		mcf
Unit cost:	$ 3.736	/mcf	$ 3.736
Conversion Factor:	1,030,000	Btu/mcf	1,030,000
Efficiency:	85.0%	Heating	78.0%

Basic Inputs

	Type #1	Type #2	Type #3	Type #4	Type #5
Fluid	**DHW**	**DHW**	**DHW**	**DHW**	**Steam**
Pipe Material	**Dull Copper**	**Dull Copper**	**Dull Copper**	**Dull Copper**	**Steel**
O.D., inches (d)	**2.00**	**0.75**	**1.50**	**1.25**	**1.25**
Total Length, ft	**54**	**67**	**16**	**7**	**0**
Fluid Temperature Inside Pipe, °F (Ts)	**120**	**120**	**120**	**120**	**215**
Ambient Temperature, °F (Ta)	**65**	**65**	**65**	**65**	**65**
Annual Operating Hours	**8,760**	**8,760**	**8,760**	**8,760**	**2,187**
New Insulation Thickness, inches	**1.5**	**1.0**	**1.25**	**1.0**	**2.0**
Thermal Conductivity - "k" (Btu-in/hr-sq ft-°	**0.250**	**0.250**	**0.250**	**0.250**	**0.250**
Heat Loss - Insulated Pipe					
Q i, Btu/hr-sq ft of outer area of insulation	6.0	7.7	7.0	8.9	10.0
Insulation Area - sq ft/lin ft of pipe	1.3	0.7	1.0	0.9	1.4
Q insul, Btu/hr-lin ft	**7.9**	**5.5**	**7.3**	**7.5**	**13.7**
Avoided Energy Loss					
Existing Loss - MBtu/year	22.3	12.0	5.2	1.9	0.0
Proposed Loss - MBtu/year	3.7	3.3	1.0	0.5	0.0
Avoided Loss - MBtu/year	18.6	8.7	4.1	1.5	0.0
Total Avoided Fuel Consumption					
41 Units Saved	23	11	5	2	0
Natural Gas Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
$ 0 $/year					

Formulas:

Based on ASHRAE 1993 Fundamentals Handbook pages 20.9 and 22.17

h convection = C x {(1 / d) ^ 0.2} x { (1 / ((Ts + Ta)/2)) ^ 0.181 } x { (Ts - Ta) ^ 0.266 }

h radiation = { emissivity x 0.1713 x 10 ^ -8 x [(Ta + 460) ^ 4 - (Ts +460) ^ 4]} / (Ta - Ts)

Q bare = h total x Pipe Area x (Ts - Ta)

Q i = (Ts - Ta) / { [Rs x (ln (Rs / Ri)] / k }

Q insul = Q i x Insul Area

Total Avoided Consumption = (Q bare - Q insul) x Total length of pipe x Annual Operating Hours

CALCULATIONS TO INSTALL MORE EFFICIENT BOILERS

FIM 14.40 County Court & Old County Hall

INPUT DATA:

Fuel Data	Present	Proposed	
Type:	Natural Gas	Natural Gas	
Units:	**mcf**	**mcf**	
Unit cost:	**$ 3.736**	**$ 3.736**	/ unit
BTU/unit:	**1,030,000**	**1,030,000**	BTU/ unit

Adjustments for Other Measures:

Fuel Savings		
387	mcf	weatherization
(366)	mcf	lighting interact
0	mcf	
0	mcf	
0	mcf	
22	mcf	

Present Annual Fuel Consumption:

Present Heating Fuel Use:	16,656	mcf
% of Bldg. Heated by Boiler:	100%	
Present Boiler Fuel Use:	**16,656**	**mcf**

13,332	MMBtu Useful Heat Output (present)
19	MMBTU Saved Other Measures (at Old CE)
13,313	MMBTU Req'd from New Boilers

	Present Boilers			Proposed		
	BI	B2		B1	New Boiler	
% of Boiler Fuel Use	100%	0%		25%	75%	of useful output
16656 mcf =	16,656	0	**mcf**			
Boiler Firing Rate	8,369	8,369	kBtuh Input	8,369	3,998	kBtuh Input
Combustion Efficiency	84.0%	84.0%		84.0%	90.0%	
Jacket Losses	1.70%	1.50%	of capacity	1.70%	0.20%	of capacity
Combustion Tested?	Yes	No				
Avg.Firing rate is =	40%	1%		40%	70%	Avg. Firing Rate
Boiler Capacity	6,887	6,904	kBtuh Output	6,887	3,590	kBtuh Output
Boiler is hot when OAT<	65	65	°F.	65	65	°F.
Hours/ Yr. Unit is Hot	5,252	2,626	hrs.	1,313	3,939	hrs.
Off-Cycle Flue Losses	1.20%	1.00%	of capacity	1.20%	0.20%	of capacity
Off-Cycle Hours/Year	127	2,626	hrs.	48	(45)	hrs.
Jacket Losses	615	272	MBtu/yr.	154	28	MBtu/yr.
Off-Cycle Flue Losses	11	181	MBtu/yr.	4	(0)	MBtu/yr.
Useful Heat Output	13,785	(453)	MBtu/yr.	3,328	9,985	MBtu/yr.
	13,332	MBtu/yr.		13,313	MBtu/yr.	
435,000 sq.ft. served by boilers	38	btu input/sq.ft.		28	btu input/sq.ft.	
	77.7%	AFUE		4,029	10,801	mcf
				87%	AFUE	

CALCULATIONS:

Off-Cycle Flue Losses = Boiler kBtuh Output x 1000 x % Off-Cycle Flue Losses x Hrs Off-Cycle per Year / 1,000,000

Jacket Losses = Boiler kBtuh Output x 1000 x % Jacket Losses x Hrs Hot per Year / 1,000,000

Useful Heat Output = Htg Fuel Use x BTU per Unit x Present Efficiency / 1,000,000 - Off Cycle Losses - Jacket Losses

Proposed Annual Fuel Consumption =

(Proposed Off-Cycle & Jacket Losses + Useful Heat Output) / Proposed Efficiency x 1,000,000 / BTU per Unit

	Annual Fuel Consumption	units	Annual Cost
Present:	16,656	mcf	
- Fuel Saved by Other FIMs	22	mcf	
Proposed:	14,831	mcf	
Annual Savings:	**1,804**	mcf	

CALCULATIONS TO INSTALL CONDENSING DOMESTIC HOT WATER HEATER

FIM 14.34 County Court & Old County Hall

INPUT DATA:

	Present Fuel		Proposed Fuel		
Fuel:	**Natural Gas**		Natural Gas		
Units:	mcf		mcf		
Fuel Cost:	$ 3.74	per mcf	$ 3.74	per mcf	
Fuel Conversion Factor:	1,030,000	Btu per mcf	1,030,000	Btu per mcf	
Annual DHW Consumption:	Present		Proposed		
Hot Water Usage:	**1.5**	Gallons/person	1.5	Gallons/person	
Number of persons:	**500**	(estimate)	500	(estimate)	
Days of Usage:	**365**	per year	365	per year	
Hours of Usage per Day:	16	hours	16	hours	
Average inlet water Temp:	50	degrees F	50	degrees F	
Average hot water temp:	125	degrees F	125	degrees F	
Storage Tank Losses:	Present Tank		Proposed Tank		
Tank U factor:	0.25	Btu/SF/Hour	0.25	Btu/SF/Hour	
ave. Height of Tank:	65.0	inches	65.0	inches	
ave. Diameter of Tank:	48.0	inches	48.0	inches	
	457	gallons/tank	457	gallons/tank	
# of Tanks	1	Qty.	1	Qty.	
Hours Tank is Hot:	8,760	Hours	8,760		
Water Temperature:	125	Deg. F.	125		
Ambient Temperature:	75	Deg. F.	75		
Recirculation Losses:	0.0%	of boiler capacity =	0	BTUh	
	8,760	hours/year	8,760	hours/year	100%
Boiler Jacket & Flue Losses:					
Burner Input	315,000	BTUH	285,000	BTUH	
Blended Efficiency:	**78.0%**		92.0%		
Boiler Output Capacity	245,700	BTU output	262,200	BTU output	
Jacket & Flue Losses:	3.5%	of boiler capacity	0.4%	of boiler capacity	
Boiler is Hot:	8,760	hours/year	8,760	hours/year	100%

CALCULATIONS:

	Present		Proposed	
Consumption Energy:	171,025,313	BTU output rqd/yr	171,025,313	BTU output rqd/yr
Tank Energy Losses:	10,203,539	BTU/year	10,203,539	BTU/year
Recirculation Losses:	0	BTU/year	0	BTU/year
Boiler Jacket Losses:	75,331,620	BTU/year	9,187,488	BTU/year
Output BTU/Year	256,560,471		190,416,339	
Annual Fuel Consumption	319	mcf	201	mcf
Demand	0	billed kW /yr.	0	kW
Annual Fuel Cost				
Annual Savings:	**118**	**mcf**	**$ 0**	**per year**
	0			
	0	billed kW /yr.		

CALCULATIONS FOR ADD HEAT RECOVERY TO AHU-GB

FIM 14.35 County Court & Old County Hall

INPUT DATA:

Exhaust Operating Hours:	**168** hours per week during the Heating Season	Heating Fuel:	**Natural Gas**
% of time operating:	100%	Units:	**mcf**
		Fuel Cost:	**$ 3.736** per mcf
		Heat Content:	**1,030,000** Btu per mcf
AHU Discharge Air Temperature:	**65** °F	Boiler Efficiency:	**85.0%**
Proposed Heat Recovery Efficiency:	**55%**	Electricity Cost	
Additional Fan Static Pressure:	**1.20** inches w.c.	Units:	**kwh**
Fan Efficiency:	**60%**	Fuel Cost:	**$ 0.053** per kwh
			$ 10.12 $/kW
		Cooling Energy Use:	**0.80** kw per ton

Additonal Electrical Power Required:

Fans		
Supply air:	4.15	HP
Exhaust air:	4.48	HP
Pump Data		
72	GPM	
45	ft. head	
55%	Pump eff.	
1.48	BHP	
90.0%	Motor Eff.	
1.23	kW	

	Outdoor Air	EF-1 Exhaust Air	
	CFM	CFM	Temp
Air Flows:	**13,200**	**14,250**	**74**
Motor Efficiency:	**95.0%**	**91.0%**	

Heat recovery system is not used if outdoor air temperature
a) is within **2** degrees of discharge air setpoint or
b) is above **100** degrees

Bin Data for **Buffalo, NY**

Bin Data		Req'd	Make-up Air Unit Operating Costs - Present				Heat Recovery Unit		Future Operating Costs - w/ Heat Recovery Unit				Add'l. Energy				
			Energy Required		Heating	Cooling	Potential	Actual			Heating	Cooling	Fan	Pump	Savings		
Temp.	Hours	SAT	Btuh	Btu/yr	mcf	kwh	ΔT	LAT	Btuh	Btu/yr	mcf	kwh	kwh	kwh	Positive	Negative	Total
92.5	**0**	**65**	(393,855)	0	0	0	(10.2)	82.3	(248,129)	0	0	0	0	0	$ 0	$ 0	$ 0
87.5	**15**	**65**	(322,245)	(4,833,675)	0	322	(7.4)	80.1	(215,904)	(3,238,562)	0	216	55	18	$ 2	$ 0	$ 2
82.5	**123**	**65**	(250,635)	(30,828,105)	0	2,055	(4.7)	77.8	(183,680)	(22,592,597)	0	1,506	452	151	$ 0	($ 3)	($ 3)
77.5	**185**	**65**	(179,025)	(33,119,625)	0	2,208	(1.9)	75.6	(151,455)	(28,019,203)	0	1,868	680	227	$ 0	($ 30)	($ 30)
72.5	**195**	**65**	(107,415)	(20,945,925)	0	1,396	0.8	72.5	(107,415)	(20,945,925)	0	1,396	717	0	$ 0	($ 38)	($ 38)
67.5	**218**	**65**	(35,805)	(7,805,490)	0	520	3.6	67.5	(35,805)	(7,805,490)	0	520	801	0	$ 0	($ 42)	($ 42)
62.5	**297**	**65**	35,805	10,634,085	12	0	6.3	65.0	0	0	0	0	1,092	364	$ 0	($ 32)	($ 32)
57.5	**201**	**65**	107,415	21,590,415	25	0	9.1	65.0	0	0	0	0	739	247	$ 40	$ 0	$ 40
52.5	**129**	**65**	179,025	23,094,225	26	0	11.8	64.3	9,667	1,247,088	1	0	895	158	$ 37	$ 0	$ 37
47.5	**181**	**65**	250,635	45,364,935	52	0	14.6	62.1	41,892	7,582,425	9	0	1,256	222	$ 83	$ 0	$ 83
42.5	**231**	**65**	322,245	74,438,595	85	0	17.3	59.8	74,116	17,120,877	20	0	1,603	283	$ 145	$ 0	$ 145
37.5	**229**	**65**	393,855	90,192,795	103	0	20.1	57.6	106,341	24,352,055	28	0	1,589	281	$ 182	$ 0	$ 182
32.5	**179**	**65**	465,465	83,318,235	95	0	22.8	55.3	138,565	24,803,198	28	0	1,242	220	$ 172	$ 0	$ 172
27.5	**92**	**65**	537,075	49,410,900	56	0	25.6	53.1	170,790	15,712,666	18	0	638	113	$ 104	$ 0	$ 104
22.5	**121**	**65**	608,685	73,650,885	84	0	28.3	50.8	203,014	24,564,736	28	0	839	148	$ 157	$ 0	$ 157
17.5	**145**	**65**	680,295	98,642,775	113	0	31.1	48.6	235,239	34,109,633	39	0	1,006	178	$ 213	$ 0	$ 213
12.5	**47**	**65**	751,905	35,339,535	40	0	33.8	46.3	267,463	12,570,777	14	0	326	58	$ 77	$ 0	$ 77
7.5	**15**	**65**	823,515	12,352,725	14	0	36.6	44.1	299,688	4,495,318	5	0	104	18	$ 27	$ 0	$ 27
2.5	**7**	**65**	895,125	6,265,875	7	0	39.3	41.8	331,912	2,323,386	3	0	49	9	$ 14	$ 0	$ 14
	2,610	Total Hours			713	6,502					193	5,507	14,082	2,694	$ 1,252	($ 145)	$ 1,107

	mcfs	Heat $	kwh	kW/year	Elec $	Total $
Present Heating & Cooling Cost:	713		6,502			
Proposed Heating & Cooling Cost:	193		5,507			
Annual Thermal Savings:	520	$ 0	995			
Additional Fan Electricity			(14,082)			
Additional Pump Electricity			(2,694)			
Aditional Demand Costs				(91.8)		
Annual Net Savings:	**520**	**$ 0**	**(15,781) kwh**		**$ 0**	**$ 0**

CALCULATIONS FOR ADD HEAT RECOVERY TO AHU-35N

FIM 14.35 County Court & Old County Hall

INPUT DATA:

Exhaust Operating Hours:	**168** hours per week during the Heating Season	Heating Fuel:	**Natural Gas**		Additonal Electrical Power Required:
% of time operating:	100%	Units:	**mcf**		
		Fuel Cost:	**$ 3.736** per mcf		Fans
		Heat Content:	**1,030,000** Btu per mcf		Supply air: 3.46 HP
AHU Discharge Air Temperature:	**65** °F	Boiler Efficiency:	**85.0%**		Exhaust air: 4.36 HP
Proposed Heat Recovery Efficiency:	**55%**	Electricity Cost			Pump Data
Additional Fan Static Pressure:	**1.20** inches w.c.	Units:	**kwh**		60 GPM
Fan Efficiency:	**60%**	Fuel Cost:	**$ 0.053** per kwh		**45** ft. head
			$ 10.12 $/kW		**55%** Pump eff.
		Cooling Energy Use:	**0.80** kw per ton		1.23 BHP
					90.0% Motor Eff.
					1.02 kW

	Outdoor Air	EF-2 Exhaust Air	
	CFM	CFM	Temp
Air Flows:	**10,980**	**13,850**	**74**
Motor Efficiency:	**94.5%**	**91.0%**	

Heat recovery system is not used if outdoor air temperature
a) is within **2** degrees of discharge air setpoint or
b) is above **100** degrees

Bin Data for **Buffalo, NY**

Bin Data		Req'd	Make-up Air Unit Operating Costs - Present				Heat Recovery Unit		Future Operating Costs - w/ Heat Recovery Unit				Add'l. Energy				
			Energy Required		Heating	Cooling	Potential	Actual			Heating	Cooling	Fan	Pump	Savings		
Temp.	Hours	SAT	Btuh	Btu/yr	mcf	kwh	ΔT	LAT	Btuh	Btu/yr	mcf	kwh	kwh	kwh	Positive	Negative	Total
92.5	**0**	**65**	(327,616)	0	0	0	(10.2)	82.3	(206,398)	0	0	0	0	0	$ 0	$ 0	$ 0
87.5	**15**	**65**	(268,049)	(4,020,739)	0	268	(7.4)	80.1	(179,593)	(2,693,895)	0	180	95	15	$ 0	($ 1)	($ 1)
82.5	**123**	**65**	(208,483)	(25,643,378)	0	1,710	(4.7)	77.8	(152,788)	(18,792,933)	0	1,253	775	125	$ 0	($ 24)	($ 24)
77.5	**185**	**65**	(148,916)	(27,549,506)	0	1,837	(1.9)	75.6	(125,983)	(23,306,882)	0	1,554	1,166	189	$ 0	($ 57)	($ 57)
72.5	**195**	**65**	(89,350)	(17,423,201)	0	1,162	0.8	72.5	(89,350)	(17,423,201)	0	1,162	1,229	0	$ 0	($ 65)	($ 65)
67.5	**218**	**65**	(29,783)	(6,492,749)	0	433	3.6	67.5	(29,783)	(6,492,749)	0	433	1,373	0	$ 0	($ 73)	($ 73)
62.5	**297**	**65**	29,783	8,845,625	10	0	6.3	65.0	0	0	0	0	1,871	303	$ 0	($ 77)	($ 77)
57.5	**201**	**65**	89,350	17,959,300	21	0	9.1	65.0	0	0	0	0	1,266	205	$ 0	($ 1)	($ 1)
52.5	**129**	**65**	148,916	19,210,196	22	0	11.8	64.3	8,041	1,037,351	1	0	813	132	$ 28	$ 0	$ 28
47.5	**181**	**65**	208,483	37,735,378	43	0	14.6	62.1	34,846	6,307,199	7	0	1,140	185	$ 64	$ 0	$ 64
42.5	**231**	**65**	268,049	61,919,377	71	0	17.3	59.8	61,651	14,241,457	16	0	1,455	236	$ 114	$ 0	$ 114
37.5	**229**	**65**	327,616	75,024,007	86	0	20.1	57.6	88,456	20,256,482	23	0	1,443	234	$ 145	$ 0	$ 145
32.5	**179**	**65**	387,182	69,305,623	79	0	22.8	55.3	115,261	20,631,751	24	0	1,128	183	$ 138	$ 0	$ 138
27.5	**92**	**65**	446,749	41,100,885	47	0	25.6	53.1	142,066	13,070,081	15	0	580	94	$ 84	$ 0	$ 84
22.5	**121**	**65**	506,315	61,264,145	70	0	28.3	50.8	168,871	20,433,394	23	0	762	123	$ 127	$ 0	$ 127
17.5	**145**	**65**	565,882	82,052,854	94	0	31.1	48.6	195,676	28,373,013	32	0	914	148	$ 173	$ 0	$ 173
12.5	**47**	**65**	625,448	29,396,068	34	0	33.8	46.3	222,481	10,456,601	12	0	296	48	$ 63	$ 0	$ 63
7.5	**15**	**65**	685,015	10,275,221	12	0	36.6	44.1	249,286	3,739,287	4	0	95	15	$ 22	$ 0	$ 22
2.5	**7**	**65**	744,581	5,212,069	6	0	39.3	41.8	276,091	1,932,635	2	0	44	7	$ 11	$ 0	$ 11
	2,610	Total Hours			593	5,409					160	4,581	16,443	2,241	$ 968	($ 298)	$ 670

	mcfs	Heat $	kwh	kW/year	Elec $	Total $
Present Heating & Cooling Cost:	593		5,409			
Proposed Heating & Cooling Cost:	160		4,581			
Annual Thermal Savings:	433	$ 0	828			
Additional Fan Electricity			(16,443)			
Additional Pump Electricity			(2,241)			
Aditional Demand Costs				(82.7)		
Annual Net Savings:	**433**	**$ 0**	**(17,857) kwh**		**$ 0**	**$ 0**

CALCULATIONS FOR VENDING MACHINE OCCUPANCY CONTROL
FIM 12.36 County Court & Old County Hall

Electricity
Unit cost: **$ 0.053** /kwh

INPUT DATA:

Machine Type	Qty.	Volts	Amps	Present Operation Hrs/Day	Present Operation Days/Yr.	Machine Location is Occupied Hrs/Day	Machine Location is Occupied Days/Yr.
Refrigerated	**4**	**115**	**11.5**	**24**	**365**	**9**	**250**

* Lighting watts is included in the volt / amp data and Total kW

Lighting Savings							
Machine Type	Lighting * Watts/ unit	Lighting Found	Ltg. Watts	Present Hrs/Yr.	Proposed Hrs/Yr.	Present Lighting kWh/yr.	Proposed Lighting kWh/Yr.
Refrigerated	**64**	**On**	256	8,760	3,064	2,243	784
						2,243	784

Compressor Savings						
	Duty Cycle		Compressor Hours			
Compressor kW	Present Normal	Proposed Nite	Present Hrs/Yr.	Proposed Hrs/Yr.	Present Compressor kWh/yr.	Proposed Compressor kWh/Yr.
3.976	**33%**	**12.5%**	2,891	1,556	11,494	6,188
					11,494	6,188

CALCULATIONS:

Ltg kWh =Ltg Watts / 1000 x # units x Hrs per Day x Days per Yr
Compressor kWh=(volts x amps x 0.80 pf/ 1000 - ltg watts)x # units x hrs per day x days per yr x duty cycle

Ltg kWh with Control = Ltg watts per unit /1000 x # units x (Occ Hrs per Yr + Unocc Hrs x Nite Duty Cycle)
Prop Compressor Run Hours = Occ Hrs x Existing Duty Cycle + Unocc Hrs x Unocc Duty Cycle)
Compressor kWh with Control=(volts x amps x 0.80 pf -ltg watts)/1000 x # units x prop compressor hrs per yr

Electricity Cost Savings = Electricity Savings x Electricity Unit Cost

	Lighting	Compressor	Total	
Existing Annual Electricity Use:	2,243	11,494	13,736	kWh
Proposed Annual Electricity Use:	784	6,188	6,972	kWh
Total Annual Savings:	1,458	5,306	6,764	kWh
			49%	reduction

CALCULATIONS TO OPEN TRIPLE DUTY VALVE
FIM 14.37

Client: County Court & Old County Hall
Address: 25 Delaware & 92 Franklin

INPUT DATA:

Fuel:	**Electricity**	
kWh:	$ 0.053	per kWh
Demand:	$ 10.12	per kW
Months of Demand	**7**	per year
Operating Hours	**6,887**	hours per year

Pump Nameplate and Performance Data

	Model		
		77%	Pump Efficiency
Design Pump Flow		**580**	gallons per minute
		95	feet of water
		18.1	BHP at design
Motor Nameplate	HP	**20**	HP
	Efficiency	**93.6%**	

Balance Valve Data

Present Setting	**55%**	Open
Manufacturer	**Bell & Gossett**	
Model Number	**3DS-6S**	
Pattern		
Valve Δp at present setting	**3.8**	feet of water
Valve Δp when 100% open	**1.7**	feet of water
Valve Δp Savings	**2.1**	feet of water

CALCULATIONS:

HP = (GPM x Valve Δp) / (3960 x Pump Eff.)
kW = HP x 0.746 / (Motor Efficiency)
kWh = kW x Hours

	Existing	Proposed	Savings		
			Standard	Minimal Data	
Flow GPM	580	580		580	
Pump Efficiency	77%	77%		77%	
Motor Efficiency	93.6%	93.6%		93.6%	
Head	95	92.9			
Head Saved				2.1	
HP	18.1	17.7	0.4	0.4	HP
Monthly kW	14.4	14.1	0.3	0.3	kW
kWh	99,195	97,002	2,193	2,193	kWh

CALCULATIONS TO IMPROVE TEMPERATURE CONTROL

FIM 12/14.38 County Court & Old County Hall

INPUT DATA: 100% of Building to be Setback

		Current	Proposed	
Heating T Setpoint:	Occupied	72	72	deg. F.
	Unoccupied	68	68	deg. F.
Cooling T Setpoint:	Occupied	74	74	deg. F.
	Unoccupied	76	76	deg. F.
HVAC Schedule	Occupied	50.0	50.0	Hours per week
	Unoccupied	118.0	118.0	Hours per week
Q internal gains:	Occupied	3,732,118	3,732,118	Btuh
	Unoccupied	488,816	488,816	Btuh
Q internal gains:	Schedule	50	50	Hours per week
BLC:	Occupied	108,625	108,625	Btuh/deg. F.
	Unoccupied	106,294	106,294	Btuh/deg. F.

Fuel Data	Heating	Cooling		
Type:	Natural Gas	Electricity		
Units:	**mcf**	kwh		
Unit cost:	**$ 3.736**	$ 0.05		
BTU/unit	**1,030,000**	3,412		
Efficiency/ COP:	**85.0%**	5.91	COP, = EER	20.2

CALCULATIONS:

Current — Buffalo, 50 hrs./week

Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use mcf	Cooling Energy kwh
(2.5)	0	1	4,360,416	7,004,913	8	0
2.5	7	24	3,817,293	6,473,443	208	0
7.5	15	47	3,274,170	5,941,973	375	0
12.5	47	172	2,731,047	5,410,502	1,210	0
17.5	145	313	2,187,924	4,879,032	2,107	0
22.5	121	279	1,644,801	4,347,562	1,613	0
27.5	92	294	1,101,678	3,816,092	1,397	0
32.5	179	468	558,555	3,284,622	1,870	0
37.5	229	707	15,432	2,753,152	2,227	0
42.5	231	563	(527,692)	2,221,682	1,429	6,044
47.5	181	564	(1,070,815)	1,690,212	1,089	9,610
52.5	129	464	(1,613,938)	1,158,742	614	10,323
57.5	201	501	(2,157,061)	627,272	359	21,498
62.5	297	638	(2,700,184)	95,801	70	39,764
67.5	218	519	(3,243,307)	(435,669)	0	46,269
72.5	195	304	(3,732,118)	(488,816)	0	43,453
77.5	185	202	(4,112,304)	(648,257)	0	44,215
82.5	123	83	(4,655,427)	(1,179,727)	0	33,247
87.5	15	7	(5,198,550)	(1,711,197)	0	4,460
92.5	0	0	(5,741,673)	(2,242,667)	0	0
97.5	0	0	(6,284,796)	(2,774,137)	0	0
102.5	0	0	(6,827,919)	(3,305,607)	0	0
107.5	0	0	(7,371,043)	(3,837,077)	0	0
	8,760	hours			14,575	258,883

Proposed		Buffalo, 50 hrs./week				
Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use	Cooling Energy kwh
(2.5)	0	1	4,360,416	7,004,913	8	0
2.5	7	24	3,817,293	6,473,443	208	0
7.5	15	47	3,274,170	5,941,973	375	0
12.5	47	172	2,731,047	5,410,502	1,210	0
17.5	145	313	2,187,924	4,879,032	2,107	0
22.5	121	279	1,644,801	4,347,562	1,613	0
27.5	92	294	1,101,678	3,816,092	1,397	0
32.5	179	468	558,555	3,284,622	1,870	0
37.5	229	707	15,432	2,753,152	2,227	0
42.5	231	563	(527,692)	2,221,682	1,429	6,044
47.5	181	564	(1,070,815)	1,690,212	1,089	9,610
52.5	129	464	(1,613,938)	1,158,742	614	10,323
57.5	201	501	(2,157,061)	627,272	359	21,498
62.5	297	638	(2,700,184)	95,801	70	39,764
67.5	218	519	(3,243,307)	(435,669)	0	46,269
72.5	195	304	(3,732,118)	(488,816)	0	43,453
77.5	185	202	(4,112,304)	(648,257)	0	44,215
82.5	123	83	(4,655,427)	(1,179,727)	0	33,247
87.5	15	7	(5,198,550)	(1,711,197)	0	4,460
92.5	0	0	(5,741,673)	(2,242,667)	0	0
97.5	0	0	(6,284,796)	(2,774,137)	0	0
102.5	0	0	(6,827,919)	(3,305,607)	0	0
107.5	0	0	(7,371,043)	(3,837,077)	0	0
	8,760	hours			14,575	258,883

		Present	Proposed	Savings
Heating	mcf	14,575	14,575	0
Cooling	kwh	258,883	258,883	0
Annual Energy $				$ 0

CALCULATIONS TO EXTEND DDC TO DHW PUMPS

FIM 12/14.40 County Court & Old County Hall

	DHW Fuel		Pump	
Type:	**Natural Gas**		**Electricity**	
Units:	**mcf**		**kwh**	
Unit cost:	$ 3.736	/mcf	**$ 0.053**	$/kWh
Heat Content of Fuel:	1,030,000	Btu/mcf		
Combustion Efficiency:	**85.0%**			

INPUT

Building Conditioned Floor Area	Schedule	hrs/week	Wks/yr	Hrs/yr.
435,000 sq.ft.	Heating	**50**	**42**	2,100
	Non-heating	**50**	**10**	500
				2,600

Electricity Savings for DHW Recirculation Pumps

Formula:

kwh = HP x % Loading x 0.746 kw per HP / motor efficiency x Qty. x Hours

Motor Description	Motor HP	Qty	Motor Loading	Motor Type	Motor y	Annual Hours Present	Annual Hours Proposed	Annual kWh Present	Annual kWh Proposed
Old County	**1/4**	**1**	70%	Std.	54.0%	8,760	2,600	2,118	629
Annex 1	**1/6**	**1**	70%	Std.	45.0%	8,760	2,600	1,694	503
Annex 2	**1/6**	**1**	70%	Std.	45.0%	8,760	2,600	1,694	503
								5,506	1,634

Thermal Savings for DHW Recirculation Pumps

Motor Description	Motor GPM	Recirc ΔT	DHW Eff.	DHW Losses Btuh	Annual Hours Present	Annual Hours Proposed	Annual mcf Present	Annual mcf Proposed
Old County	**5**	3.0	85%	7,497	8,760	2,600	75	22
Annex 1	**5**	2.5	85%	6,248	8,760	2,600	63	19
Annex 2	**5**	2.5	85%	6,248	8,760	2,600	63	19
							200	59

Formulae:

DHW Losses = GPM x Recirc ΔT x 60 min per hour x 8.33 lbs per gallon

Annual MMBtu = DHW Losses / DHW Efficiency x Annual Hours / heat content of fuel

Recirc ΔT = temperature drop between DHW leaving boiler room and returning recirculation DHW

Pump Power Savings	3,872	kwh
DHW Fuel Savings	141	mcf
Total Savings		

CALCULATIONS FOR HOLIDAY SCHEDULING
FIM 12/14.41

Client: County Court & Old County Hall
Address: 25 Delaware & 92 Franklin

Type:	**Natural Gas**	
Units:	**mcf**	
Unit cost:	**$ 3.736**	/mcf
Heat Content of Fuel	**1,030,000**	Btu/mcf
Boiler Combustion Efficiency:	**85.0%**	

DATA:

Percentage of Building to **90%**

	Present Holiday Unoccupied	Proposed Holiday Unoccupied	
T Setpoint:	72	**68**	degrees F
Q internal gains:	**439,934**	**439,934**	Btuh
BLC:	**76,225**	**76,225**	Btuh/degree F
T Balance:	66.2	62.2	degrees F

T Balance = T Setpoint - (Q internal gains / BLC)

Average Occupied Hours/Day **10**

Occupied Hours

Mid-pts	DB (F)	Total Hrs	January Hrs	February Hrs	March Hrs	April Hrs	May Hrs	June Hrs	July Hrs	August Hrs	September Hrs	October Hrs	November Hrs	December Hrs
93	90 to 95	4							4					
88	85 to 90	12					3		6	2	1			
83	80 to 85	121					15	25	42	28	11			
78	75 to 80	207					15	41	59	62	22	8		
73	70 to 75	258			2	3	22	45	70	53	41	21	1	
68	65 to 70	197			5	3	25	35	17	51	34	23	4	
63	60 to 65	247			12	4	63	50	9	25	55	17	11	1
58	55 to 60	149			7	15	31	17	2	9	27	30	6	5
53	50 to 55	211	3		21	36	31	6	1		17	50	33	13
48	45 to 50	132	8		22	25	22	1			1	34	18	1
43	40 to 45	136	12		21	33	3				1	17	32	17
38	35 to 40	211	17	9	35	50						20	46	34
33	30 to 35	216	33	32	35	22							46	48
28	25 to 30	173	31	53	32	8							16	33
23	20 to 25	115	41	38	18	1							4	13
18	15 to 20	111	46	19	12								3	31
13	10 to 15	52	26	14	4									8
8	5 to 10	44	3	31	4									6
3	0 to 5	2		2										
-3	-5 to 0	2		2										
-8	-10 to -5	0		5										

Average Monthly Temp (°F)	26	21	38	44	63	70	76	72	66	55	41	31
Holidays / Days Off During School Year	2	5	1	6	2	0	0	0	0	2	5	6
Present Unoccupied Energy (BTU)	61,570,500	170,749,327	21,649,594	100,632,280	5,087,455	0	0	0	0	16,459,384	94,332,457	160,789,838

Proposed Unoccupied Energy (BTU)	55,472,530	155,504,404	18,600,609	82,338,371	(1,010,515)	0	0	0	0	10,361,415	79,087,533	142,495,930
Holiday Setback Energy Savings (BTU)	6,097,970	15,244,924	3,048,985	18,293,909	6,097,970	0	0	0	0	6,097,970	15,244,924	18,293,909

CALCULATIONS:

Heat Loss = (T Balance - T Avg O.A.) x BLC * # Hours
Energy Cost = (Heat Loss / Conversion Factor) x (Unit cost / Efficiency)

Winter	Heat Loss (Btu/year)	Fuel Use (mcf/year)	Fuel Savings ($)
Present Unoccupied	631,270,835	721	
Proposed Unoccupied	542,850,276	620	
Annual Savings:	88,420,558	101	

CALCULATIONS FOR IMPACT OF REDUCED LIGHTING ON HEATING AND AIR CONDITIONING

FIM 13.1

Client: Health Mall
Address: 1500 Broadway

INPUT DATA:

	Heating Energy		Cooling Energy	
Fuel:	**Electricity**		**Electric**	
Units:	**kwh**		**kWh**	
Fuel Cost:	**$ 0.049**	per kwh	**$ 0.049**	per kWh
Fuel Conversion Factor:	**3,412**	Btu per kwh	**3,412**	Btu per kWh
Efficiency:	**300.0%**		**1.15**	kW/Ton
			60%	of building is air conditioned

	35,021	Lighting Retrofit
	-	Installing Sensors
Annual Lighting Savings:	**35,021**	kWh per Year
	12	months per year of lighting operation
	2,918	kwh/month

For **8** months/year the lighting retrofit will impact heating costs
20% of light fixtures are within 10 feet of an exterior wall
For **4** months/year the lighting retrofit will impact cooling costs

CALCULATIONS:

Replacement Electricity because of Reduced Lighting Energy

Useful Heat from Lights during the heating season that is no longer available is:

= kwh Lighting Savings per month x No. Months of Heating impact x % of fixtures located near exterior walls

= **4,670 kWh =** 15,932,339 BTU = 1,557 kwh

Replacement Electricity usage

Useful Heat from Lights in kwh x 3412 BTU/kwh / Heating Fuel Conversion Factor / Heating Fuel Efficiency

Replacement Electricity Cost = kwh x $per kwh

	Fuel Usage		Fuel Cost	
Useful Heat from Lights	4,670	kWh	n/a	
Replacement Electricity	**(1,557)**	**kwh**		**per year**

Reduced Air Conditioning because of Reduced Lighting

Reduced Air Conditioning Lighting Load during the cooling season from Lighting that is no longer present is:

= kwh Lighting Savings per month x No. Months Lighting Retrofit will impact cooling costs x % of building cooled

= **7,004 kWh =** 23,898,508 BTU

Reduced Air Conditioning Energy Requirements [kWh] =

Reduce Air Conditioning Lighting Load x (3412 Btu / kWh) x (1 ton-hr / 12,000 Btu) x (1.15 kW / ton)

Reduced Air Conditioning Cost = Reduced Air Conditioning Energy Requirements x Cost per kWh

Reduced Air Conditioning Energy Requirements = 2,290 kWh per year
Reduced Air Conditioning Cost = per year

Net Impact on Heating and Air Conditioning Costs because of Lighting Retrofit

Heating Fuel	**(1,556.5)**	**kwh**
Cooling	**2,290**	**kWh per year**

Project: Erie County
Building: Health Mall
Date: 5/23/2019

Heating System Efficiency:	320%	COP
Average Fuel Cost ($/unit):	$0.08	
Correction Factor:	100%	

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product
Single door sweeps	5	3	1/8	1/12	=	0.15625
Single door perimeters	5	17	1/16	1/12	=	0.442708333
Double door sweeps & astragals	2	20	1/8	1/12	=	0.416666667
Double door perimeters	2	20	1/16	1/12	=	0.208333333
Roof/wall joint	1	218	1/8	1/12	=	2.270833333
					Total =	3.494791667 ft2

Occupied Flow Rate

Q = AL√(Cs x ΔT + Cw x U2) Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in2) (without roof fan leakage area) AL	Windward Diversity (%)	Stack Coefficient (cfm2/(in4·˚F)) Cs	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient (cfm2/(in4·mph2)) Cw	Average Wind Speed (mph) U	Flow Rate (cfm) Qocc
503.25	50%	0.0299	72	34.25	0.0086	11.6	380.440

Occupied Infiltration Savings

Specific Heat of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Qocc	Temperature Differential (ΔT)	Percent Occupied (%/week)	Heating Season Bin Hours (Occupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	380.440	37.75	29.76%	4335	3412	320%	1832.694

Unoccupied Flow Rate

Q = AL√(Cs x ΔT + Cw x U2) Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in2) (with roof fan leakage area) AL	Windward Diversity (%)	Stack Coefficient (cfm2/(in4·˚F)) Cs	Indoor Air Temperature (˚F)	Averge Outdoor Air Temperature (˚F)	Wind Coefficient (cfm2/(in4·mph2)) Cw	Average Wind Speed (mph) U	Flow Rate (cfm) Qocc
503.25	50%	0.0299	67	34.14	0.0086	11.6	368.072

Unoccupied Infiltration Savings

Specific Hear of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Qocc	Temperature Differential (ΔT)	Percent Unoccupied (%/week)	Heating Season Bin Hours (Unoccupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	368.072	32.86	70.24%	4301	3412	320%	3614.261

Totals

Units of Fuel per Year (units/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
5446.956	3412	293.0832356	18.5850122

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
5446.96	$0.08	428.7555097

Total Cost Savings: **$428.76**
Cost to Retrofit: **$5,887.00**
Simple Payback: **13.73 years**

Project: Erie County
Building: Health Mall
Date: 7/3/2019

Cooling System Efficiency (kW/ton):	0.850
EFF:	14.118
Average Fuel Cost ($/unit):	$0.08

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product
Single door sweeps	5	3	1/8	1/12	=	0.15625
Single door perimeters	5	17	1/16	1/12	=	0.442708333
Double door sweeps & astragals	2	20	1/8	1/12	=	0.416666667
Double door perimeters	2	20	1/16	1/12	=	0.208333333
Roof/wall joint sealing	1	218	1/8	1/12	=	2.270833333
					Total =	3.494791667 ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
503.25	50%	0.0299	72	80.14	0.0086	11.6	297.791

Occupied Infiltration Savings Ref: ASHRAE 2013 Fundamentals 18.13 (8)

Air Total Heat Factor C_t	Flow Rate (cfm) Q_{occ}	Average Outdoor Air Enthalpy h	Cooling Supply Air Enthalpy h	% Building Occupied	Cooling Season Bin Hours	% Building Area Cooled	Btu/hrs per Ton	Cooling (kWh)
4.50	297.791	32	22.7	29.76%	1,122	100%	14,118	353.71

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
503.25	50%	0.0299	77	74.77	0.0086	11.6	262.769

Unoccupied Infiltration Savings Ref: ASHRAE 2013 Fundamentals 18.13 (8)

Air Total Heat Factor C_t	Flow Rate (cfm) Q_{occ}	Average Outdoor Air Enthalpy h	Cooling Supply Air Enthalpy h	% Building Occupied	Cooling Season Bin Hours	% Building Area Cooled	Btu/hrs per Ton	Cooling (kWh)
4.50	262.769	32	22.7	70.24%	449	100%	14,118	294.7946656

Totals

kWh per Year (kWh/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
648.508	3,412	293.08	2.212709014

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
648.51	$0.08	51.23212547

Total Cost Savings: **$51.23**
Cost to Retrofit: Cost carried on heating page
Simple Payback: **0.00 years**

CALCULATIONS TO PIPE INSULATION

FIM 13.30 Health Mall

Fuel Information

	Heating System		DHW System
Type:	**Electricity**		**Natural Gas**
Units:	kwh		mcf
Unit cost:	$ 0.049	/kwh	$ 5.381
Conversion Factor:	3,412	Btu/kwh	1,030,000
Efficiency:	100%	Heating	96%

Basic Inputs

	Type #1	Type #2	Type #3	Type #4	Type #5
Fluid	**DHW**	**DHW**	**Steam**	**DHW**	**Hot Water**
Pipe Material	**Dull Copper**	**Dull Copper**	**Steel**	**Steel**	**Steel**
O.D., inches (d)	**0.75**	**1.50**	**1.00**	**2.00**	**2.00**
Total Length, ft	**23**	**26**	**0**	**0**	**0**
Fluid Temperature Inside Pipe, °F (Ts)	**105**	**105**	**215**	**110**	**160**
Ambient Temperature, °F (Ta)	**65**	**65**	**65**	**65**	**65**
Annual Operating Hours	**8,760**	**8,760**	**2,187**	**2,187**	**2,187**
New Insulation Thickness, inches	**1.0**	**1.0**	**2.0**	**2.0**	**2.0**
Thermal Conductivity - "k" (Btu-in/hr-sq ft	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**
Heat Loss - Bare Pipe					
C factor	**1.016**	**1.016**	**1.016**	**1.016**	**1.016**
emissivity based on pipe material	0.440	0.440	0.940	0.940	0.940
Outside Radius Pipe, inches (Ri)	0	1	1	1	1
Outside Radius Insulation, inches (Rs)	1.4	1.8	2.5	3.0	3.0
h convection, Btu/hr - s.f. pipe surface area -°	1.28	1.12	1.58	1.08	1.26
h radiation, Btu/hr - s.f. pipe surface area - °F	0.49	0.49	1.41	1.06	1.22
h total	1.77	1.61	2.99	2.14	2.48
Pipe area, sq ft/lin ft of pipe	0.196	0.393	0.262	0.523	0.523
Q bare, Btu/hr-lin ft	**14**	**25**	**117**	**50**	**123**
Heat Loss - Insulated Pipe					
Q i, Btu/hr-sq ft of outer area of insulation	5.6	6.7	9.3	3.4	7.2
Insulation Area - sq ft/lin ft of pipe	0.7	0.9	1.3	1.6	1.6
Q insul, Btu/hr-lin ft	**4.0**	**6.2**	**12.2**	**5.4**	**11.3**
Avoided Energy Loss					
Existing Loss - MBtu/year	2.8	5.7	0.0	0.0	0.0
Proposed Loss - MBtu/year	0.8	1.4	0.0	0.0	0.0
Avoided Loss - MBtu/year	2.0	4.3	0.0	0.0	0.0
Total Avoided Fuel Consumption					
- 6 Units Saved	2	4	0	0	0
Electricity Natural Gas Fuel Type	Natural Gas	Natural Gas	Electricity	Natural Gas	Electricity
$ 0 $/year			**$ 0**	**$ 0**	**$ 0**

Formulas:

Based on ASHRAE 1993 Fundamentals Handbook pages 20.9 and 22.17

h convection = C x {(1 / d) ^ 0.2} x { (1 / ((Ts + Ta)/2)) ^ 0.181 } x { (Ts - Ta) ^ 0.266 }

h radiation = { emissivity x 0.1713 x 10 ^ -8 x [(Ta + 460) ^ 4 - (Ts +460) ^ 4]} / (Ta - Ts)

Q bare = h total x Pipe Area x (Ts - Ta)

Q i = (Ts - Ta) / { [Rs x (ln (Rs / Ri)] / k }

Q insul = Q i x Insul Area

Total Avoided Consumption = (Q bare - Q insul) x Total length of pipe x Annual Operating Hours

CALCULATIONS FOR VENDING MACHINE OCCUPANCY CONTROL
FIM 13.36 Health Mall

Electricity
Unit cost: **$ 0.049** /kwh

INPUT DATA:

Machine Type	Qty.	Volts	Amps	Present Operation Hrs/Day	Present Operation Days/Yr.	Machine Location is Occupied Hrs/Day	Machine Location is Occupied Days/Yr.
Refrigerated	**1**	**115**	**11.0**	**24**	**365**	**8**	**250**
Non Refrigerated	**1**	**115**	**3.0**	**24**	**365**	**8**	**250**

* Lighting watts is included in the volt / amp data and Total kW

Lighting Savings						Present	Proposed
Machine Type	Lighting * Watts/ unit	Lighting Found	Ltg. Watts	Present Hrs/Yr.	Proposed Hrs/Yr.	Lighting kWh/yr.	Lighting kWh/Yr.
Refrigerated	**128**	**On**	128	8,760	2,845	1,121	364
Non Refrigerated	**28**	**On**	28	8,760	2,845	245	80
						1,367	444

Compressor Savings						
	Duty Cycle		Compressor Hours		Present	Proposed
Compressor kW	Present Normal	Proposed Nite	Present Hrs/Yr.	Proposed Hrs/Yr.	Compressor kWh/yr.	Compressor kWh/Yr.
0.884	**33%**	**12.5%**	2,891	1,505	2,555	1,330
					2,555	1,330

CALCULATIONS:

Ltg kWh =Ltg Watts / 1000 x # units x Hrs per Day x Days per Yr
Compressor kWh=(volts x amps x 0.80 pf/ 1000 - ltg watts)x # units x hrs per day x days per yr x duty cycle

Ltg kWh with Control = Ltg watts per unit /1000 x # units x (Occ Hrs per Yr + Unocc Hrs x Nite Duty Cycle)
Prop Compressor Run Hours = Occ Hrs x Existing Duty Cycle + Unocc Hrs x Unocc Duty Cycle)
Compressor kWh with Control=(volts x amps x 0.80 pf -ltg watts)/1000 x # units x prop compressor hrs per yr

Electricity Cost Savings = Electricity Savings x Electricity Unit Cost

	Lighting	Compressor	Total	
Existing Annual Electricity Use:	1,367	2,555	3,922	kWh
Proposed Annual Electricity Use:	444	1,330	1,774	kWh
Total Annual Savings:	923	1,225	2,148	kWh
			55%	reduction

CALCULATIONS TO EXTEND DDC TO UNCONTROLLED EQUIPMENT

FIM 13.49 Health Mall

INPUT DATA:

Equipment	Qty	Capacity [kW]
Electric Heaters	**9**	**3**

Occupied		Unoccupied	
% loaded	**Total load [kW]**	**% loaded**	**Total load [kW]**
75%	**20**	**75%**	**20**

	Existing	Proposed
Percent time units on during occupied	**75%**	**50%**
Percent time units on during unoccupied	**50%**	**33%**

CALCULATIONS:

Buffalo, 50 hrs./week						
Bin Mid Pt.	Occupied Hours Heating	Unoccupied Hours Heating	Existing All heating hour usage kWh	Proposed All heating hour usage kWh	Energy Savings kWh	
(2.5)	0	1	10	7	3	
2.5	7	24	349	231	118	
7.5	15	47	704	466	238	
12.5	47	172	2,455	1,625	830	
17.5	145	313	5,371	3,560	1,812	
22.5	121	279	4,663	3,090	1,573	
27.5	92	294	4,374	2,896	1,478	
32.5	179	468	7,457	4,940	2,517	
37.5	229	696	10,525	6,970	3,555	
42.5	228	501	8,535	5,656	2,879	
47.5	147	334	5,614	3,720	1,894	
52.5	82	256	3,837	2,541	1,296	
57.5	112	204	3,767	2,497	1,269	
62.5	110	149	3,179	2,109	1,070	
67.5	39	39	987	655	332	
72.5	31	14	613	407	205	
77.5	26	18	577	384	194	
82.5	0	5	51	33	17	
87.5	0	0	0	0	0	
92.5	0	0	0	0	0	
97.5	0	0	0	0	0	
102.5	0	0	0	0	0	
107.5	0	0	0	0	0	
	5,424	hours	63,069	41,788	21,280	kWh

CALCULATIONS TO EXTEND DDC TO DHW PUMPS
FIM 13.40 Health Mall

	DHW Fuel		Pump	
Type:	**Natural Gas**		**Electricity**	
Units:	**mcf**		**kwh**	
Unit cost:	$ 5.381	/mcf	**$ 0.049**	$/kWh
Heat Content of Fuel:	1,030,000	Btu/mcf		
Combustion Efficiency:	**89.0%**			

INPUT

Building Conditioned Floor Area	Schedule	hrs/week	Wks/yr	Hrs/yr.
24,638 sq.ft.	Heating	**50**	**42**	2,100
	Non-heating	**50**	**10**	500
				2,600

Electricity Savings for DHW Recirculation Pumps

Formula:

kwh = HP x % Loading x 0.746 kw per HP / motor efficiency x Qty. x Hours

Motor Description	Motor HP	Qty	Motor Loading	Motor Type	Motor y	Annual Hours Present	Annual Hours Proposed	Annual kWh Present	Annual kWh Proposed
105° DHW	**1/8**	**2**	70%	Std.	45.0%	8,760	2,600	2,541	754
								2,541	754

Thermal Savings for DHW Recirculation Pumps

Motor Description	Motor GPM	Recirc ΔT	DHW Eff.	DHW Losses Btuh	Annual Hours Present	Annual Hours Proposed	Annual mcf Present	Annual mcf Proposed
105° DHW	**3**	0.5	89%	739	8,760	2,600	7	2
							19	6

Formulae:

DHW Losses = GPM x Recirc ΔT x 60 min per hour x 8.33 lbs per gallon

Annual MMBtu = DHW Losses / DHW Efficiency x Annual Hours / heat content of fuel

Recirc ΔT = temperature drop between DHW leaving boiler room and returning recirculation DHW

Pump Power Savings	1,787	kwh
DHW Fuel Savings	13	mcf
Total Savings	$ 0	

CALCULATIONS FOR IMPACT OF REDUCED LIGHTING ON HEATING AND AIR CONDITIONING

FIM 15.1

Client: CRP Bunker
Address 6121 Chestnut Ridge Road

INPUT DATA:

	Heating Energy		Cooling Energy	
Fuel:	**Electricity**		**Electric**	
Units:	**kwh**		**kWh**	
Fuel Cost:	**$ 0.048**	per kwh	**$ 0.048**	per kWh
Fuel Conversion F	**3,412**	Btu per kwh	**3,412**	Btu per kWh
Efficiency:	**100.0%**		**1.10**	kW/Ton
			100%	of building is air conditioned

	27,265	Lighting Retrofit
	-	Installing Sensors
Annual Lighting Savings:	**27,265**	kWh per Year
	12	months per year of lighting operation
	2,272	kwh/month

For **8** months/year the lighting retrofit will impact heating costs
20% of light fixtures are within 10 feet of an exterior wall
For **4** months/year the lighting retrofit will impact cooling costs

CALCULATIONS:

Replacement Electricity because of Reduced Lighting Energy

Useful Heat from Lights during the heating season that is no longer available is:

= kwh Lighting Savings per month x No. Months of Heating impact x % of fixtures located near exterior walls

= **3,635 kWh =** 12,403,794 BTU = 3,635 kwh

Replacement Electricity usage

Useful Heat from Lights in kwh x 3412 BTU/kwh / Heating Fuel Conversion Factor / Heating Fuel Efficienc

Replacement Electricity Cost = kwh x $per kwh

	Fuel Usage		Fuel Cost	
Useful Heat from L	3,635	kWh	n/a	
Replacement Gas	**(3,635)**	**kwh**		**per year**

Reduced Air Conditioning because of Reduced Lighting

Reduced Air Conditioning Lighting Load during the cooling season from Lighting that is no longer present is:

= kwh Lighting Savings per month x No. Months Lighting Retrofit will impact cooling costs x % of building cc

= **9,088 kWh =** 31,009,484 BTU

Reduced Air Conditioning Energy Requirements [kWh] =

Reduce Air Conditioning Lighting Load x (3412 Btu / kWh) x (1 ton-hr / 12,000 Btu) x (1.1 kW / ton)

Reduced Air Conditioning Cost = Reduced Air Conditioning Energy Requirements x Cost per kWh

Reduced Air Conditioning Energy Requiremer	**2,843**	**kWh per year**
Reduced Air Conditioning Cost =	**$ 136**	**per year**

Net Impact on Heating and Air Conditioning Costs because of Lighting Retrofit

Heating Fuel	**(3,635.3)**	**kwh**
Cooling	**2,843**	**kWh per year**

CALCULATIONS TO REPLACE AH SUPPLY MOTOR
FIM 15.32 CRP Bunker

DATA AND CALCULATIONS:

kWh:	$ 0.048	per kWh
Demand:	$ 6.05	per kW

Formula:

Demand kW = (Qty x HP x 0.746 kW/HP x % Load) / % Efficiency
Annual kWh = Demand kW x Annual Hours
Demand $ Savings = (Present kW - New kW) x months of demand x Monthly demand charge
kWh $ Savings = (Present kWh - New kWh) x Cost per kWh

		Motor			Motor Efficiency		Annual Motor Run Hours		Months of Demand
#	Description	Nominal HP	Qty	Loading vs. Nom.	Present	New	Existing	New	Savings
1	Multizone AH Supply Fan	10	1	50%	85.0%	91.7%	8,760	8,760	12

		Total	Demand kW		Annual kWh		Motor	$ Savings	Cost
#	Description	BHP/	Present	New	Present	New	Type	Total	$
1	Multizone AH Supply Fan	5.0	4.39	4.07	38,441	35,632	TEFC		
		5.0	4.4	4.1	38,441	35,632			

ODP = open drip-proof
TEFC = totally enclosed fan-cooled

Peak KW Demand Savings:	0.3	kW
Annual KW Demand Savings:	3.8	kW
Annual kWh Savings:	2,809	kWh
Total:		

CALCULATIONS TO REPLACE EXHAUST FANS B&C

FIM 15.32 CRP Bunker

DATA AND CALCULATIONS:

kWh:	$ 0.048	per kWh
Demand:	$ 6.05	per kW

Formula:

Demand kW = (Qty x HP x 0.746 kW/HP x % Load) / % Efficiency

Annual kWh = Demand kW x Annual Hours

Demand $ Savings = (Present kW - New kW) x months of demand x Monthly demand charge

kWh $ Savings = (Present kWh - New kWh) x Cost per kWh

Cooling	3,432	HRS
Generator	52	HRS
Total	3,484	HRS

		Motor			Motor Efficiency		Annual Motor Run Hours		Months of Demand
#	Description	Nominal HP	Qty	Loading vs. Nom.	Present	New	Existing	New	Savings
1	Heat Reject Fan B	10	1	50%	85.0%	91.7%	3,484	3,484	4
2	Heat Reject Fan C	10	1	50%	85.0%	91.7%	3,484	3,484	4

		Total	Demand kW		Annual kWh		Motor	$ Savings	Cost
#	Description	BHP/	Present	New	Present	New	Type	Total	$
1	Heat Reject Fan B	5.0	4.39	4.07	15,289	14,172	TEFC		
2	Heat Reject Fan C	5.0	4.39	4.07	15,289	14,172	TEFC		
		10.0	8.8	8.1	30,577	28,343			

ODP = open drip-proof

TEFC = totally enclosed fan-cooled

Peak KW Demand Savings:	0.6	kW
Annual KW Demand Savings:	2.6	kW
Annual kWh Savings:	2,234	kWh

CALCULATIONS TO REPLACE FAN D
FIM 15.32 CRP Bunker

DATA AND CALCULATIONS:

kWh:	$ 0.048	per kWh
Demand:	$ 6.05	per kW

Formula:

Demand kW = (Qty x HP x 0.746 kW/HP x % Load) / % Efficiency
Annual kWh = Demand kW x Annual Hours
Demand $ Savings = (Present kW - New kW) x months of demand x Monthly demand charge
kWh $ Savings = (Present kWh - New kWh) x Cost per kWh

Cooling	3,432	HRS
Generator	52	HRS
Total	3,484	HRS

		Motor			Motor Efficiency		Annual Motor Run Hours		Months of Demand
#	Description	Nominal HP	Qty	Loading vs. Nom.	Present	New	Existing	New	Savings
1	Fan D	7 1/2	1	50%	83.8%	91.7%	4,380	4,380	6

		Total	Demand kW		Annual kWh		Motor	$ Savings	Cost
#	Description	BHP/	Present	New	Present	New	Type	Total	$
1	Fan D	3.8	3.34	3.05	14,622	13,362	TEFC		
		3.8	3.3	3.1	14,622	13,362			

ODP = open drip-proof
TEFC = totally enclosed fan-cooled

Peak KW Demand Savings:	0.3	kW
Annual KW Demand Savings:	1.7	kW
Annual kWh Savings:	1,260	kWh

CALCULATIONS TO ADD CONTROLS TO EXHAUST FANS B&C
FIM 15.47 CRP Bunker

DATA AND CALCULATIONS:

kWh:	$ 0.048	per kWh
Demand:	$ 6.05	per kW

Formula:

Demand kW = (Qty x HP x 0.746 kW/HP x % Load) / % Efficiency
Annual kWh = Demand kW x Annual Hours
Demand $ Savings = (Present kW - New kW) x months of demand x Monthly demand charge
kWh $ Savings = (Present kWh - New kWh) x Cost per kWh

Cooling	3,432	HRS
Generator	52	HRS
Total	3,484	HRS

		Motor			Motor Efficiency		Annual Motor Run Hours		Months of Demand
#	Description	Nominal HP	Qty	Loading vs. Nom.	Present	New	Existing	New	Savings
1	Heat Reject Fan B	10	1	50%	85.0%	85.0%	8,760	3,484	12
2	Heat Reject Fan C	10	1	50%	85.0%	85.0%	8,760	3,484	12

		Total	Demand kW		Annual kWh		Motor	$ Savings	Cost
#	Description	BHP/	Present	New	Present	New	Type	Total	$
1	Heat Reject Fan B	5.0	4.39	4.39	38,441	15,289	TEFC		
2	Heat Reject Fan C	5.0	4.39	4.39	38,441	15,289	TEFC		
		10.0	8.8	8.8	76,882	30,577			

ODP = open drip-proof
TEFC = totally enclosed fan-cooled

Peak KW Demand Savings:	0.0	kW
Annual KW Demand Savings:	0.0	kW
Annual kWh Savings:	46,305	kWh

CALCULATIONS FOR IMPACT OF REDUCED LIGHTING ON HEATING AND AIR CONDITIONING

FIM 15.1

Client: CRP Casino
Address 6121 Chestnut Ridge Road

INPUT DATA:

	Heating Energy		Cooling Energy	
Fuel:	**Natural Gas**		**Electric**	
Units:	**mcf**		**kWh**	
Fuel Cost:	**$ 5.712**	per mcf	**$ 0.050**	per kWh
Fuel Conversion F	**1,030,000**	Btu per mcf	**3,412**	Btu per kWh
Efficiency:	**89.0%**		**1.10**	kW/Ton
			0%	of building is air conditioned

	16,802	Lighting Retrofit
	-	Installing Sensors
Annual Lighting Savings:	**16,802**	kWh per Year
	12	months per year of lighting operation
	1,400	kwh/month

For **8** months/year the lighting retrofit will impact heating costs
20% of light fixtures are within 10 feet of an exterior wall
For **4** months/year the lighting retrofit will impact cooling costs

CALCULATIONS:

Replacement Natural Gas because of Reduced Lighting Energy

Useful Heat from Lights during the heating season that is no longer available is:

= kwh Lighting Savings per month x No. Months of Heating impact x % of fixtures located near exterior walls

= **2,240 kWh =** 7,643,835 BTU = 8 mcf

Replacement Natural Gas usage

Useful Heat from Lights in kwh x 3412 BTU/kwh / Heating Fuel Conversion Factor / Heating Fuel Efficiency

Replacement Natural Gas Cost = mcf x $per mcf

	Fuel Usage		Fuel Cost	
Useful Heat from l	2,240	kWh	n/a	
Replacement Gas	**(8)**	**mcf**		**per year**

Reduced Air Conditioning because of Reduced Lighting

Reduced Air Conditioning Lighting Load during the cooling season from Lighting that is no longer present is:

= kwh Lighting Savings per month x No. Months Lighting Retrofit will impact cooling costs x % of building cooled

= **0 kWh =** 0 BTU

Reduced Air Conditioning Energy Requirements [kWh] =

Reduce Air Conditioning Lighting Load x (3412 Btu / kWh) x (1 ton-hr / 12,000 Btu) x (1.1 kW / ton)

Reduced Air Conditioning Cost = Reduced Air Conditioning Energy Requirements x Cost per kWh

Reduced Air Conditioning Energy Require 0 kWh per year
Reduced Air Conditioning Cost = $ 0 per year

Net Impact on Heating and Air Conditioning Costs because of Lighting Retrofit

Heating Fuel (8.3) mcf
Cooling 0 kWh per year

Project: Erie County
Building: Chestnut Ridge Park
Date: 7/3/2019

Heating System Efficiency:	80%
Average Fuel Cost ($/unit):	$0.53
Correction Factor:	100%

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product
Single door sweeps	21	3	3/16	1/12	=	0.984375
Single door perimeters	21	17	1/8	1/12	=	3.71875
Double door sweeps & astragals	3	20	3/16	1/12	=	0.9375
Double door perimeters	3	20	1/8	1/12	=	0.625
Garage doors	15	679	1/4	1/12	=	14.14583333
Roof top ventilators	4	20	1/6	1/12	=	0.277777778
Roof/wall joint	1	224	1/8	1/12	=	2.333333333
Window caulking	53	714	1/32	1/12	=	1.859375
					Total =	24.88194444

*assume roof fans open during occupied hours

ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (°F)	Average Outdoor Air Temperature (°F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
3543	50%	0.015	72	34.25	0.0092	11.6	2379.489

Occupied Infiltration Savings

Specific Heat of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Occupied (%/week)	Heating Season Bin Hours (Occupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	2379.489	37.75	29.76%	4335	103000	80%	1518.865

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (°F)	Average Outdoor Air Temperature (°F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
3583	50%	0.015	67	34.14	0.0092	11.6	2356.931

Unoccupied Infiltration Savings

Specific Hear of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Unoccupied (%/week)	Heating Season Bin Hours (Unoccupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	2356.931	32.86	70.24%	4301	103000	80%	3066.654

Totals

Units of Fuel per Year (units/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
4585.520	103000	9.708737864	472.308525

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
4585.52	$0.53	2430.325422

Total Cost Savings: **$2,430.33**
Cost to Retrofit: **$40,782.00**
Simple Payback: **16.78 years**

CALCULATIONS TO PIPE INSULATION

FIM 15.30 CRP Casino

Fuel Information

	Heating System		DHW System
Type:	**Natural Gas**		**Natural Gas**
Units:	mcf		mcf
Unit cost:	$ 5.712	/mcf	$ 5.712
Conversion Factor:	1,030,000	Btu/mcf	1,030,000
Efficiency:	89%	Heating	80%

Basic Inputs

	Type #1	Type #2	Type #3	Type #4	Type #5
Fluid	**DHW**	**DHW**	**DHW**	**DHW**	**Hot Water**
Pipe Material	**Dull Copper**	**Dull Copper**	**Dull Copper**	**Dull Copper**	**Steel**
O.D., inches (d)	**2.50**	**1.00**	**1.50**	**2.50**	**2.00**
Total Length, ft	**24**	**35**	**15**	**24**	**0**
Fluid Temperature Inside Pipe, °F (Ts)	**120**	**120**	**120**	**120**	**160**
Ambient Temperature, °F (Ta)	**70**	**70**	**70**	**70**	**70**
Annual Operating Hours	**4,380**	**4,380**	**4,380**	**8,760**	**2,187**
New Insulation Thickness, inches	**1.0**	**1.0**	**1.0**	**1.5**	**2.0**
Thermal Conductivity - "k" (Btu-in/hr-sq ft-	**0.25**	**0.25**	**0.25**	**0**	**0**
Heat Loss - Bare Pipe					
C factor	**1.016**	**1.016**	**1.016**	**1.016**	**1.016**
emissivity based on pipe material	0.440	0.440	0.440	0.440	0.940
Outside Radius Pipe, inches (Ri)	1	1	1	1	1
Outside Radius Insulation, inches (Rs)	2.3	1.5	1.8	2.8	3.0
h convection, Btu/hr - s.f. pipe surface area -°F	1.05	1.26	1.16	1.05	1.24
h radiation, Btu/hr - s.f. pipe surface area - °F	0.52	0.52	0.52	0.52	1.23
h total	1.57	1.78	1.68	1.57	2.47
Pipe area, sq ft/lin ft of pipe	0.654	0.262	0.393	0.654	0.523
Q bare, Btu/hr-lin ft	**51**	**23**	**33**	**51**	**116**
Heat Loss - Insulated Pipe					
Q i, Btu/hr-sq ft of outer area of insulation	9.5	7.6	8.4	5.8	6.8
Insulation Area - sq ft/lin ft of pipe	1.2	0.8	0.9	1.4	1.6
Q insul, Btu/hr-lin ft	**11.1**	**6.0**	**7.7**	**8.3**	**10.7**
Avoided Energy Loss					
Existing Loss - MBtu/year	5.4	3.6	2.2	10.8	0.0
Proposed Loss - MBtu/year	1.2	0.9	0.5	1.7	0.0
Avoided Loss - MBtu/year	4.2	2.7	1.7	9.0	0.0
Total Avoided Fuel Consumption					
21 Units Saved	5	3	2	11	0
Natural Gas Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
$ 0 $/year					

Formulas:

Based on ASHRAE 1993 Fundamentals Handbook pages 20.9 and 22.17

h convection = C x {(1 / d) ^ 0.2} x { (1 / ((Ts + Ta)/2)) ^ 0.181 } x { (Ts - Ta) ^ 0.266 }

h radiation = { emissivity x 0.1713 x 10 ^ -8 x [(Ta + 460) ^ 4 - (Ts +460) ^ 4]} / (Ta - Ts)

Q bare = h total x Pipe Area x (Ts - Ta)

Q i = (Ts - Ta) / { [Rs x (ln (Rs / Ri)] / k }

Q insul = Q i x Insul Area

Total Avoided Consumption = (Q bare - Q insul) x Total length of pipe x Annual Operating Hours

CALCULATIONS FOR VENDING MACHINE OCCUPANCY CONTROL
FIM 15.36 CRP Casino

Electricity
Unit cost: **$ 0.050** /kwh

INPUT DATA:

Machine Type	Qty.	Volts	Amps	Present Operation Hrs/Day	Present Operation Days/Yr.	Machine Location is Occupied Hrs/Day	Machine Location is Occupied Days/Yr.
Refrigerated	**1**	**115**	**12.0**	**24**	**365**	**3**	**250**

* Lighting watts is included in the volt / amp data and Total kW

Lighting Savings						Present	Proposed
Machine Type	Lighting * Watts/ unit	Lighting Found	Ltg. Watts	Present Hrs/Yr.	Proposed Hrs/Yr.	Lighting kWh/yr.	Lighting kWh/Yr.
Refrigerated	**128**	**On**	128	8,760	1,751	1,121	224
						1,121	224

Compressor Savings						
	Duty Cycle		Compressor Hours		Present	Proposed
Compressor kW	Present Normal	Proposed Nite	Present Hrs/Yr.	Proposed Hrs/Yr.	Compressor kWh/yr.	Compressor kWh/Yr.
0.976	**33%**	**12.5%**	2,891	1,249	2,821	1,219
					2,821	1,219

CALCULATIONS:

Ltg kWh =Ltg Watts / 1000 x # units x Hrs per Day x Days per Yr
Compressor kWh=(volts x amps x 0.80 pf/ 1000 - ltg watts)x # units x hrs per day x days per yr x duty cycle

Ltg kWh with Control = Ltg watts per unit /1000 x # units x (Occ Hrs per Yr + Unocc Hrs x Nite Duty Cycle)
Prop Compressor Run Hours = Occ Hrs x Existing Duty Cycle + Unocc Hrs x Unocc Duty Cycle)
Compressor kWh with Control=(volts x amps x 0.80 pf -ltg watts)/1000 x # units x prop compressor hrs per

Electricity Cost Savings = Electricity Savings x Electricity Unit Cost

	Lighting	Compressor	Total	
Existing Annual Electricity Use:	1,121	2,821	3,943	kWh
Proposed Annual Electricity Use:	224	1,219	1,443	kWh
Total Annual Savings:	897	1,603	2,500	kWh
			63%	reduction

CALCULATIONS TO IMPROVE TEMPERATURE CONTROL

FIM 15.38 CRP Casino

INPUT DATA: 100% of Building to be Setback

		Current	Proposed	
Heating T Setpoint:	Occupied	70	70	deg. F.
	Unoccupied	70	65	deg. F.
Cooling T Setpoint:	Occupied	80	80	deg. F.
	Unoccupied	80	80	deg. F.
HVAC Schedule	Occupied	168.0	84.0	Hours per week
	Unoccupied	0.0	84.0	Hours per week
Q internal gains:	Occupied	64,709	64,709	Btuh
	Unoccupied	3,195	3,195	Btuh
Q internal gains:	Schedule	60	60	Hours per week
BLC:	Occupied	4,718	4,718	Btuh/deg. F.
	Unoccupied	5,242	5,242	Btuh/deg. F.

Fuel Data	Heating	Cooling		
Type:	Natural Gas	Electricity		
Units:	**mcf**	kwh		
Unit cost:	**$ 5.712**	$ 0.05		
BTU/unit	**1,030,000**	3,412		
Efficiency/ COP:	**89.0%**	2.93	COP, = EER	10.0

CALCULATIONS:

Current — Buffalo, 168 hrs./week

Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use mcf	Cooling Energy kwh
(2.5)	1	0	316,879	376,853	0	
2.5	28	3	293,289	350,643	10	
7.5	60	2	269,700	324,432	18	
12.5	208	11	246,111	298,222	59	
17.5	438	20	222,522	272,012	112	
22.5	385	15	198,933	245,802	88	
27.5	366	20	175,343	219,592	75	
32.5	623	24	151,754	193,381	108	
37.5	894	42	128,165	167,171	133	
42.5	757	37	104,576	140,961	92	
47.5	706	39	80,987	114,751	67	
52.5	569	24	57,398	88,541	38	
57.5	673	29	33,808	62,330	27	
62.5	883	52	10,219	36,120	12	
67.5	707	30	(13,370)	9,910	0	
72.5	489	10	(25,165)	(3,195)	0	
77.5	382	5	(25,165)	(3,195)	0	
82.5	204	2	(36,959)	(16,300)	0	
87.5	22	0	(60,548)	(42,510)	0	
92.5	0	0	(84,138)	(68,721)	0	
97.5	0	0	(107,727)	(94,931)	0	
102.5	0	0	(131,316)	(121,141)	0	
107.5	0	0	(154,905)	(147,351)	0	
	8,760	hours			840	0

Proposed		Buffalo, 84 hrs./week				
Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use	Cooling Energy kwh
(2.5)	0	1	294,910	350,643	0	
2.5	9	22	271,320	324,432	10	
7.5	24	38	247,731	298,222	19	
12.5	71	148	224,142	272,012	61	
17.5	217	241	200,553	245,802	112	
22.5	222	178	176,964	219,592	85	
27.5	176	210	153,375	193,381	74	
32.5	314	333	129,785	167,171	105	
37.5	416	520	106,196	140,961	128	
42.5	363	431	82,607	114,751	87	
47.5	329	416	59,018	88,541	61	
52.5	254	339	35,429	62,330	33	
57.5	336	366	11,839	36,120	19	
62.5	449	486	(11,750)	9,910	5	
67.5	368	369	(35,339)	(3,195)	0	
72.5	329	170	(47,134)	(3,195)	0	
77.5	300	87	(47,134)	(3,195)	0	
82.5	181	25	(58,928)	(16,300)	0	
87.5	22	0	(82,517)	(42,510)	0	
92.5	0	0	(106,107)	(68,721)	0	
97.5	0	0	(129,696)	(94,931)	0	
102.5	0	0	(153,285)	(121,141)	0	
107.5	0	0	(176,874)	(147,351)	0	
	8,760	hours			801	0

		Present	Proposed
Heating	mcf	840	801
Cooling	kwh	0	0

CALCULATIONS FOR IMPACT OF REDUCED LIGHTING ON HEATING AND AIR CONDITIONING

FIM 15.1

Client: CRP Office
Address 6121 Chestnut Ridge Road

INPUT DATA:

	Heating Energy		Cooling Energy	
Fuel:	**Natural Gas**		**Electric**	
Units:	**mcf**		**kWh**	
Fuel Cost:	**$ 5.554**	per mcf	**$ 0.047**	per kWh
Fuel Conversion F	**########**	Btu per mcf	**3,412**	Btu per kWh
Efficiency:	**78.0%**		**1.10**	kW/Ton
			0%	of building is air conditioned

	10,915	Lighting Retrofit
	-	Installing Sensors
Annual Lighting Savings:	**10,915**	kWh per Year
	12	months per year of lighting operation
	910	kwh/month

For **8** months/year the lighting retrofit will impact heating costs
20% of light fixtures are within 10 feet of an exterior wall
For **4** months/year the lighting retrofit will impact cooling costs

CALCULATIONS:

Replacement Natural Gas because of Reduced Lighting Energy

Useful Heat from Lights during the heating season that is no longer available is:

= kwh Lighting Savings per month x No. Months of Heating impact x % of fixtures located near exterior walls

= **1,455 kWh =** ######## BTU = 6 mcf

Replacement Natural Gas usage

Useful Heat from Lights in kwh x 3412 BTU/kwh / Heating Fuel Conversion Factor / Heating Fuel Efficiency

Replacement Natural Gas Cost = mcf x $per mcf

	Fuel Usage		Fuel Cost	
Useful Heat from l	1,455	kWh	n/a	
Replacement Ga	**(6)**	**mcf**		**per year**

Reduced Air Conditioning because of Reduced Lighting

Reduced Air Conditioning Lighting Load during the cooling season from Lighting that is no longer present is:

= kwh Lighting Savings per month x No. Months Lighting Retrofit will impact cooling costs x % of building cooled

= **0 kWh =** 0 BTU

Reduced Air Conditioning Energy Requirements [kWh] =

Reduce Air Conditioning Lighting Load x (3412 Btu / kWh) x (1 ton-hr / 12,000 Btu) x (1.1 kW / ton)

Reduced Air Conditioning Cost = Reduced Air Conditioning Energy Requirements x Cost per kWh

Reduced Air Conditioning Energy Require 0 kWh per year
Reduced Air Conditioning Cost = $ 0 per year

Net Impact on Heating and Air Conditioning Costs because of Lighting Retrofit

Heating Fuel (6.2) mcf
Cooling 0 kWh per year

CALCULATIONS TO PIPE INSULATION

FIM 15.30 CRP Office

Fuel Information

	Heating System		DHW System
Type:	**Natural Gas**		**Natural Gas**
Units:	mcf		mcf
Unit cost:	$ 5.554	/mcf	$ 5.554
Conversion Factor:	1,030,000	Btu/mcf	1,030,000
Efficiency:	78%	Heating	80%

Basic Inputs

	Type #1	Type #2	Type #3	Type #4	Type #5
Fluid	**DHW**	**DHW**	**DHW**	**DHW**	**Hot Water**
Pipe Material	**Dull Copper**	**Dull Copper**	**Dull Copper**	**Dull Copper**	**Steel**
O.D., inches (d)	**1.00**	**0.50**	**1.50**	**2.50**	**2.00**
Total Length, ft	**36**	**30**	**15**	**24**	**0**
Fluid Temperature Inside Pipe, °F (Ts)	**120**	**120**	**120**	**120**	**160**
Ambient Temperature, °F (Ta)	**70**	**70**	**70**	**70**	**70**
Annual Operating Hours	**8,760**	**8,760**	**4,380**	**8,760**	**2,187**
New Insulation Thickness, inches	**1.0**	**1.0**	**1.0**	**1.5**	**2.0**
Thermal Conductivity - "k" (Btu-in/hr-sq ft	**0.25**	**0.25**	**0.25**	**0**	**0**
Heat Loss - Bare Pipe					
C factor	**1.016**	**1.016**	**1.016**	**1.016**	**1.016**
emissivity based on pipe material	0.440	0.440	0.440	0.440	0.940
Outside Radius Pipe, inches (Ri)	1	0	1	1	1
Outside Radius Insulation, inches (Rs)	1.5	1.3	1.8	2.8	3.0
h convection, Btu/hr - s.f. pipe surface area -°	1.26	1.45	1.16	1.05	1.24
h radiation, Btu/hr - s.f. pipe surface area - °F	0.52	0.52	0.52	0.52	1.23
h total	1.78	1.97	1.68	1.57	2.47
Pipe area, sq ft/lin ft of pipe	0.262	0.131	0.393	0.654	0.523
Q bare, Btu/hr-lin ft	**23**	**13**	**33**	**51**	**116**
Heat Loss - Insulated Pipe					
Q i, Btu/hr-sq ft of outer area of insulation	7.6	6.2	8.4	5.8	6.8
Insulation Area - sq ft/lin ft of pipe	0.8	0.7	0.9	1.4	1.6
Q insul, Btu/hr-lin ft	**6.0**	**4.1**	**7.7**	**8.3**	**10.7**
Avoided Energy Loss					
Existing Loss - MBtu/year	7.3	3.4	2.2	10.8	0.0
Proposed Loss - MBtu/year	1.9	1.1	0.5	1.7	0.0
Avoided Loss - MBtu/year	5.5	2.3	1.7	9.0	0.0
Total Avoided Fuel Consumption					
22 Units Saved	7	3	2	11	0
Natural Gas Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
$ 0 $/year					

Formulas:

Based on ASHRAE 1993 Fundamentals Handbook pages 20.9 and 22.17

h convection = C x {(1 / d) ^ 0.2} x { (1 / ((Ts + Ta)/2)) ^ 0.181 } x { (Ts - Ta) ^ 0.266 }

h radiation = { emissivity x 0.1713 x 10 ^ -8 x [(Ta + 460) ^ 4 - (Ts +460) ^ 4]} / (Ta - Ts)

Q bare = h total x Pipe Area x (Ts - Ta)

Q i = (Ts - Ta) / { [Rs x (ln (Rs / Ri)] / k }

Q insul = Q i x Insul Area

Total Avoided Consumption = (Q bare - Q insul) x Total length of pipe x Annual Operating Hours

CALCULATIONS TO INSTALL MORE EFFICIENT BOILER

FIM 15.31 CRP Office

INPUT DATA:

Present Annual Heating Fuel Consumption:	710	mcfs
% of Building Served by Boiler	100%	
Boiler Fuel Use	710	mcfs

Fuel Data	**Present**		**Proposed**	
Type:	Natural Gas		Natural Gas	
Units:	mcf		mcf	
Unit cost:	$ 5.554	/mcf	$ 5.554	/mcf
BTU/Unit	1,030,000	Btu/mcf	1,030,000	Btu/mcf

Boiler Type	**Present**		**Proposed**	
Boiler Firing Rate	600	kBtuh Input	600	kBtuh Input
Combustion Efficiency	78.0%		89.0%	
Jacket Losses	2.0%	of capacity	0.5%	of capacity
Boiler Capacity	**456**	kBtuh Outpu	**531**	kBtuh Output
Off-cycle Flue Losses	1.5%	of capacity	0.5%	of capacity
Boiler is hot when OAT<	65	°F.	65	°F.
Hours/ Yr. Unit is Hot	5,252	hrs.	5,252	hrs.
Off-Cycle Hours/Year	4,034	hrs.	4,300	hrs.
Standby Losses	48	MBtu	14	MBtu
Off-Cycle Flue Losses	28	MBtu	11	MBtu
Useful Heat Output	495	MBtu	495	MBtu

CALCULATIONS:

Off-Cycle Flue Losses = Boiler kBtuh Output x 1000 x % Off-Cycle Flue Losses x Hrs Off-Cycle per Year / 1,000,000
Jacket Losses = Boiler kBtuh Output x 1000 x % Jacket Losses x Hrs Hot per Year / 1,000,000
Useful Heat Output = Htg Fuel Use x BTU per Unit x Present Efficiency / 1,000,000 - Off Cycle Losses - Jacket Losses
Proposed Annual Fuel Consumption =
(Proposed Standby Losses + Useful Heat Output) / Proposed Efficiency x 1,000,000 / BTU per Unit

	Annual Fuel Consumption		Annual Cost
Present:	710	mcf	
Proposed:	567	mcf	
Annual Savings:	142	mcf	

CALCULATIONS TO IMPROVE TEMPERATURE CONTROL

FIM 15.38 CRP Office

INPUT DATA: 100% of Building to be Setback

		Current	Proposed	
Heating T Setpoint:	Occupied	72	72	deg. F.
	Unoccupied	72	63	deg. F.
Cooling T Setpoint:	Occupied	80	80	deg. F.
	Unoccupied	80	80	deg. F.
HVAC Schedule	Occupied	168.0	50.0	Hours per week
	Unoccupied	0.0	118.0	Hours per week
Q internal gains:	Occupied	20,183	20,183	Btuh
	Unoccupied	4,725	4,725	Btuh
Q internal gains:	Schedule	60	60	Hours per week
BLC:	Occupied	2,989	2,989	Btuh/deg. F.
	Unoccupied	3,322	3,322	Btuh/deg. F.

Fuel Data	Heating	Cooling		
Type:	Natural Gas	Electricity		
Units:	**mcf**	kwh		
Unit cost:	**$ 5.554**	$ 0.05		
BTU/unit	**1,030,000**	3,412		
Efficiency/ COP:	**78.0%**	2.93	COP, = EER	10.0

CALCULATIONS:

Current — Buffalo, 168 hrs./week

Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use mcf	Cooling Energy kwh
(2.5)	1	0	212,471	242,738	0	
2.5	28	3	197,524	226,130	8	
7.5	60	2	182,576	209,522	14	
12.5	208	11	167,629	192,914	46	
17.5	438	20	152,681	176,305	88	
22.5	385	15	137,734	159,697	69	
27.5	366	20	122,786	143,089	59	
32.5	623	24	107,839	126,481	87	
37.5	894	42	92,892	109,872	109	
42.5	757	37	77,944	93,264	78	
47.5	706	39	62,997	76,656	59	
52.5	569	24	48,049	60,047	36	
57.5	673	29	33,102	43,439	29	
62.5	883	52	18,154	26,831	22	
67.5	707	30	3,207	10,223	3	
72.5	489	10	(10,246)	(4,725)	0	
77.5	382	5	(10,246)	(4,725)	0	
82.5	204	2	(17,720)	(13,029)	0	
87.5	22	0	(32,667)	(29,637)	0	
92.5	0	0	(47,614)	(46,245)	0	
97.5	0	0	(62,562)	(62,854)	0	
102.5	0	0	(77,509)	(79,462)	0	
107.5	0	0	(92,457)	(96,070)	0	
	8,760	hours			708	0

Proposed		Buffalo, 50 hrs./week				
Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use	Cooling Energy kwh
(2.5)	0	1	202,533	211,533	0	
2.5	7	24	187,586	194,925	7	
7.5	15	47	172,638	178,317	14	
12.5	47	172	157,691	161,709	44	
17.5	145	313	142,744	145,100	82	
22.5	121	279	127,796	128,492	64	
27.5	92	294	112,849	111,884	54	
32.5	179	468	97,901	95,276	77	
37.5	229	707	82,954	78,667	93	
42.5	231	563	68,006	62,059	63	
47.5	181	564	53,059	45,451	44	
52.5	129	464	38,112	28,843	23	
57.5	201	501	23,164	12,234	13	
62.5	297	638	8,217	(4,374)	3	
67.5	218	519	(6,731)	(6,035)	0	
72.5	195	304	(20,183)	(6,035)	0	
77.5	185	202	(20,183)	(6,035)	0	
82.5	123	83	(27,657)	(14,339)	0	
87.5	15	7	(42,605)	(30,947)	0	
92.5	0	0	(57,552)	(47,555)	0	
97.5	0	0	(72,499)	(64,164)	0	
102.5	0	0	(87,447)	(80,772)	0	
107.5	0	0	(102,394)	(97,380)	0	
	8,760	hours			582	0

		Present	Proposed
Heating	mcf	708	582
Cooling	kwh	0	0

CALCULATIONS FOR IMPACT OF REDUCED LIGHTING ON HEATING AND AIR CONDITIONING

FIM 15.1

Client: CRP Radio Tower
Address 6121 Chestnut Ridge Road

INPUT DATA:

	Heating Energy		Cooling Energy	
Fuel:	**Natural Gas**		**Electric**	
Units:	**mcf**		**kWh**	
Fuel Cost:	**$ 5.690**	per mcf	**$ 0.049**	per kWh
Fuel Conversion F	**1,030,000**	Btu per mcf	**3,412**	Btu per kWh
Efficiency:	**72.0%**		**1.10**	kW/Ton
			0%	of building is air conditioned

	10,210	Lighting Retrofit
	-	Installing Sensors
Annual Lighting Savings:	**10,210**	kWh per Year
	12	months per year of lighting operation
	851	kwh/month

For **8** months/year the lighting retrofit will impact heating costs
20% of light fixtures are within 10 feet of an exterior wall
For **4** months/year the lighting retrofit will impact cooling costs

CALCULATIONS:

Replacement Natural Gas because of Reduced Lighting Energy

Useful Heat from Lights during the heating season that is no longer available is:

= kwh Lighting Savings per month x No. Months of Heating impact x % of fixtures located near exterior walls

= **1,361 kWh =** 4,644,915 BTU = 6 mcf

Replacement Natural Gas usage

Useful Heat from Lights in kwh x 3412 BTU/kwh / Heating Fuel Conversion Factor / Heating Fuel Efficiency

Replacement Natural Gas Cost = mcf x $per mcf

	Fuel Usage		Fuel Cost	
Useful Heat from L	1,361	kWh	n/a	
Replacement Gas	**(6)**	**mcf**		**per year**

Reduced Air Conditioning because of Reduced Lighting

Reduced Air Conditioning Lighting Load during the cooling season from Lighting that is no longer present is:

= kwh Lighting Savings per month x No. Months Lighting Retrofit will impact cooling costs x % of building cooled

= **0 kWh =** 0 BTU

Reduced Air Conditioning Energy Requirements [kWh] =

Reduce Air Conditioning Lighting Load x (3412 Btu / kWh) x (1 ton-hr / 12,000 Btu) x (1.1 kW / ton)

Reduced Air Conditioning Cost = Reduced Air Conditioning Energy Requirements x Cost per kWh

Reduced Air Conditioning Energy Requir	**0**	**kWh per year**
Reduced Air Conditioning Cost =	**$ 0**	**per year**

Net Impact on Heating and Air Conditioning Costs because of Lighting Retrofit

Heating Fuel	**(6.3)**	**mcf**	**$ 0**
Cooling	**0**	**kWh per year**	**$ 0**
			$ 0

CALCULATIONS TO INSTALL MORE EFFICIENT BOILER

FIM 15.31 CRP Radio Tower

INPUT DATA:

Present Annual Heating Fuel Consumption:	457	mcfs
% of Building Served by Boiler	100%	
Boiler Fuel Use	457	mcfs

Fuel Data	**Present**		**Proposed**	
Type:	Natural Gas		Natural Gas	
Units:	mcf		mcf	
Unit cost:	$ 5.690	/mcf	$ 5.690	/mcf
BTU/Unit	1,030,000	Btu/mcf	1,030,000	Btu/mcf

Boiler Type	**Present**		**Proposed**	
Boiler Firing Rate	500	kBtuh Input	500	kBtuh Input
Combustion Efficiency	72.0%		89.0%	
Jacket Losses	2.0%	of capacity	0.5%	of capacity
Boiler Capacity	**350**	kBtuh Outpu	**443**	kBtuh Output
Off-cycle Flue Losses	1.5%	of capacity	0.5%	of capacity
Boiler is hot when OAT<	65	°F.	65	°F.
Hours/ Yr. Unit is Hot	5,252	hrs.	5,252	hrs.
Off-Cycle Hours/Year	4,312	hrs.	4,599	hrs.
Standby Losses	37	MBtu	12	MBtu
Off-Cycle Flue Losses	23	MBtu	10	MBtu
Useful Heat Output	279	MBtu	279	MBtu

CALCULATIONS:

Off-Cycle Flue Losses = Boiler kBtuh Output x 1000 x % Off-Cycle Flue Losses x Hrs Off-Cycle per Year / 1,0(

Jacket Losses = Boiler kBtuh Output x 1000 x % Jacket Losses x Hrs Hot per Year / 1,000,000

Useful Heat Output = Htg Fuel Use x BTU per Unit x Present Efficiency / 1,000,000 - Off Cycle Losses - Jacke

Proposed Annual Fuel Consumption =

(Proposed Standby Losses + Useful Heat Output) / Proposed Efficiency x 1,000,000 / BTU per Unit

	Annual Fuel Consumption		Annual Cost
Present:	457	mcf	
Proposed:	328	mcf	
Annual Savings:	128	mcf	

CALCULATIONS TO IMPROVE TEMPERATURE CONTROL

FIM 15.38 CRP Radio Tower

INPUT DATA: 100% of Building to be Setback

		Current	Proposed	
Heating T Setpoint:	Occupied	73	73	deg. F.
	Unoccupied	73	65	deg. F.
Cooling T Setpoint:	Occupied	80	80	deg. F.
	Unoccupied	80	80	deg. F.
HVAC Schedule	Occupied	168.0	50.0	Hours per week
	Unoccupied	0.0	118.0	Hours per week
Q internal gains:	Occupied	22,057	22,057	Btuh
	Unoccupied	5,370	5,370	Btuh
Q internal gains:	Schedule	60	60	Hours per week
BLC:	Occupied	1,898	1,898	Btuh/deg. F.
	Unoccupied	2,108	2,108	Btuh/deg. F.

Fuel Data	Heating	Cooling		
Type:	Natural Gas	Electricity		
Units:	**mcf**	kwh		
Unit cost:	**$ 5.690**	$ 0.05		
BTU/unit	**1,030,000**	3,412		
Efficiency/ COP:	**72.0%**	2.93	COP, = EER	10.0

CALCULATIONS:

Current — Buffalo, 168 hrs./week

Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use mcf	Cooling Energy kwh
(2.5)	1	0	131,942	153,820	0	
2.5	28	3	122,453	143,278	5	
7.5	60	2	112,965	132,735	9	
12.5	208	11	103,477	122,193	31	
17.5	438	20	93,989	111,651	59	
22.5	385	15	84,501	101,108	46	
27.5	366	20	75,012	90,566	39	
32.5	623	24	65,524	80,023	58	
37.5	894	42	56,036	69,481	71	
42.5	757	37	46,548	58,938	50	
47.5	706	39	37,060	48,396	38	
52.5	569	24	27,572	37,854	22	
57.5	673	29	18,083	27,311	17	
62.5	883	52	8,595	16,769	11	
67.5	707	30	(893)	6,226	0	
72.5	489	10	(10,381)	(4,316)	0	
77.5	382	5	(11,330)	(5,370)	0	
82.5	204	2	(16,074)	(10,642)	0	
87.5	22	0	(25,562)	(21,184)	0	
92.5	0	0	(35,050)	(31,726)	0	
97.5	0	0	(44,539)	(42,269)	0	
102.5	0	0	(54,027)	(52,811)	0	
107.5	0	0	(63,515)	(63,354)	0	
	8,760	hours			459	0

Proposed		Buffalo, 50 hrs./week				
Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use	Cooling Energy kwh
(2.5)	0	1	121,214	135,538	0	
2.5	7	24	111,726	124,996	5	
7.5	15	47	102,238	114,453	9	
12.5	47	172	92,750	103,911	30	
17.5	145	313	83,262	93,369	56	
22.5	121	279	73,773	82,826	43	
27.5	92	294	64,285	72,284	37	
32.5	179	468	54,797	61,741	52	
37.5	229	707	45,309	51,199	63	
42.5	231	563	35,821	40,656	42	
47.5	181	564	26,333	30,114	29	
52.5	129	464	16,844	19,572	15	
57.5	201	501	7,356	9,029	8	
62.5	297	638	(2,132)	(1,513)	0	
67.5	218	519	(11,620)	(6,784)	0	
72.5	195	304	(21,108)	(6,784)	0	
77.5	185	202	(22,057)	(6,784)	0	
82.5	123	83	(26,801)	(12,056)	0	
87.5	15	7	(36,289)	(22,598)	0	
92.5	0	0	(45,778)	(33,140)	0	
97.5	0	0	(55,266)	(43,683)	0	
102.5	0	0	(64,754)	(54,225)	0	
107.5	0	0	(74,242)	(64,768)	0	
	8,760	hours			390	0

		Present	Proposed
Heating	mcf	459	390
Cooling	kwh	0	0

CALCULATIONS FOR IMPACT OF REDUCED LIGHTING ON HEATING AND AIR CONDITIONING

FIM 15.1

Client: CRP Truck Shop
Address 6121 Chestnut Ridge Road

INPUT DATA:

	Heating Energy		Cooling Energy	
Fuel:	**Natural Gas**		**Electric**	
Units:	**mcf**		**kWh**	
Fuel Cost:	**$ 5.447**	per mcf	**$ 0.047**	per kWh
Fuel Conversion F	**1,030,000**	Btu per mcf	**3,412**	Btu per kWh
Efficiency:	**72.0%**		**1.10**	kW/Ton
			0%	of building is air conditioned

	9,508	Lighting Retrofit
	-	Installing Sensors
Annual Lighting Savings:	**9,508**	kWh per Year
	12	months per year of lighting operation
	792	kwh/month

For **8** months/year the lighting retrofit will impact heating costs
20% of light fixtures are within 10 feet of an exterior wall
For **4** months/year the lighting retrofit will impact cooling costs

CALCULATIONS:

Replacement Natural Gas because of Reduced Lighting Energy

Useful Heat from Lights during the heating season that is no longer available is:

= kwh Lighting Savings per month x No. Months of Heating impact x % of fixtures located near exterior walls

= **1,268 kWh =** 4,325,279 BTU = 6 mcf

Replacement Natural Gas usage

Useful Heat from Lights in kwh x 3412 BTU/kwh / Heating Fuel Conversion Factor / Heating Fuel Efficiency

Replacement Natural Gas Cost = mcf x $per mcf

	Fuel Usage		Fuel Cost	
Useful Heat from L	1,268	kWh	n/a	
Replacement Gas	**(6)**	**mcf**		**per year**

Reduced Air Conditioning because of Reduced Lighting

Reduced Air Conditioning Lighting Load during the cooling season from Lighting that is no longer present is:

= kwh Lighting Savings per month x No. Months Lighting Retrofit will impact cooling costs x % of building cooled

= **0 kWh =** 0 BTU

Reduced Air Conditioning Energy Requirements [kWh] =

Reduce Air Conditioning Lighting Load x (3412 Btu / kWh) x (1 ton-hr / 12,000 Btu) x (1.1 kW / ton)

Reduced Air Conditioning Cost = Reduced Air Conditioning Energy Requirements x Cost per kWh

Reduced Air Conditioning Energy Requiremen **0 kWh per year**
Reduced Air Conditioning Cost = **$ 0 per year**

Net Impact on Heating and Air Conditioning Costs because of Lighting Retrofit

Heating Fuel **(5.8) mcf**
Cooling **0 kWh per year**

CALCULATIONS TO INSTALL MORE EFFICIENT BOILER

FIM 15.31 CRP Truck Shop

INPUT DATA:

Present Annual Heating Fuel Consumption:	1,032	mcfs
% of Building Served by Boiler	100%	
Boiler Fuel Use	1,032	mcfs

Fuel Data	**Present**		**Proposed**	
Type:	Natural Gas		Natural Gas	
Units:	mcf		mcf	
Unit cost:	$ 5.447	/mcf	$ 5.447	/mcf
BTU/Unit	1,030,000	Btu/mcf	1,030,000	Btu/mcf

Boiler Type	**Present**		**Proposed**	
Boiler Firing Rate	776	kBtuh Input	776	kBtuh Input
Combustion Efficiency	72.0%		89.0%	
Jacket Losses	2.0%	of capacity	0.5%	of capacity
Boiler Capacity	**543**	kBtuh Outpu	**687**	kBtuh Output
Off-cycle Flue Losses	1.5%	of capacity	0.5%	of capacity
Boiler is hot when OAT<	65	°F.	65	°F.
Hours/ Yr. Unit is Hot	5,252	hrs.	5,252	hrs.
Off-Cycle Hours/Year	3,883	hrs.	4,247	hrs.
Standby Losses	57	MBtu	18	MBtu
Off-Cycle Flue Losses	32	MBtu	15	MBtu
Useful Heat Output	676	MBtu	676	MBtu

CALCULATIONS:

Off-Cycle Flue Losses = Boiler kBtuh Output x 1000 x % Off-Cycle Flue Losses x Hrs Off-Cycle per Year / 1,000,000
Jacket Losses = Boiler kBtuh Output x 1000 x % Jacket Losses x Hrs Hot per Year / 1,000,000
Useful Heat Output = Htg Fuel Use x BTU per Unit x Present Efficiency / 1,000,000 - Off Cycle Losses - Jacket Losses
Proposed Annual Fuel Consumption =
(Proposed Standby Losses + Useful Heat Output) / Proposed Efficiency x 1,000,000 / BTU per Unit

	Annual Fuel Consumption	
Present:	1,032	mcf
Proposed:	774	mcf
Annual Savings:	258	mcf

CALCULATIONS TO IMPROVE TEMPERATURE CONTROL

FIM 15.38 CRP Truck Shop

INPUT DATA: 100% of Building to be Setback

		Current	Proposed	
Heating T Setpoint:	Occupied	65	65	deg. F.
	Unoccupied	65	60	deg. F.
Cooling T Setpoint:	Occupied	80	80	deg. F.
	Unoccupied	80	80	deg. F.
HVAC Schedule	Occupied	168.0	50.0	Hours per week
	Unoccupied	0.0	118.0	Hours per week
Q internal gains:	Occupied	31,856	31,856	Btuh
	Unoccupied	7,809	7,809	Btuh
Q internal gains:	Schedule	60	60	Hours per week
BLC:	Occupied	5,318	5,318	Btuh/deg. F.
	Unoccupied	5,909	5,909	Btuh/deg. F.

Fuel Data	Heating	Cooling		
Type:	Natural Gas	Electricity		
Units:	**mcf**	kwh		
Unit cost:	**$ 5.447**	$ 0.05		
BTU/unit	**1,030,000**	3,412		
Efficiency/ COP:	**72.0%**	2.93	COP, = EER	10.0

CALCULATIONS:

Current — Buffalo, 168 hrs./week

Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use mcf	Cooling Energy kwh
(2.5)	1	0	342,559	391,031	0	
2.5	28	3	315,969	361,487	13	
7.5	60	2	289,380	331,944	24	
12.5	208	11	262,791	302,400	78	
17.5	438	20	236,201	272,856	147	
22.5	385	15	209,612	243,312	114	
27.5	366	20	183,023	213,769	96	
32.5	623	24	156,433	184,225	137	
37.5	894	42	129,844	154,681	165	
42.5	757	37	103,255	125,138	112	
47.5	706	39	76,665	95,594	78	
52.5	569	24	50,076	66,050	41	
57.5	673	29	23,487	36,506	23	
62.5	883	52	(3,103)	6,963	0	
67.5	707	30	(16,397)	(7,809)	0	
72.5	489	10	(16,397)	(7,809)	0	
77.5	382	5	(16,397)	(7,809)	0	
82.5	204	2	(29,692)	(22,581)	0	
87.5	22	0	(56,282)	(52,125)	0	
92.5	0	0	(82,871)	(81,668)	0	
97.5	0	0	(109,460)	(111,212)	0	
102.5	0	0	(136,050)	(140,756)	0	
107.5	0	0	(162,639)	(170,300)	0	
	8,760	hours			1,029	0

Proposed		Buffalo, 50 hrs./week				
Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use	Cooling Energy kwh
(2.5)	0	1	327,100	359,449	0	
2.5	9	22	300,511	329,906	13	
7.5	20	42	273,921	300,362	24	
12.5	56	163	247,332	270,818	78	
17.5	142	316	220,743	241,275	145	
22.5	114	286	194,153	211,731	112	
27.5	97	289	167,564	182,187	93	
32.5	187	460	140,975	152,643	130	
37.5	230	706	114,385	123,100	153	
42.5	234	560	87,796	93,556	98	
47.5	184	561	61,207	64,012	64	
52.5	146	447	34,617	34,469	28	
57.5	198	504	8,028	4,925	5	
62.5	297	638	(18,561)	(9,847)	0	
67.5	224	513	(31,856)	(9,847)	0	
72.5	184	315	(31,856)	(9,847)	0	
77.5	168	219	(31,856)	(9,847)	0	
82.5	105	101	(45,151)	(24,619)	0	
87.5	15	7	(71,740)	(54,163)	0	
92.5	0	0	(98,330)	(83,706)	0	
97.5	0	0	(124,919)	(113,250)	0	
102.5	0	0	(151,508)	(142,794)	0	
107.5	0	0	(178,098)	(172,338)	0	
	8,760	hours			944	0

		Present	Proposed
Heating	mcf	1,029	944
Cooling	kwh	0	0

CALCULATIONS FOR IMPACT OF REDUCED LIGHTING ON HEATING AND AIR CONDITIONING

FIM 16.1

Client:	Harlem District Highway
Address:	1080 Harlem Road

INPUT DATA:

	Heating Energy		Cooling Energy	
Fuel:	**Natural Gas**		**Electric**	
Units:	**mcf**		**kWh**	
Fuel Cost:	**$ 5.326**	per mcf	**$ 0.052**	per kWh
Fuel Conversion Factor:	**1,030,000**	Btu per mcf	**3,412**	Btu per kWh
Efficiency:	**80.0%**		**1.10**	kW/Ton
			0%	of building is air conditioned

	29,610	Lighting Retrofit
	6,358	Installing Sensors
Annual Lighting Savings:	**35,968**	kWh per Year
	12	months per year of lighting operation
	2,997	kwh/month

For	**8**	months/year the lighting retrofit will impact heating costs
	20%	of light fixtures are within 10 feet of an exterior wall
For	**4**	months/year the lighting retrofit will impact cooling costs

CALCULATIONS:

Replacement Natural Gas because of Reduced Lighting Energy

Useful Heat from Lights during the heating season that is no longer available is:

= kwh Lighting Savings per month x No. Months of Heating impact x % of fixtures located near exterior walls

= **4,796 kWh =** 16,362,942 BTU = 20 mcf

Replacement Natural Gas usage

Useful Heat from Lights in kwh x 3412 BTU/kwh / Heating Fuel Conversion Factor / Heating Fuel Efficiency

Replacement Natural Gas Cost = mcf x $per mcf

	Fuel Usage		Fuel Cost	
Useful Heat from Lights	4,796	kWh	n/a	
Replacement Gas	**(20)**	**mcf**		**per year**

Reduced Air Conditioning because of Reduced Lighting

Reduced Air Conditioning Lighting Load during the cooling season from Lighting that is no longer present is:

= kwh Lighting Savings per month x No. Months Lighting Retrofit will impact cooling costs x % of building cooled

= **0 kWh =** 0 BTU

Reduced Air Conditioning Energy Requirements [kWh] =

Reduce Air Conditioning Lighting Load x (3412 Btu / kWh) x (1 ton-hr / 12,000 Btu) x (1.1 kW / ton)

Reduced Air Conditioning Cost = Reduced Air Conditioning Energy Requirements x Cost per kWh

Reduced Air Conditioning Energy Requirements =	**0**	**kWh per year**
Reduced Air Conditioning Cost =	**$ 0**	**per year**

Net Impact on Heating and Air Conditioning Costs because of Lighting Retrofit

Heating Fuel	**(19.9)**	**mcf**
Cooling	**0**	**kWh per year**

Project: Erie County
Building: Harlem District Highway
Date: 7/3/2019

Heating System Efficiency:	80%
Average Fuel Cost ($/unit):	$0.53
Correction Factor:	100%

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product
Single door sweeps	18	3	3/16	1/12	=	0.84375
Single door perimeters	18	17	1/8	1/12	=	3.1875
Garage doors	15	797	1/4	1/12	=	16.60416667
Roof top ventilators	2	8	1/6	1/12	=	0.111111111
Roof/wall joint	1	551	1/8	1/12	=	5.739583333
					Total =	26.48611111

*assume roof fans open during occupied hours

ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
3798	50%	0.015	72	34.25	0.0065	11.6	2279.504

Occupied Infiltration Savings

Specific Heat of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Occupied (%/week)	Heating Season Bin Hours (Occupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	2279.504	37.75	29.76%	4335	103000	80%	1455.043

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
3814	50%	0.015	67	34.14	0.0065	11.6	2230.081

Unoccupied Infiltration Savings

Specific Hear of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Unoccupied (%/week)	Heating Season Bin Hours (Unoccupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	2230.081	32.86	70.24%	4301	103000	80%	2901.608

Totals

Units of Fuel per Year (units/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
4356.651	103000	9.708737864	448.7350943

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
4356.65	$0.53	2294.256134

Total Cost Savings: **$2,294.26**
Cost to Retrofit: **$41,346.00**
Simple Payback: **18.02 years**

CALCULATIONS FOR INSTALLING CONDENSING UNIT HEATERS

FIM 16.26

Client:	Harlem District Highway			
Address:	1080 Harlem Road	Type:	**Natural Gas**	
		Units:	**mcf**	
		Unit cost:	**$ 5.326**	/mcf
		Heat Content of Fuel	**1,030,000**	Btu/mcf

INPUT DATA:

Present Annual Fuel Consumption:			
	2,256	mcf	Total heating fuel use
	75.2%	of building served by these Unit Heaters	
	1,696	mcf	Unit Heaters fuel use
Efficiencies			
Present:	**80.0%**	thermal efficiency	
Proposed:	**93.0%**	thermal efficiency	
Number of Unit Heaters:	**11**		

CALCULATIONS:

Proposed Annual Fuel Consumption =
(Present Annual Fuel Consumption x Present Efficiency) / Proposed Efficiency

	Annual Fuel Consumption (mcf)
Present:	1,696
Proposed:	1,459
Annual Savings:	237

CALCULATIONS TO INSTALL CONDENSING FURNACES

FIM 16.29 Harlem District Highway

INPUT DATA:

Select Closest Facility Type:			Type:	Natural Gas	
Small Office			Units:	mcf	
Select City Closest to Site	EFLH heat		Unit cost:	$ 5.326	/mcf
Buffalo	760		BTU/unit	1,030,000	Btu/mcf
			Electricity:	$ 0.052	/kwh

Firing Rate	# Furnaces		
35,000	1		
100,000	1		
Totals	2	135,000	Btu/hour total

Present annual fuel use:	100	mcf	
Total heating fuel use:	2,256	mcf	
	4%	of building served by these furnaces	
	100	mcf	Furnace fuel use
Present AFUE	80.0%	Non-condensing furnace	
Proposed AFUE	96.0%	Condensing furnace with variable speed BPM motor	

CALCULATIONS:

Present Fuel Use = Total Firing Rate x EFLHheat / Btu per unit fuel

Proposed Annual Fuel Use =

(Present Annual Fuel Use x Present Efficiency) / Proposed Efficiency

Furnace Output in MBtu/year = Fuel consumption x AFUE x BTU per unit fuel / 1,000,000

Furnace Electricity = Furnace output in MBtu per year x kwh per MBtu

where Mbtu = one million BTUs

	Annual Fuel Consumption (mcf)	Furnace Output in MBtu/year	Furnace Electricity kWh/MBtu	kWh
Present Conumption:	100	82	6	492
Proposed Conumption:	83	82	5	410
Annual Savings:	17			82

CALCULATIONS TO PIPE INSULATION

FIM 16.30 Harlem District Highway

Fuel Information

	Heating System		DHW System
Type:	**Natural Gas**		**Natural Gas**
Units:	mcf		mcf
Unit cost:	$ 5.326	/mcf	$ 5.326
Conversion Factor:	1,030,000	Btu/mcf	1,030,000
Efficiency:	80%	Heating	80%

Basic Inputs

	Type #1	Type #2	Type #3	Type #4	Type #5
Fluid	**Hot Water**	**DHW**	**Hot Water**	**Hot Water**	**Hot Water**
Pipe Material	**Dull Copper**	**Dull Copper**	**Dull Copper**	**Dull Copper**	**Dull Copper**
O.D., inches (d)	**1.00**	**0.50**	**1.00**	**2.00**	**2.00**
Total Length, ft	**53**	**15**	**0**	**0**	**0**
Fluid Temperature Inside Pipe, °F (Ts)	**160**	**100**	**160**	**160**	**160**
Ambient Temperature, °F (Ta)	**65**	**65**	**65**	**65**	**65**
Annual Operating Hours	**5,424**	**8,760**	**2,187**	**2,187**	**2,187**
New Insulation Thickness, inches	**1.0**	**1.0**	**2.0**	**2.0**	**2.0**
Thermal Conductivity - "k" (Btu-in/hr-sq ft	**0.250**	**0.250**	**0.250**	**0.250**	**0.250**
Heat Loss - Bare Pipe					
C factor	**1.016**	**1.016**	**1.016**	**1.016**	**1.016**
emissivity based on pipe material	0.440	0.440	0.440	0.440	0.440
Outside Radius Pipe, inches (Ri)	1	0	1	1	1
Outside Radius Insulation, inches (Rs)	1.5	1.3	2.5	3.0	3.0
h convection, Btu/hr - s.f. pipe surface area -°	1.45	1.35	1.45	1.26	1.26
h radiation, Btu/hr - s.f. pipe surface area - °F	0.57	0.48	0.57	0.57	0.57
h total	2.02	1.83	2.02	1.83	1.83
Pipe area, sq ft/lin ft of pipe	0.262	0.131	0.262	0.523	0.523
Q bare, Btu/hr-lin ft	**50**	**8**	**50**	**91**	**91**
Heat Loss - Insulated Pipe					
Q i, Btu/hr-sq ft of outer area of insulation	14.4	4.3	5.9	7.2	7.2
Insulation Area - sq ft/lin ft of pipe	0.8	0.7	1.3	1.6	1.6
Q insul, Btu/hr-lin ft	**11.3**	**2.8**	**7.7**	**11.3**	**11.3**
Avoided Energy Loss					
Existing Loss - MBtu/year	14.4	1.1	0.0	0.0	0.0
Proposed Loss - MBtu/year	3.3	0.4	0.0	0.0	0.0
Avoided Loss - MBtu/year	11.2	0.7	0.0	0.0	0.0
Total Avoided Fuel Consumption					
14 Units Saved	14	1	0	0	0
Natural Gas Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
$/year	**$ 72**	**$ 5**	**$ 0**	**$ 0**	**$ 0**

Formulas:

Based on ASHRAE 1993 Fundamentals Handbook pages 20.9 and 22.17

h convection = C x {(1 / d) ^ 0.2} x { (1 / ((Ts + Ta)/2)) ^ 0.181 } x { (Ts - Ta) ^ 0.266 }

h radiation = { emissivity x 0.1713 x 10 ^ -8 x [(Ta + 460) ^ 4 - (Ts +460) ^ 4]} / (Ta - Ts)

Q bare = h total x Pipe Area x (Ts - Ta)

Q i = (Ts - Ta) / { [Rs x (ln (Rs / Ri)] / k }

Q insul = Q i x Insul Area

Total Avoided Consumption = (Q bare - Q insul) x Total length of pipe x Annual Operating Hours

CALCULATIONS TO INSTALL MORE EFFICIENT BOILER

FIM 16.31 Harlem District Highway

INPUT DATA:

Present Annual Heating Fuel Consumption:	2,256	mcfs
% of Building Served by Boiler	13%	
Boiler Fuel Use	286	mcfs

Fuel Data	**Present**		**Proposed**	
Type:	Natural Gas		Natural Gas	
Units:	mcf		mcf	
Unit cost:	$ 5.326	/mcf	$ 5.326	/mcf
BTU/Unit	1,030,000	Btu/mcf	1,030,000	Btu/mcf

Boiler Type	**Present**		**Proposed**	
Boiler Firing Rate	145	kBtuh Input	145	kBtuh Input
Combustion Efficiency	80.0%		89.0%	
Jacket Losses	1.5%	of capacity	1.0%	of capacity
Boiler Capacity	**114**	kBtuh Outpu	**128**	kBtuh Output
Off-cycle Flue Losses	1.5%	of capacity	0.5%	of capacity
Boiler is hot when OAT<	65	°F.	65	°F.
Hours/ Yr. Unit is Hot	5,252	hrs.	5,252	hrs.
Off-Cycle Hours/Year	3,220	hrs.	3,485	hrs.
Standby Losses	9	MBtu	7	MBtu
Off-Cycle Flue Losses	5	MBtu	2	MBtu
Useful Heat Output	221	MBtu	221	MBtu

CALCULATIONS:

Off-Cycle Flue Losses = Boiler kBtuh Output x 1000 x % Off-Cycle Flue Losses x Hrs Off-Cycle per Year / 1,000,00

Jacket Losses = Boiler kBtuh Output x 1000 x % Jacket Losses x Hrs Hot per Year / 1,000,000

Useful Heat Output = Htg Fuel Use x BTU per Unit x Present Efficiency / 1,000,000 - Off Cycle Losses - Jacket Los

Proposed Annual Fuel Consumption =

(Proposed Standby Losses + Useful Heat Output) / Proposed Efficiency x 1,000,000 / BTU per Unit

	Annual Fuel Consumption	
Present:	286	mcf
Proposed:	251	mcf
Annual Savings:	35	mcf

CALCULATIONS TO INSTALL CONDENSING DOMESTIC HOT WATER HEATER

FIM 16.34 Harlem District Highway

INPUT DATA:

	Present Fuel		Proposed Fuel	
Fuel:	**Natural Gas**		Natural Gas	
Units:	mcf		mcf	
Fuel Cost:	$ 5.33	per mcf	$ 5.33	per mcf
Fuel Conversion Factor:	1,030,000	Btu per mcf	1,030,000	Btu per mcf

Annual DHW Consumption:	Present		Proposed	
Hot Water Usage:	**1.2**	Gallons/person	1.2	Gallons/person
Number of persons:	**28**	(estimate)	28	(estimate)
Days of Usage:	**260**	per year	260	per year
Hours of Usage per Day:	8	hours	8	hours
Average inlet water Temp	50	degrees F	50	degrees F
Average hot water temp:	120	degrees F	120	degrees F

Storage Tank Losses:	Present Tank		Proposed Tank	
Tank U factor:	0.15	Btu/SF/Hour	0.12	Btu/SF/Hour
Height of Tank:	47.0	inches	47.0	inches
Diameter of Tank:	18.0	inches	18.0	inches
	40	gallons/tank	40	gallons/tank
# of Tanks	1	Qty.	1	Qty.
Hours Tank is Hot:	8,760	Hours	8,760	
Water Temperature:	125	Deg. F.	125	
Ambient Temperature:	65	Deg. F.	65	

Recirculation Losses:				
	0.0%	of boiler capacity =	0	BTUh
	8,760	hours/year	8,760	hours/year

Boiler Jacket & Flue Losses:				
Burner Input	34,000	BTUH	34,000	BTUH
Efficiency:	**80.0%**		96.0%	
Boiler Output Capacity	27,200	BTU output	32,640	BTU output
Jacket & Flue Losses:	0.5%	of boiler capacity	0.5%	of boiler capacity
Boiler is Hot:	8,760	hours/year	8,760	hours/year

CALCULATIONS:

	Present		Proposed	
Consumption Energy:	5,178,861	BTU output rqd/yr	5,178,861	BTU output rqd/yr
Tank Energy Losses:	1,729,995	BTU/year	1,386,764	BTU/year
Recirculation Losses:	0	BTU/year	0	BTU/year
Boiler Jacket Losses:	1,191,360	BTU/year	1,429,632	BTU/year
Output BTU/Year	8,100,216		7,995,257	
Annual Fuel Consumption	9.8	mcf	8	mcf
Demand	0	billed kW /yr.	0	kW
Annual Fuel Cost				
Annual Savings:	**2**	**mcf**		**per year**
	0			
	0	billed kW /yr.		

CALCULATIONS TO IMPROVE TEMPERATURE CONTROL

FIM 16.38 Harlem District Highway

INPUT DATA: 100% of Building to be Setback

		Current	Proposed	
Heating T Setpoint:	Occupied	68	61	deg. F.
	Unoccupied	68	61	deg. F.
Cooling T Setpoint:	Occupied	88	88	deg. F.
	Unoccupied	88	88	deg. F.
HVAC Schedule	Occupied	167.9	167.9	Hours per week
	Unoccupied	0.1	0.1	Hours per week
Q internal gains:	Occupied	106,721	106,721	Btuh
	Unoccupied	5,404	5,404	Btuh
Q internal gains:	Schedule	84	84	Hours per week
BLC:	Occupied	10,926	10,926	Btuh/deg. F.
	Unoccupied	12,020	12,020	Btuh/deg. F.

Fuel Data	Heating	Cooling		
Type:	Natural Gas	Electricity		
Units:	**mcf**	kwh		
Unit cost:	**$ 5.326**	$ 0.05		
BTU/unit	**1,030,000**	3,412		
Efficiency/ COP:	**80.0%**	2.93	COP, = EER	10.0

CALCULATIONS:

Current — Buffalo, 168 hrs./week

Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use mcf	Cooling Energy kwh
(2.5)	1	0	717,313	845,447	1	
2.5	28	3	662,685	785,348	25	
7.5	60	2	608,056	725,250	46	
12.5	208	11	553,428	665,152	149	
17.5	438	20	498,799	605,053	280	
22.5	385	15	444,171	544,955	217	
27.5	366	20	389,542	484,856	185	
32.5	623	24	334,913	424,758	266	
37.5	894	42	280,285	364,660	323	
42.5	757	37	225,656	304,561	221	
47.5	706	39	171,028	244,463	158	
52.5	569	24	116,399	184,364	86	
57.5	673	29	61,771	124,266	55	
62.5	883	52	7,142	64,168	12	
67.5	707	30	(47,486)	4,069	0	
72.5	489	10	(56,098)	(5,404)	0	
77.5	382	5	(56,098)	(5,404)	0	
82.5	204	2	(56,098)	(5,404)	0	
87.5	22	0	(56,098)	(5,404)	0	
92.5	0	0	(105,682)	(59,954)	0	
97.5	0	0	(160,311)	(120,052)	0	
102.5	0	0	(214,939)	(180,150)	0	
107.5	0	0	(269,568)	(240,249)	0	
	8,760	hours			2,023	0

Proposed		Buffalo, 168 hrs./week				
Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use	Cooling Energy kwh
(2.5)	1	0	637,804	757,976	1	
2.5	28	3	583,175	697,878	22	
7.5	60	2	528,547	637,779	40	
12.5	208	11	473,918	577,681	127	
17.5	438	20	419,290	517,582	235	
22.5	385	15	364,661	457,484	179	
27.5	366	20	310,032	397,386	147	
32.5	623	24	255,404	337,287	203	
37.5	894	42	200,775	277,189	232	
42.5	757	37	146,147	217,091	144	
47.5	706	39	91,518	156,992	86	
52.5	569	24	36,890	96,894	28	
57.5	673	29	(17,739)	36,795	1	
62.5	883	52	(56,098)	(5,404)	0	
67.5	707	30	(56,098)	(5,404)	0	
72.5	489	10	(56,098)	(5,404)	0	
77.5	382	5	(56,098)	(5,404)	0	
82.5	204	2	(56,098)	(5,404)	0	
87.5	22	0	(56,098)	(5,404)	0	
92.5	0	0	(105,682)	(59,954)	0	
97.5	0	0	(160,311)	(120,052)	0	
102.5	0	0	(214,939)	(180,150)	0	
107.5	0	0	(269,568)	(240,249)	0	
	8,760	hours			1,446	0

		Present	Proposed	Savings
Heating	mcf	2,023	1,446	576
Cooling	kwh	0	0	0

CALCULATIONS FOR IMPACT OF REDUCED LIGHTING ON HEATING AND AIR CONDITIONING

FIM 17.1

Client: Concord Highway
Address 9125 Sibley Rd

INPUT DATA:

	Heating Energy		Cooling Energy	
Fuel:	**Natural Gas**		**Electric**	
Units:	**mcf**		**kWh**	
Fuel Cost:	**$ 5.288**	per mcf	**$ 0.055**	per kWh
Fuel Conversion F	**1,030,000**	Btu per mcf	**3,412**	Btu per kWh
Efficiency:	**80.0%**		**1.10**	kW/Ton
			0%	of building is air conditioned

	44,250	Lighting Retrofit
	12,863	Installing Sensors
Annual Lighting Savings:	**57,113**	kWh per Year
	12	months per year of lighting operation
	4,759	kwh/month

For **8** months/year the lighting retrofit will impact heating costs
20% of light fixtures are within 10 feet of an exterior wall
For **4** months/year the lighting retrofit will impact cooling costs

CALCULATIONS:

Replacement Natural Gas because of Reduced Lighting Energy

Useful Heat from Lights during the heating season that is no longer available is:

= kwh Lighting Savings per month x No. Months of Heating impact x % of fixtures located near exterior walls

= **7,615 kWh =** ######### BTU = 32 mcf

Replacement Natural Gas usage

Useful Heat from Lights in kwh x 3412 BTU/kwh / Heating Fuel Conversion Factor / Heating Fuel Efficiency

Replacement Natural Gas Cost = mcf x $per mcf

	Fuel Usage		Fuel Cost
Useful Heat from I	7,615	kWh	n/a
Replacement Ga	**(32)**	**mcf**	**per year**

Reduced Air Conditioning because of Reduced Lighting

Reduced Air Conditioning Lighting Load during the cooling season from Lighting that is no longer present is:

= kwh Lighting Savings per month x No. Months Lighting Retrofit will impact cooling costs x % of building cooled

= **0 kWh =** 0 BTU

Reduced Air Conditioning Energy Requirements [kWh] =

Reduce Air Conditioning Lighting Load x (3412 Btu / kWh) x (1 ton-hr / 12,000 Btu) x (1.1 kW / ton)

Reduced Air Conditioning Cost = Reduced Air Conditioning Energy Requirements x Cost per kWh

Reduced Air Conditioning Energy Requir	**0**	**kWh per year**
Reduced Air Conditioning Cost =	**$ 0**	**per year**

Net Impact on Heating and Air Conditioning Costs because of Lighting Retrofit

Heating Fuel	**(31.5)**	**mcf**
Cooling	**0**	**‹Wh per year**

Project: Erie County
Building: East Concord Highway
Date: 7/3/2019

Heating System Efficiency:	80%
Average Fuel Cost ($/unit):	$0.52
Correction Factor:	100%

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product
Single door sweeps	13	3	3/16	1/12	=	0.609375
Single door perimeters	13	17	1/8	1/12	=	2.302083333
Garage doors	13	788	1/4	1/12	=	16.41666667
Wall joint	1	222	1/8	1/12	=	2.3125
A/C unit perimeter	1	6	1/8	1/12	=	0.0625
					Total =	21.703125

*assume roof fans open during occupied hours

ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (°F)	Average Outdoor Air Temperature (°F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
3125.25	50%	0.015	72	34.25	0.0092	11.6	2098.927

Occupied Infiltration Savings

Specific Heat of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Occupied (%/week)	Heating Season Bin Hours (Occupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	2098.927	37.75	29.76%	5848	103000	80%	1807.387

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (°F)	Average Outdoor Air Temperature (°F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
3125.25	50%	0.015	72	67	0.0092	11.6	1790.520

Unoccupied Infiltration Savings

Specific Hear of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Unoccupied (%/week)	Heating Season Bin Hours (Unoccupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	1790.520	5	70.24%	5848	103000	80%	481.990

Totals

Units of Fuel per Year (units/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
2289.376	103000	9.708737864	235.805776

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
2289.38	$0.52	1194.777168

Total Cost Savings: **$1,194.78**
Cost to Retrofit: **$34,207.00**
Simple Payback: **28.63 years**

CALCULATIONS TO INSTALL VENTILATION CONTROLS

FIM 17.6 Concord Highway

INPUT DATA:

Exhaust Fans to be controlled

	Present	Proposed	
Ventilation	200	200	cfm
Ventilation	56	28	hrs./week
Heat Recovery	0%	0%	
HP	0.25	0.25	BHP
T Setpoint:	71	71	degrees F
	28.2	28.2	btu/Lb enthalpy

FUEL DATA:

Type:	Natural Gas	Electricity	
Units:	mcf	kwh	
Unit cost:	$ 5.288	$ 0.055	/unit
Heat Content:	1,030,000	3,412	Btu/unit
Efficiency:	89.0%	2.93	
		10.0	EER

CALCULATIONS:

Bin Mid-Pt.	Enthalpy	Present Hours	Proposed Hours	Present kBtu	Proposed kBtu	Present Fan kWh	Proposed Fan kWh
(2.5)	0.0	0	0	5	3	0	0
2.5	1.8	10	5	153	77	2	1
7.5	2.8	21	10	285	142	4	2
12.5	4.0	73	37	927	463	14	7
17.5	5.6	153	76	1,773	887	28	14
22.5	7.5	133	67	1,405	702	25	12
27.5	9.0	129	64	1,216	608	24	12
32.5	10.8	216	108	1,806	903	40	20
37.5	12.9	312	156	2,276	1,138	58	29
42.5	15.1	265	132	1,645	822	49	25
47.5	17.5	248	124	1,275	637	46	23
52.5	19.6	198	99	801	401	37	18
57.5	21.5	234	117	696	348	44	22
62.5	24.2	312	156	590	295	58	29
67.5	27.6	246	123	200	100	46	23
72.5	29.5	166	83	-199	-100	31	16
77.5	31.0	129	65	-330	-165	24	12
82.5	33.1	69	34	-305	-153	13	6
87.5	35.5	7	4	-48	-24	1	1
92.5	0.0	0	0	0	0	0	0
97.5	0.0	0	0	0	0	0	0
102.5	0.0	0	0	0	0	0	0
107.5	0.0	0	0	0	0	0	0
		2,920	1,460	Present	Proposed		

Heating Energy	kBtu		15,053	7,527		
Cooling energy	kBtu		(882)	(441)	Savings	Savings
Heating Fuel		mcf	16	8	8	
Cooling energy		kwh	88	44	44	
Fan energy		kwh	545	272	272	
		kwh	633	316	316	$ 0

CALCULATIONS FOR INSTALLING CONDENSING UNIT HEATERS
FIM 17.26

Client: Concord Highway
Address: 9125 Sibley Rd

Type: **Natural Gas**
Units: **mcf**
Unit cost: **$ 5.288** /mcf
Heat Content of Fuel **1,030,000** Btu/mcf

INPUT DATA:

Present Annual Fuel Consumption:				**Adjustments for Other Measures:** Fuel Savings
	2,553	mcf	Total heating fuel use	**0**
	47.7%	of building served by theseUnit Heaters		**0**
	1,218	mcf	Unit Heaters fuel use	**0**
Efficiencies				**0**
Present:	**80.0%**	thermal efficiency		**0**
Proposed:	**93.0%**	thermal efficiency		0
Number of Unit Heaters:	**7**			

CALCULATIONS:

Proposed Annual Fuel Consumption =
(Present Annual Fuel Consumption x Present Efficiency) / Proposed Efficiency

	Annual Fuel Consumption (mcf)
Present:	1,218
Proposed:	1,048

Annual Savings: 170

CALCULATIONS TO PIPE INSULATION

FIM 17.30 Concord Highway

Fuel Information

	Heating System		DHW System
Type:	**Natural Gas**		**Natural Gas**
Units:	mcf		mcf
Unit cost:	$ 5.288	/mcf	$ 5.288
Conversion Factor:	1,030,000	Btu/mcf	1,030,000
Efficiency:	80%	Heating	80%

Basic Inputs

	Type #1	Type #2	Type #3	Type #4	Type #5
Fluid	**DHW**	**DHW**	**DHW**	**DHW**	**Hot Water**
Pipe Material	**Dull Copper**	**Dull Copper**	**Dull Copper**	**Steel**	**Steel**
O.D., inches (d)	**1.00**	**0.75**	**1.00**	**2.00**	**2.00**
Total Length, ft	**29**	**80**	**0**	**0**	**0**
Fluid Temperature Inside Pipe, °F (Ts)	**110**	**110**	**110**	**110**	**160**
Ambient Temperature, °F (Ta)	**65**	**65**	**65**	**65**	**65**
Annual Operating Hours	**8,760**	**8,760**	**2,187**	**2,187**	**2,187**
New Insulation Thickness, inches	**1.5**	**1.5**	**2.0**	**2.0**	**2.0**
Thermal Conductivity - "k" (Btu-in/hr-sq ft	**0.250**	**0.250**	**0.250**	**0.250**	**0.250**
Heat Loss - Bare Pipe					
C factor	**1.016**	**1.016**	**1.016**	**1.016**	**1.016**
emissivity based on pipe material	0.440	0.440	0.440	0.940	0.940
Outside Radius Pipe, inches (Ri)	1	0	1	1	1
Outside Radius Insulation, inches (Rs)	2.0	1.9	2.5	3.0	3.0
h convection, Btu/hr - s.f. pipe surface area -°	1.24	1.32	1.24	1.08	1.26
h radiation, Btu/hr - s.f. pipe surface area - °F	0.50	0.50	0.50	1.06	1.22
h total	1.74	1.81	1.74	2.14	2.48
Pipe area, sq ft/lin ft of pipe	0.262	0.196	0.262	0.523	0.523
Q bare, Btu/hr-lin ft	**20**	**16**	**20**	**50**	**123**
Heat Loss - Insulated Pipe					
Q i, Btu/hr-sq ft of outer area of insulation	4.1	3.7	2.8	3.4	7.2
Insulation Area - sq ft/lin ft of pipe	1.0	1.0	1.3	1.6	1.6
Q insul, Btu/hr-lin ft	**4.2**	**3.7**	**3.7**	**5.4**	**11.3**
Avoided Energy Loss					
Existing Loss - MBtu/year	5.2	11.2	0.0	0.0	0.0
Proposed Loss - MBtu/year	1.1	2.6	0.0	0.0	0.0
Avoided Loss - MBtu/year	4.1	8.7	0.0	0.0	0.0
Total Avoided Fuel Consumption					
16 Units Saved	5	11	0	0	0
Natural Gas Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
$ 0 $/year			**$ 0**	**$ 0**	**$ 0**

Formulas:

Based on ASHRAE 1993 Fundamentals Handbook pages 20.9 and 22.17

h convection = C x {(1 / d) ^ 0.2} x { (1 / ((Ts + Ta)/2)) ^ 0.181 } x { (Ts - Ta) ^ 0.266 }

h radiation = { emissivity x 0.1713 x 10 ^ -8 x [(Ta + 460) ^ 4 - (Ts +460) ^ 4]} / (Ta - Ts)

Q bare = h total x Pipe Area x (Ts - Ta)

Q i = (Ts - Ta) / { [Rs x (ln (Rs / Ri)] / k }

Q insul = Q i x Insul Area

Total Avoided Consumption = (Q bare - Q insul) x Total length of pipe x Annual Operating Hours

CALCULATIONS TO INSTALL MORE EFFICIENT BOILER

FIM 17.31 Concord Highway

INPUT DATA:

					Area served	Total area
Present Annual Heating Fuel Consumption:		2,553	mcfs		1,300	27,683
% of Building Served by Boiler		5%		**Adjustments for Other Measures:**		
Boiler Fuel Use		120	mcfs		Fuel Savings	
					0	
Fuel Data	**Present**		**Proposed**		**0**	
Type:	Natural Gas		Natural Gas		**0**	
Units:	mcf		mcf		**0**	
Unit cost:	$ 5.288	/mcf	$ 5.288	/mcf	**0**	
BTU/Unit	1,030,000	Btu/mcf	1,030,000	Btu/mcf	0	0

Boiler Type	**Present**		**Proposed**	
Boiler Firing Rate	112.5	kBtuh Input	112.5	kBtuh Input
Combustion Efficiency	75.0%		89.0%	
Jacket Losses	1.5%	of capacity	1.0%	of capacity
Boiler Capacity	**83**	kBtuh Output	**99**	kBtuh Output
Off-cycle Flue Losses	1.5%	of capacity	1.0%	of capacity
Boiler is hot when OAT<	65	°F.	65	°F.
Hours/ Yr. Unit is Hot	5,252	hrs.	5,252	hrs.
Off-Cycle Hours/Year	4,155	hrs.	4,392	hrs.
Standby Losses	7	MBtu	5	MBtu
Off-Cycle Flue Losses	5	MBtu	4	MBtu
Useful Heat Output	81	MBtu	81	MBtu

CALCULATIONS:

Off-Cycle Flue Losses = Boiler kBtuh Output x 1000 x % Off-Cycle Flue Losses x Hrs Off-Cycle per Year / 1,000,000
Jacket Losses = Boiler kBtuh Output x 1000 x % Jacket Losses x Hrs Hot per Year / 1,000,000
Useful Heat Output = Htg Fuel Use x BTU per Unit x Present Efficiency / 1,000,000 - Off Cycle Losses - Jacket Losses
Proposed Annual Fuel Consumption =
(Proposed Standby Losses + Useful Heat Output) / Proposed Efficiency x 1,000,000 / BTU per Unit

	Annual Fuel Consumption		Annual Cost
Present:	120	mcf	
Proposed:	99	mcf	
Annual Savings:	21	mcf	$ 0

CALCULATIONS FOR VENDING MACHINE OCCUPANCY CONTROL
FIM 17.36 Concord Highway

Electricity
Unit cost: **$ 0.055** /kwh

INPUT DATA:

Machine Type	Qty.	Volts	Amps	Present Operation Hrs/Day	Present Operation Days/Yr.	Machine Location is Occupied Hrs/Day	Machine Location is Occupied Days/Yr.
Refrigerated	**1**	**115**	**11.0**	**24**	**365**	**3**	**250**
Non Refrigerated	**1**	**115**	**0.6**	**24**	**365**	**3**	**250**

* Lighting watts is included in the volt / amp data and Total kW

Lighting Savings						Present	Proposed
Machine Type	Lighting * Watts/ unit	Lighting Found	Ltg. Watts	Present Hrs/Yr.	Proposed Hrs/Yr.	Lighting kWh/yr.	Lighting kWh/Yr.
Refrigerated	**128**	**On**	128	8,760	1,751	1,121	224
Non Refrigerated	**28**	**On**	28	8,760	1,751	245	49
						1,367	273

Compressor Savings						
	Duty Cycle		Compressor Hours		Present	Proposed
Compressor kW	Present Normal	Proposed Nite	Present Hrs/Yr.	Proposed Hrs/Yr.	Compressor kWh/yr.	Compressor kWh/Yr.
0.884	**33%**	**12.5%**	2,891	1,249	2,555	1,104
					2,555	1,104

CALCULATIONS:

Ltg kWh =Ltg Watts / 1000 x # units x Hrs per Day x Days per Yr
Compressor kWh=(volts x amps x 0.80 pf/ 1000 - ltg watts)x # units x hrs per day x days per yr x duty cycle

Ltg kWh with Control = Ltg watts per unit /1000 x # units x (Occ Hrs per Yr + Unocc Hrs x Nite Duty Cycle)
Prop Compressor Run Hours = Occ Hrs x Existing Duty Cycle + Unocc Hrs x Unocc Duty Cycle)
Compressor kWh with Control=(volts x amps x 0.80 pf -ltg watts)/1000 x # units x prop compressor hrs per yr

Electricity Cost Savings = Electricity Savings x Electricity Unit Cost

	Lighting	Compressor	Total	
Existing Annual Electricity Use:	1,367	2,555	3,922	kWh
Proposed Annual Electricity Use:	273	1,104	1,377	kWh
Total Annual Savings:	1,093	1,452	2,545	kWh
			65%	reduction

CALCULATIONS TO IMPROVE TEMPERATURE CONTROL

FIM 17.38 Concord Highway

INPUT DATA: 90% of Building to be Setback

		Current	Proposed	
Heating T Setpoint:	Occupied	71	63	deg. F.
	Unoccupied	71	60	deg. F.
Cooling T Setpoint:	Occupied	80	80	deg. F.
	Unoccupied	80	80	deg. F.
HVAC Schedule	Occupied	167.9	167.9	Hours per week
	Unoccupied	0.1	0.1	Hours per week
Q internal gains:	Occupied	92,427	92,427	Btuh
	Unoccupied	8,542	8,542	Btuh
Q internal gains:	Schedule	84	84	Hours per week
BLC:	Occupied	9,784	9,784	Btuh/deg. F.
	Unoccupied	10,763	10,763	Btuh/deg. F.

Fuel Data	Heating	Cooling		
Type:	Natural Gas	Electricity		
Units:	**mcf**	kwh		
Unit cost:	**$ 5.288**	$ 0.06		
BTU/unit	**1,030,000**	3,412		
Efficiency/ COP:	**80.0%**	2.93	COP, = EER	10.0

CALCULATIONS:

Current — Buffalo, 168 hrs./week

Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use mcf	Cooling Energy kwh
(2.5)	1	0	671,257	785,458	1	
2.5	28	3	622,336	731,641	24	
7.5	60	2	573,415	677,824	43	
12.5	208	11	524,493	624,008	141	
17.5	438	20	475,572	570,191	267	
22.5	385	15	426,651	516,374	209	
27.5	366	20	377,730	462,557	179	
32.5	623	24	328,809	408,740	261	
37.5	894	42	279,888	354,923	322	
42.5	757	37	230,966	301,106	226	
47.5	706	39	182,045	247,290	168	
52.5	569	24	133,124	193,473	98	
57.5	673	29	84,203	139,656	74	
62.5	883	52	35,282	85,839	43	
67.5	707	30	(13,639)	32,022	1	
72.5	489	10	(50,514)	(8,542)	0	
77.5	382	5	(50,514)	(8,542)	0	
82.5	204	2	(74,974)	(35,451)	0	
87.5	22	0	(123,895)	(89,267)	0	
92.5	0	0	(172,817)	(143,084)	0	
97.5	0	0	(221,738)	(196,901)	0	
102.5	0	0	(270,659)	(250,718)	0	
107.5	0	0	(319,580)	(304,535)	0	
	8,760	hours			2,054	0

Proposed		Buffalo, 168 hrs./week				
Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use	Cooling Energy kwh
(2.5)	1	0	595,114	664,169	1	
2.5	28	3	546,193	610,352	21	
7.5	60	2	497,272	556,535	38	
12.5	208	11	448,351	502,718	120	
17.5	438	20	399,430	448,901	223	
22.5	385	15	350,509	395,084	171	
27.5	366	20	301,587	341,267	142	
32.5	623	24	252,666	287,451	199	
37.5	894	42	203,745	233,634	233	
42.5	757	37	154,824	179,817	150	
47.5	706	39	105,903	126,000	97	
52.5	569	24	56,982	72,183	41	
57.5	673	29	8,060	18,366	7	
62.5	883	52	(40,861)	(8,542)	0	
67.5	707	30	(50,514)	(8,542)	0	
72.5	489	10	(50,514)	(8,542)	0	
77.5	382	5	(50,514)	(8,542)	0	
82.5	204	2	(74,974)	(35,451)	0	
87.5	22	0	(123,895)	(89,267)	0	
92.5	0	0	(172,817)	(143,084)	0	
97.5	0	0	(221,738)	(196,901)	0	
102.5	0	0	(270,659)	(250,718)	0	
107.5	0	0	(319,580)	(304,535)	0	
	8,760	hours			1,443	0

		Present	Proposed	Savings
Heating	mcf	2,054	1,443	
Cooling	kwh	0	0	0
Annual Energy $				$ 0

CALCULATIONS TO INSTALL AQUASTAT TO CONTROL DHW RECIRC PUMP FIM 17.40 Concord Highway

	DHW Fuel		Pump	
Type:	**Natural Gas**		**Electricity**	
Units:	**mcf**		**kwh**	
Unit cost:	$ 5.288	/mcf	**$ 0.055**	$/kWh
Heat Content of Fuel:	1,030,000	Btu/mcf		
Combustion Efficiency:	**80.0%**			

INPUT

Building Conditioned Floor Area	Schedule	hrs/week	Wks/yr	Hrs/yr.
27,683 sq.ft.	Heating	**60**	**42**	2,520
	Non-heating	**60**	**10**	600
				3,120

Electricity Savings for DHW Recirculation Pumps

Formula:

kwh = HP x % Loading x 0.746 kw per HP / motor efficiency x Qty. x Hours

Motor Description	Motor HP	Qty	Motor Loading	Motor Type	Motor y	Annual Hours Present	Annual Hours Proposed	Annual kWh Present	Annual kWh Proposed
DHW Recirc	**1/25**	**1**	70%	Std.	45.0%	8,760	3,120	407	145
								407	145

Thermal Savings for DHW Recirculation Pumps

Motor Description	Motor GPM	Recirc ΔT	DHW Eff.	DHW Losses Btuh	Annual Hours Present	Annual Hours Proposed	Annual mcf Present	Annual mcf Proposed
DHW Recirc	**3**	1.0	80%	1,499	8,760	3,120	16	6
							16	6

Formulae:

DHW Losses = GPM x Recirc ΔT x 60 min per hour x 8.33 lbs per gallon

Annual MMBtu = DHW Losses / DHW Efficiency x Annual Hours / heat content of fuel

Recirc ΔT = temperature drop between DHW leaving boiler room and returning recirculation DHW

Pump Power Savings	262	kwh
DHW Fuel Savings	10.263	mcf
Total Savings		

CALCULATIONS FOR IMPACT OF REDUCED LIGHTING ON HEATING AND AIR CONDITIONING

FIM 18.1

Client: Hamburg Highway
Address: 50 West Avenue

INPUT DATA:

	Heating Energy		Cooling Energy	
Fuel:	**Natural Gas**		**Electric**	
Units:	**mcf**		**kWh**	
Fuel Cost:	**$ 5.278**	per mcf	**$ 0.051**	per kWh
Fuel Conversion Factor:	**1,030,000**	Btu per mc	**3,412**	Btu per kWh
Efficiency:	**80.0%**		**1.20**	kW/Ton
			5%	of building is air conditioned

	38,843	Lighting Retrofit
	16,152	Installing Sensors
Annual Lighting Savings:	**54,995**	kWh per Year
	12	months per year of lighting operation
	4,583	kwh/month

For	**8**	months/year the lighting retrofit will impact heating costs
	20%	of light fixtures are within 10 feet of an exterior wall
For	**4**	months/year the lighting retrofit will impact cooling costs

CALCULATIONS:

Replacement Natural Gas because of Reduced Lighting Energy

Useful Heat from Lights during the heating season that is no longer available is:

= kwh Lighting Savings per month x No. Months of Heating impact x % of fixtures located near exterior walls

= **7,333 kWh =** ######### BTU = 30 mcf

Replacement Natural Gas usage

Useful Heat from Lights in kwh x 3412 BTU/kwh / Heating Fuel Conversion Factor / Heating Fuel Efficiency

Replacement Natural Gas Cost = mcf x $per mcf

	Fuel Usage		Fuel Cost	
Useful Heat from Lights	7,333	kWh	n/a	
Replacement Gas	**(30)**	**mcf**		**per year**

Reduced Air Conditioning because of Reduced Lighting

Reduced Air Conditioning Lighting Load during the cooling season from Lighting that is no longer present is:

= kwh Lighting Savings per month x No. Months Lighting Retrofit will impact cooling costs x % of building cooled

= **917 kWh =** 3,127,362 BTU

Reduced Air Conditioning Energy Requirements [kWh] =

Reduce Air Conditioning Lighting Load x (3412 Btu / kWh) x (1 ton-hr / 12,000 Btu) x (1.2 kW / ton)

Reduced Air Conditioning Cost = Reduced Air Conditioning Energy Requirements x Cost per kWh

Reduced Air Conditioning Energy Requirements = 313 kWh per year

Reduced Air Conditioning Cost = per year

Net Impact on Heating and Air Conditioning Costs because of Lighting Retrofit

Heating Fuel	**(30.4)**	**mcf**
Cooling	**313**	**Wh per year**

Project: Erie County
Building: Hamburg Highway
Date: 7/3/2019

Heating System Efficiency:	80%
Average Fuel Cost ($/unit):	$0.52
Correction Factor:	100%

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product
Single door sweeps	11	3	3/16	1/12	=	0.515625
Single door perimeters	11	17	1/8	1/12	=	1.947916667
Garage doors	7	348	1/4	1/12	=	7.25
Soffit joint	1	250	1/2	1/12	=	10.41666667
A/C unit perimeter	1	9	1/8	1/12	=	0.09375
					Total =	20.22395833 ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
2912.25	50%	0.015	72	34.25	0.0065	11.6	1747.890

Occupied Infiltration Savings

Specific Heat of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Occupied (%/week)	Heating Season Bin Hours (Occupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	1747.890	37.75	29.76%	4335	103000	80%	1115.706

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
2912.25	50%	0.015	67	34.14	0.0065	11.6	1702.820

Unoccupied Infiltration Savings

Specific Hear of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Unoccupied (%/week)	Heating Season Bin Hours (Unoccupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	1702.820	32.86	70.24%	4301	103000	80%	2215.576

Totals

Units of Fuel per Year (units/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
3331.282	103000	9.708737864	343.1220402

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
3331.28	$0.52	1723.692434

Total Cost Savings: **$1,723.69**
Cost to Retrofit: **$19,702.00**
Simple Payback: **11.43 years**

Project: Erie County
Building: Hamburg Highway
Date: 7/3/2019

Heating System Efficiency:	80%		
Fuel Cost ($/MMBtu):	$3.91		
Building Section:	Soffit		
Surface Area (ft^2):	333		
Existing U-Value (U_i):	1	R-Value	1
Proposed U-Value (U_o):	0.125	R-Value	8

Existing Occupied Conductive Loss

Existing U-Value (U_i)	Surface Area (ft^2)	Indoor Temperature (˚F)	Outdoor Temperature (˚F)	Heating Degree Days (HDD)	Percent Occupied (%/week)	Fuel Cost ($/MMBtu)	Heating System Efficiency (%)	Thermal Loss Direction (%)	Heat Loss ($/yr)
1.000	333	72	34.25	5848	29.76%	$3.91	80%	75%	80.23035792

Proposed Occupied Conductive Loss

Existing U-Value (U_i)	Surface Area (ft^2)	Indoor Temperature (˚F)	Outdoor Temperature (˚F)	Heating Degree Days (HDD)	Percent Occupied (%/week)	Fuel Cost ($/MMBtu)	Heating System Efficiency (%)	Thermal Loss Direction (%)	Heat Loss ($/yr)
0.125	333	72	34.25	5848	29.76%	$3.91	80%	75%	10.02879474

Occupied Conductive Loss Savings

Existing Heat Loss ($/yr)	Proposed Heat Loss ($/yr)	Occupied Heat Savings ($/yr)
$80.23	$10.03	$70.20

Existing Unoccupied Conductive Loss

Existing U-Value (U_i)	Surface Area (ft^2)	Indoor Temperature (˚F)	Outdoor Temperature (˚F)	Heating Degree Days (HDD)	Percent Unoccupied (%/week)	Fuel Cost ($/MMBtu)	Heating System Efficiency (%)	Thermal Loss Direction (%)	Heat Loss ($/yr)
1.000	333	67	34.14	5848	70.24%	$3.91	80%	75%	164.8317649

Proposed Unoccupied Conductive Loss

Existing U-Value (U_i)	Surface Area (ft^2)	Indoor Temperature (˚F)	Outdoor Temperature (˚F)	Heating Degree Days (HDD)	Percent Unoccupied (%/week)	Fuel Cost ($/MMBtu)	Heating System Efficiency (%)	Thermal Loss Direction (%)	Heat Loss ($/yr)
0.125	333	67	34.14	5848	70.24%	$3.91	80%	75%	20.60397061

Unoccupied Conductive Loss Savings

Existing Heat Loss ($/yr)	Proposed Heat Loss ($/yr)	Unoccupied Heat Savings ($/yr)
$164.83	$20.60	$144.23

Total Savings (MMBtu/yr)	Total Savings ($/yr)
54.82	$214.43

Total Cost Savings: **$214.43**
Cost to Retrofit: * Cost carried on infiltration page
Simple Payback: **0.00 years**

CALCULATIONS FOR INSTALLING CONDENSING UNIT HEATERS
FIM 18.26

Client: Hamburg Highway
Address: 50 West Avenue

Type: **Natural Gas**
Units: **mcf**
Unit cost: **$ 5.278** /mcf
Heat Content of Fuel **1,030,000** Btu/mcf

INPUT DATA:

Present Annual Fuel Consumption:				**Adjustments for Other Measures:** Fuel Savings
	4,373	mcf	Total heating fuel use	**0**
	64.5%	of building served by theseUnit Heaters		**0**
	2,822	mcf	Unit Heaters fuel use	**0**
Efficiencies				**0**
Present:	**80.0%**	thermal efficiency		**0**
Proposed:	**93.0%**	thermal efficiency		0
Number of Unit Heaters:	**12**			

CALCULATIONS:

Proposed Annual Fuel Consumption =
(Present Annual Fuel Consumption x Present Efficiency) / Proposed Efficiency

	Annual Fuel Consumption (mcf)
Present:	2,822
Proposed:	2,428

Annual Savings: 395

CALCULATIONS TO PIPE INSULATION

FIM 18.30 Hamburg Highway

Fuel Information

	Heating System		DHW System
Type:	**Natural Gas**		**Natural Gas**
Units:	mcf		mcf
Unit cost:	$ 5.278	/mcf	$ 5.278
Conversion Factor:	1,030,000	Btu/mcf	1,030,000
Efficiency:	80%	Heating	80%

Basic Inputs

	Type #1	Type #2	Type #3	Type #4	Type #5
Fluid	**DHW**	**Hot Water**	**Steam**	**DHW**	**Hot Water**
Pipe Material	**Dull Copper**	**Dull Copper**	**Steel**	**Steel**	**Steel**
O.D., inches (d)	**1.00**	**1.00**	**1.00**	**2.00**	**2.00**
Total Length, ft	**16**	**0**	**0**	**0**	**0**
Fluid Temperature Inside Pipe, °F (Ts)	**125**	**160**	**215**	**110**	**160**
Ambient Temperature, °F (Ta)	**65**	**65**	**65**	**65**	**65**
Annual Operating Hours	**8,760**	**2,187**	**2,187**	**2,187**	**2,187**
New Insulation Thickness, inches	**1.0**	**2.0**	**2.0**	**2.0**	**2.0**
Thermal Conductivity - "k" (Btu-in/hr-sq ft	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**
Heat Loss - Bare Pipe					
C factor	**1.016**	**1.016**	**1.016**	**1.016**	**1.016**
emissivity based on pipe material	0.440	0.440	0.940	0.940	0.940
Outside Radius Pipe, inches (Ri)	1	1	1	1	1
Outside Radius Insulation, inches (Rs)	1.5	2.5	2.5	3.0	3.0
h convection, Btu/hr - s.f. pipe surface area -°	1.32	1.45	1.58	1.08	1.26
h radiation, Btu/hr - s.f. pipe surface area - °F	0.52	0.57	1.41	1.06	1.22
h total	1.84	2.02	2.99	2.14	2.48
Pipe area, sq ft/lin ft of pipe	0.262	0.262	0.262	0.523	0.523
Q bare, Btu/hr-lin ft	**29**	**50**	**117**	**50**	**123**
Heat Loss - Insulated Pipe					
Q i, Btu/hr-sq ft of outer area of insulation	9.1	5.9	9.3	3.4	7.2
Insulation Area - sq ft/lin ft of pipe	0.8	1.3	1.3	1.6	1.6
Q insul, Btu/hr-lin ft	**7.1**	**7.7**	**12.2**	**5.4**	**11.3**
Avoided Energy Loss					
Existing Loss - MBtu/year	4.1	0.0	0.0	0.0	0.0
Proposed Loss - MBtu/year	1.0	0.0	0.0	0.0	0.0
Avoided Loss - MBtu/year	3.0	0.0	0.0	0.0	0.0
Total Avoided Fuel Consumption					
4 Units Saved	4	0	0	0	0
Natural Gas Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
$ 0 $/year		**$ 0**	**$ 0**	**$ 0**	**$ 0**

Formulas:

Based on ASHRAE 1993 Fundamentals Handbook pages 20.9 and 22.17

h convection = C x {(1 / d) ^ 0.2} x { (1 / ((Ts + Ta)/2)) ^ 0.181 } x { (Ts - Ta) ^ 0.266 }

h radiation = { emissivity x 0.1713 x 10 ^ -8 x [(Ta + 460) ^ 4 - (Ts +460) ^ 4]} / (Ta - Ts)

Q bare = h total x Pipe Area x (Ts - Ta)

Q i = (Ts - Ta) / { [Rs x (ln (Rs / Ri)] / k }

Q insul = Q i x Insul Area

Total Avoided Consumption = (Q bare - Q insul) x Total length of pipe x Annual Operating Hours

CALCULATIONS FOR VENDING MACHINE OCCUPANCY CONTROL
FIM 18.36 Hamburg Highway

Electricity
Unit cost: **$ 0.051** /kwh

INPUT DATA:

Machine Type	Qty.	Volts	Amps	Present Operation Hrs/Day	Present Operation Days/Yr.	Machine Location is Occupied Hrs/Day	Machine Location is Occupied Days/Yr.
Refrigerated	**1**	**115**	**11.0**	**24**	**365**	**2**	**365**
Non Refrigerated	**1**	**115**	**3.0**	**24**	**365**	**2**	**365**

* Lighting watts is included in the volt / amp data and Total kW

Lighting Savings						Present	Proposed
Machine Type	Lighting * Watts/ unit	Lighting Found	Ltg. Watts	Present Hrs/Yr.	Proposed Hrs/Yr.	Lighting kWh/yr.	Lighting kWh/Yr.
Refrigerated	**128**	**Off**	0	0	0	0	0
Non Refrigerated	**14**	**On**	14	8,760	1,734	123	24
						123	24

Compressor Savings						
	Duty Cycle		Compressor Hours		Present	Proposed
Compressor kW	Present Normal	Proposed Nite	Present Hrs/Yr.	Proposed Hrs/Yr.	Compressor kWh/yr.	Compressor kWh/Yr.
0.884	**33%**	**12.5%**	2,891	1,245	2,555	1,100
					2,555	1,100

CALCULATIONS:

Ltg kWh =Ltg Watts / 1000 x # units x Hrs per Day x Days per Yr
Compressor kWh=(volts x amps x 0.80 pf/ 1000 - ltg watts)x # units x hrs per day x days per yr x duty cycle

Ltg kWh with Control = Ltg watts per unit /1000 x # units x (Occ Hrs per Yr + Unocc Hrs x Nite Duty Cycle)
Prop Compressor Run Hours = Occ Hrs x Existing Duty Cycle + Unocc Hrs x Unocc Duty Cycle)
Compressor kWh with Control=(volts x amps x 0.80 pf -ltg watts)/1000 x # units x prop compressor hrs per yr

Electricity Cost Savings = Electricity Savings x Electricity Unit Cost

	Lighting	Compressor	Total	
Existing Annual Electricity Use:	123	2,555	2,678	kWh
Proposed Annual Electricity Use:	24	1,100	1,125	kWh
Total Annual Savings:	98	1,455	1,554	kWh
			58%	reduction

CALCULATIONS TO IMPROVE TEMPERATURE CONTROL

FIM 18.38 Hamburg Highway

INPUT DATA: 90% of Building to be Setback

		Current	Proposed	
Heating T Setpoint:	Occupied	66	62	deg. F.
	Unoccupied	66	62	deg. F.
Cooling T Setpoint:	Occupied	90	90	deg. F.
	Unoccupied	90	90	deg. F.
HVAC Schedule	Occupied	167.9	167.9	Hours per week
	Unoccupied	0.1	0.1	Hours per week
Q internal gains:	Occupied	106,431	106,431	Btuh
	Unoccupied	13,816	13,816	Btuh
Q internal gains:	Schedule	60	60	Hours per week
BLC:	Occupied	19,666	19,666	Btuh/deg. F.
	Unoccupied	21,851	21,851	Btuh/deg. F.

Fuel Data	Heating	Cooling		
Type:	Natural Gas	Electricity		
Units:	**mcf**	kwh		
Unit cost:	**$ 5.278**	$ 0.05		
BTU/unit	**1,030,000**	3,412		
Efficiency/ COP:	**80.0%**	2.93	COP, = EER	10.0

CALCULATIONS:

Current — Buffalo, 168 hrs./week

Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use mcf	Cooling Energy kwh
(2.5)	1	0	1,304,327	1,487,565	2	
2.5	28	3	1,205,999	1,378,311	46	
7.5	60	2	1,107,671	1,269,058	84	
12.5	208	11	1,009,343	1,159,804	270	
17.5	438	20	911,015	1,050,551	510	
22.5	385	15	812,686	941,298	397	
27.5	366	20	714,358	832,044	337	
32.5	623	24	616,030	722,791	487	
37.5	894	42	517,702	613,537	593	
42.5	757	37	419,374	504,284	408	
47.5	706	39	321,046	395,031	294	
52.5	569	24	222,718	285,777	162	
57.5	673	29	124,390	176,524	108	
62.5	883	52	26,062	67,271	32	
67.5	707	30	(46,916)	(13,816)	0	
72.5	489	10	(46,916)	(13,816)	0	
77.5	382	5	(46,916)	(13,816)	0	
82.5	204	2	(46,916)	(13,816)	0	
87.5	22	0	(46,916)	(13,816)	0	
92.5	0	0	(96,080)	(68,443)	0	
97.5	0	0	(194,408)	(177,697)	0	
102.5	0	0	(292,736)	(286,950)	0	
107.5	0	0	(391,064)	(396,203)	0	
	8,760	hours			3,729	0

Proposed		Buffalo, 168 hrs./week				
Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use	Cooling Energy kwh
(2.5)	1	0	1,214,597	1,387,865	1	
2.5	28	3	1,116,269	1,278,612	43	
7.5	60	2	1,017,941	1,169,358	77	
12.5	208	11	919,613	1,060,105	246	
17.5	438	20	821,285	950,852	460	
22.5	385	15	722,957	841,598	353	
27.5	366	20	624,629	732,345	295	
32.5	623	24	526,301	623,091	416	
37.5	894	42	427,973	513,838	491	
42.5	757	37	329,645	404,585	321	
47.5	706	39	231,317	295,331	212	
52.5	569	24	132,989	186,078	97	
57.5	673	29	34,661	76,825	31	
62.5	883	52	(46,916)	(13,816)	0	
67.5	707	30	(46,916)	(13,816)	0	
72.5	489	10	(46,916)	(13,816)	0	
77.5	382	5	(46,916)	(13,816)	0	
82.5	204	2	(46,916)	(13,816)	0	
87.5	22	0	(46,916)	(13,816)	0	
92.5	0	0	(96,080)	(68,443)	0	
97.5	0	0	(194,408)	(177,697)	0	
102.5	0	0	(292,736)	(286,950)	0	
107.5	0	0	(391,064)	(396,203)	0	
	8,760	hours			3,043	0

		Present	Proposed	Savings
Heating	mcf	3,729	3,043	686
Cooling	kwh	0	0	0
Annual Energy $				

CALCULATIONS FOR IMPACT OF REDUCED LIGHTING ON HEATING AND AIR CONDITIONING

FIM 19.1

Client: Angola Highway
Address: 8752 Delameter Rd

INPUT DATA:

	Heating Energy		Cooling Energy	
Fuel:	**Natural Gas**		**Electric**	
Units:	**mcf**		**kWh**	
Fuel Cost:	**$ 5.479**	per mcf	**$ 0.063**	per kWh
Fuel Conversion Factor:	**1,030,000**	Btu per mcf	**3,412**	Btu per kWh
Efficiency:	**80.0%**		**1.10**	kW/Ton
			0%	of building is air conditioned

	4,213	Lighting Retrofit
	-	Installing Sensors
Annual Lighting Savings:	**4,213**	kWh per Year
	12	months per year of lighting operation
	351	kwh/month

For **8** months/year the lighting retrofit will impact heating costs
20% of light fixtures are within 10 feet of an exterior wall
For **4** months/year the lighting retrofit will impact cooling costs

CALCULATIONS:

Replacement Natural Gas because of Reduced Lighting Energy

Useful Heat from Lights during the heating season that is no longer available is:

= kwh Lighting Savings per month x No. Months of Heating impact x % of fixtures located near exterior walls

= **562 kWh =** 1,916,516 BTU = 2 mcf

Replacement Natural Gas usage

Useful Heat from Lights in kwh x 3412 BTU/kwh / Heating Fuel Conversion Factor / Heating Fuel Efficiency

Replacement Natural Gas Cost = mcf x $per mcf

	Fuel Usage		Fuel Cost	
Useful Heat from Lights	562	kWh	n/a	
Replacement Gas	**(2)**	**mcf**		**per year**

Reduced Air Conditioning because of Reduced Lighting

Reduced Air Conditioning Lighting Load during the cooling season from Lighting that is no longer present is:

= kwh Lighting Savings per month x No. Months Lighting Retrofit will impact cooling costs x % of building cooled

= **0 kWh =** 0 BTU

Reduced Air Conditioning Energy Requirements [kWh] =

Reduce Air Conditioning Lighting Load x (3412 Btu / kWh) x (1 ton-hr / 12,000 Btu) x (1.1 kW / ton)

Reduced Air Conditioning Cost = Reduced Air Conditioning Energy Requirements x Cost per kWh

Reduced Air Conditioning Energy Requirements =	**0**	**kWh per year**
Reduced Air Conditioning Cost =	**$ 0**	**per year**

Net Impact on Heating and Air Conditioning Costs because of Lighting Retrofit

Heating Fuel	**(2.3)**	**mcf**	**$ 0**
Cooling	**0**	**kWh per yea**	**$ 0**
			$ 0

Project: Erie County
Building: Angola Highway
Date: 7/3/2019

Heating System Efficiency:	80%
Average Fuel Cost ($/unit):	$0.56
Correction Factor:	100%

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product
Single door sweeps	6	3	3/16	1/12	=	0.28125
Single door perimeters	6	17	1/8	1/12	=	1.0625
Garage doors	8	480	1/4	1/12	=	10
Roof/wall joint	1	443	1/8	1/12	=	4.61458333
					Total =	15.9583333 ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
2298	50%	0.015	72	34.25	0.0092	11.6	1543.344

Occupied Infiltration Savings

Specific Heat of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Occupied (%/week)	Heating Season Bin Hours (Occupied) (HDD)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	1543.344	37.75	29.76%	4335	103000	80%	985.140

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
2298	50%	0.015	67	34.14	0.0092	11.6	1511.646

Unoccupied Infiltration Savings

Specific Hear of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Unoccupied (%/week)	Heating Season Bin Hours (Unoccupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	1511.646	32.86	70.24%	4301	103000	80%	1966.836

Totals

Units of Fuel per Year (units/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
2951.976	103000	9.708737864	304.053522

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
2951.98	$0.56	1663.913539

Total Cost Savings: **$1,663.91**
Cost to Retrofit: **$25,178.00**
Simple Payback: **15.13 years**

CALCULATIONS TO IMPROVE TEMPERATURE CONTROL

FIM 19.38 Angola Highway

INPUT DATA: 100% of Building to be Setback

		Current	Proposed	
Heating T Setpoint:	Occupied	65	52	deg. F.
	Unoccupied	65	52	deg. F.
Cooling T Setpoint:	Occupied	100	100	deg. F.
	Unoccupied	100	100	deg. F.
HVAC Schedule	Occupied	167.9	167.9	Hours per week
	Unoccupied	0.1	0.1	Hours per week
Q internal gains:	Occupied	14,771	14,771	Btuh
	Unoccupied	4,201	4,201	Btuh
Q internal gains:	Schedule	84	84	Hours per week
BLC:	Occupied	6,237	6,237	Btuh/deg. F.
	Unoccupied	6,930	6,930	Btuh/deg. F.

Fuel Data	Heating	Cooling		
Type:	Natural Gas	Electricity		
Units:	**mcf**	kwh		
Unit cost:	**$ 5.479**	$ 0.06		
BTU/unit	**1,030,000**	3,412		
Efficiency/ COP:	**80.0%**	2.93	COP, = EER	10.0

CALCULATIONS:

Current Buffalo, 168 hrs./week

Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use mcf	Cooling Energy kwh
(2.5)	1	0	412,747	464,951	1	
2.5	28	3	381,563	430,301	15	
7.5	60	2	350,378	395,652	26	
12.5	208	11	319,194	361,003	85	
17.5	438	20	288,009	326,353	161	
22.5	385	15	256,825	291,704	125	
27.5	366	20	225,641	257,055	106	
32.5	623	24	194,456	222,405	153	
37.5	894	42	163,272	187,756	187	
42.5	757	37	132,087	153,107	128	
47.5	706	39	100,903	118,457	92	
52.5	569	24	69,719	83,808	51	
57.5	673	29	38,534	49,159	33	
62.5	883	52	7,350	14,509	9	
67.5	707	30	(9,490)	(4,201)	0	
72.5	489	10	(9,490)	(4,201)	0	
77.5	382	5	(9,490)	(4,201)	0	
82.5	204	2	(9,490)	(4,201)	0	
87.5	22	0	(9,490)	(4,201)	0	
92.5	0	0	(9,490)	(4,201)	0	
97.5	0	0	(9,490)	(4,201)	0	
102.5	0	0	(25,082)	(21,526)	0	
107.5	0	0	(56,266)	(56,176)	0	
	8,760	hours			1,173	0

Proposed		Buffalo, 168 hrs./week				
Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use	Cooling Energy kwh
(2.5)	1	0	330,420	373,476	0	
2.5	28	3	299,236	338,827	11	
7.5	60	2	268,051	304,178	20	
12.5	208	11	236,867	269,528	63	
17.5	438	20	205,683	234,879	115	
22.5	385	15	174,498	200,230	85	
27.5	366	20	143,314	165,580	68	
32.5	623	24	112,129	130,931	89	
37.5	894	42	80,945	96,282	93	
42.5	757	37	49,761	61,632	48	
47.5	706	39	18,576	26,983	17	
52.5	569	24	(9,490)	(4,201)	0	
57.5	673	29	(9,490)	(4,201)	0	
62.5	883	52	(9,490)	(4,201)	0	
67.5	707	30	(9,490)	(4,201)	0	
72.5	489	10	(9,490)	(4,201)	0	
77.5	382	5	(9,490)	(4,201)	0	
82.5	204	2	(9,490)	(4,201)	0	
87.5	22	0	(9,490)	(4,201)	0	
92.5	0	0	(9,490)	(4,201)	0	
97.5	0	0	(9,490)	(4,201)	0	
102.5	0	0	(25,082)	(21,526)	0	
107.5	0	0	(56,266)	(56,176)	0	
	8,760	hours			610	0

		Present	Proposed	Savings
Heating	mcf	1,173	610	562
Cooling	kwh	0	0	0
Annual Energy $				

CALCULATIONS FOR IMPACT OF REDUCED LIGHTING ON HEATING AND AIR CONDITIONING

FIM 20.1

Client: Collins Highway
Address 14020 Jennings Road

INPUT DATA:

	Heating Energy		Cooling Energy	
Fuel:	**Natural Gas**		**Electric**	
Units:	**mcf**		**kWh**	
Fuel Cost:	**$ 5.344**	per mcf	**$ 0.048**	per kWh
Fuel Conversion F	**1,030,000**	Btu per	**3,412**	Btu per kWh
Efficiency:	**80.0%**		**1.10**	kW/Ton
			0%	of building is air conditioned

	1,641	Lighting Retrofit
	3,902	Installing Sensors
Annual Lighting Savings:	**5,542**	kWh per Year
	12	months per year of lighting operation
	462	kwh/month

For **8** months/year the lighting retrofit will impact heating costs
20% of light fixtures are within 10 feet of an exterior wall
For **4** months/year the lighting retrofit will impact cooling costs

CALCULATIONS:

Replacement Natural Gas because of Reduced Lighting Energy

Useful Heat from Lights during the heating season that is no longer available is:

= kwh Lighting Savings per month x No. Months of Heating impact x % of fixtures located near exterior walls

= **739 kWh =** 2,521,363 BTU = 3 mcf

Replacement Natural Gas usage

Useful Heat from Lights in kwh x 3412 BTU/kwh / Heating Fuel Conversion Factor / Heating Fuel Efficiency

Replacement Natural Gas Cost = mcf x $per mcf

	Fuel Usage		Fuel Cost	
Useful Heat from I	739	kWh	n/a	
Replacement Ga	**(3)**	**mcf**		**per year**

Reduced Air Conditioning because of Reduced Lighting

Reduced Air Conditioning Lighting Load during the cooling season from Lighting that is no longer present is:

= kwh Lighting Savings per month x No. Months Lighting Retrofit will impact cooling costs x % of building cooled

= **0 kWh =** 0 BTU

Reduced Air Conditioning Energy Requirements [kWh] =

Reduce Air Conditioning Lighting Load x (3412 Btu / kWh) x (1 ton-hr / 12,000 Btu) x (1.1 kW / ton)

Reduced Air Conditioning Cost = Reduced Air Conditioning Energy Requirements x Cost per kWh

Reduced Air Conditioning Energy Re	**0**	**kWh per year**
Reduced Air Conditioning Cost =	**$ 0**	**per year**

Net Impact on Heating and Air Conditioning Costs because of Lighting Retrofit

Heating Fuel	**(3.1)**	**mcf**	**$ 0**
Cooling	**0**	**/h per y**	**$ 0**
			$ 0

Project: Erie County
Building: Collins Highway
Date: 7/3/2019

Heating System Efficiency:	80%
Average Fuel Cost ($/unit):	$0.53
Correction Factor:	100%

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product
Single door sweeps	9	3	3/16	1/12	=	0.421875
Single door perimeters	9	17	1/8	1/12	=	1.59375
Garage doors	7	420	1/4	1/12	=	8.75
Roof/wall joint	1	316	1/8	1/12	=	3.291666667
Vertical wall joint	1	8	1/16	1/12	=	0.041666667
Wall penetrations	5	1	1	1/12	=	0.083333333
Damper/Fan unit	1	1.5	10	1/12	=	1.25
					Total =	15.43229167 ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot ^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
2222.25	50%	0.015	72	34.25	0.0092	11.6	1492.470

Occupied Infiltration Savings

Specific Heat of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Occupied (%/week)	Heating Season Bin Hours (Occupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	1492.470	37.75	29.76%	4335	103000	80%	952.667

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot ^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
2222.25	50%	0.015	67	34.14	0.0092	11.6	1461.817

Unoccupied Infiltration Savings

Specific Hear of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Unoccupied (%/week)	Heating Season Bin Hours (Unoccupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	1461.817	32.86	70.24%	4301	103000	80%	1902.002

Totals

Units of Fuel per Year (units/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
2854.669	103000	9.708737864	294.0308701

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
2854.67	$0.53	1519.083513

Total Cost Savings: **$1,519.08**
Cost to Retrofit: **$22,563.00**
Simple Payback: **14.85 years**

CALCULATIONS FOR INSTALLING CONDENSING UNIT HEATERS
FIM 20.26

Client: Collins Highway
Address: 14020 Jennings Road

Type: **Natural Gas**
Units: **mcf**
Unit cost: **$ 5.344** /mcf
Heat Content of Fuel **1,030,000** Btu/mcf

INPUT DATA:

				Adjustments for Other Measures: Fuel Savings	
Present Annual Fuel Consumption:				**0**	
	1,611	mcf	Total heating fuel use	**0**	
	60.5%	of building served by theseUnit Heaters		**0**	
	974	mcf	Unit Heaters fuel use	**0**	
Efficiencies				**0**	
Present:	**80.0%**	thermal efficiency		0	0
Proposed:	**93.0%**	thermal efficiency			
Number of Unit Heaters:	**4**				

CALCULATIONS:

Proposed Annual Fuel Consumption =
(Present Annual Fuel Consumption x Present Efficiency) / Proposed Efficiency

	Annual Fuel Consumption (mcf)
Present:	974
Proposed:	838
Annual Savings:	136

CALCULATIONS TO PIPE INSULATION

FIM 20.30 Collins Highway

Fuel Information

	Heating System		DHW System
Type:	**Natural Gas**		**Natural Gas**
Units:	mcf		mcf
Unit cost:	$ 5.344	/mcf	$ 5.344
Conversion Factor:	1,030,000	Btu/mcf	1,030,000
Efficiency:	80%	Heating	80%

Basic Inputs

	Type #1	Type #2	Type #3	Type #4	Type #5
Fluid	**DHW**	**Hot Water**	**Steam**	**DHW**	**Hot Water**
Pipe Material	**Dull Copper**	**Dull Copper**	**Steel**	**Steel**	**Steel**
O.D., inches (d)	**1.50**	**0.75**	**1.00**	**2.00**	**2.00**
Total Length, ft	**102**	**0**	**0**	**0**	**0**
Fluid Temperature Inside Pipe, °F (Ts)	**125**	**125**	**215**	**110**	**160**
Ambient Temperature, °F (Ta)	**65**	**65**	**65**	**65**	**65**
Annual Operating Hours	**1,752**	**5,424**	**2,187**	**2,187**	**2,187**
New Insulation Thickness, inches	**1.0**	**1.0**	**2.0**	**2.0**	**2.0**
Thermal Conductivity - "k" (Btu-in/hr-sq ft	**0**	**0**	**0**	**0**	**0**
Heat Loss - Bare Pipe					
C factor	**1.016**	**1.016**	**1.016**	**1.016**	**1.016**
emissivity based on pipe material	0.440	0.440	0.940	0.940	0.940
Outside Radius Pipe, inches (Ri)	1	0	1	1	1
Outside Radius Insulation, inches (Rs)	1.8	1.4	2.5	3.0	3.0
h convection, Btu/hr - s.f. pipe surface area -°	1.22	1.40	1.58	1.08	1.26
h radiation, Btu/hr - s.f. pipe surface area - °F	0.52	0.52	1.41	1.06	1.22
h total	1.74	1.92	2.99	2.14	2.48
Pipe area, sq ft/lin ft of pipe	0.393	0.196	0.262	0.523	0.523
Q bare, Btu/hr-lin ft	**41**	**23**	**117**	**50**	**123**
Heat Loss - Insulated Pipe					
Q i, Btu/hr-sq ft of outer area of insulation	10.1	8.4	9.3	3.4	7.2
Insulation Area - sq ft/lin ft of pipe	0.9	0.7	1.3	1.6	1.6
Q insul, Btu/hr-lin ft	**9.3**	**6.0**	**12.2**	**5.4**	**11.3**
Avoided Energy Loss					
Existing Loss - MBtu/year	7.3	0.0	0.0	0.0	0.0
Proposed Loss - MBtu/year	1.7	0.0	0.0	0.0	0.0
Avoided Loss - MBtu/year	5.7	0.0	0.0	0.0	0.0
Total Avoided Fuel Consumption					
7 Units Saved	7	0	0	0	0
Natural Gas Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
$ 0 $/year		**$ 0**	**$ 0**	**$ 0**	**$ 0**

Formulas:

Based on ASHRAE 1993 Fundamentals Handbook pages 20.9 and 22.17

h convection = C x {(1 / d) ^ 0.2} x { (1 / ((Ts + Ta)/2)) ^ 0.181 } x { (Ts - Ta) ^ 0.266 }

h radiation = { emissivity x 0.1713 x 10 ^ -8 x [(Ta + 460) ^ 4 - (Ts +460) ^ 4]} / (Ta - Ts)

Q bare = h total x Pipe Area x (Ts - Ta)

Q i = (Ts - Ta) / { [Rs x (ln (Rs / Ri)] / k }

Q insul = Q i x Insul Area

Total Avoided Consumption = (Q bare - Q insul) x Total length of pipe x Annual Operating Hours

CALCULATIONS TO INSTALL MORE EFFICIENT BOILER

FIM 20.31 Collins Highway

INPUT DATA:

Present Annual Heating Fuel Consumption:	1,611	mcfs
% of Building Served by Boiler	7%	
Boiler Fuel Use	108	mcfs

nents for Other Measures:

					Fuel Savings
Fuel Data	**Present**		**Proposed**		**0**
Type:	Natural Gas		Natural Gas		**0**
Units:	mcf		mcf		**0**
Unit cost:	$ 5.344	/mcf	$ 5.344	/mcf	**0**
BTU/Unit	1,030,000	Btu/mcf	1,030,000	Btu/mcf	**0**
					0

Boiler Type	**Present**		**Proposed**	
Boiler Firing Rate	150	kBtuh Input	150	kBtuh Input
Combustion Efficiency	76.0%		89.0%	
Jacket Losses	1.5%	of capacity	1.0%	of capacity
Boiler Capacity	**112**	kBtuh Output	**132**	kBtuh Output
Off-cycle Flue Losses	1.5%	of capacity	1.0%	of capacity
Boiler is hot when OAT<	65	°F.	65	°F.
Hours/ Yr. Unit is Hot	5,252	hrs.	5,252	hrs.
Off-Cycle Hours/Year	4,509	hrs.	4,688	hrs.
Standby Losses	9	MBtu	7	MBtu
Off-Cycle Flue Losses	8	MBtu	6	MBtu
Useful Heat Output	68	MBtu	68	MBtu

CALCULATIONS:

Off-Cycle Flue Losses = Boiler kBtuh Output x 1000 x % Off-Cycle Flue Losses x Hrs Off-Cycle per Year / 1,000,000
Jacket Losses = Boiler kBtuh Output x 1000 x % Jacket Losses x Hrs Hot per Year / 1,000,000
Useful Heat Output = Htg Fuel Use x BTU per Unit x Present Efficiency / 1,000,000 - Off Cycle Losses - Jacket Losses
Proposed Annual Fuel Consumption =
(Proposed Standby Losses + Useful Heat Output) / Proposed Efficiency x 1,000,000 / BTU per Unit

	Annual Fuel Consumption		Annual Cost
Present:	108	mcf	
Proposed:	89	mcf	
Annual Savings:	19	mcf	$ 0

CALCULATIONS TO IMPROVE TEMPERATURE CONTROL

FIM 20.38 Collins Highway

INPUT DATA: 100% of Building to be Setback

		Current	Proposed	
Heating T Setpoint:	Occupied	59	52	deg. F.
	Unoccupied	59	52	deg. F.
Cooling T Setpoint:	Occupied	80	80	deg. F.
	Unoccupied	80	80	deg. F.
HVAC Schedule	Occupied	167.9	167.9	Hours per week
	Unoccupied	0.1	0.1	Hours per week
Q internal gains:	Occupied	12,949	12,949	Btuh
	Unoccupied	5,985	5,985	Btuh
Q internal gains:	Schedule	40	40	Hours per week
BLC:	Occupied	10,023	10,023	Btuh/deg. F.
	Unoccupied	11,137	11,137	Btuh/deg. F.

Fuel Data	Heating	Cooling		
Type:	Natural Gas	Electricity		
Units:	**mcf**	kwh		
Unit cost:	**$ 5.344**	$ 0.05		
BTU/unit	**1,030,000**	3,412		
Efficiency/ COP:	**80.0%**	2.93	COP, = EER	10.0

CALCULATIONS:

Current — Buffalo, 168 hrs./week

Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use mcf	Cooling Energy kwh
(2.5)	1	0	607,321	677,310	1	
2.5	28	3	557,207	621,627	21	
7.5	60	2	507,092	565,944	38	
12.5	208	11	456,977	510,261	122	
17.5	438	20	406,862	454,578	227	
22.5	385	15	356,747	398,895	174	
27.5	366	20	306,633	343,212	145	
32.5	623	24	256,518	287,529	202	
37.5	894	42	206,403	231,845	236	
42.5	757	37	156,288	176,162	151	
47.5	706	39	106,174	120,479	97	
52.5	569	24	56,059	64,796	41	
57.5	673	29	5,944	9,113	5	
62.5	883	52	(7,644)	(5,985)	0	
67.5	707	30	(7,644)	(5,985)	0	
72.5	489	10	(7,644)	(5,985)	0	
77.5	382	5	(7,644)	(5,985)	0	
82.5	204	2	(32,702)	(33,827)	0	
87.5	22	0	(82,817)	(89,510)	0	
92.5	0	0	(132,931)	(145,193)	0	
97.5	0	0	(183,046)	(200,876)	0	
102.5	0	0	(233,161)	(256,559)	0	
107.5	0	0	(283,276)	(312,242)	0	
	8,760	hours			1,460	0

Proposed		Buffalo, 168 hrs./week				
Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use	Cooling Energy kwh
(2.5)	1	0	538,606	600,960	1	
2.5	28	3	488,492	545,277	19	
7.5	60	2	438,377	489,594	33	
12.5	208	11	388,262	433,911	104	
17.5	438	20	338,147	378,228	189	
22.5	385	15	288,033	322,545	140	
27.5	366	20	237,918	266,862	112	
32.5	623	24	187,803	211,179	148	
37.5	894	42	137,688	155,496	157	
42.5	757	37	87,574	99,813	85	
47.5	706	39	37,459	44,130	34	
52.5	569	24	(7,644)	(5,985)	0	
57.5	673	29	(7,644)	(5,985)	0	
62.5	883	52	(7,644)	(5,985)	0	
67.5	707	30	(7,644)	(5,985)	0	
72.5	489	10	(7,644)	(5,985)	0	
77.5	382	5	(7,644)	(5,985)	0	
82.5	204	2	(32,702)	(33,827)	0	
87.5	22	0	(82,817)	(89,510)	0	
92.5	0	0	(132,931)	(145,193)	0	
97.5	0	0	(183,046)	(200,876)	0	
102.5	0	0	(233,161)	(256,559)	0	
107.5	0	0	(283,276)	(312,242)	0	
	8,760	hours			1,022	0

		Present	Proposed	Savings
Heating	mcf	1,460	1,022	438
Cooling	kwh	0	0	0
Annual Energy $				

CALCULATIONS FOR IMPACT OF REDUCED LIGHTING ON HEATING AND AIR CONDITIONING

FIM 21.1

Client:	Clarence Highway
Address:	5105 Salt Road

INPUT DATA:

	Heating Energy		Cooling Energy	
Fuel:	**Natural Gas**		**Electric**	
Units:	**mcf**		**kWh**	
Fuel Cost:	**$ 5.308**	per mcf	**$ 0.056**	per kWh
Fuel Conversion Factor:	**1,030,000**	Btu per mcf	**3,412**	Btu per kWh
Efficiency:	**80.0%**		**1.09**	kW/Ton
			5%	of building is air conditioned

	57,787	Lighting Retrofit
	9,211	Installing Sensors
Annual Lighting Savings:	**66,999**	kWh per Year
	12	months per year of lighting operation
	5,583	kwh/month

For	**8**	months/year the lighting retrofit will impact heating costs
	20%	of light fixtures are within 10 feet of an exterior wall
For	**4**	months/year the lighting retrofit will impact cooling costs

CALCULATIONS:

Replacement Natural Gas because of Reduced Lighting Energy

Useful Heat from Lights during the heating season that is no longer available is:

= kwh Lighting Savings per month x No. Months of Heating impact x % of fixtures located near exterior walls

= **8,933 kWh =** 30,479,933 BTU = 37 mcf

Replacement Natural Gas usage

Useful Heat from Lights in kwh x 3412 BTU/kwh / Heating Fuel Conversion Factor / Heating Fuel Efficiency

Replacement Natural Gas Cost = mcf x $per mcf

	Fuel Usage		Fuel Cost	
Useful Heat from Lights	8,933	kWh	n/a	
Replacement Gas	**(37)**	**mcf**		**per year**

Reduced Air Conditioning because of Reduced Lighting

Reduced Air Conditioning Lighting Load during the cooling season from Lighting that is no longer present is:

= kwh Lighting Savings per month x No. Months Lighting Retrofit will impact cooling costs x % of building cooled

= **1,117 kWh =** 3,809,992 BTU

Reduced Air Conditioning Energy Requirements [kWh] =

Reduce Air Conditioning Lighting Load x (3412 Btu / kWh) x (1 ton-hr / 12,000 Btu) x (1.09090909090909 kW / ton)

Reduced Air Conditioning Cost = Reduced Air Conditioning Energy Requirements x Cost per kWh

Reduced Air Conditioning Energy Requirements =	**346**	**kWh per year**
Reduced Air Conditioning Cost =		**per year**

Project: Erie County
Building: Clarence Highway
Date: 7/3/2019

Heating System Efficiency:	80%
Average Fuel Cost ($/unit):	$0.53
Correction Factor:	100%

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product
Single door sweeps	11	3	3/16	1/12	=	0.515625
Single door perimeters	11	17	1/8	1/12	=	1.947916667
Garage doors	5	288	1/4	1/12	=	6
					Total =	8.463541667 ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
1218.75	50%	0.015	72	34.25	0.0092	11.6	818.516

Occupied Infiltration Savings

Specific Heat of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Occupied (%/week)	Heating Season Bin Hours (Occupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	818.516	37.75	29.76%	4335	103000	80%	522.472

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
1218.75	50%	0.015	67	34.14	0.0092	11.6	801.705

Unoccupied Infiltration Savings

Specific Hear of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Unoccupied (%/week)	Heating Season Bin Hours (Unoccupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	801.705	32.86	70.24%	4301	103000	80%	1043.116

Totals

Units of Fuel per Year (units/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
1565.588	103000	9.708737864	161.2555396

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
1565.59	$0.53	822.512225

Total Cost Savings: **$822.51**
Cost to Retrofit: **$13,037.00**
Simple Payback: **15.85 years**

CALCULATIONS TO INSTALL VENTILATION CONTROLS

FIM 21.6 Clarence Highway

INPUT DATA:

Exhaust Fans to be controlled

	Present	Proposed	
Ventilation	110	110	cfm
Ventilation	126	50	hrs./week
Heat Recovery	0%	0%	
HP	0.02	0.02	BHP
T Setpoint:	68	68	degrees F
	28.2	28.2	btu/Lb enthalpy

FUEL DATA:

Type:	Natural Gas	Electricity	
Units:	mcf	kwh	
Unit cost:	$ 5.308	$ 0.056	/unit
Heat Content:	1,030,000	3,412	Btu/unit
Efficiency:	80.0%	2.93	
		10.0	EER

CALCULATIONS:

Bin Mid-Pt.	Enthalpy	Present Hours	Proposed Hours	Present kBtu	Proposed kBtu	Present Fan kWh	Proposed Fan kWh
(2.5)	0.0	1	0	6	2	0	0
2.5	1.8	23	9	181	72	0	0
7.5	2.8	47	18	335	133	1	0
12.5	4.0	164	65	1,087	431	2	1
17.5	5.6	344	136	2,069	821	4	2
22.5	7.5	300	119	1,629	646	4	1
27.5	9.0	290	115	1,400	555	3	1
32.5	10.8	485	193	2,058	817	6	2
37.5	12.9	702	279	2,560	1,016	8	3
42.5	15.1	596	236	1,818	721	7	3
47.5	17.5	559	222	1,374	545	7	3
52.5	19.6	445	176	829	329	5	2
57.5	21.5	527	209	669	266	6	2
62.5	24.2	701	278	475	188	8	3
67.5	27.6	553	219	46	18	6	3
72.5	29.5	374	149	-247	-98	4	2
77.5	31.0	290	115	-408	-162	3	1
82.5	33.1	155	61	-378	-150	2	1
87.5	35.5	17	7	-59	-24	0	0
92.5	0.0	0	0	0	0	0	0
97.5	0.0	0	0	0	0	0	0
102.5	0.0	0	0	0	0	0	0
107.5	0.0	0	0	0	0	0	0
		6,570	2,607				

		Present	Proposed	Savings	Savings
Heating Energy	kBtu	16,536	6,562		
Cooling energy	kBtu	0	0		
Heating Fuel	mcf	20	8	12	
Cooling energy	kwh	0	0	0	
Fan energy	kwh	77	31	46	
	kwh	77	31	46	$ 0

CALCULATIONS FOR INSTALLING CONDENSING UNIT HEATERS
FIM 21.26

Client: Clarence Highway
Address: 5105 Salt Road
Type: **Natural Gas**
Units: **mcf**
Unit cost: **$ 5.308** /mcf
Heat Content of Fuel **1,030,000** Btu/mcf

INPUT DATA:

Present Annual Fuel Consumption:			
	2,156	mcf	Total heating fuel use
	61.7%	of building served by theseUnit Heaters	
	1,330	mcf	Unit Heaters fuel use
Efficiencies			
Present:	**80.0%**	thermal efficiency	
Proposed:	**93.0%**	thermal efficiency	
Number of Unit Heaters:	**8**		

CALCULATIONS:

Proposed Annual Fuel Consumption =
(Present Annual Fuel Consumption x Present Efficiency) / Proposed Efficiency

	Annual Fuel Consumption (mcf)
Present:	1,330
Proposed:	1,144
Annual Savings:	186

CALCULATIONS TO INSTALL CONDENSING FURNACES

FIM 21.29 Clarence Highway

INPUT DATA:

Select Closest Facility Type:			Type:	Natural Gas	
Other			Units:	mcf	
Select City Closest to Site	EFLH heat		Unit cost:	$ 5.308	/mcf
Buffalo	600		BTU/unit	1,030,000	Btu/mcf
			Electricity:	$ 0.056	/kwh
Firing Rate	# Furnaces				
75,000	1				

Totals	1	75,000	Btu/hour total
Present annual fuel use:	44	mcf	
Total heating fuel use:	2,156	mcf	
	2.0%	of building served by these furnaces	
	44	mcf	Furnace fuel use
Present AFUE	80.0%	Non-condensing furnace	
Proposed AFUE	94.0%	Condensing furnace with variable speed BPM motor	

CALCULATIONS:

Present Fuel Use = Total Firing Rate x EFLHheat / Btu per unit fuel
Proposed Annual Fuel Use =
(Present Annual Fuel Use x Present Efficiency) / Proposed Efficiency
Furnace Output in MBtu/year = Fuel consumption x AFUE x BTU per unit fuel / 1,000,000
Furnace Electricity = Furnace output in MBtu per year x kwh per MBtu
where Mbtu = one million BTUs

	Annual Fuel Consumption (mcf)	Furnace Output in MBtu/year	Furnace Electricity kWh/MBtu	kWh	Annual Cost
Present Conumption:	44	36	6	216	
Proposed Conumption:	37	36	5	180	
Annual Savings:	7			36	$ 0

CALCULATIONS TO PIPE INSULATION

FIM 21.30 Clarence Highway

Fuel Information

	Heating System		DHW System
Type:	**Natural Gas**		**Natural Gas**
Units:	mcf		mcf
Unit cost:	$ 5.308	/mcf	$ 5.308
Conversion Factor:	1,030,000	Btu/mcf	1,030,000
Efficiency:	80%	Heating	80%

Basic Inputs

	Type #1	Type #2	Type #3	Type #4	Type #5
Fluid	**DHW**	**Hot Water**	**Hot Water**	**DHW**	**Hot Water**
Pipe Material	**Dull Copper**	**Dull Copper**	**Dull Copper**	**Steel**	**Steel**
O.D., inches (d)	**0.75**	**1.50**	**2.00**	**2.00**	**2.00**
Total Length, ft	**6**	**6**	**10**	**0**	**0**
Fluid Temperature Inside Pipe, °F (Ts)	**125**	**160**	**160**	**110**	**160**
Ambient Temperature, °F (Ta)	**65**	**65**	**65**	**65**	**65**
Annual Operating Hours	**8,760**	**5,424**	**5,424**	**2,187**	**2,187**
New Insulation Thickness, inches	**1.0**	**1.0**	**1.5**	**2.0**	**2.0**
Thermal Conductivity - "k" (Btu-in/hr-sq ft	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**
Heat Loss - Bare Pipe					
C factor	**1.016**	**1.016**	**1.016**	**1.016**	**1.016**
emissivity based on pipe material	0.440	0.440	0.440	0.940	0.940
Outside Radius Pipe, inches (Ri)	0	1	1	1	1
Outside Radius Insulation, inches (Rs)	1.4	1.8	2.5	3.0	3.0
h convection, Btu/hr - s.f. pipe surface area -°	1.40	1.34	1.26	1.08	1.26
h radiation, Btu/hr - s.f. pipe surface area - °F	0.52	0.57	0.57	1.06	1.22
h total	1.92	1.91	1.83	2.14	2.48
Pipe area, sq ft/lin ft of pipe	0.196	0.393	0.523	0.523	0.523
Q bare, Btu/hr-lin ft	**23**	**71**	**91**	**50**	**123**
Heat Loss - Insulated Pipe					
Q i, Btu/hr-sq ft of outer area of insulation	8.4	16.0	10.4	3.4	7.2
Insulation Area - sq ft/lin ft of pipe	0.7	0.9	1.3	1.6	1.6
Q insul, Btu/hr-lin ft	**6.0**	**14.7**	**13.6**	**5.4**	**11.3**
Avoided Energy Loss					
Existing Loss - MBtu/year	1.2	2.3	4.9	0.0	0.0
Proposed Loss - MBtu/year	0.3	0.5	0.7	0.0	0.0
Avoided Loss - MBtu/year	0.9	1.8	4.2	0.0	0.0
Total Avoided Fuel Consumption					
8 Units Saved	1	2	5	0	0
Natural Gas Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
$ 0 $/year					

Formulas:

Based on ASHRAE 1993 Fundamentals Handbook pages 20.9 and 22.17

h convection = C x {(1 / d) ^ 0.2} x { (1 / ((Ts + Ta)/2)) ^ 0.181 } x { (Ts - Ta) ^ 0.266 }

h radiation = { emissivity x 0.1713 x 10 ^ -8 x [(Ta + 460) ^ 4 - (Ts +460) ^ 4]} / (Ta - Ts)

Q bare = h total x Pipe Area x (Ts - Ta)

Q i = (Ts - Ta) / { [Rs x (ln (Rs / Ri)] / k }

Q insul = Q i x Insul Area

Total Avoided Consumption = (Q bare - Q insul) x Total length of pipe x Annual Operating Hours

CALCULATIONS TO INSTALL CONDENSING DOMESTIC HOT WATER HEATER

FIM 21.34 Clarence Highway

INPUT DATA:

	Present Fuel		Proposed Fuel	
Fuel:	**Natural Gas**		Natural Gas	
Units:	mcf		mcf	
Fuel Cost:	$ 5.31	per mcf	$ 5.31	per mcf
Fuel Conversion Factor:	1,030,000	Btu per mcf	1,030,000	Btu per mcf

Annual DHW Consumption:	Present		Proposed	
Hot Water Usage:	**2.7**	Gallons/person	2.7	Gallons/person
Number of persons:	**20**	(estimate)	20	(estimate)
Days of Usage:	**260**	per year	260	per year
Hours of Usage per Day:	8	hours	8	hours
Average inlet water Temp	50	degrees F	50	degrees F
Average hot water temp:	125	degrees F	125	degrees F

Storage Tank Losses:	Present Tank		Proposed Tank	
Tank U factor:	0.15	Btu/SF/Hour	0.15	Btu/SF/Hour
Height of Tank:	47.0	inches	47.0	inches
Diameter of Tank:	18.0	inches	18.0	inches
	40	gallons/tank	40	gallons/tank
# of Tanks	1	Qty.	1	Qty.
Hours Tank is Hot:	8,760	Hours	8,760	
Water Temperature:	125	Deg. F.	125	
Ambient Temperature:	65	Deg. F.	65	

Recirculation Losses:				
	0.0%	of boiler capacity =	0	BTUh
	8,760	hours/year	8,760	hours/year

Boiler Jacket & Flue Losses:				
Burner Input	40,000	BTUH	40,000	BTUH
Efficiency:	**80.0%**		96.0%	
Boiler Output Capacity	32,000	BTU output	38,400	BTU output
Jacket & Flue Losses:	0.5%	of boiler capacity	0.5%	of boiler capacity
Boiler is Hot:	8,760	hours/year	8,760	hours/year

CALCULATIONS:

	Present		Proposed	
Consumption Energy:	8,771,490	BTU output rqd/yr	8,771,490	BTU output rqd/yr
Tank Energy Losses:	1,729,995	BTU/year	1,729,995	BTU/year
Recirculation Losses:	0	BTU/year	0	BTU/year
Boiler Jacket Losses:	1,401,600	BTU/year	1,681,920	BTU/year
Output BTU/Year	11,903,085		12,183,405	
Annual Fuel Consumption	14.4	mcf	12	mcf
Demand	0	billed kW /yr.	0	kW
Annual Fuel Cost				
Annual Savings:	**2**	**mcf**	**$ 0**	**per year**
	0			
	0	billed kW /yr.		

CALCULATIONS TO IMPROVE TEMPERATURE CONTROL

FIM 21.38 Clarence Highway

INPUT DATA: 100% of Building to be Setback

		Current	Proposed	
Heating T Setpoint:	Occupied	68	64	deg. F.
	Unoccupied	68	64	deg. F.
Cooling T Setpoint:	Occupied	90	90	deg. F.
	Unoccupied	90	90	deg. F.
HVAC Schedule	Occupied	167.9	167.9	Hours per week
	Unoccupied	0.1	0.1	Hours per week
Q internal gains:	Occupied	131,358	131,358	Btuh
	Unoccupied	5,625	5,625	Btuh
Q internal gains:	Schedule	84	84	Hours per week
BLC:	Occupied	10,936	10,936	Btuh/deg. F.
	Unoccupied	11,887	11,887	Btuh/deg. F.

Fuel Data	Heating	Cooling		
Type:	Natural Gas	Electricity		
Units:	**mcf**	kwh		
Unit cost:	**$ 5.308**	$ 0.06		
BTU/unit	**1,030,000**	3,412		
Efficiency/ COP:	**80.0%**	2.93	COP, = EER	10.0

CALCULATIONS:

Current — Buffalo, 168 hrs./week

Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use mcf	Cooling Energy kwh
(2.5)	1	0	704,574	834,722	1	
2.5	28	3	649,897	775,289	25	
7.5	60	2	595,219	715,856	45	
12.5	208	11	540,541	656,423	145	
17.5	438	20	485,863	596,990	273	
22.5	385	15	431,186	537,557	211	
27.5	366	20	376,508	478,124	179	
32.5	623	24	321,830	418,691	256	
37.5	894	42	267,153	359,258	308	
42.5	757	37	212,475	299,825	209	
47.5	706	39	157,797	240,392	147	
52.5	569	24	103,120	180,959	76	
57.5	673	29	48,442	121,526	44	
62.5	883	52	(6,236)	62,093	4	
67.5	707	30	(60,913)	2,660	0	
72.5	489	10	(68,535)	(5,625)	0	
77.5	382	5	(68,535)	(5,625)	0	
82.5	204	2	(68,535)	(5,625)	0	
87.5	22	0	(68,535)	(5,625)	0	
92.5	0	0	(95,874)	(35,341)	0	
97.5	0	0	(150,552)	(94,774)	0	
102.5	0	0	(205,229)	(154,207)	0	
107.5	0	0	(259,907)	(213,640)	0	
	8,760	hours			1,922	0

Proposed		Buffalo, 168 hrs./week				
Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use	Cooling Energy kwh
(2.5)	1	0	661,881	788,315	1	
2.5	28	3	607,203	728,882	23	
7.5	60	2	552,526	669,449	42	
12.5	208	11	497,848	610,016	134	
17.5	438	20	443,170	550,583	249	
22.5	385	15	388,493	491,150	190	
27.5	366	20	333,815	431,717	159	
32.5	623	24	279,137	372,284	222	
37.5	894	42	224,459	312,851	259	
42.5	757	37	169,782	253,418	167	
47.5	706	39	115,104	193,985	108	
52.5	569	24	60,426	134,552	46	
57.5	673	29	5,749	75,119	7	
62.5	883	52	(48,929)	15,686	1	
67.5	707	30	(68,535)	(5,625)	0	
72.5	489	10	(68,535)	(5,625)	0	
77.5	382	5	(68,535)	(5,625)	0	
82.5	204	2	(68,535)	(5,625)	0	
87.5	22	0	(68,535)	(5,625)	0	
92.5	0	0	(95,874)	(35,341)	0	
97.5	0	0	(150,552)	(94,774)	0	
102.5	0	0	(205,229)	(154,207)	0	
107.5	0	0	(259,907)	(213,640)	0	
	8,760	hours			1,608	0

		Present	Proposed	Savings
Heating	mcf	1,922	1,608	314
Cooling	kwh	0	0	0
Annual Energy $				

CALCULATIONS FOR IMPACT OF REDUCED LIGHTING ON HEATING AND AIR CONDITIONING
FIM 22.1

Client: South Protection Hwy
Address 9988 South Protection Rd.

INPUT DATA:

	Heating Energy		Cooling Energy	
Fuel:	**Natural Gas**		**Electric**	
Units:	**mcf**		**kWh**	
Fuel Cost:	**$ 5.424**	per mcf	**$ 0.071**	per kWh
Fuel Conversion F	**1,030,000**	Btu per mcf	**3,412**	Btu per kWh
Efficiency:	**80.0%**		**1.10**	kW/Ton
			0%	of building is air conditioned

	4,964	Lighting Retrofit
	-	Installing Sensors
Annual Lighting Savings:	**4,964**	kWh per Year
	12	months per year of lighting operation
	414	kwh/month

For **8** months/year the lighting retrofit will impact heating costs
20% of light fixtures are within 10 feet of an exterior wall
For **4** months/year the lighting retrofit will impact cooling costs

CALCULATIONS:

Replacement Natural Gas because of Reduced Lighting Energy

Useful Heat from Lights during the heating season that is no longer available is:

= kwh Lighting Savings per month x No. Months of Heating impact x % of fixtures located near exterior walls

= **662 kWh =** 2,258,171 BTU = 3 mcf

Replacement Natural Gas usage

Useful Heat from Lights in kwh x 3412 BTU/kwh / Heating Fuel Conversion Factor / Heating Fuel Efficiency

Replacement Natural Gas Cost = mcf x $per mcf

	Fuel Usage		Fuel Cost
Useful Heat from l	662	kWh	n/a
Replacement Gas	**(3)**	**mcf**	**per year**

Reduced Air Conditioning because of Reduced Lighting

Reduced Air Conditioning Lighting Load during the cooling season from Lighting that is no longer present is:

= kwh Lighting Savings per month x No. Months Lighting Retrofit will impact cooling costs x % of building coo

= **0 kWh =** 0 BTU

Reduced Air Conditioning Energy Requirements [kWh] =

Reduce Air Conditioning Lighting Load x (3412 Btu / kWh) x (1 ton-hr / 12,000 Btu) x (1.1 kW / ton)

Reduced Air Conditioning Cost = Reduced Air Conditioning Energy Requirements x Cost per kWh

Reduced Air Conditioning Energy Requirement 0 kWh per year
Reduced Air Conditioning Cost = $ 0 per year

Net Impact on Heating and Air Conditioning Costs because of Lighting Retrofit

Heating Fuel (2.7) mcf $ 0

Project: Erie County
Building: South Protection Highway
Date: 7/3/2019

Heating System Efficiency:	80%
Average Fuel Cost ($/unit):	$0.56
Correction Factor:	100%

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product
Single door sweeps	3	3	3/16	1/12	=	0.140625
Single door perimeters	3	17	1/8	1/12	=	0.53125
Garage doors	6	360	1/4	1/12	=	7.5
Roof/wall joint	1	368	1/8	1/12	=	3.833333333
					Total =	12.00520833 ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
1728.75	50%	0.015	72	34.25	0.0092	11.6	1161.034

Occupied Infiltration Savings

Specific Heat of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Occupied (%/week)	Heating Season Bin Hours (Occupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	1161.034	37.75	29.76%	4335	103000	80%	741.106

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot {}^\circ F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
1728.75	50%	0.015	67	34.14	0.0092	11.6	1137.188

Unoccupied Infiltration Savings

Specific Hear of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Unoccupied (%/week)	Heating Season Bin Hours (Unoccupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	1137.188	32.86	70.24%	4301	103000	80%	1479.620

Totals

Units of Fuel per Year (units/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
2220.726	103000	9.708737864	228.734781

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
2220.73	$0.56	1234.481727

Total Cost Savings: **$1,234.48**
Cost to Retrofit: **$19,013.00**
Simple Payback: **15.40 years**

CALCULATIONS FOR INSTALLING CONDENSING UNIT HEATERS
FIM 22.26

Client: South Protection Hwy
Address: 9988 South Protection Rd.

Type: **Natural Gas**
Units: **mcf**
Unit cost: **$ 5.424** /mcf
Heat Content of Fuel **1,030,000** Btu/mcf

INPUT DATA:

Present Annual Fuel Consumption:

	740	mcf	Total heating fuel use
	10.8%	of building served by theseUnit Heaters	
	80	mcf	Unit Heaters fuel use

Efficiencies

Present:	**80.0%**	thermal efficiency
Proposed:	**93.0%**	thermal efficiency
Number of Unit Heaters:	**2**	

CALCULATIONS:

Proposed Annual Fuel Consumption =
(Present Annual Fuel Consumption x Present Efficiency) / Proposed Efficiency

	Annual Fuel Consumption (mcf)
Present:	80
Proposed:	69
Annual Savings:	11

CALCULATIONS TO IMPROVE TEMPERATURE CONTROL

FIM 22.38 South Protection Hwy

INPUT DATA: 100% of Building to be Setback

		Current	Proposed	
Heating T Setpoint:	Occupied	60	50	deg. F.
	Unoccupied	60	50	deg. F.
Cooling T Setpoint:	Occupied	90	90	deg. F.
	Unoccupied	90	90	deg. F.
HVAC Schedule	Occupied	167.9	167.9	Hours per week
	Unoccupied	0.1	0.1	Hours per week
Q internal gains:	Occupied	6,454	6,454	Btuh
	Unoccupied	5,737	5,737	Btuh
Q internal gains:	Schedule	84	84	Hours per week
BLC:	Occupied	3,904	3,904	Btuh/deg. F.
	Unoccupied	4,338	4,338	Btuh/deg. F.

Fuel Data	Heating	Cooling		
Type:	Natural Gas	Electricity		
Units:	**mcf**	kwh		
Unit cost:	**$ 5.424**	$ 0.07		
BTU/unit	**1,030,000**	3,412		
Efficiency/ COP:	**80.0%**	2.93	COP, = EER	10.0

CALCULATIONS:

Current — Buffalo, 168 hrs./week

Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use mcf	Cooling Energy kwh
(2.5)	1	0	237,908	265,379	0	
2.5	28	3	218,388	243,689	8	
7.5	60	2	198,868	222,000	15	
12.5	208	11	179,347	200,311	48	
17.5	438	20	159,827	178,622	89	
22.5	385	15	140,307	156,932	68	
27.5	366	20	120,786	135,243	57	
32.5	623	24	101,266	113,554	80	
37.5	894	42	81,746	91,865	93	
42.5	757	37	62,225	70,176	60	
47.5	706	39	42,705	48,486	39	
52.5	569	24	23,185	26,797	17	
57.5	673	29	3,665	5,108	3	
62.5	883	52	(6,096)	(5,737)	0	
67.5	707	30	(6,096)	(5,737)	0	
72.5	489	10	(6,096)	(5,737)	0	
77.5	382	5	(6,096)	(5,737)	0	
82.5	204	2	(6,096)	(5,737)	0	
87.5	22	0	(6,096)	(5,737)	0	
92.5	0	0	(15,856)	(16,581)	0	
97.5	0	0	(35,376)	(38,271)	0	
102.5	0	0	(54,896)	(59,960)	0	
107.5	0	0	(74,417)	(81,649)	0	
	8,760	hours			579	0

Proposed		Buffalo, 168 hrs./week				
Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use	Cooling Energy kwh
(2.5)	1	0	198,868	222,000	0	
2.5	28	3	179,347	200,311	7	
7.5	60	2	159,827	178,622	12	
12.5	208	11	140,307	156,932	38	
17.5	438	20	120,786	135,243	67	
22.5	385	15	101,266	113,554	49	
27.5	366	20	81,746	91,865	39	
32.5	623	24	62,225	70,176	49	
37.5	894	42	42,705	48,486	49	
42.5	757	37	23,185	26,797	23	
47.5	706	39	3,665	5,108	3	
52.5	569	24	(6,096)	(5,737)	0	
57.5	673	29	(6,096)	(5,737)	0	
62.5	883	52	(6,096)	(5,737)	0	
67.5	707	30	(6,096)	(5,737)	0	
72.5	489	10	(6,096)	(5,737)	0	
77.5	382	5	(6,096)	(5,737)	0	
82.5	204	2	(6,096)	(5,737)	0	
87.5	22	0	(6,096)	(5,737)	0	
92.5	0	0	(15,856)	(16,581)	0	
97.5	0	0	(35,376)	(38,271)	0	
102.5	0	0	(54,896)	(59,960)	0	
107.5	0	0	(74,417)	(81,649)	0	
	8,760	hours			336	0

		Present	Proposed	Savings
Heating	mcf	579	336	243

CALCULATIONS FOR IMPACT OF REDUCED LIGHTING ON HEATING AND AIR CONDITIONING

FIM 23.1

Client: Tonawanda Highway
Address 1870 Military Road

INPUT DATA:

	Heating Energy		Cooling Energy	
Fuel:	**Natural Gas**		**Electric**	
Units:	**mcf**		**kWh**	
Fuel Cost:	**$ 5.319**	per mcf	**$ 0.048**	per kWh
Fuel Conversion F	**1,030,000**	Btu per mcf	**3,412**	Btu per kWh
Efficiency:	**80.0%**		**1.10**	kW/Ton
			0%	of building is air conditioned

	30,724	Lighting Retrofit
	10,950	Installing Sensors
Annual Lighting Savings:	**41,674**	kWh per Year
	12	months per year of lighting operation
	3,473	kwh/month

For **8** months/year the lighting retrofit will impact heating costs
20% of light fixtures are within 10 feet of an exterior wall
For **4** months/year the lighting retrofit will impact cooling costs

CALCULATIONS:

Replacement Natural Gas because of Reduced Lighting Energy

Useful Heat from Lights during the heating season that is no longer available is:

= kwh Lighting Savings per month x No. Months of Heating impact x % of fixtures located near exterior walls

= **5,557 kWh =** 18,958,828 BTU = 23 mcf

Replacement Natural Gas usage

Useful Heat from Lights in kwh x 3412 BTU/kwh / Heating Fuel Conversion Factor / Heating Fuel Efficiency

Replacement Natural Gas Cost = mcf x $per mcf

	Fuel Usage		Fuel Cost	
Useful Heat from L	5,557	kWh	n/a	
Replacement Gas	**(23)**	**mcf**		**per year**

Reduced Air Conditioning because of Reduced Lighting

Reduced Air Conditioning Lighting Load during the cooling season from Lighting that is no longer present is:

= kwh Lighting Savings per month x No. Months Lighting Retrofit will impact cooling costs x % of building cooled

= **0 kWh =** 0 BTU

Reduced Air Conditioning Energy Requirements [kWh] =

Reduce Air Conditioning Lighting Load x (3412 Btu / kWh) x (1 ton-hr / 12,000 Btu) x (1.1 kW / ton)

Reduced Air Conditioning Cost = Reduced Air Conditioning Energy Requirements x Cost per kWh

Reduced Air Conditioning Energy Requirem	**0**	**kWh per year**
Reduced Air Conditioning Cost =	**$ 0**	**per year**

Net Impact on Heating and Air Conditioning Costs because of Lighting Retrofit

Heating Fuel	**(23.0)**	**mcf**	**$ 0**
Cooling	**0**	**kWh per year**	**$ 0**
			$ 0

Project: Erie County
Building: Tonawanda Highway
Date: 7/2/2019

Heating System Efficiency:	80%
Average Fuel Cost ($/unit):	$0.53
Correction Factor:	100%

Area

Work to be completed	No. of Units	Perimeter (ft)	Crackage (in)	Conversion to feet		Product
Single door sweeps	6	3	3/16	1/12	=	0.28125
Single door perimeters	6	17	1/8	1/12	=	1.0625
Garage doors	9	540	1/4	1/12	=	11.25
Roof/wall joint	1	371	1/8	1/12	=	3.864583333
Window in-fill perimeter caulking	2	53	1/16	1/12	=	0.276041667
					Total =	16.734375 ft^2

Occupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (without roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot °F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
2409.75	50%	0.015	72	34.25	0.0065	11.6	1446.297

Occupied Infiltration Savings

Specific Heat of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Occupied (%/week)	Heating Season Bin Hours (Occupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	1446.297	37.75	29.76%	4335	103000	80%	923.194

Unoccupied Flow Rate

$Q = A_L\sqrt{(C_s \times \Delta T + C_w \times U^2)}$ Ref: ASHRAE 2009 Fundamentals 16.23 (43)

Effective Air Leakage Area (in^2) (with roof fan leakage area) A_L	Windward Diversity (%)	Stack Coefficient ($cfm^2/(in^4 \cdot °F)$) C_s	Indoor Air Temperature (˚F)	Average Outdoor Air Temperature (˚F)	Wind Coefficient ($cfm^2/(in^4 \cdot mph^2)$) C_w	Average Wind Speed (mph) U	Flow Rate (cfm) Q_{occ}
2409.75	50%	0.015	67	34.14	0.0065	11.6	1409.003

Unoccupied Infiltration Savings

Specific Hear of Air by Density of Inlet Air Constant Rho ρ	Flow Rate (cfm) Q_{occ}	Temperature Differential (ΔT)	Percent Unoccupied (%/week)	Heating Season Bin Hours (Unoccupied)	Fuel Heating Value Btu's/unit	Heating System Efficiency (%)	Units of Fuel per Year (units/yr.)
1.08	1409.003	32.86	70.24%	4301	103000	80%	1833.285

Totals

Units of Fuel per Year (units/yr.)	Fuel Heating Value Btu's/unit	Units/MMBtu	Total MMBtu Savings (MMBtu/yr)
2756.479	103000	9.708737864	283.9173616

Total Amount of Fuel Savings (units/yr)	Fuel Cost ($/unit)	Total Cost Savings ($/yr)
2756.48	$0.53	1455.404279

Total Cost Savings: **$1,455.40**
Cost to Retrofit: **$26,222.00**
Simple Payback: **18.02 years**

CALCULATIONS FOR INSTALLING CONDENSING UNIT HEATERS
FIM 23.26

Client: Tonawanda Highway
Address: 1870 Military Road

Type: **Natural Gas**
Units: **mcf**
Unit cost: **$ 5.319** /mcf
Heat Content of Fuel **1,030,000** Btu/mcf

INPUT DATA:

Present Annual Fuel Consumption:

	1,875	mcf	Total heating fuel use
	67.3%	of building served by theseUnit Heaters	
	1,262	mcf	Unit Heaters fuel use

Efficiencies

Present:	**80.0%**	thermal efficiency
Proposed:	**93.0%**	thermal efficiency
Number of Unit Heaters:	**6**	

CALCULATIONS:

Proposed Annual Fuel Consumption =
(Present Annual Fuel Consumption x Present Efficiency) / Proposed Efficiency

	Annual Fuel Consumption (mcf)
Present:	1,262
Proposed:	1,085

Annual Savings: 176

CALCULATIONS TO IMPROVE TEMPERATURE CONTROL

FIM 23.38 Tonawanda Highway

INPUT DATA: 100% of Building to be Setback

		Current	Proposed	
Heating T Setpoint:	Occupied	66	54	deg. F.
	Unoccupied	66	54	deg. F.
Cooling T Setpoint:	Occupied	90	90	deg. F.
	Unoccupied	90	90	deg. F.
HVAC Schedule	Occupied	167.9	167.9	Hours per week
	Unoccupied	0.1	0.1	Hours per week
Q internal gains:	Occupied	42,982	42,982	Btuh
	Unoccupied	11,462	11,462	Btuh
Q internal gains:	Schedule	84	84	Hours per week
BLC:	Occupied	8,905	8,905	Btuh/deg. F.
	Unoccupied	9,894	9,894	Btuh/deg. F.

Fuel Data	Heating	Cooling		
Type:	Natural Gas	Electricity		
Units:	**mcf**	kwh		
Unit cost:	**$ 5.319**	$ 0.05		
BTU/unit	**1,030,000**	3,412		
Efficiency/ COP:	**80.0%**	2.93	COP, = EER	10.0

CALCULATIONS:

Current — Buffalo, 168 hrs./week

Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use mcf	Cooling Energy kwh
(2.5)	1	0	586,674	670,657	1	
2.5	28	3	542,150	621,186	21	
7.5	60	2	497,626	571,714	38	
12.5	208	11	453,101	522,243	121	
17.5	438	20	408,577	472,771	229	
22.5	385	15	364,053	423,300	178	
27.5	366	20	319,529	373,829	151	
32.5	623	24	275,004	324,357	217	
37.5	894	42	230,480	274,886	264	
42.5	757	37	185,956	225,414	181	
47.5	706	39	141,432	175,943	130	
52.5	569	24	96,907	126,472	71	
57.5	673	29	52,383	77,000	45	
62.5	883	52	7,859	27,529	10	
67.5	707	30	(27,233)	(11,462)	0	
72.5	489	10	(27,233)	(11,462)	0	
77.5	382	5	(27,233)	(11,462)	0	
82.5	204	2	(27,233)	(11,462)	0	
87.5	22	0	(27,233)	(11,462)	0	
92.5	0	0	(49,495)	(36,198)	0	
97.5	0	0	(94,019)	(85,669)	0	
102.5	0	0	(138,543)	(135,140)	0	
107.5	0	0	(183,068)	(184,612)	0	
	8,760	hours			1,656	0

Proposed		Buffalo, 168 hrs./week				
Bin Mid Pt.	Occupied Hours	Unoccupied Hours	Occ Net Heat Loss BTUH	Unocc Net Heat Loss BTUH	Heating Fuel Use	Cooling Energy kwh
(2.5)	1	0	474,484	546,001	1	
2.5	28	3	429,960	496,530	16	
7.5	60	2	385,435	447,058	29	
12.5	208	11	340,911	397,587	91	
17.5	438	20	296,387	348,116	166	
22.5	385	15	251,863	298,644	123	
27.5	366	20	207,338	249,173	98	
32.5	623	24	162,814	199,701	129	
37.5	894	42	118,290	150,230	136	
42.5	757	37	73,765	100,759	72	
47.5	706	39	29,241	51,287	27	
52.5	569	24	(15,283)	1,816	0	
57.5	673	29	(27,233)	(11,462)	0	
62.5	883	52	(27,233)	(11,462)	0	
67.5	707	30	(27,233)	(11,462)	0	
72.5	489	10	(27,233)	(11,462)	0	
77.5	382	5	(27,233)	(11,462)	0	
82.5	204	2	(27,233)	(11,462)	0	
87.5	22	0	(27,233)	(11,462)	0	
92.5	0	0	(49,495)	(36,198)	0	
97.5	0	0	(94,019)	(85,669)	0	
102.5	0	0	(138,543)	(135,140)	0	
107.5	0	0	(183,068)	(184,612)	0	
	8,760	hours			889	0

		Present	Proposed	Savings
Heating	mcf	1,656	889	766

ENHANCED LIGHTING SURVEY LOG

Project Name: **608 WILLIAM ST**

Months: 12

Hours: 2500 **Multipliers:** **0.0475** **11.89**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	Existing Watts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Labor Price	Material Price	Sensor	Sensor Qnty
1	2		MEDICAL RECORDS			3500	10	A3TT8	4' 3L TROFFER W/ T8S	930	3255	$154.61	$132.69	$287.30	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	10	390	1365	$64.84	$55.65	$120.48	$89.78	$77.05	$166.82	$ 520.00	$ 340.00	CP	2
2	2		ROOM			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$22.09	$26.54	$48.63	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$9.26	$11.13	$20.39	$12.83	$15.41	$28.23	$ 104.00	$ 68.00	WS	1
3	2	7	EXAM			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$22.09	$26.54	$48.63	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$9.26	$11.13	$20.39	$12.83	$15.41	$28.23	$ 104.00	$ 68.00	WS	1
4	2	6	EXAM			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$22.09	$26.54	$48.63	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$9.26	$11.13	$20.39	$12.83	$15.41	$28.23	$ 104.00	$ 68.00	WS	1
5	2	5	EXAM			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$22.09	$26.54	$48.63	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$9.26	$11.13	$20.39	$12.83	$15.41	$28.23	$ 104.00	$ 68.00	WS	1
6	2	4	EXAM			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$22.09	$26.54	$48.63	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$9.26	$11.13	$20.39	$12.83	$15.41	$28.23	$ 104.00	$ 68.00	WS	1
7	2	3	EXAM			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$22.09	$26.54	$48.63	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$9.26	$11.13	$20.39	$12.83	$15.41	$28.23	$ 104.00	$ 68.00	WS	1
8	2	2	EXAM			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$22.09	$26.54	$48.63	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$9.26	$11.13	$20.39	$12.83	$15.41	$28.23	$ 104.00	$ 68.00	WS	1
9	2		OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$22.09	$26.54	$48.63	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$9.26	$11.13	$20.39	$12.83	$15.41	$28.23	$ 104.00	$ 68.00	WS	1
10	2		OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$22.09	$26.54	$48.63	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$9.26	$11.13	$20.39	$12.83	$15.41	$28.23	$ 104.00	$ 68.00	WS	1
11	2		OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$22.09	$26.54	$48.63	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$9.26	$11.13	$20.39	$12.83	$15.41	$28.23	$ 104.00	$ 68.00	WS	1
12	2		COMMUNICATION			500	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	59	$2.80	$16.84	$19.64	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.24	$7.42	$8.65	$1.57	$9.42	$10.98	$ 100.00	$ 48.00	WS	1
13	2		TOILET			1000	1	D2VT8	2' 2L VANITY	33	33	$1.57	$4.71	$6.28	NDV	REMOVE FIX. & INSTALL NEW 2' LED VANITY	1	17	17	$0.81	$2.43	$3.23	$0.76	$2.28	$3.04	$ 55.00	$ 75.00	WS	1
14	2		WORK AREA			3500	5	A3TT8	4' 3L TROFFER W/ T8S	465	1628	$77.31	$66.35	$143.65	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	5	195	683	$32.42	$27.82	$60.24	$44.89	$38.52	$83.41	$ 260.00	$ 170.00	CP	2
15	2		WORK AREA			3500	4	A2RT8	4' 2L RECESSED FIXTURE W/T8S	236	826	$39.24	$33.67	$72.91	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	364	$17.29	$14.84	$32.13	$21.95	$18.83	$40.78	$ 200.00	$ 96.00		
16	2		RECEPTION			3500	18	2-13CP	(2) 13W COMPACT FLUORESCENT	540	1890	$89.78	$77.05	$166.82	NAT	REMOVE FIX. & INSTALL NEW 4' LED 2X4 TROFFER	8	288	1008	$47.88	$41.09	$88.97	$41.90	$35.96	$77.85	$ 1,200.00	$ 720.00		
17	2		STAIRS			8760	1	D3TT8	2' 3L TROFFER W/ T8S	77	675	$32.04	$10.99	$43.03	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	158	$7.49	$2.57	$10.06	$24.55	$8.42	$32.97	$ 55.00	$ 34.00		
18	2		STAIRS			8760	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	517	$24.55	$8.42	$32.97	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$10.82	$3.71	$14.53	$13.73	$4.71	$18.44	$ 50.00	$ 24.00		
19	2		ELEVATOR			8760	5	A1ST8	4' 1L STRIP FIXTURE W/ 32W T8'S	160	1402	$66.58	$22.83	$89.40	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	5	65	569	$27.05	$9.27	$36.32	$39.53	$13.55	$53.08	$ 250.00	$ 55.00		
20	2		WOMENS			2500	1	A2RT8	4' 2L RECESSED FIXTURE W/T8S	59	148	$7.01	$8.42	$15.42	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.09	$3.71	$6.80	$3.92	$4.71	$8.63	$ 50.00	$ 24.00	WS	1
21	2		WOMENS			2500	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	148	$7.01	$8.42	$15.42	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.09	$3.71	$6.80	$3.92	$4.71	$8.63	$ 50.00	$ 24.00	INCL	1
22	2		MENS			2500	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	148	$7.01	$8.42	$15.42	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.09	$3.71	$6.80	$3.92	$4.71	$8.63	$ 50.00	$ 24.00	WS	1
23	2		MENS			2500	1	A2RT8	4' 2L RECESSED FIXTURE W/T8S	59	148	$7.01	$8.42	$15.42	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.09	$3.71	$6.80	$3.92	$4.71	$8.63	$ 50.00	$ 24.00	INCL	1
24	2		CORRIDOR			8760	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	517	$24.55	$8.42	$32.97	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$10.82	$3.71	$14.53	$13.73	$4.71	$18.44	$ 50.00	$ 24.00		
25	2		RECEPTION			3500	8	23CP	23W COMPACT FLUORESCENT	200	700	$33.25	$28.54	$61.79	NAT	REMOVE FIX. & INSTALL NEW 4' LED 2X4 TROFFER	8	288	1008	$47.88	$41.09	$88.97	-$14.63	-$12.56	-$27.19	$ 1,200.00	$ 720.00		
26	2		RECEPTION			3500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	620	$29.43	$25.25	$54.68	ELIM	REMOVE FIXTURE	3						$29.43	$25.25	$54.68	$ 150.00	$ -		
27	2		OPEN AREA			3500	5	A2RT8	4' 2L RECESSED FIXTURE W/T8S	295	1033	$49.04	$42.09	$91.13	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	455	$21.61	$18.55	$40.16	$27.43	$23.54	$50.97	$ 250.00	$ 120.00	CP	1
28	2		OPEN AREA			3500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	620	$29.43	$25.25	$54.68	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	273	$12.97	$11.13	$24.10	$16.46	$14.13	$30.58	$ 150.00	$ 72.00	CP	1
29	2	212	OPEN AREA			3500	6	A3TT8	4' 3L TROFFER W/ T8S	558	1953	$92.77	$79.62	$172.38	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	6	156	546	$25.94	$22.26	$48.19	$66.83	$57.36	$124.19	$ 330.00	$ 216.00	CP	1
30	2	213	OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.01	$16.84	$30.85	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.18	$7.42	$13.59	$7.84	$9.42	$17.25	$ 100.00	$ 48.00	WS	1
31	2	214	OFFICE			2500	6	A2RT8	4' 2L RECESSED FIXTURE W/T8S	354	885	$42.04	$50.51	$92.55	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	390	$18.53	$22.26	$40.78	$23.51	$28.25	$51.76	$ 300.00	$ 144.00	WS	1
32	2	215	COPY			2500	3	A2RT8	4' 2L RECESSED FIXTURE W/T8S	177	443	$21.02	$25.25	$46.27	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$9.26	$11.13	$20.39	$11.76	$14.13	$25.88	$ 150.00	$ 72.00	CP	1
33	2	216	OFFICE			2500	6	A2RT8	4' 2L RECESSED FIXTURE W/T8S	354	885	$42.04	$50.51	$92.55	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	390	$18.53	$22.26	$40.78	$23.51	$28.25	$51.76	$ 300.00	$ 144.00	WS	1
34	2	217	OFFICE			2500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	443	$21.02	$25.25	$46.27	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$9.26	$11.13	$20.39	$11.76	$14.13	$25.88	$ 150.00	$ 72.00	WS	1
35	2	207	OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.01	$16.84	$30.85	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.18	$7.42	$13.59	$7.84	$9.42	$17.25	$ 100.00	$ 48.00	WS	1
36	2	209	PROVIDER			2500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	590	$28.03	$33.67	$61.70	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$12.35	$14.84	$27.19	$15.68	$18.83	$34.51	$ 200.00	$ 96.00	WS	1
37	2	210	BREAK AREA			3500	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	1239	$58.85	$50.51	$109.36	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	546	$25.94	$22.26	$48.19	$32.92	$28.25	$61.17	$ 300.00	$ 144.00	CP	1

ENHANCED LIGHTING SURVEY LOG

Project Name: 608 WILLIAM ST

Months: 12

Hours: 2500 **Multipliers:** **0.0475** **11.89**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	Existing Watts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Labor Price	Material Price	Sensor	Sensor Qnty
38	2	211	STORAGE			1000	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	59	$2.80	$8.42	$11.22	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.24	$3.71	$4.94	$1.57	$4.71	$6.28	$ 50.00	$ 24.00	WS	1
39	2	206	OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.01	$16.84	$30.85	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.18	$7.42	$13.59	$7.84	$9.42	$17.25	$ 100.00	$ 48.00	WS	1
40	2	202	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$22.09	$26.54	$48.63	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$9.26	$11.13	$20.39	$12.83	$15.41	$28.23	$ 104.00	$ 68.00	CP	1
41	2	201	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$22.09	$26.54	$48.63	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$9.26	$11.13	$20.39	$12.83	$15.41	$28.23	$ 104.00	$ 68.00	CP	1
42	2	204	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$22.09	$26.54	$48.63	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$9.26	$11.13	$20.39	$12.83	$15.41	$28.23	$ 104.00	$ 68.00	WS	1
43	2	220	TOILET			1500	1	D2VT8	2' 2L VANITY	33	50	$2.35	$4.71	$7.06	NDV	REMOVE FIX. & INSTALL NEW 2' LED VANITY	1	17	26	$1.21	$2.43	$3.64	$1.14	$2.28	$3.42	$ 55.00	$ 75.00	WS	1
44	2	205	OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.01	$16.84	$30.85	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.18	$7.42	$13.59	$7.84	$9.42	$17.25	$ 100.00	$ 48.00	WS	1
45	2	286	ROOF EXIT			500	2	I60	60W INCANDESCENT	120	60	$2.85	$17.12	$19.97	LED9SI	NEW 9W LED SCREW IN	2	18	9	$0.43	$2.57	$3.00	$2.42	$14.55	$16.98	$ 20.00	$ 6.00		
46	2	241	HALL			8760	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	1034	$49.10	$16.84	$65.94	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$21.64	$7.42	$29.06	$27.46	$9.42	$36.88	$ 100.00	$ 48.00		
47	2	241	HALL			8760	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	1034	$49.10	$16.84	$65.94	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$21.64	$7.42	$29.06	$27.46	$9.42	$36.88	$ 100.00	$ 48.00		
48	2	242	RESOURCE			500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	59	$2.80	$16.84	$19.64	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.24	$7.42	$8.65	$1.57	$9.42	$10.98	$ 100.00	$ 48.00	WS	1
49	2	262	PASSAGE			8760	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	1034	$49.10	$16.84	$65.94	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$21.64	$7.42	$29.06	$27.46	$9.42	$36.88	$ 100.00	$ 48.00		
50	2	244	VACANT			500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	59	$2.80	$16.84	$19.64	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.24	$7.42	$8.65	$1.57	$9.42	$10.98	$ 100.00	$ 48.00	WS	1
51	2	245	VACANT			500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	59	$2.80	$16.84	$19.64	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.24	$7.42	$8.65	$1.57	$9.42	$10.98	$ 100.00	$ 48.00	WS	1
52	2	246	VACANT			500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	59	$2.80	$16.84	$19.64	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.24	$7.42	$8.65	$1.57	$9.42	$10.98	$ 100.00	$ 48.00	WS	1
53	2	249	FILES			500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	59	$2.80	$16.84	$19.64	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.24	$7.42	$8.65	$1.57	$9.42	$10.98	$ 100.00	$ 48.00	CP	1
54	2	250	STORAGE			500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	59	$2.80	$16.84	$19.64	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.24	$7.42	$8.65	$1.57	$9.42	$10.98	$ 100.00	$ 48.00	WS	1
55	2	273	STORAGE			1000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	118	$5.61	$16.84	$22.44	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.47	$7.42	$9.89	$3.14	$9.42	$12.55	$ 100.00	$ 48.00	WS	1
56	2		ROOM			500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	59	$2.80	$16.84	$19.64	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.24	$7.42	$8.65	$1.57	$9.42	$10.98	$ 100.00	$ 48.00	WS	1
57	2	255	ROOM			500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	59	$2.80	$16.84	$19.64	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.24	$7.42	$8.65	$1.57	$9.42	$10.98	$ 100.00	$ 48.00	WS	1
58	2	256	STORAGE			500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	59	$2.80	$16.84	$19.64	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.24	$7.42	$8.65	$1.57	$9.42	$10.98	$ 100.00	$ 48.00	WS	1
59	2	257	STORAGE			500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	59	$2.80	$16.84	$19.64	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.24	$7.42	$8.65	$1.57	$9.42	$10.98	$ 100.00	$ 48.00	WS	1
60	2	258	TOILET			1000	1	D2VT8	2' 2L VANITY	33	33	$1.57	$4.71	$6.28	NDV	REMOVE FIX. & INSTALL NEW 2' LED VANITY	1	17	17	$0.81	$2.43	$3.23	$0.76	$2.28	$3.04	$ 55.00	$ 75.00	WS	1
61	2	251	LACTATION			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.01	$16.84	$30.85	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.18	$7.42	$13.59	$7.84	$9.42	$17.25	$ 100.00	$ 48.00	WS	1
62	2		CLINICAL OPEN			2500	10	A2TT8	4' 2L TROFFER FIXTURE W/T8S	590	1475	$70.06	$84.18	$154.24	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	10	260	650	$30.88	$37.10	$67.97	$39.19	$47.08	$86.27	$ 500.00	$ 240.00	CP	2
63	2		CLINICAL OPEN			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$22.09	$26.54	$48.63	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$9.26	$11.13	$20.39	$12.83	$15.41	$28.23	$ 104.00	$ 68.00	INCL	1
64	2	240	TOILET			1500	1	D2VT8	2' 2L VANITY	33	50	$2.35	$4.71	$7.06	NDV	REMOVE FIX. & INSTALL NEW 2' LED VANITY	1	17	26	$1.21	$2.43	$3.64	$1.14	$2.28	$3.42	$ 55.00	$ 75.00	WS	1
65	2	2	EXAM			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$11.04	$13.27	$24.31	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	98	$4.63	$5.56	$10.20	$6.41	$7.70	$14.12	$ 52.00	$ 34.00	WS	1
66	2	234	ROOM			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$11.04	$13.27	$24.31	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	98	$4.63	$5.56	$10.20	$6.41	$7.70	$14.12	$ 52.00	$ 34.00	WS	1
67	2	224	LAB			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$33.13	$39.81	$72.94	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$13.89	$16.69	$30.59	$19.24	$23.11	$42.35	$ 156.00	$ 102.00	CP	1
68	2	226	EXAM			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$22.09	$26.54	$48.63	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$9.26	$11.13	$20.39	$12.83	$15.41	$28.23	$ 104.00	$ 68.00	WS	1
69	2	227	EXAM			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$22.09	$26.54	$48.63	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$9.26	$11.13	$20.39	$12.83	$15.41	$28.23	$ 104.00	$ 68.00	WS	1
70	2	229	EXAM			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$22.09	$26.54	$48.63	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$9.26	$11.13	$20.39	$12.83	$15.41	$28.23	$ 104.00	$ 68.00	WS	1
71	2	236	VACCINE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$22.09	$26.54	$48.63	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$9.26	$11.13	$20.39	$12.83	$15.41	$28.23	$ 104.00	$ 68.00	WS	1
72	2	237	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$22.09	$26.54	$48.63	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$9.26	$11.13	$20.39	$12.83	$15.41	$28.23	$ 104.00	$ 68.00	WS	1
73	2	238	PROVIDER			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$22.09	$26.54	$48.63	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$9.26	$11.13	$20.39	$12.83	$15.41	$28.23	$ 104.00	$ 68.00	WS	1
74	2	239	EXAM			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$22.09	$26.54	$48.63	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$9.26	$11.13	$20.39	$12.83	$15.41	$28.23	$ 104.00	$ 68.00	WS	1

ENHANCED LIGHTING SURVEY LOG

Project Name: **608 WILLIAM ST**

Months: 12

Hours: 2500 **Multipliers:** **0.0475** **11.89**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Labor Price	Material Price	Sensor	Sensor Qnty
75	1	115	OFFICE			2500	5	A2TT8	4' 2L TROFFER FIXTURE W/T8S	295	738	$35.03	$42.09	$77.12	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	325	$15.44	$18.55	$33.99	$19.59	$23.54	$43.14	$ 250.00	$ 120.00	WS	1
76	1	113	COPY			2500	6	A2RT8	4' 2L RECESSED FIXTURE W/T8S	354	885	$42.04	$50.51	$92.55	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	390	$18.53	$22.26	$40.78	$23.51	$28.25	$51.76	$ 300.00	$ 144.00	CP	1
77	1	112	OFFICE			2500	6	A4TT8	4' 4L RECESSED TROFFER W/T8S	672	1680	$79.80	$95.88	$175.68	RR3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS, DELAMP KIT	6	288	720	$34.20	$41.09	$75.29	$45.60	$54.79	$100.39	$ 330.00	$ 276.00	CP	1
78	1	111	OFFICE			2500	6	A4TT8	4' 4L RECESSED TROFFER W/T8S	672	1680	$79.80	$95.88	$175.68	RR3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS, DELAMP KIT	6	288	720	$34.20	$41.09	$75.29	$45.60	$54.79	$100.39	$ 330.00	$ 276.00	CP	1
79	1		PASSAGE			2500	2	A4TT8	4' 4L RECESSED TROFFER W/T8S	224	560	$26.60	$31.96	$58.56	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	130	$6.18	$7.42	$13.59	$20.43	$24.54	$44.97	$ 110.00	$ 72.00		
80	1	110	OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.01	$16.84	$30.85	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.18	$7.42	$13.59	$7.84	$9.42	$17.25	$ 100.00	$ 48.00	WS	1
81	1	109	OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.01	$16.84	$30.85	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.18	$7.42	$13.59	$7.84	$9.42	$17.25	$ 100.00	$ 48.00	WS	1
82	1		STORAGE			500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	59	$2.80	$16.84	$19.64	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.24	$7.42	$8.65	$1.57	$9.42	$10.98	$ 100.00	$ 48.00	WS	1
83	1	108	STORAGE			500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	59	$2.80	$16.84	$19.64	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.24	$7.42	$8.65	$1.57	$9.42	$10.98	$ 100.00	$ 48.00	WS	1
84	1	106	CONFERENCE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.01	$16.84	$30.85	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.18	$7.42	$13.59	$7.84	$9.42	$17.25	$ 100.00	$ 48.00	WS	1
85	1	105	OFFICE			2500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	443	$21.02	$25.25	$46.27	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$9.26	$11.13	$20.39	$11.76	$14.13	$25.88	$ 150.00	$ 72.00	WS	1
86	1	107	SERVER			500	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	30	$1.40	$8.42	$9.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.62	$3.71	$4.33	$0.78	$4.71	$5.49	$ 50.00	$ 24.00	WS	1
87	1		HALL			8760	5	A2TT8	4' 2L TROFFER FIXTURE W/T8S	295	2584	$122.75	$42.09	$164.84	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	1139	$54.09	$18.55	$72.64	$68.66	$23.54	$92.20	$ 250.00	$ 120.00		
88	1		HALL			8760	1	A2RT8	4' 2L RECESSED FIXTURE W/T8S	59	517	$24.55	$8.42	$32.97	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$10.82	$3.71	$14.53	$13.73	$4.71	$18.44	$ 50.00	$ 24.00		
89	1		RECEPTION			3500	6	I60	60W INCANDESCENT	360	1260	$59.85	$51.36	$111.21	NAT	REMOVE FIX. & INSTALL NEW 4' LED 2X4 TROFFER	6	216	756	$35.91	$30.82	$66.73	$23.94	$20.55	$44.49	$ 900.00	$ 540.00		
90	1		RECEPTION			3500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	413	$19.62	$16.84	$36.45	ELIM	REMOVE FIXTURE	2						$19.62	$16.84	$36.45	$ 100.00	$ -		
91	1		FAMILY PLANNING			3500	9	A2RT8	4' 2L RECESSED FIXTURE W/T8S	531	1859	$88.28	$75.76	$164.04	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	9	234	819	$38.90	$33.39	$72.29	$49.38	$42.38	$91.75	$ 450.00	$ 216.00	CP	1
92	1		FAMILY PLANNING			3500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	826	$39.24	$33.67	$72.91	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	364	$17.29	$14.84	$32.13	$21.95	$18.83	$40.78	$ 200.00	$ 96.00	CP	1
93	1		FAMILY PLANNING			3500	2	A3TT8	4' 3L TROFFER W/ T8S	186	651	$30.92	$26.54	$57.46	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	182	$8.65	$7.42	$16.06	$22.28	$19.12	$41.40	$ 110.00	$ 72.00	INCL	1
94	1	120	EXAM			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.01	$16.84	$30.85	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.18	$7.42	$13.59	$7.84	$9.42	$17.25	$ 100.00	$ 48.00	WS	1
95	1	121	EXAM			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.01	$16.84	$30.85	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.18	$7.42	$13.59	$7.84	$9.42	$17.25	$ 100.00	$ 48.00	WS	1
96	1	122	EXAM			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.01	$16.84	$30.85	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.18	$7.42	$13.59	$7.84	$9.42	$17.25	$ 100.00	$ 48.00	WS	1
97	1	123	LAB			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.01	$16.84	$30.85	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.18	$7.42	$13.59	$7.84	$9.42	$17.25	$ 100.00	$ 48.00	WS	1
98	1	124	STORAGE			1000	1	A2RT8	4' 2L RECESSED FIXTURE W/T8S	59	59	$2.80	$8.42	$11.22	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.24	$3.71	$4.94	$1.57	$4.71	$6.28	$ 50.00	$ 24.00	WS	1
99	1	125	OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.01	$16.84	$30.85	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.18	$7.42	$13.59	$7.84	$9.42	$17.25	$ 100.00	$ 48.00	WS	1
100	1	127	EXAM			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.01	$16.84	$30.85	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.18	$7.42	$13.59	$7.84	$9.42	$17.25	$ 100.00	$ 48.00	WS	1
101	1	129	EXAM			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.01	$16.84	$30.85	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.18	$7.42	$13.59	$7.84	$9.42	$17.25	$ 100.00	$ 48.00	WS	1
102	1		OFFICE			2500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	443	$21.02	$25.25	$46.27	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$9.26	$11.13	$20.39	$11.76	$14.13	$25.88	$ 150.00	$ 72.00	CP	1
103	1	135	TOILET			1500	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	89	$4.20	$8.42	$12.62	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	39	$1.85	$3.71	$5.56	$2.35	$4.71	$7.06	$ 50.00	$ 24.00	WS	1
104	1		ENTRY			8760	2	I60	60W INCANDESCENT	120	1051	$49.93	$17.12	$67.05	NAT	REMOVE FIX. & INSTALL NEW 4' LED 2X4 TROFFER	2	72	631	$29.96	$10.27	$40.23	$19.97	$6.85	$26.82	$ 300.00	$ 180.00		
105	1		WAITING			3500	8	23CP	23W COMPACT FLUORESCENT	200	700	$33.25	$28.54	$61.79	NAT	REMOVE FIX. & INSTALL NEW 4' LED 2X4 TROFFER	8	288	1008	$47.88	$41.09	$88.97	-$14.63	-$12.56	-$27.19	$ 1,200.00	$ 720.00	CP	2
106	1		WAITING			3500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	207	$9.81	$8.42	$18.23	NAT	REMOVE FIX. & INSTALL NEW 4' LED 2X4 TROFFER	1	36	126	$5.99	$5.14	$11.12	$3.82	$3.28	$7.11	$ 150.00	$ 90.00		
107	1		STAIRS			8760	1	D3TT8	2' 3L TROFFER W/ T8S	77	675	$32.04	$10.99	$43.03	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	158	$7.49	$2.57	$10.06	$24.55	$8.42	$32.97	$ 55.00	$ 34.00		
108	1		STAIRS			8760	1	D3TT8	2' 3L TROFFER W/ T8S	77	675	$32.04	$10.99	$43.03	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	158	$7.49	$2.57	$10.06	$24.55	$8.42	$32.97	$ 55.00	$ 34.00		
109	1		MENS			2500	1	A2RT8	4' 2L RECESSED FIXTURE W/T8S	59	148	$7.01	$8.42	$15.42	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.09	$3.71	$6.80	$3.92	$4.71	$8.63	$ 50.00	$ 24.00	WS	1
110	1		MENS			2500	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	148	$7.01	$8.42	$15.42	NAV	REMOVE FIX. & INSTALL NEW 4' LED VANITY	1	36	90	$4.28	$5.14	$9.41	$2.73	$3.28	$6.01	$ 55.00	$ 105.00	INCL	1
111	1		WOMENS			2500	1	A2RT8	4' 2L RECESSED FIXTURE W/T8S	59	148	$7.01	$8.42	$15.42	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.09	$3.71	$6.80	$3.92	$4.71	$8.63	$ 50.00	$ 24.00	WS	1

ENHANCED LIGHTING SURVEY LOG

Project Name: 608 WILLIAM ST

Months: 12

Hours: 2500 **Multipliers:** **0.0475** **11.89**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	Existing Watts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Labor Price	Material Price	Sensor	Sensor Qnty
112	1		WOMENS			2500	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	148	$7.01	$8.42	$15.42	NAV	REMOVE FIX. & INSTALL NEW 4' LED VANITY	1	36	90	$4.28	$5.14	$9.41	$2.73	$3.28	$6.01	$ 55.00	$ 105.00	INCL	1
113	1		COMMUNITY ROOM			2500	10	A2TT8	4' 2L TROFFER FIXTURE W/T8S	590	1475	$70.06	$84.18	$154.24	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	10	260	650	$30.88	$37.10	$67.97	$39.19	$47.08	$86.27	$ 500.00	$ 240.00	CP	2
114	1	170	OFFICE			2500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	443	$21.02	$25.25	$46.27	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$9.26	$11.13	$20.39	$11.76	$14.13	$25.88	$ 150.00	$ 72.00	WS	1
115	1	169	CONFERENCE			2500	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	885	$42.04	$50.51	$92.55	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	390	$18.53	$22.26	$40.78	$23.51	$28.25	$51.76	$ 300.00	$ 144.00	CP	1
116	1	172	CONFERENCE			2500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	590	$28.03	$33.67	$61.70	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$12.35	$14.84	$27.19	$15.68	$18.83	$34.51	$ 200.00	$ 96.00	CP	1
117	1	175	OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.01	$16.84	$30.85	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.18	$7.42	$13.59	$7.84	$9.42	$17.25	$ 100.00	$ 48.00	CP	1
118	1		ENTRY			8760	2	I60	60W INCANDESCENT	120	1051	$49.93	$17.12	$67.05	NAT	REMOVE FIX. & INSTALL NEW 4' LED 2X4 TROFFER	2	72	631	$29.96	$10.27	$40.23	$19.97	$6.85	$26.82	$ 300.00	$ 180.00		
119	1		PASSAGE			8760	5	A2RT8	4' 2L RECESSED FIXTURE W/T8S	295	2584	$122.75	$42.09	$164.84	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	1139	$54.09	$18.55	$72.64	$68.66	$23.54	$92.20	$ 250.00	$ 120.00		
120	1		TOILET			1000	1	D2VT8	2' 2L VANITY	33	33	$1.57	$4.71	$6.28	NDV	REMOVE FIX. & INSTALL NEW 2' LED VANITY	1	17	17	$0.81	$2.43	$3.23	$0.76	$2.28	$3.04	$ 55.00	$ 75.00	WS	1
121	1		STORAGE			1000	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	118	$5.61	$16.84	$22.44	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.47	$7.42	$9.89	$3.14	$9.42	$12.55	$ 100.00	$ 48.00	CP	1
122	1		STORAGE			1000	1	I60	60W INCANDESCENT	60	60	$2.85	$8.56	$11.41	LED9SI	NEW 9W LED SCREW IN	1	9	9	$0.43	$1.28	$1.71	$2.42	$7.28	$9.70	$ 10.00	$ 3.00	INCL	1
123	1	180	OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.01	$16.84	$30.85	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.18	$7.42	$13.59	$7.84	$9.42	$17.25	$ 100.00	$ 48.00	WS	1
124	1	179	STORAGE			1000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	118	$5.61	$16.84	$22.44	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.47	$7.42	$9.89	$3.14	$9.42	$12.55	$ 100.00	$ 48.00	WS	1
125	1	186	WOMENS			1000	1	A2RT8	4' 2L RECESSED FIXTURE W/T8S	59	59	$2.80	$8.42	$11.22	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.24	$3.71	$4.94	$1.57	$4.71	$6.28	$ 50.00	$ 24.00	WS	1
126	1	186	WOMENS			1000	1	D2VT8	2' 2L VANITY	33	33	$1.57	$4.71	$6.28	NDV	REMOVE FIX. & INSTALL NEW 2' LED VANITY	1	17	17	$0.81	$2.43	$3.23	$0.76	$2.28	$3.04	$ 55.00	$ 75.00	INCL	1
127	1	187	SLOP SINK			500	1	23CP	23W COMPACT FLUORESCENT	25	13	$0.59	$3.57	$4.16	LED9SI	NEW 9W LED SCREW IN	1	9	5	$0.21	$1.28	$1.50	$0.38	$2.28	$2.66	$ 10.00	$ 3.00	WS	1
128	1	188	MENS			1000	1	A2RT8	4' 2L RECESSED FIXTURE W/T8S	59	59	$2.80	$8.42	$11.22	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.24	$3.71	$4.94	$1.57	$4.71	$6.28	$ 50.00	$ 24.00	WS	1
129	1	188	MENS			1000	1	D2VT8	2' 2L VANITY	33	33	$1.57	$4.71	$6.28	NDV	REMOVE FIX. & INSTALL NEW 2' LED VANITY	1	17	17	$0.81	$2.43	$3.23	$0.76	$2.28	$3.04	$ 55.00	$ 75.00	INCL	1
130	1	189	STORAGE			1000	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	118	$5.61	$16.84	$22.44	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.47	$7.42	$9.89	$3.14	$9.42	$12.55	$ 100.00	$ 48.00	WS	1
131	1		OPEN AREA			1500	24	A2TT8	4' 2L TROFFER FIXTURE W/T8S	1416	2124	$100.89	$202.03	$302.92	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	24	624	936	$44.46	$89.03	$133.49	$56.43	$113.00	$169.43	$ 1,200.00	$ 576.00	CP	2
132	1	190	KITCHEN			1500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	354	$16.82	$33.67	$50.49	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	156	$7.41	$14.84	$22.25	$9.41	$18.83	$28.24	$ 200.00	$ 96.00	CW	1
133	1	191	RECEIVING			1500	4	A2RT8	4' 2L RECESSED FIXTURE W/T8S	236	354	$16.82	$33.67	$50.49	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	156	$7.41	$14.84	$22.25	$9.41	$18.83	$28.24	$ 200.00	$ 96.00	CP	1
134	1	163	STORAGE			1000	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	118	$5.61	$16.84	$22.44	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.47	$7.42	$9.89	$3.14	$9.42	$12.55	$ 100.00	$ 48.00	CP	1
135	1		PASSAGE			8760	3	A2RT8	4' 2L RECESSED FIXTURE W/T8S	177	1551	$73.65	$25.25	$98.90	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	683	$32.46	$11.13	$43.58	$41.19	$14.13	$55.32	$ 150.00	$ 72.00		
136	1	160	SLOP SINK			500	1	23CP	23W COMPACT FLUORESCENT	25	13	$0.59	$3.57	$4.16	LED9SI	NEW 9W LED SCREW IN	1	9	5	$0.21	$1.28	$1.50	$0.38	$2.28	$2.66	$ 10.00	$ 3.00	WS	1
137	1	159	MENS LOCKER			500	3	A2RT8	4' 2L RECESSED FIXTURE W/T8S	177	89	$4.20	$25.25	$29.46	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	39	$1.85	$11.13	$12.98	$2.35	$14.13	$16.48	$ 150.00	$ 72.00	CP	1
138	1	159	MENS LOCKER			500	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	30	$1.40	$8.42	$9.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.62	$3.71	$4.33	$0.78	$4.71	$5.49	$ 50.00	$ 24.00	INCL	1
139	1	155	WOMENS LOCKER			500	3	A2RT8	4' 2L RECESSED FIXTURE W/T8S	177	89	$4.20	$25.25	$29.46	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	39	$1.85	$11.13	$12.98	$2.35	$14.13	$16.48	$ 150.00	$ 72.00	CP	1
140	1	155	WOMENS LOCKER			500	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	30	$1.40	$8.42	$9.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.62	$3.71	$4.33	$0.78	$4.71	$5.49	$ 50.00	$ 24.00	INCL	1
141	1		PASSAGE			8760	3	A2RT8	4' 2L RECESSED FIXTURE W/T8S	177	1551	$73.65	$25.25	$98.90	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	683	$32.46	$11.13	$43.58	$41.19	$14.13	$55.32	$ 150.00	$ 72.00		
142	1		STAIRS			8760	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	526	$24.97	$8.56	$33.53	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	158	$7.49	$2.57	$10.06	$17.48	$5.99	$23.47	$ 55.00	$ 34.00		
143	1	141	STORAGE			1000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	118	$5.61	$16.84	$22.44	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.47	$7.42	$9.89	$3.14	$9.42	$12.55	$ 100.00	$ 48.00	WS	1
144	1	142	TOILET			1000	1	D2VT8	2' 2L VANITY	33	33	$1.57	$4.71	$6.28	NDV	REMOVE FIX. & INSTALL NEW 2' LED VANITY	1	17	17	$0.81	$2.43	$3.23	$0.76	$2.28	$3.04	$ 55.00	$ 75.00	WS	1
145	1	143	OFFICE			2500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	443	$21.02	$25.25	$46.27	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$9.26	$11.13	$20.39	$11.76	$14.13	$25.88	$ 150.00	$ 72.00	CP	1
146	1	145	OFFICE			2500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	590	$28.03	$33.67	$61.70	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$12.35	$14.84	$27.19	$15.68	$18.83	$34.51	$ 200.00	$ 96.00	WS	1
147	1	147	OFFICE			2500	2	23CP	23W COMPACT FLUORESCENT	50	125	$5.94	$7.13	$13.07	ELIM	REMOVE FIXTURE	2						$5.94	$7.13	$13.07	$ 100.00	$ -		
148	1	147	OFFICE			2500	2	D2TUT8	2' 2L TROFFER WT8/U-TUBES	120	300	$14.25	$17.12	$31.37	NAT	REMOVE FIX. & INSTALL NEW 4' LED 2X4 TROFFER	2	72	180	$8.55	$10.27	$18.82	$5.70	$6.85	$12.55	$ 300.00	$ 180.00	WS	1

ENHANCED LIGHTING SURVEY LOG

Project Name: 608 WILLIAM ST

Months: 12

Hours: 2500 **Multipliers:** **0.0475** **11.89**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	Existing Watts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Labor Price	Material Price	Sensor	Sensor Qnty
149	1	148	OFFICE			2500	6	D2TUT8	2' 2L TROFFER WT8/U-TUBES	360	900	$42.75	$51.36	$94.11	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	6	108	270	$12.83	$15.41	$28.23	$29.93	$35.96	$65.88	$ 330.00	$ 204.00	CP	1
150	1	148	OFFICE			2500	1	23CP	23W COMPACT FLUORESCENT	25	63	$2.97	$3.57	$6.54	ELIM	REMOVE FIXTURE	1						$2.97	$3.57	$6.54	$ 50.00	$ -		
151	1		BREAK AREA			3500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	413	$19.62	$16.84	$36.45	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	182	$8.65	$7.42	$16.06	$10.97	$9.42	$20.39	$ 100.00	$ 48.00	WS	1
152	1		HALL			8760	3	A2RT8	4' 2L RECESSED FIXTURE W/T8S	177	1551	$73.65	$25.25	$98.90	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	683	$32.46	$11.13	$43.58	$41.19	$14.13	$55.32	$ 150.00	$ 72.00		
153	1		WAITING			2500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	590	$28.03	$33.67	$61.70	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$12.35	$14.84	$27.19	$15.68	$18.83	$34.51	$ 200.00	$ 96.00	CP	1
154	1	138	STORAGE			1000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	118	$5.61	$16.84	$22.44	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.47	$7.42	$9.89	$3.14	$9.42	$12.55	$ 100.00	$ 48.00	WS	1
155	B		STAIRS			8760	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	526	$24.97	$8.56	$33.53	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	158	$7.49	$2.57	$10.06	$17.48	$5.99	$23.47	$ 55.00	$ 34.00		
156	B		PASSAGE			8760	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	1034	$49.10	$16.84	$65.94	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$21.64	$7.42	$29.06	$27.46	$9.42	$36.88	$ 100.00	$ 48.00		
157	B	6	STORAGE			1000	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	118	$5.61	$16.84	$22.44	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.47	$7.42	$9.89	$3.14	$9.42	$12.55	$ 100.00	$ 48.00	WS	1
158	B	5	STORAGE			1000	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	118	$5.61	$16.84	$22.44	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.47	$7.42	$9.89	$3.14	$9.42	$12.55	$ 100.00	$ 48.00	WS	1
159	B		KITCHEN			1000	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	118	$5.61	$16.84	$22.44	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.47	$7.42	$9.89	$3.14	$9.42	$12.55	$ 100.00	$ 48.00	WS	1
160	B		HALL			8760	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	1034	$49.10	$16.84	$65.94	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$21.64	$7.42	$29.06	$27.46	$9.42	$36.88	$ 100.00	$ 48.00		
161	B	3	STORAGE			500	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	59	$2.80	$16.84	$19.64	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.24	$7.42	$8.65	$1.57	$9.42	$10.98	$ 100.00	$ 48.00	WS	1
162	B	2	STORAGE			500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	59	$2.80	$16.84	$19.64	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.24	$7.42	$8.65	$1.57	$9.42	$10.98	$ 100.00	$ 48.00	WS	1
163	B	1	STORAGE			500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	59	$2.80	$16.84	$19.64	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.24	$7.42	$8.65	$1.57	$9.42	$10.98	$ 100.00	$ 48.00	WS	1
164	B		OPEN AREA			1000	15	A2TT8	4' 2L TROFFER FIXTURE W/T8S	885	885	$42.04	$126.27	$168.31	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	15	390	390	$18.53	$55.65	$74.17	$23.51	$70.63	$94.14	$ 750.00	$ 360.00	CP	2
165	B		ELECTRIC			500	2	15CP	15W COMPACT FLUORESCENT	34	17	$0.81	$4.85	$5.66	LED9SI	NEW 9W LED SCREW IN	2	18	9	$0.43	$2.57	$3.00	$0.38	$2.28	$2.66	$ 20.00	$ 6.00	WS	1
166	B		STORAGE			1000	4	A6FT8	4' 6L 4X4 W/T8S	684	684	$32.49	$97.59	$130.08	R6A	RETRO (1) FIX. W/ (6) 4' LED LAMPS	4	312	312	$14.82	$44.52	$59.34	$17.67	$53.08	$70.75	$ 240.00	$ 272.00	WS	1
167	B		STORAGE			1000	8	A2TT8	4' 2L TROFFER FIXTURE W/T8S	472	472	$22.42	$67.34	$89.76	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	208	$9.88	$29.68	$39.56	$12.54	$37.67	$50.21	$ 400.00	$ 192.00	WS	1
168	B		WOMENS			1000	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	118	$5.61	$16.84	$22.44	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.47	$7.42	$9.89	$3.14	$9.42	$12.55	$ 100.00	$ 48.00	CP	1
169	B		MENS			1000	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	118	$5.61	$16.84	$22.44	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.47	$7.42	$9.89	$3.14	$9.42	$12.55	$ 100.00	$ 48.00	CP	1
170	B		BOILER			1000	2	42CP	42W COMPACT FLUORESCENT	96	96	$4.56	$13.70	$18.26	NDW	REMOVE (1) FIX. & INSTALL NEW 2' LED FIX.	2	44	44	$2.09	$6.28	$8.37	$2.47	$7.42	$9.89	$ 110.00	$ 160.00		
171	B		HALL			8760	5	A2RT8	4' 2L RECESSED FIXTURE W/T8S	295	2584	$122.75	$42.09	$164.84	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	1139	$54.09	$18.55	$72.64	$68.66	$23.54	$92.20	$ 250.00	$ 120.00		
172	B		HALL			8760	2	A2ST8	4' 2L STRIP FIXTURES W/T8S	118	1034	$49.10	$16.84	$65.94	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$21.64	$7.42	$29.06	$27.46	$9.42	$36.88	$ 100.00	$ 48.00		
173	B		OFFICE			2500	3	A2ST8	4' 2L STRIP FIXTURES W/T8S	177	443	$21.02	$25.25	$46.27	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$9.26	$11.13	$20.39	$11.76	$14.13	$25.88	$ 150.00	$ 72.00	WS	1
174	B		BOILER			1000	8	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	472	472	$22.42	$67.34	$89.76	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	208	$9.88	$29.68	$39.56	$12.54	$37.67	$50.21	$ 400.00	$ 192.00		
175			MISC FIXTURES			2500	20	A2TT8	4' 2L TROFFER FIXTURE W/T8S	1180	2950	$140.13	$168.36	$308.49	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	20	520	1300	$61.75	$74.19	$135.94	$78.38	$94.17	$172.54	$ 1,000.00	$ 480.00		
							529.00	**Totals:**		33173	93741	$4,452.67	$4,733.12	$9,185.80			519.00	14602	41358	$1,964	$2,083	$4,048	$2,488	$2,650	$5,138	$ 29,759.00	$ 16,466.00		145
										KW	33							**KW**	15										

ENHANCED LIGHTING SURVEY LOG

Project Name: **608 WILLIAM EXTERIOR**

Months: 5

Hours: 4200 **Multipliers:** **0.0475** **11.89**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Labor Price	Material Price
1			EXTERIOR			4200	3	32CP	32W COMPACT FLUORESCENT	102	428	$20.35	$6.06	$26.41	LED8P	LED 8 PIN LAMP	3	24	101	$4.79	$1.43	$6.21	$15.56	$4.64	$20.20	$ 120.00	$ 42.00
2			EXTERIOR			4200	2	MH250	250W METAL HALIDE	590	2478	$117.71	$35.08	$152.78	LED150F	NEW 150W LED FLOOD	2	300	1260	$59.85	$17.84	$77.69	$57.86	$17.24	$75.10	$ 280.00	$ 320.00
3			EXTERIOR			4200	2	MH400	400W METAL HALIDE	916	3847	$182.74	$54.46	$237.20	LED150F	NEW 150W LED FLOOD	2	300	1260	$59.85	$17.84	$77.69	$122.89	$36.62	$159.51	$ 280.00	$ 320.00
							7.00	**Totals:**		1608	6754	$320.80	$95.60	$416.39			7.00	624	2621	$124	$37	$162	$196	$58	$255	$ 680.00	$ 682.00
										KW	2							**KW**	1								

ENHANCED LIGHTING SURVEY LOG

Project Name: HOLDING CENTER

Months: 12

Hours: 2500

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
																							Multipliers:	0.05	10.141		
1	7		AIR HANDELING 6			500	17	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	1003	502	$25.08	$122.06	$147.13	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	17	442	221	$11.05	$53.79	$64.84	$14.03	$68.27	$82.29		
2	7		AIR HANDELING 7			500	10	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	590	295	$14.75	$71.80	$86.55	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	10	260	130	$6.50	$31.64	$38.14	$8.25	$40.16	$48.41		
3	7		EXTERIOR			4200	4	MH400	400W METAL HALIDE	1832	7694	$384.72	$222.94	$607.66	LED150F	NEW 150W LED FLOOD	4	600	2520	$126.00	$73.02	$199.02	$258.72	$149.92	$408.64		
4	7		EXTERIOR			8760	2	A2BT8	4' 2L BOX FIXTURE W/T8S	118	1034	$51.68	$14.36	$66.04	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$22.78	$6.33	$29.10	$28.91	$8.03	$36.94		
5	7		HALL			8760	6	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	192	1682	$84.10	$23.36	$107.46	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	6	78	683	$34.16	$9.49	$43.66	$49.93	$13.87	$63.80		
6	7		CLOSET			1000	3	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	177	177	$8.85	$21.54	$30.39	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	78	$3.90	$9.49	$13.39	$4.95	$12.05	$17.00		
7	7		ELEVATOR MACHINE ROOMS			500	16	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	944	472	$23.60	$114.88	$138.48	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	16	416	208	$10.40	$50.62	$61.02	$13.20	$64.25	$77.45		
8	6		ELEVATORS			8760	3	A2VT8	4' 2L VANITY W/ 32W T8'S	177	1551	$77.53	$21.54	$99.07	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	683	$34.16	$9.49	$43.66	$43.36	$12.05	$55.41		
9	6		HALL			8760	4	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	128	1121	$56.06	$15.58	$71.64	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	4	52	456	$22.78	$6.33	$29.10	$33.29	$9.25	$42.54		
10	6		OUTSIDE RECREATION			5000		NR	NO RETROFIT REQUIRED																		
11	6		SLOPSINK			500	1	I43	43W INCANDESCENT	43	22	$1.08	$5.23	$6.31	LED9SI	NEW 9W LED SCREW IN	1	9	5	$0.23	$1.10	$1.32	$0.85	$4.14	$4.99	WS	1
12	6		TOILET			5000	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	295	$14.75	$7.18	$21.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.50	$3.16	$9.66	$8.25	$4.02	$12.27	WS	1
13	6		GOLF SOUTH HOUSING			8760	1	MH150	150W METAL HALIDE	175	1533	$76.65	$21.30	$97.95	LED60HB	NEW 60W LED HIGH BAY	1	60	526	$26.28	$7.30	$33.58	$50.37	$13.99	$64.36		
14	6		GOLF SOUTH HOUSING			1000	4	MH150	150W METAL HALIDE	700	700	$35.00	$85.18	$120.18	LED60HB	NEW 60W LED HIGH BAY	4	240	240	$12.00	$29.21	$41.21	$23.00	$55.98	$78.98		
15	6		GOLF SOUTH HALL			8760	9	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	288	2523	$126.14	$35.05	$161.19	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	9	117	1025	$51.25	$14.24	$65.48	$74.90	$20.81	$95.71		
16	6		PIPE CHASES			500	3	18CP	18W COMPACT FLUORESCENT	60	30	$1.50	$7.30	$8.80	LED9SI	NEW 9W LED SCREW IN	3	27	14	$0.68	$3.29	$3.96	$0.83	$4.02	$4.84		
17	6		SHOWERS			1000	2	I43	43W INCANDESCENT	86	86	$4.30	$10.47	$14.77	LED9SI	NEW 9W LED SCREW IN	2	18	18	$0.90	$2.19	$3.09	$3.40	$8.28	$11.68		
18	6		CELLS			1000	4	A2VT8	4' 2L VANITY W/ 32W T8'S	236	236	$11.80	$28.72	$40.52	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	104	$5.20	$12.66	$17.86	$6.60	$16.06	$22.66	WS	1
19	6		SLOPSINK			5000	1	A1BT8	4' 1L BOX W/T8S	32	160	$8.00	$3.89	$11.89	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	65	$3.25	$1.58	$4.83	$4.75	$2.31	$7.06		
20	6		COMMON AREA			5000	14	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	448	2240	$112.00	$54.52	$166.52	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	14	182	910	$45.50	$22.15	$67.65	$66.50	$32.37	$98.87		
21	6		GOLF EAST HOUSING			5000	20	A2VT8	4' 2L VANITY W/ 32W T8'S	1180	5900	$295.00	$143.60	$438.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	20	520	2600	$130.00	$63.28	$193.28	$165.00	$80.32	$245.32		
22	6		PIPE CHASES			500	12	18CP	18W COMPACT FLUORESCENT	240	120	$6.00	$29.21	$35.21	LED9SI	NEW 9W LED SCREW IN	12	108	54	$2.70	$13.14	$15.84	$3.30	$16.06	$19.36		
23	6		COMMON AREA			5000	7	MH150	150W METAL HALIDE	1225	6125	$306.25	$149.07	$455.32	LED60HB	NEW 60W LED HIGH BAY	7	420	2100	$105.00	$51.11	$156.11	$201.25	$97.96	$299.21		
24	6		COMMON AREA			5000	14	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	448	2240	$112.00	$54.52	$166.52	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	14	182	910	$45.50	$22.15	$67.65	$66.50	$32.37	$98.87		
25	6		CLOSET			5000	1	A1BT8	4' 1L BOX W/T8S	32	160	$8.00	$3.89	$11.89	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	65	$3.25	$1.58	$4.83	$4.75	$2.31	$7.06	WS	1
26	6		SHOWERS			5000	2	I43	43W INCANDESCENT	86	430	$21.50	$10.47	$31.97	LED9SI	NEW 9W LED SCREW IN	2	18	90	$4.50	$2.19	$6.69	$17.00	$8.28	$25.28		
27	6		PIPE CHASES			500	12	18CP	18W COMPACT FLUORESCENT	240	120	$6.00	$29.21	$35.21	LED9SI	NEW 9W LED SCREW IN	12	108	54	$2.70	$13.14	$15.84	$3.30	$16.06	$19.36		
28	6		GOLF NORTH HOUSING			5000	28	A2VT8	4' 2L VANITY W/ 32W T8'S	1652	8260	$413.00	$201.04	$614.04	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	28	728	3640	$182.00	$88.59	$270.59	$231.00	$112.44	$343.44		
29	6		COMMON AREA			5000	8	MH150	150W METAL HALIDE	1400	7000	$350.00	$170.37	$520.37	LED60HB	NEW 60W LED HIGH BAY	8	480	2400	$120.00	$58.41	$178.41	$230.00	$111.96	$341.96		
30	6		COMMON AREA			5000	26	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	832	4160	$208.00	$101.25	$309.25	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	26	338	1690	$84.50	$41.13	$125.63	$123.50	$60.12	$183.62		
31	6		SHOWERS			5000	2	I43	43W INCANDESCENT	86	430	$21.50	$10.47	$31.97	LED9SI	NEW 9W LED SCREW IN	2	18	90	$4.50	$2.19	$6.69	$17.00	$8.28	$25.28		
32	6		DAY ROOM			5000	6	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	192	960	$48.00	$23.36	$71.36	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	6	78	390	$19.50	$9.49	$28.99	$28.50	$13.87	$42.37		
33	6		HALL			8760	5	23CP	23W COMPACT FLUORESCENT	125	1095	$54.75	$15.21	$69.96	LED12SI	NEW 12W LED SCREW IN	5	60	526	$26.28	$7.30	$33.58	$28.47	$7.91	$36.38		
34	6		TOILET			5000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	295	$14.75	$7.18	$21.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.50	$3.16	$9.66	$8.25	$4.02	$12.27	WS	1
35	6		NIGHT LIGHT			1000	1	I43	43W INCANDESCENT	43	43	$2.15	$5.23	$7.38	LED9SI	NEW 9W LED SCREW IN	1	9	9	$0.45	$1.10	$1.55	$1.70	$4.14	$5.84		
36	6		PIPE CHASES			500	16	20CP	20W COMPACT FLUORESCENT	352	176	$8.80	$42.84	$51.64	LED9SI	NEW 9W LED SCREW IN	16	144	72	$3.60	$17.52	$21.12	$5.20	$25.31	$30.51		
37	6		SLOPSINK			500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	30	$1.48	$7.18	$8.65	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.65	$3.16	$3.81	$0.83	$4.02	$4.84	WS	1
38	5M		MECHANICAL			500	1	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	59	30	$1.48	$7.18	$8.65	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.65	$3.16	$3.81	$0.83	$4.02	$4.84		
39	5M		MECHANICAL			500	2	A1BT8	4' 1L BOX W/T8S	64	32	$1.60	$7.79	$9.39	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	13	$0.65	$3.16	$3.81	$0.95	$4.62	$5.57		

ENHANCED LIGHTING SURVEY LOG

Project Name: HOLDING CENTER

Months: 12

Hours: 2500

Multipliers: 0.05 | 10.141

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
40	5		HALL			8760	4	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	128	1121	$56.06	$15.58	$71.64	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	4	52	456	$22.78	$6.33	$29.10	$33.29	$9.25	$42.54		
41	5		HALL			8760	5	I43	43W INCANDESCENT	215	1883	$94.17	$26.16	$120.33	LED12SI	NEW 12W LED SCREW IN	5	60	526	$26.28	$7.30	$33.58	$67.89	$18.86	$86.75		
42	5		TOILET			5000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	295	$14.75	$7.18	$21.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.50	$3.16	$9.66	$8.25	$4.02	$12.27	WS	1
43	5		FOX SOUTH HOUSING			5000	36	A2VT8	4' 2L VANITY W/ 32W T8'S	2124	10620	$531.00	$258.47	$789.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	36	936	4680	$234.00	$113.90	$347.90	$297.00	$144.57	$441.57		
44	5		COMMON AREA			5000	8	MH150	150W METAL HALIDE	1400	7000	$350.00	$170.37	$520.37	LED60HB	NEW 60W LED HIGH BAY	8	480	2400	$120.00	$58.41	$178.41	$230.00	$111.96	$341.96		
45	5		COMMON AREA			5000	33	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	1056	5280	$264.00	$128.51	$392.51	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	33	429	2145	$107.25	$52.21	$159.46	$156.75	$76.30	$233.05		
46	5		SHOWERS			5000	4	I43	43W INCANDESCENT	172	860	$43.00	$20.93	$63.93	LED9SI	NEW 9W LED SCREW IN	4	36	180	$9.00	$4.38	$13.38	$34.00	$16.55	$50.55		
47	5		DAY ROOM			5000	6	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	192	960	$48.00	$23.36	$71.36	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	6	78	390	$19.50	$9.49	$28.99	$28.50	$13.87	$42.37		
48	5		NIGHT LIGHT			1000	1	I43	43W INCANDESCENT	43	43	$2.15	$5.23	$7.38	LED9SI	NEW 9W LED SCREW IN	1	9	9	$0.45	$1.10	$1.55	$1.70	$4.14	$5.84		
49	5		DAY ROOM			5000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	295	$14.75	$7.18	$21.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.50	$3.16	$9.66	$8.25	$4.02	$12.27		
50	5		SLOPSINK			5000	1	A1BT8	4' 1L BOX W/T8S	32	160	$8.00	$3.89	$11.89	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	65	$3.25	$1.58	$4.83	$4.75	$2.31	$7.06		
51	5		DAY ROOM			5000	6	A2R	4' 2L RECESSED FIXTURE	432	2160	$108.00	$52.57	$160.57	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	780	$39.00	$18.98	$57.98	$69.00	$33.59	$102.59		
52	5		NIGHT LIGHT			1000	1	I52	52W INCANDESCENT	52	52	$2.60	$6.33	$8.93	NDR	INSTALL LED DRUM FIX.	1	15	15	$0.75	$1.83	$2.58	$1.85	$4.50	$6.35		
53	5		DAY ROOM			5000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	295	$14.75	$7.18	$21.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.50	$3.16	$9.66	$8.25	$4.02	$12.27		
54	5		PIPE CHASES			500	20	20CP	20W COMPACT FLUORESCENT	440	220	$11.00	$53.54	$64.54	LED9SI	NEW 9W LED SCREW IN	20	180	90	$4.50	$21.90	$26.40	$6.50	$31.64	$38.14		
55	5		FOX EAST HOUSING			5000	20	A2VT8	4' 2L VANITY W/ 32W T8'S	1180	5900	$295.00	$143.60	$438.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	20	520	2600	$130.00	$63.28	$193.28	$165.00	$80.32	$245.32		
56	5		COMMON AREA			5000	12	MH150	150W METAL HALIDE	2100	10500	$525.00	$255.55	$780.55	LED60HB	NEW 60W LED HIGH BAY	12	720	3600	$180.00	$87.62	$267.62	$345.00	$167.93	$512.93		
57	5		COMMON AREA			5000	14	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	448	2240	$112.00	$54.52	$166.52	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	14	182	910	$45.50	$22.15	$67.65	$66.50	$32.37	$98.87		
58	5		SLOPSINK			5000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	295	$14.75	$7.18	$21.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.50	$3.16	$9.66	$8.25	$4.02	$12.27	WS	1
59	5		SHOWERS			5000	2	I43	43W INCANDESCENT	86	430	$21.50	$10.47	$31.97	LED9SI	NEW 9W LED SCREW IN	2	18	90	$4.50	$2.19	$6.69	$17.00	$8.28	$25.28		
60	5		FOX NORTH HOUSING			5000	28	A2VT8	4' 2L VANITY W/ 32W T8'S	1652	8260	$413.00	$201.04	$614.04	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	28	728	3640	$182.00	$88.59	$270.59	$231.00	$112.44	$343.44		
61	5		COMMON AREA			5000	7	MH150	150W METAL HALIDE	1225	6125	$306.25	$149.07	$455.32	LED60HB	NEW 60W LED HIGH BAY	7	420	2100	$105.00	$51.11	$156.11	$201.25	$97.96	$299.21		
62	5		COMMON AREA			5000	27	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	864	4320	$216.00	$105.14	$321.14	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	27	351	1755	$87.75	$42.71	$130.46	$128.25	$62.43	$190.68		
63	5		SHOWERS			5000	2	I43	43W INCANDESCENT	86	430	$21.50	$10.47	$31.97	LED9SI	NEW 9W LED SCREW IN	2	18	90	$4.50	$2.19	$6.69	$17.00	$8.28	$25.28		
64	5		PIPE CHASES			500	16	20CP	20W COMPACT FLUORESCENT	352	176	$8.80	$42.84	$51.64	LED9SI	NEW 9W LED SCREW IN	16	144	72	$3.60	$17.52	$21.12	$5.20	$25.31	$30.51		
65	5		SLOPSINK			5000	1	A1BT8	4' 1L BOX W/T8S	32	160	$8.00	$3.89	$11.89	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	65	$3.25	$1.58	$4.83	$4.75	$2.31	$7.06	WS	1
66	5		DAY ROOM			5000	4	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	128	640	$32.00	$15.58	$47.58	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	4	52	260	$13.00	$6.33	$19.33	$19.00	$9.25	$28.25		
67	5		DAY ROOM			5000	2	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	118	590	$29.50	$14.36	$43.86	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	260	$13.00	$6.33	$19.33	$16.50	$8.03	$24.53		
68	5		NIGHT LIGHT			1000	1	I43	43W INCANDESCENT	43	43	$2.15	$5.23	$7.38	LED9SI	NEW 9W LED SCREW IN	1	9	9	$0.45	$1.10	$1.55	$1.70	$4.14	$5.84		
69	4		HALL			8760	8	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	256	2243	$112.13	$31.15	$143.28	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	8	104	911	$45.55	$12.66	$58.21	$66.58	$18.50	$85.07		
70	4		ECO HALL			8760	4	23CP	23W COMPACT FLUORESCENT	100	876	$43.80	$12.17	$55.97	LED12SI	NEW 12W LED SCREW IN	4	48	420	$21.02	$5.84	$26.87	$22.78	$6.33	$29.10		
71	4		TOILET			5000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	295	$14.75	$7.18	$21.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.50	$3.16	$9.66	$8.25	$4.02	$12.27	WS	1
72	4		ECO SOUTH HOUSING			5000	37	A2VT8	4' 2L VANITY W/ 32W T8'S	2183	10915	$545.75	$265.65	$811.40	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	37	962	4810	$240.50	$117.07	$357.57	$305.25	$148.59	$453.84		
73	4		COMMON AREA			5000	8	MH150	150W METAL HALIDE	1400	7000	$350.00	$170.37	$520.37	LED60HB	NEW 60W LED HIGH BAY	8	480	2400	$120.00	$58.41	$178.41	$230.00	$111.96	$341.96		
74	4		COMMON AREA			5000	34	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	1088	5440	$272.00	$132.40	$404.40	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	34	442	2210	$110.50	$53.79	$164.29	$161.50	$78.61	$240.11		
75	4		SHOWERS			5000	4	I43	43W INCANDESCENT	172	860	$43.00	$20.93	$63.93	LED9SI	NEW 9W LED SCREW IN	4	36	180	$9.00	$4.38	$13.38	$34.00	$16.55	$50.55		
76	4		PIPE CHASES			500	22	18CP	18W COMPACT FLUORESCENT	440	220	$11.00	$53.54	$64.54	LED9SI	NEW 9W LED SCREW IN	22	198	99	$4.95	$24.10	$29.05	$6.05	$29.45	$35.50		
77	4		SLOPSINK			5000	1	A1BT8	4' 1L BOX W/T8S	32	160	$8.00	$3.89	$11.89	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	65	$3.25	$1.58	$4.83	$4.75	$2.31	$7.06	WS	1
78	4		DAY ROOM			5000	6	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	192	960	$48.00	$23.36	$71.36	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	6	78	390	$19.50	$9.49	$28.99	$28.50	$13.87	$42.37		

ENHANCED LIGHTING SURVEY LOG

Project Name: **HOLDING CENTER**

Months: 12

Hours: 2500

Multipliers: **0.05** **10.141**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	Existing Watts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
79	4		DAY ROOM			5000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	295	$14.75	$7.18	$21.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.50	$3.16	$9.66	$8.25	$4.02	$12.27		
80	4		NIGHT LIGHT			1000	1	I43	43W INCANDESCENT	43	43	$2.15	$5.23	$7.38	LED9SI	NEW 9W LED SCREW IN	1	9	9	$0.45	$1.10	$1.55	$1.70	$4.14	$5.84		
81	4		DAY ROOM			5000	6	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	192	960	$48.00	$23.36	$71.36	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	6	78	390	$19.50	$9.49	$28.99	$28.50	$13.87	$42.37		
82	4		DAY ROOM			5000	6	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	192	960	$48.00	$23.36	$71.36	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	6	78	390	$19.50	$9.49	$28.99	$28.50	$13.87	$42.37		
83	4		NIGHT LIGHT			1000	1	I43	43W INCANDESCENT	43	43	$2.15	$5.23	$7.38	LED9SI	NEW 9W LED SCREW IN	1	9	9	$0.45	$1.10	$1.55	$1.70	$4.14	$5.84		
84	4		ECO EAST HOUSING			5000	48	A2VT8	4' 2L VANITY W/ 32W T8'S	2832	14160	$708.00	$344.63	$1,052.63	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	48	1248	6240	$312.00	$151.87	$463.87	$396.00	$192.76	$588.76		
85	4		COMMON AREA			5000	11	MH150	150W METAL HALIDE	1925	9625	$481.25	$234.26	$715.51	LED60HB	NEW 60W LED HIGH BAY	11	660	3300	$165.00	$80.32	$245.32	$316.25	$153.94	$470.19		
86	4		COMMON AREA			5000	46	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	1472	7360	$368.00	$179.13	$547.13	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	46	598	2990	$149.50	$72.77	$222.27	$218.50	$106.36	$324.86		
87	4		SLOPSINK			5000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	295	$14.75	$7.18	$21.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.50	$3.16	$9.66	$8.25	$4.02	$12.27	WS	1
88	4		PIPE CHASES			500	28	20CP	20W COMPACT FLUORESCENT	616	308	$15.40	$74.96	$90.36	LED9SI	NEW 9W LED SCREW IN	28	252	126	$6.30	$30.67	$36.97	$9.10	$44.30	$53.40		
89	4		DAY ROOM			5000	3	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	96	480	$24.00	$11.68	$35.68	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	3	39	195	$9.75	$4.75	$14.50	$14.25	$6.94	$21.19		
90	4		2ND FLOOR OPEN			5000	2	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	118	590	$29.50	$14.36	$43.86	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	260	$13.00	$6.33	$19.33	$16.50	$8.03	$24.53		
91	4		MECHANICAL			500	2	A2BT8	4' 2L BOX FIXTURE W/T8S	118	59	$2.95	$14.36	$17.31	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	2	36	18	$0.90	$4.38	$5.28	$2.05	$9.98	$12.03	WS	1
92	4		ECO SHORT HOUSING			5000	22	I43	43W INCANDESCENT	946	4730	$236.50	$115.12	$351.62	LED9SI	NEW 9W LED SCREW IN	22	198	990	$49.50	$24.10	$73.60	$187.00	$91.03	$278.03		
93	4		CAT WALK			5000	5	D2VTT8	2' 2L VAPOR TIGHT W/ T8S	165	825	$41.25	$20.08	$61.33	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	5	90	450	$22.50	$10.95	$33.45	$18.75	$9.13	$27.88		
94	4		CAT WALK			5000	8	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	472	2360	$118.00	$57.44	$175.44	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	1040	$52.00	$25.31	$77.31	$66.00	$32.13	$98.13		
95	4		CAT WALK			5000	1	2-11CP	2-11W COMPACT FLUORESCENT	26	130	$6.50	$3.16	$9.66	LED6P-2	(2) LED 6 PIN LAMPS	1	12	60	$3.00	$1.46	$4.46	$3.50	$1.70	$5.20		
96	4		NIGHT LIGHT			3000	7	I60	60W INCANDESCENT	420	1260	$63.00	$51.11	$114.11	LED9SI	NEW 9W LED SCREW IN	7	63	189	$9.45	$7.67	$17.12	$53.55	$43.44	$96.99		
97	4		ECO LONG HOUSING			5000	28	I43	43W INCANDESCENT	1204	6020	$301.00	$146.52	$447.52	LED9SI	NEW 9W LED SCREW IN	28	252	1260	$63.00	$30.67	$93.67	$238.00	$115.85	$353.85		
98	4		CAT WALK			5000	14	D2VTT8	2' 2L VAPOR TIGHT W/ T8S	462	2310	$115.50	$56.22	$171.72	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	14	252	1260	$63.00	$30.67	$93.67	$52.50	$25.56	$78.06		
99	4		CAT WALK			5000	8	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	472	2360	$118.00	$57.44	$175.44	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	1040	$52.00	$25.31	$77.31	$66.00	$32.13	$98.13		
100	4		NIGHT LIGHT			3000	12	I60	60W INCANDESCENT	720	2160	$108.00	$87.62	$195.62	LED9SI	NEW 9W LED SCREW IN	12	108	324	$16.20	$13.14	$29.34	$91.80	$74.48	$166.28		
101	4		DAY ROOM			5000	9	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	288	1440	$72.00	$35.05	$107.05	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	9	117	585	$29.25	$14.24	$43.49	$42.75	$20.81	$63.56		
102	4		NIGHT LIGHT			1000	1	I43	43W INCANDESCENT	43	43	$2.15	$5.23	$7.38	LED9SI	NEW 9W LED SCREW IN	1	9	9	$0.45	$1.10	$1.55	$1.70	$4.14	$5.84		
103	4		HALL			8760	3	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	177	1551	$77.53	$21.54	$99.07	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	683	$34.16	$9.49	$43.66	$43.36	$12.05	$55.41		
104	4		TOILET			5000	1	I43	43W INCANDESCENT	43	215	$10.75	$5.23	$15.98	LED9SI	NEW 9W LED SCREW IN	1	9	45	$2.25	$1.10	$3.35	$8.50	$4.14	$12.64		
105	4		TOILET			5000	1	2-11CP	2-11W COMPACT FLUORESCENT	26	130	$6.50	$3.16	$9.66	LED6P-2	(2) LED 6 PIN LAMPS	1	12	60	$3.00	$1.46	$4.46	$3.50	$1.70	$5.20		
106	4		TRUSTEE			5000	20	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	640	3200	$160.00	$77.88	$237.88	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	20	260	1300	$65.00	$31.64	$96.64	$95.00	$46.24	$141.24		
107	4		TOILET			5000	5	A2VT8	4' 2L VANITY W/ 32W T8'S	295	1475	$73.75	$35.90	$109.65	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	650	$32.50	$15.82	$48.32	$41.25	$20.08	$61.33		
108	4		TOILET			5000	2	2-18CP	(2) 18W COMPACT FLUORESCENT	80	400	$20.00	$9.74	$29.74	LED6P-2	(2) LED 6 PIN LAMPS	2	24	120	$6.00	$2.92	$8.92	$14.00	$6.81	$20.81		
109	4		STORAGE			5000	3	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	96	480	$24.00	$11.68	$35.68	LED6P-2	(2) LED 6 PIN LAMPS	3	36	180	$9.00	$4.38	$13.38	$15.00	$7.30	$22.30		
110	4		RECREATION AREA			3500	32	A2BT8	4' 2L BOX FIXTURE W/T8S	1888	6608	$330.40	$229.75	$560.15	R2ANL	RETRO (1) FIX. W/ (2) 4' LED LAMPS NEW LENS	32	832	2912	$145.60	$101.25	$246.85	$184.80	$128.51	$313.31		
111	4		BREAK AREA			3500	4	A2BT8	4' 2L BOX FIXTURE W/T8S	236	826	$41.30	$28.72	$70.02	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	364	$18.20	$12.66	$30.86	$23.10	$16.06	$39.16		
112	4		STAIRS			8760	1	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	59	517	$25.84	$7.18	$33.02	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$11.39	$3.16	$14.55	$14.45	$4.02	$18.47		
113	4M		MECHANICAL			500	1	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	59	30	$1.48	$7.18	$8.65	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.65	$3.16	$3.81	$0.83	$4.02	$4.84		
114	4M		MECHANICAL			500	2	A1BT8	4' 1L BOX W/T8S	64	32	$1.60	$7.79	$9.39	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	13	$0.65	$3.16	$3.81	$0.95	$4.62	$5.57		
115	4		STAIRS			8760	5	A2BT8	4' 2L BOX FIXTURE W/T8S	295	2584	$129.21	$35.90	$165.11	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	1139	$56.94	$15.82	$72.76	$72.27	$20.08	$92.35		
116	3		HALL			8760	10	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	320	2803	$140.16	$38.94	$179.10	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	10	130	1139	$56.94	$15.82	$72.76	$83.22	$23.12	$106.34		
117	3		HALL			8760	1	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	59	517	$25.84	$7.18	$33.02	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$11.39	$3.16	$14.55	$14.45	$4.02	$18.47		

ENHANCED LIGHTING SURVEY LOG

Project Name: HOLDING CENTER

Months: 12

Hours: 2500

Multipliers: 0.05 | 10.141

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
118	3		HALL			8760	2	MV100	100W MERCURY VAPOR	250	2190	$109.50	$30.42	$139.92	LED12SI	NEW 12W LED SCREW IN	2	24	210	$10.51	$2.92	$13.43	$98.99	$27.50	$126.49		
119	3		OFFICE			500	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	30	$1.50	$7.30	$8.80	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	9	$0.45	$2.19	$2.64	$1.05	$5.11	$6.16		
120	3		ELEVATOR MACHINE			500	4	I60	60W INCANDESCENT	240	120	$6.00	$29.21	$35.21	LED9SI	NEW 9W LED SCREW IN	4	36	18	$0.90	$4.38	$5.28	$5.10	$24.83	$29.93		
121	3		CONTROL			5000	5	I43	43W INCANDESCENT	215	1075	$53.75	$26.16	$79.91	LED10CAN	NEW 10W LED CAN	5	50	250	$12.50	$6.08	$18.58	$41.25	$20.08	$61.33		
122	3		TOILET			5000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	295	$14.75	$7.18	$21.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.50	$3.16	$9.66	$8.25	$4.02	$12.27	WS	1
123	3		DELTA NORTH HOUSING			5000	15	A2VT8	4' 2L VANITY W/ 32W T8'S	885	4425	$221.25	$107.70	$328.95	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	15	390	1950	$97.50	$47.46	$144.96	$123.75	$60.24	$183.99		
124	3		COMMON AREA			5000	10	I43	43W INCANDESCENT	430	2150	$107.50	$52.33	$159.83	LED10CAN	NEW 10W LED CAN	10	100	500	$25.00	$12.17	$37.17	$82.50	$40.16	$122.66		
125	3		COMMON AREA			5000	18	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	576	2880	$144.00	$70.09	$214.09	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	18	234	1170	$58.50	$28.48	$86.98	$85.50	$41.62	$127.12		
126	3		PIPE CHASES			500	8	18CP	18W COMPACT FLUORESCENT	160	80	$4.00	$19.47	$23.47	LED9SI	NEW 9W LED SCREW IN	8	72	36	$1.80	$8.76	$10.56	$2.20	$10.71	$12.91		
127	3		STORAGE			500	2	A1BT8	4' 1L BOX W/T8S	64	32	$1.60	$7.79	$9.39	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	13	$0.65	$3.16	$3.81	$0.95	$4.62	$5.57		
128	3		SHOWERS			5000	1	I43	43W INCANDESCENT	43	215	$10.75	$5.23	$15.98	LED9SI	NEW 9W LED SCREW IN	1	9	45	$2.25	$1.10	$3.35	$8.50	$4.14	$12.64		
129	3		DETA EAST HOUSING			5000	12	A2VT8	4' 2L VANITY W/ 32W T8'S	708	3540	$177.00	$86.16	$263.16	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	12	312	1560	$78.00	$37.97	$115.97	$99.00	$48.19	$147.19		
130	3		PIPE CHASES			5000	7	20CP	20W COMPACT FLUORESCENT	154	770	$38.50	$18.74	$57.24	LED9SI	NEW 9W LED SCREW IN	7	63	315	$15.75	$7.67	$23.42	$22.75	$11.07	$33.82		
131	3		COMMON AREA			5000	12	I43	43W INCANDESCENT	516	2580	$129.00	$62.79	$191.79	LED10CAN	NEW 10W LED CAN	12	120	600	$30.00	$14.60	$44.60	$99.00	$48.19	$147.19		
132	3		COMMON AREA			5000	10	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	320	1600	$80.00	$38.94	$118.94	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	10	130	650	$32.50	$15.82	$48.32	$47.50	$23.12	$70.62		
133	3		FERENZIC ROOMS			5000	14	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	448	2240	$112.00	$54.52	$166.52	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	14	182	910	$45.50	$22.15	$67.65	$66.50	$32.37	$98.87		
134	3		SLOPSINK			1000	1	A2BT8	4' 2L BOX FIXTURE W/T8S	59	59	$2.95	$7.18	$10.13	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	1	18	18	$0.90	$2.19	$3.09	$2.05	$4.99	$7.04		
135	3		DELTA CONTROL			5000	6	I43	43W INCANDESCENT	258	1290	$64.50	$31.40	$95.90	LED10CAN	NEW 10W LED CAN	6	60	300	$15.00	$7.30	$22.30	$49.50	$24.10	$73.60		
136	3		TUB ROOM			500	1	A2RT8	4' 2L RECESSED FIXTURE W/T8S	59	30	$1.48	$7.18	$8.65	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	1	18	9	$0.45	$2.19	$2.64	$1.03	$4.99	$6.01		
137	3		HALL			8760	2	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	64	561	$28.03	$7.79	$35.82	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	228	$11.39	$3.16	$14.55	$16.64	$4.62	$21.27		
138	3		DELTA CENTRAL HALL			8760	4	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	128	1121	$56.06	$15.58	$71.64	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	4	52	456	$22.78	$6.33	$29.10	$33.29	$9.25	$42.54		
139	3		CELLS			5000	5	A2VT8	4' 2L VANITY W/ 32W T8'S	295	1475	$73.75	$35.90	$109.65	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	650	$32.50	$15.82	$48.32	$41.25	$20.08	$61.33		
140	3		PIPE CHASES			500	3	20CP	20W COMPACT FLUORESCENT	66	33	$1.65	$8.03	$9.68	LED9SI	NEW 9W LED SCREW IN	3	27	14	$0.68	$3.29	$3.96	$0.98	$4.75	$5.72		
141	3		SHOWERS			5000	1	I43	43W INCANDESCENT	43	215	$10.75	$5.23	$15.98	LED9SI	NEW 9W LED SCREW IN	1	9	45	$2.25	$1.10	$3.35	$8.50	$4.14	$12.64		
142	3		WAITING			8760	2	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	64	561	$28.03	$7.79	$35.82	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	228	$11.39	$3.16	$14.55	$16.64	$4.62	$21.27		
143	3		WAITING			8760	9	I43	43W INCANDESCENT	387	3390	$169.51	$47.09	$216.60	LED10CAN	NEW 10W LED CAN	9	90	788	$39.42	$10.95	$50.37	$130.09	$36.14	$166.23		
144	3		STORAGE			500	1	I43	43W INCANDESCENT	43	22	$1.08	$5.23	$6.31	LED9SI	NEW 9W LED SCREW IN	1	9	5	$0.23	$1.10	$1.32	$0.85	$4.14	$4.99		
145	3		PIPE CHASES			5000	1	20CP	20W COMPACT FLUORESCENT	22	110	$5.50	$2.68	$8.18	LED9SI	NEW 9W LED SCREW IN	1	9	45	$2.25	$1.10	$3.35	$3.25	$1.58	$4.83		
146	3		HALL			8760	9	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	288	2523	$126.14	$35.05	$161.19	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	9	117	1025	$51.25	$14.24	$65.48	$74.90	$20.81	$95.71		
147	3		DOCTOR OFFICE			5000	6	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	192	960	$48.00	$23.36	$71.36	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	6	78	390	$19.50	$9.49	$28.99	$28.50	$13.87	$42.37		
148	3		SHOWERS			5000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	160	$8.00	$3.89	$11.89	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	65	$3.25	$1.58	$4.83	$4.75	$2.31	$7.06		
149	3		MECHANICAL			8760	9	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	531	4652	$232.58	$64.62	$297.20	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	9	234	2050	$102.49	$28.48	$130.97	$130.09	$36.14	$166.23		
150	3	3	EXAM			8760	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	1034	$51.68	$14.36	$66.04	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$22.78	$6.33	$29.10	$28.91	$8.03	$36.94	WS	1
151	3	2	EXAM			8760	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	1034	$51.68	$14.36	$66.04	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$22.78	$6.33	$29.10	$28.91	$8.03	$36.94	WS	1
152	3	1	EXAM			8760	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	1034	$51.68	$14.36	$66.04	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$22.78	$6.33	$29.10	$28.91	$8.03	$36.94	WS	1
153	3		OPEN AREA			8760	9	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	288	2523	$126.14	$35.05	$161.19	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	9	117	1025	$51.25	$14.24	$65.48	$74.90	$20.81	$95.71		
154	3		OPEN AREA			1000	2	I43	43W INCANDESCENT	86	86	$4.30	$10.47	$14.77	LED9SI	NEW 9W LED SCREW IN	2	18	18	$0.90	$2.19	$3.09	$3.40	$8.28	$11.68		
155	3		RECORDS			8760	12	A4BT5	4' 4L BOX FIXTURE W/T5S	1344	11773	$588.67	$163.55	$752.23	R4AT5	RETRO (1) FIX. W/ (4) 4' LED 13W LAMPS, LAMPS	12	624	5466	$273.31	$75.94	$349.25	$315.36	$87.62	$402.98		
156	3		DENTIST			5000	2	A4T	4' 4L RECESSED TROFFER	288	1440	$72.00	$35.05	$107.05	R4AT5	RETRO (1) FIX. W/ (4) 4' LED 13W LAMPS, LAMPS	2	104	520	$26.00	$12.66	$38.66	$46.00	$22.39	$68.39		

ENHANCED LIGHTING SURVEY LOG

Project Name: HOLDING CENTER

Months: 12

Hours: 2500

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
																							Multipliers:	0.05	10.141		
157	3		TOILET			1000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	59	$2.95	$7.18	$10.13	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.30	$3.16	$4.46	$1.65	$4.02	$5.67	WS	1
158	3		TRACK LIGHTS			500	6	I60	60W INCANDESCENT	360	180	$9.00	$43.81	$52.81	LED9SI	NEW 9W LED SCREW IN	6	54	27	$1.35	$6.57	$7.92	$7.65	$37.24	$44.89		
159	3		OFFICE			4000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	472	$23.60	$14.36	$37.96	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	208	$10.40	$6.33	$16.73	$13.20	$8.03	$21.23	WS	1
160	3		MEDS			4000	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	944	$47.20	$28.72	$75.92	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	416	$20.80	$12.66	$33.46	$26.40	$16.06	$42.46	WS	1
161	3		TASK LIGHTS			4000	2	A1VT8	4' 1L VANITY W/T8S	64	256	$12.80	$7.79	$20.59	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	104	$5.20	$3.16	$8.36	$7.60	$4.62	$12.22		
162	3		DENTIST			4000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	472	$23.60	$14.36	$37.96	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	208	$10.40	$6.33	$16.73	$13.20	$8.03	$21.23	WS	1
163	3		STORAGE			500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	59	$2.95	$14.36	$17.31	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.30	$6.33	$7.63	$1.65	$8.03	$9.68	WS	1
164	3		MULE MEDICAL			5000	8	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	256	1280	$64.00	$31.15	$95.15	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	8	104	520	$26.00	$12.66	$38.66	$38.00	$18.50	$56.50		
165	3		CELLS			5000	4	A2VT8	4' 2L VANITY W/ 32W T8'S	236	1180	$59.00	$28.72	$87.72	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	520	$26.00	$12.66	$38.66	$33.00	$16.06	$49.06		
166	3		PIPE CHASES			500	2	20CP	20W COMPACT FLUORESCENT	44	22	$1.10	$5.35	$6.45	LED9SI	NEW 9W LED SCREW IN	2	18	9	$0.45	$2.19	$2.64	$0.65	$3.16	$3.81		
167	3		SHOWERS			5000	1	I43	43W INCANDESCENT	43	215	$10.75	$5.23	$15.98	LED9SI	NEW 9W LED SCREW IN	1	9	45	$2.25	$1.10	$3.35	$8.50	$4.14	$12.64		
168	3		DELTA SEG HOUSING			5000	8	I43	43W INCANDESCENT	344	1720	$86.00	$41.86	$127.86	LED9SI	NEW 9W LED SCREW IN	8	72	360	$18.00	$8.76	$26.76	$68.00	$33.10	$101.10		
169	3		SHOWERS			5000	2	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	118	590	$29.50	$14.36	$43.86	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	260	$13.00	$6.33	$19.33	$16.50	$8.03	$24.53		
170	3		CAT WALK			5000	4	D2VTT8	2' 2L VAPOR TIGHT W/ T8S	132	660	$33.00	$16.06	$49.06	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	4	72	360	$18.00	$8.76	$26.76	$15.00	$7.30	$22.30		
171	3		CAT WALK			5000	4	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	236	1180	$59.00	$28.72	$87.72	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	520	$26.00	$12.66	$38.66	$33.00	$16.06	$49.06		
172	3		NIGHT LIGHTS			3000	6	I60	60W INCANDESCENT	360	1080	$54.00	$43.81	$97.81	LED9SI	NEW 9W LED SCREW IN	6	54	162	$8.10	$6.57	$14.67	$45.90	$37.24	$83.14		
173	3		SUISIDE WATCH			2000	7	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	224	448	$22.40	$27.26	$49.66	LED9SI	NEW 9W LED SCREW IN	7	63	126	$6.30	$7.67	$13.97	$16.10	$19.59	$35.69		
174	3		SUISIDE WATCH			2000	6	A2VT8	4' 2L VANITY W/ 32W T8'S	354	708	$35.40	$43.08	$78.48	LED9SI	NEW 9W LED SCREW IN	6	54	108	$5.40	$6.57	$11.97	$30.00	$36.51	$66.51		
175	3		DELTA SHORT CELLS			5000	22	I43	43W INCANDESCENT	946	4730	$236.50	$115.12	$351.62	LED9SI	NEW 9W LED SCREW IN	22	198	990	$49.50	$24.10	$73.60	$187.00	$91.03	$278.03		
176	3		SHOWERS			5000	2	A2BT8	4' 2L BOX FIXTURE W/T8S	118	590	$29.50	$14.36	$43.86	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	260	$13.00	$6.33	$19.33	$16.50	$8.03	$24.53		
177	3		CAT WALK			5000	7	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	413	2065	$103.25	$50.26	$153.51	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	7	182	910	$45.50	$22.15	$67.65	$57.75	$28.11	$85.86		
178	3		CAT WALK			5000	7	D2VTT8	2' 2L VAPOR TIGHT W/ T8S	231	1155	$57.75	$28.11	$85.86	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	7	126	630	$31.50	$15.33	$46.83	$26.25	$12.78	$39.03		
179	3		NIGHT LIGHTS			3000	7	I60	60W INCANDESCENT	420	1260	$63.00	$51.11	$114.11	LED9SI	NEW 9W LED SCREW IN	7	63	189	$9.45	$7.67	$17.12	$53.55	$43.44	$96.99		
180	3		DELTA LONG CELLS			5000	28	I43	43W INCANDESCENT	1204	6020	$301.00	$146.52	$447.52	LED9SI	NEW 9W LED SCREW IN	28	252	1260	$63.00	$30.67	$93.67	$238.00	$115.85	$353.85		
181	3		SHOWERS			5000	2	A2BT8	4' 2L BOX FIXTURE W/T8S	118	590	$29.50	$14.36	$43.86	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	260	$13.00	$6.33	$19.33	$16.50	$8.03	$24.53		
182	3		CAT WALK			5000	16	D2VTT8	2' 2L VAPOR TIGHT W/ T8S	528	2640	$132.00	$64.25	$196.25	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	16	288	1440	$72.00	$35.05	$107.05	$60.00	$29.21	$89.21		
183	3		CAT WALK			5000	10	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	590	2950	$147.50	$71.80	$219.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	10	260	1300	$65.00	$31.64	$96.64	$82.50	$40.16	$122.66		
184	3		NIGHT LIGHTS			3000	12	I60	60W INCANDESCENT	720	2160	$108.00	$87.62	$195.62	LED9SI	NEW 9W LED SCREW IN	12	108	324	$16.20	$13.14	$29.34	$91.80	$74.48	$166.28		
185	2		DEPUTY EXCERSIZE			2000	4	A2VT8	4' 2L VANITY W/ 32W T8'S	236	472	$23.60	$28.72	$52.32	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	208	$10.40	$12.66	$23.06	$13.20	$16.06	$29.26		
186	2		AIR HANDELER 3&5			8760	7	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	413	3618	$180.89	$50.26	$231.15	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	7	182	1594	$79.72	$22.15	$101.86	$101.18	$28.11	$129.29		
187	2		HALL			8760	6	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	192	1682	$84.10	$23.36	$107.46	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	6	78	683	$34.16	$9.49	$43.66	$49.93	$13.87	$63.80		
188	2		HALL			8760	10	A3TT8	4' 3L TROFFER W/ T8S	930	8147	$407.34	$113.17	$520.51	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	10	260	2278	$113.88	$31.64	$145.52	$293.46	$81.53	$374.99		
189	2		AIR HANDELER 2			500	15	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	885	443	$22.13	$107.70	$129.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	15	390	195	$9.75	$47.46	$57.21	$12.38	$60.24	$72.61		
190	2		AIR HANDELER 1			500	13	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	767	384	$19.18	$93.34	$112.51	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	13	338	169	$8.45	$41.13	$49.58	$10.73	$52.21	$62.93		
191	2		CLASIFICATION			5000	11	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	352	1760	$88.00	$42.84	$130.84	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	11	143	715	$35.75	$17.40	$53.15	$52.25	$25.43	$77.68		
192	2		LAW LIBRARY			2000	46	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	1472	2944	$147.20	$179.13	$326.33	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	46	598	1196	$59.80	$72.77	$132.57	$87.40	$106.36	$193.76		
193	2		HALL			8760	2	A3TT8	4' 3L TROFFER W/ T8S	186	1629	$81.47	$22.63	$104.10	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	456	$22.78	$6.33	$29.10	$58.69	$16.31	$75.00		
194	2		RECEPTION			8760	5	A3TT8	4' 3L TROFFER W/ T8S	465	4073	$203.67	$56.59	$260.26	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	5	130	1139	$56.94	$15.82	$72.76	$146.73	$40.77	$187.50		
195	2	1	EXAM			8760	2	A3TT8	4' 3L TROFFER W/ T8S	186	1629	$81.47	$22.63	$104.10	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	456	$22.78	$6.33	$29.10	$58.69	$16.31	$75.00		

ENHANCED LIGHTING SURVEY LOG

Project Name: HOLDING CENTER

Months: 12

Hours: 2500

Multipliers: 0.05 | 10.141

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	Existing Watts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
196	2	2	EXAM			8760	2	A3TT8	4' 3L TROFFER W/ T8S	186	1629	$81.47	$22.63	$104.10	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	456	$22.78	$6.33	$29.10	$58.69	$16.31	$75.00		
197	2	3	EXAM			8760	2	A3TT8	4' 3L TROFFER W/ T8S	186	1629	$81.47	$22.63	$104.10	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	456	$22.78	$6.33	$29.10	$58.69	$16.31	$75.00		
198	2		SINK			8760	1	A3TT8	4' 3L TROFFER W/ T8S	93	815	$40.73	$11.32	$52.05	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	228	$11.39	$3.16	$14.55	$29.35	$8.15	$37.50		
199	2	4	EXAM			8760	2	A3TT8	4' 3L TROFFER W/ T8S	186	1629	$81.47	$22.63	$104.10	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	456	$22.78	$6.33	$29.10	$58.69	$16.31	$75.00		
200	2		BUNKS			8760	35	A4TT8	4' 4L RECESSED TROFFER W/T8S	3920	34339	$1,716.96	$477.03	$2,193.99	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	35	910	7972	$398.58	$110.74	$509.32	$1,318.38	$366.29	$1,684.67		
201	2		SHOWERS			8760	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	3101	$155.05	$43.08	$198.13	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	6	156	1367	$68.33	$18.98	$87.31	$86.72	$24.10	$110.82		
202	2		CONTROL			5000	7	I43	43W INCANDESCENT	301	1505	$75.25	$36.63	$111.88	LED9SI	NEW 9W LED SCREW IN	7	63	315	$15.75	$7.67	$23.42	$59.50	$28.96	$88.46		
203	2	2	CLASSROOM			2000	8	A2R	4' 2L RECESSED FIXTURE	576	1152	$57.60	$70.09	$127.69	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	416	$20.80	$25.31	$46.11	$36.80	$44.78	$81.58		
204	2	2	SOFFIT			2000	3	A1ST8	4' 1L STRIP FIXTURE W/ 32W T8'S	96	192	$9.60	$11.68	$21.28	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	3	39	78	$3.90	$4.75	$8.65	$5.70	$6.94	$12.64		
205	2		OFFICE			2000	2	A2BT8	4' 2L BOX FIXTURE W/T8S	118	236	$11.80	$14.36	$26.16	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	104	$5.20	$6.33	$11.53	$6.60	$8.03	$14.63		
206	2	1	CLASSROOM			2000	8	A2RT8	4' 2L RECESSED FIXTURE W/T8S	472	944	$47.20	$57.44	$104.64	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	416	$20.80	$25.31	$46.11	$26.40	$32.13	$58.53		
207	2	1	SOFFIT			2000	3	A1ST8	4' 1L STRIP FIXTURE W/ 32W T8'S	96	192	$9.60	$11.68	$21.28	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	3	39	78	$3.90	$4.75	$8.65	$5.70	$6.94	$12.64		
208	2	3	CLASIFICATION			2000	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	236	$11.80	$14.36	$26.16	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	104	$5.20	$6.33	$11.53	$6.60	$8.03	$14.63	WS	1
209	2	2	CLASIFICATION			2000	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	236	$11.80	$14.36	$26.16	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	104	$5.20	$6.33	$11.53	$6.60	$8.03	$14.63	WS	1
210	2	1	CLASIFICATION			2000	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	236	$11.80	$14.36	$26.16	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	104	$5.20	$6.33	$11.53	$6.60	$8.03	$14.63	WS	1
211	2	3	CHAPLAIN			2000	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	236	$11.80	$14.36	$26.16	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	104	$5.20	$6.33	$11.53	$6.60	$8.03	$14.63		
212	2	2	CHAPLAIN			2000	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	236	$11.80	$14.36	$26.16	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	104	$5.20	$6.33	$11.53	$6.60	$8.03	$14.63		
213	2	1	CHAPLAIN			2000	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	236	$11.80	$14.36	$26.16	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	104	$5.20	$6.33	$11.53	$6.60	$8.03	$14.63		
214	2		CHAPEL			2000	21	NR	NO RETROFIT REQUIRED								21										
215	2		STORAGE			500	2	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	64	32	$1.60	$7.79	$9.39	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	13	$0.65	$3.16	$3.81	$0.95	$4.62	$5.57		
216	2		STORAGE			500	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	59	$2.95	$14.36	$17.31	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.30	$6.33	$7.63	$1.65	$8.03	$9.68		
217	2		BRAVO SHORT CELL			5000	22	I43	43W INCANDESCENT	946	4730	$236.50	$115.12	$351.62	LED9SI	NEW 9W LED SCREW IN	22	198	990	$49.50	$24.10	$73.60	$187.00	$91.03	$278.03		
218	2		CAT WALK			5000	8	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	472	2360	$118.00	$57.44	$175.44	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	1040	$52.00	$25.31	$77.31	$66.00	$32.13	$98.13		
219	2		CAT WALK			5000	5	D2VTT8	2' 2L VAPOR TIGHT W/ T8S	165	825	$41.25	$20.08	$61.33	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	5	90	450	$22.50	$10.95	$33.45	$18.75	$9.13	$27.88		
220	2		NIGHT LIGHTS			3000	6	I60	60W INCANDESCENT	360	1080	$54.00	$43.81	$97.81	LED9SI	NEW 9W LED SCREW IN	6	54	162	$8.10	$6.57	$14.67	$45.90	$37.24	$83.14		
221	2		SHOWERS			5000	2	A2BT8	4' 2L BOX FIXTURE W/T8S	118	590	$29.50	$14.36	$43.86	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	260	$13.00	$6.33	$19.33	$16.50	$8.03	$24.53		
222	2		BRAVO LONG CELLS			5000	28	I43	43W INCANDESCENT	1204	6020	$301.00	$146.52	$447.52	LED9SI	NEW 9W LED SCREW IN	28	252	1260	$63.00	$30.67	$93.67	$238.00	$115.85	$353.85		
223	2		SHOWERS			5000	2	A2BT8	4' 2L BOX FIXTURE W/T8S	118	590	$29.50	$14.36	$43.86	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	260	$13.00	$6.33	$19.33	$16.50	$8.03	$24.53		
224	2		CAT WALK			5000	16	D2VTT8	2' 2L VAPOR TIGHT W/ T8S	528	2640	$132.00	$64.25	$196.25	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	16	288	1440	$72.00	$35.05	$107.05	$60.00	$29.21	$89.21		
225	2		CAT WALK			5000	10	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	590	2950	$147.50	$71.80	$219.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	10	260	1300	$65.00	$31.64	$96.64	$82.50	$40.16	$122.66		
226	2		NIGHT LIGHTS			3000	12	I60	60W INCANDESCENT	720	2160	$108.00	$87.62	$195.62	LED9SI	NEW 9W LED SCREW IN	12	108	324	$16.20	$13.14	$29.34	$91.80	$74.48	$166.28		
227	2		SUISIDE WATCH			2000	7	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	224	448	$22.40	$27.26	$49.66	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	7	91	182	$9.10	$11.07	$20.17	$13.30	$16.19	$29.49		
228	2		SUISIDE WATCH			2000	6	A2VT8	4' 2L VANITY W/ 32W T8'S	354	708	$35.40	$43.08	$78.48	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	312	$15.60	$18.98	$34.58	$19.80	$24.10	$43.90		
229	2		HALL			8760	3	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	177	1551	$77.53	$21.54	$99.07	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	683	$34.16	$9.49	$43.66	$43.36	$12.05	$55.41		
230	2		HALL			8760	2	A2BT8	4' 2L BOX FIXTURE W/T8S	118	1034	$51.68	$14.36	$66.04	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$22.78	$6.33	$29.10	$28.91	$8.03	$36.94		
231	2		HALL			8760	1	D2VTT8	2' 2L VAPOR TIGHT W/ T8S	33	289	$14.45	$4.02	$18.47	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	1	18	158	$7.88	$2.19	$10.07	$6.57	$1.83	$8.40		
232	2		BRAVO SEG CELLS			5000	8	I43	43W INCANDESCENT	344	1720	$86.00	$41.86	$127.86	LED9SI	NEW 9W LED SCREW IN	8	72	360	$18.00	$8.76	$26.76	$68.00	$33.10	$101.10		
233	2		CAT WALK			5000	8	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	472	2360	$118.00	$57.44	$175.44	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	1040	$52.00	$25.31	$77.31	$66.00	$32.13	$98.13		
234	2		CAT WALK			5000	4	D2VTT8	2' 2L VAPOR TIGHT W/ T8S	132	660	$33.00	$16.06	$49.06	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	4	72	360	$18.00	$8.76	$26.76	$15.00	$7.30	$22.30		

ENHANCED LIGHTING SURVEY LOG

Project Name: HOLDING CENTER

Months: 12

Hours: 2500

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
																							Multipliers:	0.05	10.141		
235	2		NIGHT LIGHTS			3000	6	I43	43W INCANDESCENT	258	774	$38.70	$31.40	$70.10	LED9SI	NEW 9W LED SCREW IN	6	54	162	$8.10	$6.57	$14.67	$30.60	$24.83	$55.43		
236	2		ALPHA SHORT CELLS			5000	22	I43	43W INCANDESCENT	946	4730	$236.50	$115.12	$351.62	LED9SI	NEW 9W LED SCREW IN	22	198	990	$49.50	$24.10	$73.60	$187.00	$91.03	$278.03		
237	2		TOILET			4000	1	D2TT8	2' 2L TROFFER W/ T8'S	33	132	$6.60	$4.02	$10.62	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	1	18	72	$3.60	$2.19	$5.79	$3.00	$1.83	$4.83	WS	1
238	2		STORAGE			1000	1	D2TT8	2' 2L TROFFER W/ T8'S	33	33	$1.65	$4.02	$5.67	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	1	18	18	$0.90	$2.19	$3.09	$0.75	$1.83	$2.58	WS	1
239	2		SHOWERS			5000	2	A2BT8	4' 2L BOX FIXTURE W/T8S	118	590	$29.50	$14.36	$43.86	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	260	$13.00	$6.33	$19.33	$16.50	$8.03	$24.53		
240	2		CAT WALK			5000	8	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	472	2360	$118.00	$57.44	$175.44	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	1040	$52.00	$25.31	$77.31	$66.00	$32.13	$98.13		
241	2		CAT WALK			5000	5	D2VTT8	2' 2L VAPOR TIGHT W/ T8S	165	825	$41.25	$20.08	$61.33	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	5	90	450	$22.50	$10.95	$33.45	$18.75	$9.13	$27.88		
242	2		NIGHT LIGHTS			3000	6	I60	60W INCANDESCENT	360	1080	$54.00	$43.81	$97.81	LED9SI	NEW 9W LED SCREW IN	6	54	162	$8.10	$6.57	$14.67	$45.90	$37.24	$83.14		
243	2		ALPHA LONG CELLS			5000	28	I43	43W INCANDESCENT	1204	6020	$301.00	$146.52	$447.52	LED9SI	NEW 9W LED SCREW IN	28	252	1260	$63.00	$30.67	$93.67	$238.00	$115.85	$353.85		
244	2		SHOWERS			5000	2	A2BT8	4' 2L BOX FIXTURE W/T8S	118	590	$29.50	$14.36	$43.86	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	260	$13.00	$6.33	$19.33	$16.50	$8.03	$24.53		
245	2		CAT WALK			5000	16	D2VTT8	2' 2L VAPOR TIGHT W/ T8S	528	2640	$132.00	$64.25	$196.25	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	16	288	1440	$72.00	$35.05	$107.05	$60.00	$29.21	$89.21		
246	2		CAT WALK			5000	10	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	590	2950	$147.50	$71.80	$219.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	10	260	1300	$65.00	$31.64	$96.64	$82.50	$40.16	$122.66		
247	2		NIGHT LIGHTS			3000	12	I60	60W INCANDESCENT	720	2160	$108.00	$87.62	$195.62	LED9SI	NEW 9W LED SCREW IN	12	108	324	$16.20	$13.14	$29.34	$91.80	$74.48	$166.28		
248	2		DAYROOM			5000	8	A2RT8	4' 2L RECESSED FIXTURE W/T8S	472	2360	$118.00	$57.44	$175.44	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	1040	$52.00	$25.31	$77.31	$66.00	$32.13	$98.13		
249	2		HALL			8760	1	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	59	517	$25.84	$7.18	$33.02	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$11.39	$3.16	$14.55	$14.45	$4.02	$18.47		
250	2		ALPPHA SEG CELLS			5000	8	I43	43W INCANDESCENT	344	1720	$86.00	$41.86	$127.86	LED9SI	NEW 9W LED SCREW IN	8	72	360	$18.00	$8.76	$26.76	$68.00	$33.10	$101.10		
251	2		CAT WALK			5000	4	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	236	1180	$59.00	$28.72	$87.72	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	520	$26.00	$12.66	$38.66	$33.00	$16.06	$49.06		
252	2		CAT WALK			5000	8	D2VTT8	2' 2L VAPOR TIGHT W/ T8S	264	1320	$66.00	$32.13	$98.13	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	8	144	720	$36.00	$17.52	$53.52	$30.00	$14.60	$44.60		
253	2		NIGHT LIGHTS			3000	6	I60	60W INCANDESCENT	360	1080	$54.00	$43.81	$97.81	LED9SI	NEW 9W LED SCREW IN	6	54	162	$8.10	$6.57	$14.67	$45.90	$37.24	$83.14		
254	2		OFFICE			5000	2	A2BT8	4' 2L BOX FIXTURE W/T8S	118	590	$29.50	$14.36	$43.86	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	260	$13.00	$6.33	$19.33	$16.50	$8.03	$24.53		
255	2		CHARLY SHORT CELLS			5000	22	I43	43W INCANDESCENT	946	4730	$236.50	$115.12	$351.62	LED9SI	NEW 9W LED SCREW IN	22	198	990	$49.50	$24.10	$73.60	$187.00	$91.03	$278.03		
256	2		CAT WALK			5000	8	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	472	2360	$118.00	$57.44	$175.44	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	1040	$52.00	$25.31	$77.31	$66.00	$32.13	$98.13		
257	2		CAT WALK			5000	5	D2VTT8	2' 2L VAPOR TIGHT W/ T8S	165	825	$41.25	$20.08	$61.33	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	5	90	450	$22.50	$10.95	$33.45	$18.75	$9.13	$27.88		
258	2		NIGHT LIGHTS			3000	6	I60	60W INCANDESCENT	360	1080	$54.00	$43.81	$97.81	LED9SI	NEW 9W LED SCREW IN	6	54	162	$8.10	$6.57	$14.67	$45.90	$37.24	$83.14		
259	2		SHOWERS			5000	2	A2BT8	4' 2L BOX FIXTURE W/T8S	118	590	$29.50	$14.36	$43.86	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	260	$13.00	$6.33	$19.33	$16.50	$8.03	$24.53		
260	2		CHARLY LONG CELLS			5000	28	I43	43W INCANDESCENT	1204	6020	$301.00	$146.52	$447.52	LED9SI	NEW 9W LED SCREW IN	28	252	1260	$63.00	$30.67	$93.67	$238.00	$115.85	$353.85		
261	2		SHOWERS			5000	2	A2BT8	4' 2L BOX FIXTURE W/T8S	118	590	$29.50	$14.36	$43.86	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	260	$13.00	$6.33	$19.33	$16.50	$8.03	$24.53		
262	2		CAT WALK			5000	16	D2VTT8	2' 2L VAPOR TIGHT W/ T8S	528	2640	$132.00	$64.25	$196.25	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	16	288	1440	$72.00	$35.05	$107.05	$60.00	$29.21	$89.21		
263	2		CAT WALK			5000	10	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	590	2950	$147.50	$71.80	$219.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	10	260	1300	$65.00	$31.64	$96.64	$82.50	$40.16	$122.66		
264	2		NIGHT LIGHTS			3000	12	I60	60W INCANDESCENT	720	2160	$108.00	$87.62	$195.62	LED9SI	NEW 9W LED SCREW IN	12	108	324	$16.20	$13.14	$29.34	$91.80	$74.48	$166.28		
265	2		DAYROOM			5000	8	A2RT8	4' 2L RECESSED FIXTURE W/T8S	472	2360	$118.00	$57.44	$175.44	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	1040	$52.00	$25.31	$77.31	$66.00	$32.13	$98.13		
266	2		HALL			8760	1	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	59	517	$25.84	$7.18	$33.02	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$11.39	$3.16	$14.55	$14.45	$4.02	$18.47		
267	2		CHARLY SEG CELLS			5000	4	I43	43W INCANDESCENT	172	860	$43.00	$20.93	$63.93	LED9SI	NEW 9W LED SCREW IN	4	36	180	$9.00	$4.38	$13.38	$34.00	$16.55	$50.55		
268	2		CAT WALK			5000	4	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	236	1180	$59.00	$28.72	$87.72	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	520	$26.00	$12.66	$38.66	$33.00	$16.06	$49.06		
269	2		CAT WALK			5000	8	D2VTT8	2' 2L VAPOR TIGHT W/ T8S	264	1320	$66.00	$32.13	$98.13	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	8	144	720	$36.00	$17.52	$53.52	$30.00	$14.60	$44.60		
270	2		NIGHT LIGHTS			3000	6	I60	60W INCANDESCENT	360	1080	$54.00	$43.81	$97.81	LED9SI	NEW 9W LED SCREW IN	6	54	162	$8.10	$6.57	$14.67	$45.90	$37.24	$83.14		
271	2		OFFICE			5000	1	A2BT8	4' 2L BOX FIXTURE W/T8S	59	295	$14.75	$7.18	$21.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.50	$3.16	$9.66	$8.25	$4.02	$12.27		
272	1		CONTROL			5000	28	I43	43W INCANDESCENT	1204	6020	$301.00	$146.52	$447.52	LED10CAN	NEW 10W LED CAN	28	280	1400	$70.00	$34.07	$104.07	$231.00	$112.44	$343.44		
273	1		ARMORY			2000	3	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	96	192	$9.60	$11.68	$21.28	LED10CAN	NEW 10W LED CAN	3	30	60	$3.00	$3.65	$6.65	$6.60	$8.03	$14.63	WS	1

ENHANCED LIGHTING SURVEY LOG

Project Name: HOLDING CENTER

Months: 12

Hours: 2500

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
																							Multipliers:	0.05	10.141		
274	1		TOILET			4000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	236	$11.80	$7.18	$18.98	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	104	$5.20	$3.16	$8.36	$6.60	$4.02	$10.62	WS	1
275	1		KITCHEN			5000	4	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	128	640	$32.00	$15.58	$47.58	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	4	52	260	$13.00	$6.33	$19.33	$19.00	$9.25	$28.25		
276	1		OFFICE			5000	3	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	96	480	$24.00	$11.68	$35.68	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	3	39	195	$9.75	$4.75	$14.50	$14.25	$6.94	$21.19		
277	1		TIME CLOCK			5000	2	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	64	320	$16.00	$7.79	$23.79	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	130	$6.50	$3.16	$9.66	$9.50	$4.62	$14.12		
278	1		HALL			8760	9	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	288	2523	$126.14	$35.05	$161.19	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	9	117	1025	$51.25	$14.24	$65.48	$74.90	$20.81	$95.71		
279	1		FEMALE SEARCH			5000	3	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	96	480	$24.00	$11.68	$35.68	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	3	39	195	$9.75	$4.75	$14.50	$14.25	$6.94	$21.19		
280	1		VISITATION			8760	44	I43	43W INCANDESCENT	1892	16574	$828.70	$230.24	$1,058.94	LED12SI	NEW 12W LED SCREW IN	44	528	4625	$231.26	$64.25	$295.52	$597.43	$165.99	$763.42		
281	1		VISITATION			8760	1	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	59	517	$25.84	$7.18	$33.02	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$11.39	$3.16	$14.55	$14.45	$4.02	$18.47		
282	1		MALE SEARCH			5000	4	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	128	640	$32.00	$15.58	$47.58	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	4	52	260	$13.00	$6.33	$19.33	$19.00	$9.25	$28.25		
283	1		INMATE WAITING			5000	4	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	128	640	$32.00	$15.58	$47.58	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	4	52	260	$13.00	$6.33	$19.33	$19.00	$9.25	$28.25		
284	1		CONTROL			5000	10	I43	43W INCANDESCENT	430	2150	$107.50	$52.33	$159.83	LED10CAN	NEW 10W LED CAN	10	100	500	$25.00	$12.17	$37.17	$82.50	$40.16	$122.66		
285	1		CONTROL			1000	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	59	$2.95	$7.18	$10.13	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.30	$3.16	$4.46	$1.65	$4.02	$5.67		
286	1		FEMALE WAITING			5000	2	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	64	320	$16.00	$7.79	$23.79	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	130	$6.50	$3.16	$9.66	$9.50	$4.62	$14.12		
287	1		OFFICE			5000	4	NR	NO RETROFIT REQUIRED								4										
288	1		PASSAGE			5000	2	NR	NO RETROFIT REQUIRED								2										
289	1		HALL			8760	4	NR	NO RETROFIT REQUIRED								4										
290	1		HALL			8760	3	NR	NO RETROFIT REQUIRED								3										
291	1		PASSAGE			5000	2	NR	NO RETROFIT REQUIRED								2										
292	1		HALL			8760	8	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	256	2243	$112.13	$31.15	$143.28	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	8	104	911	$45.55	$12.66	$58.21	$66.58	$18.50	$85.07		
293	1		CONFERENCE			2000	2	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	64	128	$6.40	$7.79	$14.19	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	52	$2.60	$3.16	$5.76	$3.80	$4.62	$8.42		
294	1		CONFERENCE			2000	2	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	64	128	$6.40	$7.79	$14.19	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	52	$2.60	$3.16	$5.76	$3.80	$4.62	$8.42		
295	1		CONFERENCE			2000	2	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	64	128	$6.40	$7.79	$14.19	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	52	$2.60	$3.16	$5.76	$3.80	$4.62	$8.42		
296	1		CONFERENCE			2000	2	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	64	128	$6.40	$7.79	$14.19	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	52	$2.60	$3.16	$5.76	$3.80	$4.62	$8.42		
297	1		CONFERENCE			2000	2	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	64	128	$6.40	$7.79	$14.19	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	52	$2.60	$3.16	$5.76	$3.80	$4.62	$8.42		
298	1		CONFERENCE			2000	2	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	64	128	$6.40	$7.79	$14.19	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	52	$2.60	$3.16	$5.76	$3.80	$4.62	$8.42		
299	1		VISITATION			5000	2	NR	NO RETROFIT REQUIRED								2										
300	1		VISITATION			5000	2	NR	NO RETROFIT REQUIRED								2										
301	1		VISITATION			5000	2	NR	NO RETROFIT REQUIRED								2										
302	1		VISITATION			5000	2	NR	NO RETROFIT REQUIRED								2										
303	1		VISITATION			5000	2	NR	NO RETROFIT REQUIRED								2										
304	1		HALL			8760	8	NR	NO RETROFIT REQUIRED								8										
305	1		VISITOR SALLY PORT			5000	3	NR	NO RETROFIT REQUIRED								3										
306	1		STORAGE			500	1	NR	NO RETROFIT REQUIRED								1										
307	1		VISITORS			8760	1	NR	NO RETROFIT REQUIRED								1										
308	1		VISITORS			8760	36	NR	NO RETROFIT REQUIRED								36										
309	1		SOFFIT			8760	4	NR	NO RETROFIT REQUIRED								4										
310	1		SHERRIF DESK			8760	1	A4WT8	4' 4L WRAP FIXTURE W/ 32W T8'S	112	981	$49.06	$13.63	$62.69	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	1	52	456	$22.78	$6.33	$29.10	$26.28	$7.30	$33.58		
311	1	108	SHERRIF DESK			5000	5	I43	43W INCANDESCENT	215	1075	$53.75	$26.16	$79.91	LED10CAN	NEW 10W LED CAN	5	50	250	$12.50	$6.08	$18.58	$41.25	$20.08	$61.33		
312	1	107	INTAKE VISITOR			5000	2	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	64	320	$16.00	$7.79	$23.79	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	130	$6.50	$3.16	$9.66	$9.50	$4.62	$14.12		

ENHANCED LIGHTING SURVEY LOG

Project Name: HOLDING CENTER

Months: 12

Hours: 2500 **Multipliers:** 0.05 10.141

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
313	1		MENS			5000	2	NR	NO RETROFIT REQUIRED								2										
314	1		MENS			5000	1	NR	NO RETROFIT REQUIRED								1										
315	1		WOMENS			5000	2	NR	NO RETROFIT REQUIRED								2										
316	1		WOMENS			5000	1	NR	NO RETROFIT REQUIRED								1										
317	1		HALL			8760	5	NR	NO RETROFIT REQUIRED								5										
318	1		SOFFIT			8760	3	NR	NO RETROFIT REQUIRED								3										
319	1		STORAGE			500	1	NR	NO RETROFIT REQUIRED								1										
320	1		HALL			8760	4	NR	NO RETROFIT REQUIRED								4										
321	1		OFFICE			5000	2	NR	NO RETROFIT REQUIRED								2										
322	1		RECORDS			5000	20	NR	NO RETROFIT REQUIRED								20										
323	1		SIDE OFFICE			5000	6	NR	NO RETROFIT REQUIRED								6										
324	1		BACK AREA			5000	3	NR	NO RETROFIT REQUIRED								3										
325	1		TOILET			5000	1	NR	NO RETROFIT REQUIRED								1										
326	1		OFFICE			2500	4	NR	NO RETROFIT REQUIRED								4										
327	1		STORAGE			500	1	NR	NO RETROFIT REQUIRED								1										
328	1		OFFICE			3000	6	NR	NO RETROFIT REQUIRED								6										
329	1		OFFICE			3000	6	NR	NO RETROFIT REQUIRED								6										
330	1		OFFICE			3000	1	NR	NO RETROFIT REQUIRED								1										
331	1		OFFICE			3000	1	NR	NO RETROFIT REQUIRED								1										
332	1		OFFICE			3000	4	NR	NO RETROFIT REQUIRED								4										
333	1		PASSAGE AND OFFICE			5000	4	NR	NO RETROFIT REQUIRED								4										
334	1		HALL			8760	3	NR	NO RETROFIT REQUIRED								3										
335	1		TOILET			5000	1	NR	NO RETROFIT REQUIRED								1										
336	1	162	OFFICE			3000	4	NR	NO RETROFIT REQUIRED								4										
337	1	163	OFFICE			3000	4	NR	NO RETROFIT REQUIRED								4										
338	1	164	OFFICE			3000	6	NR	NO RETROFIT REQUIRED								6										
339	1		HALL			8760	12	NR	NO RETROFIT REQUIRED								12										
340	1		WOMENS			8760	7	NR	NO RETROFIT REQUIRED								7										
341	1		WOMENS			8760	2	NR	NO RETROFIT REQUIRED								2										
342	1		MENS			8760	10	NR	NO RETROFIT REQUIRED								10										
343	1		MENS			8760	2	NR	NO RETROFIT REQUIRED								2										
344	1		LOCKERS FOR OFFICERS			5000		NR	NO RETROFIT REQUIRED																		
345	1	155	STORAGE			500	1	NR	NO RETROFIT REQUIRED								1										
346	1	129	STORAGE			500	1	NR	NO RETROFIT REQUIRED								1										
347	1		ELEVATOR MACHINE			500	2	NR	NO RETROFIT REQUIRED								2										
348	GF		HALL			8760	16	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	512	4485	$224.26	$62.31	$286.56	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	16	208	1822	$91.10	$25.31	$116.42	$133.15	$36.99	$170.15		
349	GF		ELECTRICAL			500	5	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	295	148	$7.38	$35.90	$43.27	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	65	$3.25	$15.82	$19.07	$4.13	$20.08	$24.20		
350	GF		GARAGE			5000	10	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	590	2950	$147.50	$71.80	$219.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	10	260	1300	$65.00	$31.64	$96.64	$82.50	$40.16	$122.66		
351	GF		STORAGE			5000	3	A2BT8	4' 2L BOX FIXTURE W/T8S	177	885	$44.25	$21.54	$65.79	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	390	$19.50	$9.49	$28.99	$24.75	$12.05	$36.80		

ENHANCED LIGHTING SURVEY LOG

Project Name: HOLDING CENTER

Months: 12

Hours: 2500

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
																							Multipliers:	0.05	10.141		
352	GF		STORAGE			5000	6	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	354	1770	$88.50	$43.08	$131.58	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	780	$39.00	$18.98	$57.98	$49.50	$24.10	$73.60		
353	GF		OFFICE			3000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	354	$17.70	$14.36	$32.06	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	156	$7.80	$6.33	$14.13	$9.90	$8.03	$17.93		
354	GF		OFFICE			3000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	96	$4.80	$3.89	$8.69	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	39	$1.95	$1.58	$3.53	$2.85	$2.31	$5.16		
355	GF		SUPPLIES			5000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	160	$8.00	$3.89	$11.89	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	65	$3.25	$1.58	$4.83	$4.75	$2.31	$7.06		
356	GF		STORAGE			5000	10	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	590	2950	$147.50	$71.80	$219.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	10	260	1300	$65.00	$31.64	$96.64	$82.50	$40.16	$122.66		
357	GF		OPERATIONS			5000	21	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	1239	6195	$309.75	$150.78	$460.53	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	21	546	2730	$136.50	$66.44	$202.94	$173.25	$84.33	$257.58		
358	GF		SPECIAL SERVICES			5000	5	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	295	1475	$73.75	$35.90	$109.65	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	650	$32.50	$15.82	$48.32	$41.25	$20.08	$61.33		
359	GF		TOILET			5000	1	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	59	295	$14.75	$7.18	$21.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.50	$3.16	$9.66	$8.25	$4.02	$12.27		
360	GF		OFFICE			3000	2	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	64	192	$9.60	$7.79	$17.39	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	78	$3.90	$3.16	$7.06	$5.70	$4.62	$10.32		
361	GF		AIR HANDLER			500	5	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	295	148	$7.38	$35.90	$43.27	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	65	$3.25	$15.82	$19.07	$4.13	$20.08	$24.20		
362	GF		HALL			8760	6	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	192	1682	$84.10	$23.36	$107.46	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	6	78	683	$34.16	$9.49	$43.66	$49.93	$13.87	$63.80		
363	GF		KITCHEN STORAGE			5000	8	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	472	2360	$118.00	$57.44	$175.44	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	1040	$52.00	$25.31	$77.31	$66.00	$32.13	$98.13		
364	GF		OFFICE			5000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	590	$29.50	$14.36	$43.86	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	260	$13.00	$6.33	$19.33	$16.50	$8.03	$24.53	WS	1
365	GF		BOILER			500	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	30	$1.48	$7.18	$8.65	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.65	$3.16	$3.81	$0.83	$4.02	$4.84		
366	GF		KITCHEN			5000	52	A2RT8	4' 2L RECESSED FIXTURE W/T8S	3068	15340	$767.00	$373.35	$1,140.35	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	52	1352	6760	$338.00	$164.53	$502.53	$429.00	$208.82	$637.82		
367	GF		HOOD			2000	4	A2RT8	4' 2L RECESSED FIXTURE W/T8S	236	472	$23.60	$28.72	$52.32	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	208	$10.40	$12.66	$23.06	$13.20	$16.06	$29.26		
368	GF		HOOD			2000	4	I60	60W INCANDESCENT	240	480	$24.00	$29.21	$53.21	LED9SI	NEW 9W LED SCREW IN	4	36	72	$3.60	$4.38	$7.98	$20.40	$24.83	$45.23		
369	GF		HALL			8760	4	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	236	2067	$103.37	$28.72	$132.09	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	911	$45.55	$12.66	$58.21	$57.82	$16.06	$73.88		
370	GF		HALL			8760	4	A2BT8	4' 2L BOX FIXTURE W/T8S	236	2067	$103.37	$28.72	$132.09	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	911	$45.55	$12.66	$58.21	$57.82	$16.06	$73.88		
371	GF		STORAGE			5000	7	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	413	2065	$103.25	$50.26	$153.51	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	7	182	910	$45.50	$22.15	$67.65	$57.75	$28.11	$85.86		
372	GF		MECHANICAL			8760	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	517	$25.84	$7.18	$33.02	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$11.39	$3.16	$14.55	$14.45	$4.02	$18.47		
373	GF		MECHANICAL			8760	2	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	118	1034	$51.68	$14.36	$66.04	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$22.78	$6.33	$29.10	$28.91	$8.03	$36.94		
374	GF		MECHANICAL			8760	1	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	59	517	$25.84	$7.18	$33.02	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$11.39	$3.16	$14.55	$14.45	$4.02	$18.47		
375	GF		MECHANICAL			8760	3	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	177	1551	$77.53	$21.54	$99.07	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	683	$34.16	$9.49	$43.66	$43.36	$12.05	$55.41		
376	GF		HOT WATER			8760	5	A2TT8	4' 2L TROFFER FIXTURE W/T8S	295	2584	$129.21	$35.90	$165.11	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	1139	$56.94	$15.82	$72.76	$72.27	$20.08	$92.35		
377	GF		HALL			8760	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	2067	$103.37	$28.72	$132.09	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	911	$45.55	$12.66	$58.21	$57.82	$16.06	$73.88		
378	GF		MENS			5000	1	C2VT8	3' 2L VANITY FIXTURE W/T8S	46	230	$11.50	$5.60	$17.10	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	1	28	140	$7.00	$3.41	$10.41	$4.50	$2.19	$6.69		
379	GF		MENS			5000	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	300	$15.00	$7.30	$22.30	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	90	$4.50	$2.19	$6.69	$10.50	$5.11	$15.61		
380	GF		WOMENS			5000	1	C2VT8	3' 2L VANITY FIXTURE W/T8S	46	230	$11.50	$5.60	$17.10	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	1	28	140	$7.00	$3.41	$10.41	$4.50	$2.19	$6.69		
381	GF		WOMENS			5000	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	300	$15.00	$7.30	$22.30	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	90	$4.50	$2.19	$6.69	$10.50	$5.11	$15.61		
382	GF		LOCKER			5000	4	A2VT8	4' 2L VANITY W/ 32W T8'S	236	1180	$59.00	$28.72	$87.72	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	520	$26.00	$12.66	$38.66	$33.00	$16.06	$49.06		
383	GF		SLOP SINK			500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	30	$1.48	$7.18	$8.65	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.65	$3.16	$3.81	$0.83	$4.02	$4.84		
384	GF		FOOD STORAGE			5000	10	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	320	1600	$80.00	$38.94	$118.94	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	10	130	650	$32.50	$15.82	$48.32	$47.50	$23.12	$70.62		
385	GF		DINING			8760	20	I43	43W INCANDESCENT	860	7534	$376.68	$104.66	$481.34	LED10CAN	NEW 10W LED CAN	20	200	1752	$87.60	$24.34	$111.94	$289.08	$80.32	$369.40		
386	GF		TRAINING			2000	18	A2RT8	4' 2L RECESSED FIXTURE W/T8S	1062	2124	$106.20	$129.24	$235.44	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	18	468	936	$46.80	$56.95	$103.75	$59.40	$72.29	$131.69	CP	1
387	GF		OFFICE			5000	4	A2RT8	4' 2L RECESSED FIXTURE W/T8S	236	1180	$59.00	$28.72	$87.72	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	520	$26.00	$12.66	$38.66	$33.00	$16.06	$49.06	WS	1
388	GF		CLOSET			500	2	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	118	59	$2.95	$14.36	$17.31	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.30	$6.33	$7.63	$1.65	$8.03	$9.68	WS	1
389	GF	G65	WOMENS			5000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	295	$14.75	$7.18	$21.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.50	$3.16	$9.66	$8.25	$4.02	$12.27	WS	1
390	GF	G66	MENS			5000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	295	$14.75	$7.18	$21.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.50	$3.16	$9.66	$8.25	$4.02	$12.27	WS	1

ENHANCED LIGHTING SURVEY LOG

Project Name: HOLDING CENTER

Months: 12

Hours: 2500

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
																							Multipliers:	0.05	10.141		
391	GF	G67	OFFICE			5000	6	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	192	960	$48.00	$23.36	$71.36	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	6	78	390	$19.50	$9.49	$28.99	$28.50	$13.87	$42.37		
392	GF		HALL			8760	10	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	320	2803	$140.16	$38.94	$179.10	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	10	130	1139	$56.94	$15.82	$72.76	$83.22	$23.12	$106.34		
393	GF		CHANGING ROOMS			8760	6	2-13CP	(2) 13W COMPACT FLUORESCENT	180	1577	$78.84	$21.90	$100.74	NDR	INSTALL LED DRUM FIX.	6	90	788	$39.42	$10.95	$50.37	$39.42	$10.95	$50.37		
394	GF		LAUNDRY			5000	7	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	413	2065	$103.25	$50.26	$153.51	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	7	182	910	$45.50	$22.15	$67.65	$57.75	$28.11	$85.86		
395	GF		LAUNDRY			5000	1	I60	60W INCANDESCENT	60	300	$15.00	$7.30	$22.30	LED9SI	NEW 9W LED SCREW IN	1	9	45	$2.25	$1.10	$3.35	$12.75	$6.21	$18.96		
396	GF		PROPERTY			5000	17	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	1003	5015	$250.75	$122.06	$372.81	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	17	442	2210	$110.50	$53.79	$164.29	$140.25	$68.27	$208.52		
397	GF		HALL			8760	12	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	384	3364	$168.19	$46.73	$214.92	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	12	156	1367	$68.33	$18.98	$87.31	$99.86	$27.75	$127.61		
398	GF		CELLS			5000	5	A2VT8	4' 2L VANITY W/ 32W T8'S	295	1475	$73.75	$35.90	$109.65	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	650	$32.50	$15.82	$48.32	$41.25	$20.08	$61.33		
399	GF		PIPE CHASES			500	4	I43	43W INCANDESCENT	172	86	$4.30	$20.93	$25.23	LED9SI	NEW 9W LED SCREW IN	4	36	18	$0.90	$4.38	$5.28	$3.40	$16.55	$19.95		
400	GF		BOOKING			8760	4	A4TT8	4' 4L RECESSED TROFFER W/T8S	448	3924	$196.22	$54.52	$250.74	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	4	208	1822	$91.10	$25.31	$116.42	$105.12	$29.21	$134.33		
401	GF		BOOKING			8760	14	D2TUT8	2' 2L TROFFER WT8/U-TUBES	840	7358	$367.92	$102.22	$470.14	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	14	252	2208	$110.38	$30.67	$141.04	$257.54	$71.55	$329.10		
402	GF		BOOKING			8760	7	I43	43W INCANDESCENT	301	2637	$131.84	$36.63	$168.47	LED12SI	NEW 12W LED SCREW IN	7	84	736	$36.79	$10.22	$47.01	$95.05	$26.41	$121.45		
403	GF		BOOKING			8760	2	A3RT8	4' 3L RECESSED FIXTURE W/T8S	186	1629	$81.47	$22.63	$104.10	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	683	$34.16	$9.49	$43.66	$47.30	$13.14	$60.45		
404	GF		CELLS			5000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	295	$14.75	$7.18	$21.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.50	$3.16	$9.66	$8.25	$4.02	$12.27		
405	GF		SHOWER			5000	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	295	$14.75	$7.18	$21.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.50	$3.16	$9.66	$8.25	$4.02	$12.27		
406	GF		CHECK IN			5000	3	I43	43W INCANDESCENT	129	645	$32.25	$15.70	$47.95	LED10CAN	NEW 10W LED CAN	3	30	150	$7.50	$3.65	$11.15	$24.75	$12.05	$36.80		
407	GF		TOILET			5000	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	295	$14.75	$7.18	$21.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.50	$3.16	$9.66	$8.25	$4.02	$12.27		
408	GF		CONTROL			5000	10	I43	43W INCANDESCENT	430	2150	$107.50	$52.33	$159.83	LED10CAN	NEW 10W LED CAN	10	100	500	$25.00	$12.17	$37.17	$82.50	$40.16	$122.66		
409	GF		HALL			8760	4	I43	43W INCANDESCENT	172	1507	$75.34	$20.93	$96.27	LED12SI	NEW 12W LED SCREW IN	4	48	420	$21.02	$5.84	$26.87	$54.31	$15.09	$69.40		
410	GF		STORAGE			5000	2	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	64	320	$16.00	$7.79	$23.79	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	130	$6.50	$3.16	$9.66	$9.50	$4.62	$14.12		
411	GF		TOILET			5000	1	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	59	295	$14.75	$7.18	$21.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.50	$3.16	$9.66	$8.25	$4.02	$12.27		
412	GF		HALL			8760	10	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	320	2803	$140.16	$38.94	$179.10	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	10	130	1139	$56.94	$15.82	$72.76	$83.22	$23.12	$106.34		
413	GF	6	CELL			5000	2	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	64	320	$16.00	$7.79	$23.79	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	130	$6.50	$3.16	$9.66	$9.50	$4.62	$14.12		
414	GF	4	CELL			5000	4	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	128	640	$32.00	$15.58	$47.58	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	4	52	260	$13.00	$6.33	$19.33	$19.00	$9.25	$28.25		
415	GF	2	CELL			5000	2	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	64	320	$16.00	$7.79	$23.79	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	130	$6.50	$3.16	$9.66	$9.50	$4.62	$14.12		
416	GF	1	CELL			5000	5	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	160	800	$40.00	$19.47	$59.47	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	5	65	325	$16.25	$7.91	$24.16	$23.75	$11.56	$35.31		
417	GF	3	CELL			5000	4	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	128	640	$32.00	$15.58	$47.58	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	4	52	260	$13.00	$6.33	$19.33	$19.00	$9.25	$28.25		
418	GF	5	CELL			5000	4	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	128	640	$32.00	$15.58	$47.58	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	4	52	260	$13.00	$6.33	$19.33	$19.00	$9.25	$28.25		
419	GF	7	CELL			5000	7	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	224	1120	$56.00	$27.26	$83.26	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	7	91	455	$22.75	$11.07	$33.82	$33.25	$16.19	$49.44		
420	GF		ELECTICAL SERVICE AREA			500	20	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	1180	590	$29.50	$143.60	$173.10	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	20	520	260	$13.00	$63.28	$76.28	$16.50	$80.32	$96.82		
421			STAIRS			8760	75	A2BT8	4' 2L BOX FIXTURE W/T8S	4425	38763	$1,938.15	$538.49	$2,476.64	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	75	1950	17082	$854.10	$237.30	$1,091.40	$1,084.05	$301.19	$1,385.24		
422			STAIRS			8760	90	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	5310	46516	$2,325.78	$646.18	$2,971.96	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	90	2340	20498	$1,024.92	$284.76	$1,309.68	$1,300.86	$361.43	$1,662.29		
423	1		ELECTRIC ROOM			500	4	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	236	118	$5.90	$28.72	$34.62	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	52	$2.60	$12.66	$15.26	$3.30	$16.06	$19.36		
424			MISC FIXTURE			5000	10	D2VTT8	2' 2L VAPOR TIGHT W/ T8S	330	1650	$82.50	$40.16	$122.66	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	10	180	900	$45.00	$21.90	$66.90	$37.50	$18.25	$55.75		
425			MISC FIXTURE			5000	10	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	590	2950	$147.50	$71.80	$219.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	10	260	1300	$65.00	$31.64	$96.64	$82.50	$40.16	$122.66		
426			MISC FIXTURE			5000	20	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	1180	5900	$295.00	$143.60	$438.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	20	520	2600	$130.00	$63.28	$193.28	$165.00	$80.32	$245.32		
427			MISC FIXTURE			5000	40	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	1280	6400	$320.00	$155.77	$475.77	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	40	520	2600	$130.00	$63.28	$193.28	$190.00	$92.49	$282.49		
428			MISC FIXTURE			5000	50	I43	43W INCANDESCENT	2150	10750	$537.50	$261.64	$799.14	LED9SI	NEW 9W LED SCREW IN	50	450	2250	$112.50	$54.76	$167.26	$425.00	$206.88	$631.88		
429			MISC FIXTURE			5000	40	A2VT8	4' 2L VANITY W/ 32W T8'S	2360	11800	$590.00	$287.19	$877.19	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	40	1040	5200	$260.00	$126.56	$386.56	$330.00	$160.63	$490.63		

ENHANCED LIGHTING SURVEY LOG

Project Name: **HOLDING CENTER**

Months: 12

Hours: 2500

Multipliers: **0.05** **10.141**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
430			MISC FIXTURE			5000	20	I43	43W INCANDESCENT	860	4300	$215.00	$104.66	$319.66	LED12SI	NEW 12W LED SCREW IN	20	240	1200	$60.00	$29.21	$89.21	$155.00	$75.45	$230.45		
							3,260.00	**Totals:**		154192	796100	$39,804.98	$18,763.93	$58,568.92			3,260.00	57080	295546	$14,777	$6,946	$21,723	$25,028	$11,818	$36,845		35
										KW	154							**KW**	57								

ENHANCED LIGHTING SURVEY LOG

Project Name: **10 DELAWARE**

Months: 12

Hours: 2500 **Multipliers:** **0.0485** **10.124**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
1	1		OUTSIDE MECHANICAL			500	1	A2W	4' 2L WRAP FIXTURE	72	36	$1.75	$8.75	$10.49	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.63	$3.16	$3.79	$1.12	$5.59	$6.70		
2	1		OUTSIDE MECHANICAL			500	3	I60	60W INCANDESCENT	180	90	$4.37	$21.87	$26.23	LED9SI	NEW 9W LED SCREW IN	3	27	14	$0.65	$3.28	$3.93	$3.71	$18.59	$22.30		
3	1		ENTRANCE			8760	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	517	$25.07	$7.17	$32.23	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$11.05	$3.16	$14.21	$14.02	$4.01	$18.03		
4	1		LOBBY			2500	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	885	$42.92	$43.01	$85.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	390	$18.92	$18.95	$37.87	$24.01	$24.05	$48.06		
5	1		CONFERENCE			2500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	590	$28.62	$28.67	$57.29	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$12.61	$12.63	$25.24	$16.01	$16.04	$32.04	CP	1
6	1		MENS			1000	2	A1ST8	4' 1L STRIP FIXTURE W/ 32W T8'S	64	64	$3.10	$7.78	$10.88	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	26	$1.26	$3.16	$4.42	$1.84	$4.62	$6.46	WS	1
7	1		RECORDS			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.43	$7.17	$8.60	R2ANL	RETRO (1) FIX. W/ (2) 4' LED LAMPS NEW LENS	1	26	13	$0.63	$3.16	$3.79	$0.80	$4.01	$4.81	WS	1
8	1		OPEN AREA			2500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	590	$28.62	$28.67	$57.29	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$12.61	$12.63	$25.24	$16.01	$16.04	$32.04		
9	1		MAIL			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.15	$7.17	$14.32	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.15	$3.16	$6.31	$4.00	$4.01	$8.01	WS	1
10	1		OFFICE			1500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	89	$4.29	$7.17	$11.46	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	39	$1.89	$3.16	$5.05	$2.40	$4.01	$6.41	WS	1
11	1		OFFICE			2500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	590	$28.62	$28.67	$57.29	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$12.61	$12.63	$25.24	$16.01	$16.04	$32.04	WS	1
12	1		HALL			3500	7	A2TT8	4' 2L TROFFER FIXTURE W/T8S	413	1446	$70.11	$50.17	$120.28	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	7	182	637	$30.89	$22.11	$53.01	$39.21	$28.06	$67.28		
13	1		OFFICE			2500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	590	$28.62	$28.67	$57.29	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$12.61	$12.63	$25.24	$16.01	$16.04	$32.04	CP	1
14	1		CHIEF			2500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	590	$28.62	$28.67	$57.29	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$12.61	$12.63	$25.24	$16.01	$16.04	$32.04	CP	1
15	1		CLOSET			2500	1	23CP	23W COMPACT FLUORESCENT	25	63	$3.03	$3.04	$6.07	LED9SI	NEW 9W LED SCREW IN	1	9	23	$1.09	$1.09	$2.18	$1.94	$1.94	$3.88		
16			STAIRS			8760	4	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	236	2067	$100.27	$28.67	$128.94	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	911	$44.19	$12.63	$56.82	$56.08	$16.04	$72.12		
17	2		STORAGE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.15	$7.17	$14.32	R2ANL	RETRO (1) FIX. W/ (2) 4' LED LAMPS NEW LENS	1	26	65	$3.15	$3.16	$6.31	$4.00	$4.01	$8.01		
18			STORAGE			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.43	$7.17	$8.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.63	$3.16	$3.79	$0.80	$4.01	$4.81		
19			OFFICE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.15	$7.17	$14.32	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.15	$3.16	$6.31	$4.00	$4.01	$8.01	WS	1
20			CLOSET			500	1	A2BT8	4' 2L BOX FIXTURE W/T8S	59	30	$1.43	$7.17	$8.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.63	$3.16	$3.79	$0.80	$4.01	$4.81	WS	1
21			OPEN AREA			2500	7	A2TT8	4' 2L TROFFER FIXTURE W/T8S	413	1033	$50.08	$50.17	$100.25	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	7	182	455	$22.07	$22.11	$44.18	$28.01	$28.06	$56.07		
22			OFFICE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.15	$7.17	$14.32	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.15	$3.16	$6.31	$4.00	$4.01	$8.01	WS	1
23			TOILET			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$2.86	$7.17	$10.03	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.26	$3.16	$4.42	$1.60	$4.01	$5.61	WS	1
24			OFFICE			1500	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	531	$25.75	$43.01	$68.76	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	234	$11.35	$18.95	$30.30	$14.40	$24.05	$38.46	CP	1
25			CONFERENCE			1000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	118	$5.72	$14.34	$20.06	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.52	$6.32	$8.84	$3.20	$8.02	$11.22	WS	1
26			OFFICE			1000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	118	$5.72	$14.34	$20.06	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.52	$6.32	$8.84	$3.20	$8.02	$11.22		
27			OFFICE			2500		NR	NO RETROFIT REQUIRED																		
28			OFFICE			2500		NR	NO RETROFIT REQUIRED																		
29			OFFICE			2500		NR	NO RETROFIT REQUIRED																		
30			KITCHEN			2500	1	CIR80	80W CIRCLING FIX	80	200	$9.70	$9.72	$19.42	NDRL	INSTALLLARGE LED DRUM FIX.	1	22	55	$2.67	$2.67	$5.34	$7.03	$7.05	$14.08		
31			TOILET			1000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	59	$2.86	$7.17	$10.03	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.26	$3.16	$4.42	$1.60	$4.01	$5.61	WS	1
							73.00	**Totals:**		4256	11002	$533.58	$517.05	$1,050.64			73.00	1800	4779	$232	$219	$450	$302	$298	$600		15
										KW	4							**KW**	2								

ENHANCED LIGHTING SURVEY LOG

Project Name: **10 DELAWARE EXTERIOR**

Months: 5

Hours: 4200 **Multipliers:** **0.0485** **10.124**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	ProposedWatts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
1			EXTERIOR			4200	1	HPS100	250W HIGH PRESSURE SODIUM	125	525	$25.46	$6.33	$31.79	LED100F	NEW 100W LED FLOOD	1	100	420	$20.37	$5.06	$25.43	$5.09	$1.27	$6.36	
2			EXTERIOR			4200	1	HPS250	250W HIGH PRESSURE SODIUM	295	1239	$60.09	$14.93	$75.02	LED100F	NEW 100W LED FLOOD	1	100	420	$20.37	$5.06	$25.43	$39.72	$9.87	$49.59	
3			EXTERIOR			4200	1	MH250	250W METAL HALIDE	295	1239	$60.09	$14.93	$75.02	LED70WP	NEW 70W LED WALLPACK FIXTURE	1	70	294	$14.26	$3.54	$17.80	$45.83	$11.39	$57.22	
4			EXTERIOR			4200	1	MV250	250W MERCURY VAPOR	290	1218	$59.07	$14.68	$73.75	LED100F	NEW 100W LED FLOOD	1	100	420	$20.37	$5.06	$25.43	$38.70	$9.62	$48.32	
							4.00	**Totals:**		1005	4221	$204.72	$50.87	$255.59			4.00	370	1554	$75	$19	$94	$129	$32	$161	
										KW	1							**KW**	0							

ENHANCED LIGHTING SURVEY LOG

Project Name: 134 WEST EAGLE

Months: 12

Hours: 2500 **Multipliers:** **0.048** **10.2**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
1			ELEVATOR			8760	4	NR	NO RETROFIT REQUIRED								4										
2	5		STORAGE			500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	30	$1.42	$7.22	$8.64	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.62	$3.18	$3.81	$0.79	$4.04	$4.83		
3	5	502	OFFICE			2500	1	A4WT8	4' 4L WRAP FIXTURE W/ 32W T8'S	112	280	$13.44	$13.71	$27.15	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	1	52	130	$6.24	$6.36	$12.60	$7.20	$7.34	$14.54		
4	5	501	OFFICE			2500	1	A4WT8	4' 4L WRAP FIXTURE W/ 32W T8'S	112	280	$13.44	$13.71	$27.15	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	1	52	130	$6.24	$6.36	$12.60	$7.20	$7.34	$14.54		
5	5	500	OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.16	$14.44	$28.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00		
6	5	538	OFFICE			2500	3	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	177	443	$21.24	$21.66	$42.90	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$9.36	$9.55	$18.91	$11.88	$12.12	$24.00	WS	1
7	5		OFFICE			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$14.16	$14.44	$28.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00		
8	5	541	OFFICE			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$14.16	$14.44	$28.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00		
9	5	542	OFFICE			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$14.16	$14.44	$28.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00		
10	5	543	OFFICE			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$14.16	$14.44	$28.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00		
11	5	544	OFFICE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00		
12	5		SLOP SINK			500	1	I60	60W INCANDESCENT	60	30	$1.44	$7.34	$8.78	NDR	INSTALL LED DRUM FIX.	1	15	8	$0.36	$1.84	$2.20	$1.08	$5.51	$6.59		
13	5		STORAGE			500	1	I60	60W INCANDESCENT	60	30	$1.44	$7.34	$8.78	NDR	INSTALL LED DRUM FIX.	1	15	8	$0.36	$1.84	$2.20	$1.08	$5.51	$6.59		
14	5		MEETING ROOM			2500	8	A3WT8	4' 3L WRAP FIXTURE W/T8S	744	1860	$89.28	$91.07	$180.35	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	8	312	780	$37.44	$38.19	$75.63	$51.84	$52.88	$104.72		
15	5		MEETING ROOM			2500	4	A3WT8	4' 3L WRAP FIXTURE W/T8S	372	930	$44.64	$45.53	$90.17	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$18.72	$19.09	$37.81	$25.92	$26.44	$52.36		
16	5		STORAGE			500	1	I60	60W INCANDESCENT	60	30	$1.44	$7.34	$8.78	NDR	INSTALL LED DRUM FIX.	1	15	8	$0.36	$1.84	$2.20	$1.08	$5.51	$6.59		
17	5	534	OFFICE			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$14.16	$14.44	$28.60	NAW	REMOVE (1) FIX. & INSTALL NEW 4 LED' WRAP FIX.	2	72	180	$8.64	$8.81	$17.45	$5.52	$5.63	$11.15		
18	5		OFFICE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00	WS	1
19	5		OFFICE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00	WS	1
20	5		STORAGE			500	1	I60	60W INCANDESCENT	60	30	$1.44	$7.34	$8.78	NDR	INSTALL LED DRUM FIX.	1	15	8	$0.36	$1.84	$2.20	$1.08	$5.51	$6.59		
21	5	532	OFFICE			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$14.16	$14.44	$28.60	NAW	REMOVE (1) FIX. & INSTALL NEW 4 LED' WRAP FIX.	2	72	180	$8.64	$8.81	$17.45	$5.52	$5.63	$11.15		
22	5		OFFICE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00		
23	5	528	OFFICE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00		
24	5	526	OFFICE			2500	2	NR	NO RETROFIT REQUIRED								2										
25	5		STORAGE			500	1	NR	NO RETROFIT REQUIRED								1										
26	5		YOUTH SERVICE OPEN			2500	14	A4T	4' 4L RECESSED TROFFER	2016	5040	$241.92	$246.76	$488.68	RR3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS, DELAMP KIT	14	672	1680	$80.64	$82.25	$162.89	$161.28	$164.51	$325.79		
27	5		OFFICE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00	WS	1
28	5		OFFICE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00	WS	1
29	5		OFFICE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00	WS	1
30	5		OFFICE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00	WS	1
31	5		PASSAGE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00		
32	5		OFFICE			2500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	590	$28.32	$28.89	$57.21	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$12.48	$12.73	$25.21	$15.84	$16.16	$32.00		
33	5		OFFICE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00		
34	5		OFFICE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00	WS	1
35	5		OFFICE			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$14.16	$14.44	$28.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00		
36	5		OFFICE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00	WS	1
37	5		MENS			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00	WS	1
38	5		SLOP SINK			500	1	2-13CP	(2) 13W COMPACT FLUORESCENT	30	15	$0.72	$3.67	$4.39	NDR	INSTALL LED DRUM FIX.	1	15	8	$0.36	$1.84	$2.20	$0.36	$1.84	$2.20	WS	1

ENHANCED LIGHTING SURVEY LOG

Project Name: 134 WEST EAGLE

Months: 12

Hours: 2500 **Multipliers:** **0.048** **10.2**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
39	5		WOMENS			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$14.16	$14.44	$28.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00		
40	5		STORAGE			500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	30	$1.42	$7.22	$8.64	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.62	$3.18	$3.81	$0.79	$4.04	$4.83		
41	5	511	STORAGE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00		
42	5	509	OFFICE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00		
43	5	507	OFFICE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00		
44	5	505	OFFICE			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$14.16	$14.44	$28.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00		
45	5		SLOP SINK			500	1	2-13CP	(2) 13W COMPACT FLUORESCENT	30	15	$0.72	$3.67	$4.39	NR	RETROFIT NOT REQUIRED	1						$0.72	$3.67	$4.39		
46	5	537	STORAGE			500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	30	$1.42	$7.22	$8.64	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.62	$3.18	$3.81	$0.79	$4.04	$4.83	WS	1
47	5	535	STORAGE			500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	30	$1.42	$7.22	$8.64	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.62	$3.18	$3.81	$0.79	$4.04	$4.83		
48	5	533	OFFICE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	NAW	REMOVE (1) FIX. & INSTALL NEW 4 LED' WRAP FIX.	1	36	90	$4.32	$4.41	$8.73	$2.76	$2.82	$5.58		
49	5	531	OFFICE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00		
50	5	529	OFFICE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00		
51	5	527	TRAINING			2500	6	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	354	885	$42.48	$43.33	$85.81	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	390	$18.72	$19.09	$37.81	$23.76	$24.24	$48.00		
52	5		PASSAGE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00		
53	5		OFFICE			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$14.16	$14.44	$28.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00		
54	5	512	OFFICE			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$14.16	$14.44	$28.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00	WS	1
55	5	510	OFFICE			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$14.16	$14.44	$28.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00	WS	1
56	5	508	OFFICE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00	WS	1
57	5	506	OFFICE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00	WS	1
58	5	504	OFFICE			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$14.16	$14.44	$28.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00	WS	1
59	5		HALL			3500	25	A2TT8	4' 2L TROFFER FIXTURE W/T8S	1475	5163	$247.80	$180.54	$428.34	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	25	650	2275	$109.20	$79.56	$188.76	$138.60	$100.98	$239.58		
60	4		OFFICE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00	WS	1
61	4		OFFICE			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$14.16	$14.44	$28.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00	WS	1
62	4		OFFICE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00	WS	1
63	4		OFFICE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00	WS	1
64	4		OPEN AREA			2500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	443	$21.24	$21.66	$42.90	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$9.36	$9.55	$18.91	$11.88	$12.12	$24.00	CP	1
65	4		OFFICE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00	WS	1
66	4		TOILET			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00	WS	1
67	4		OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.16	$14.44	$28.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00	WS	1
68	4		OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.16	$14.44	$28.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00	WS	1
69	4		OFFICE			2500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	590	$28.32	$28.89	$57.21	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$12.48	$12.73	$25.21	$15.84	$16.16	$32.00	CP	1
70	4		OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.16	$14.44	$28.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00	WS	1
71	4		STORAGE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00		
72	4		OPEN AREA			2500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	443	$21.24	$21.66	$42.90	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$9.36	$9.55	$18.91	$11.88	$12.12	$24.00	CP	1
73	4		BREAK AREA			2500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	590	$28.32	$28.89	$57.21	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$12.48	$12.73	$25.21	$15.84	$16.16	$32.00	WS	1
74	4		OFFICE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00	WS	1
75	4		TOILET			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00	WS	1
76	4		OFFICE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00	WS	1

ENHANCED LIGHTING SURVEY LOG

Project Name: 134 WEST EAGLE

Months: 12

Hours: 2500 **Multipliers:** **0.048** **10.2**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
77	4		OFFICE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00	WS	1
78	4		CONFERENCE			1000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	118	$5.66	$14.44	$20.11	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.50	$6.36	$8.86	$3.17	$8.08	$11.25		
79	4		STORAGE			500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	59	$2.83	$14.44	$17.28	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.25	$6.36	$7.61	$1.58	$8.08	$9.66	WS	1
80	4		OFFICE			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$14.16	$14.44	$28.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00	WS	1
81	4		OFFICE			2500	4	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	236	590	$28.32	$28.89	$57.21	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$12.48	$12.73	$25.21	$15.84	$16.16	$32.00	WS	1
82	4		STORAGE			500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	59	$2.83	$14.44	$17.28	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.25	$6.36	$7.61	$1.58	$8.08	$9.66		
83	4		STORAGE			500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	59	$2.83	$14.44	$17.28	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.25	$6.36	$7.61	$1.58	$8.08	$9.66	WS	1
84	4		SLOP SINK			500	1	23CP	23W COMPACT FLUORESCENT	25	13	$0.60	$3.06	$3.66	NDR	INSTALL LED DRUM FIX.	1	15	8	$0.36	$1.84	$2.20	$0.24	$1.22	$1.46		
85	4		OFFICE			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$14.16	$14.44	$28.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00	WS	1
86	4	416	ENFORCEMENT			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$14.16	$14.44	$28.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00		
87	4	404	OFFICE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00	WS	1
88	4	402	BREAK AREA			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00		
89	4		WARRANT			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$14.16	$14.44	$28.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00		
90	4		OPEN AREA			2500	23	A4TT8	4' 4L RECESSED TROFFER W/T8S	2576	6440	$309.12	$315.30	$624.42	RR3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS, DELAMP KIT	23	1104	2760	$132.48	$135.13	$267.61	$176.64	$180.17	$356.81		
91	4		WOMENS			2500	1	23CP	23W COMPACT FLUORESCENT	25	63	$3.00	$3.06	$6.06	NDR	INSTALL LED DRUM FIX.	1	15	38	$1.80	$1.84	$3.64	$1.20	$1.22	$2.42	WS	1
92	4		OFFICE			2500	3	A4TT8	4' 4L RECESSED TROFFER W/T8S	336	840	$40.32	$41.13	$81.45	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	3	78	195	$9.36	$9.55	$18.91	$30.96	$31.58	$62.54		
93	4		OFFICE			2500	2	A4TT8	4' 4L RECESSED TROFFER W/T8S	224	560	$26.88	$27.42	$54.30	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	130	$6.24	$6.36	$12.60	$20.64	$21.05	$41.69		
94	4		OFFICE			2500	4	A4TT8	4' 4L RECESSED TROFFER W/T8S	448	1120	$53.76	$54.84	$108.60	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	4	104	260	$12.48	$12.73	$25.21	$41.28	$42.11	$83.39		
95	4		SLOP SINK			1000	1	23CP	23W COMPACT FLUORESCENT	25	25	$1.20	$3.06	$4.26	NDR	INSTALL LED DRUM FIX.	1	15	15	$0.72	$1.84	$2.56	$0.48	$1.22	$1.70		
96	4		STORAGE			2500	3	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	177	443	$21.24	$21.66	$42.90	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$9.36	$9.55	$18.91	$11.88	$12.12	$24.00		
97	4		TOILET			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00	WS	1
98	4		STORAGE			500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	30	$1.42	$7.22	$8.64	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.62	$3.18	$3.81	$0.79	$4.04	$4.83		
99	4		OFFICE			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$14.16	$14.44	$28.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00		
100	4	405	OFFICE			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$14.16	$14.44	$28.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00		
101	4	407	OFFICE			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$14.16	$14.44	$28.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00	WS	1
102	4		HALL			3500	18	A2TT8	4' 2L TROFFER FIXTURE W/T8S	1062	3717	$178.42	$129.99	$308.40	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	18	468	1638	$78.62	$57.28	$135.91	$99.79	$72.71	$172.50		
103	3		THIRD FLOOR					NR	NO RETROFIT REQUIRED																		
104	2		PRINTING			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2ANL	RETRO (1) FIX. W/ (2) 4' LED LAMPS NEW LENS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00		
105	2		PRINTING			2500	6	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	354	885	$42.48	$43.33	$85.81	R2ANL	RETRO (1) FIX. W/ (2) 4' LED LAMPS NEW LENS	6	156	390	$18.72	$19.09	$37.81	$23.76	$24.24	$48.00		
106	2		PRINTING			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2ANL	RETRO (1) FIX. W/ (2) 4' LED LAMPS NEW LENS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00		
107	2		SIDE ROOM			2500	8	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	472	1180	$56.64	$57.77	$114.41	R2ANL	RETRO (1) FIX. W/ (2) 4' LED LAMPS NEW LENS	8	208	520	$24.96	$25.46	$50.42	$31.68	$32.31	$63.99		
108	2		SIDE ROOM			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$14.16	$14.44	$28.60	R2ANL	RETRO (1) FIX. W/ (2) 4' LED LAMPS NEW LENS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00		
109	2		MENS			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$14.16	$14.44	$28.60	R2ANL	RETRO (1) FIX. W/ (2) 4' LED LAMPS NEW LENS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00		
110	2	206	OFFICE			2500	3	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	177	443	$21.24	$21.66	$42.90	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$9.36	$9.55	$18.91	$11.88	$12.12	$24.00		
111	2	206																									
112	2	207	OFFICE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00		
113	2	208	OFFICE			2500	4	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	236	590	$28.32	$28.89	$57.21	R2ANL	RETRO (1) FIX. W/ (2) 4' LED LAMPS NEW LENS	4	104	260	$12.48	$12.73	$25.21	$15.84	$16.16	$32.00		
114	2		STORAGE			2500	4	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	236	590	$28.32	$28.89	$57.21	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$12.48	$12.73	$25.21	$15.84	$16.16	$32.00		

ENHANCED LIGHTING SURVEY LOG

Project Name: 134 WEST EAGLE

Months: 12

Hours: 2500 **Multipliers:** **0.048** **10.2**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
115	2		STORAGE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00		
116	2	213	BREAK ROOM			2500	4	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	236	590	$28.32	$28.89	$57.21	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$12.48	$12.73	$25.21	$15.84	$16.16	$32.00		
117	2		CIA			2500		NR	NO RETROFIT REQUIRED																		
118	2		PASSAGE			2500	1	23CP	23W COMPACT FLUORESCENT	25	63	$3.00	$3.06	$6.06	NDR	INSTALL LED DRUM FIX.	1	15	38	$1.80	$1.84	$3.64	$1.20	$1.22	$2.42		
119	2		BREAK AREA			2500	3	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	177	443	$21.24	$21.66	$42.90	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$9.36	$9.55	$18.91	$11.88	$12.12	$24.00		
120	2		PAINT			2500	3	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	177	443	$21.24	$21.66	$42.90	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$9.36	$9.55	$18.91	$11.88	$12.12	$24.00		
121	2		PAINT																								
122	2		STORAGE			500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	59	$2.83	$14.44	$17.28	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.25	$6.36	$7.61	$1.58	$8.08	$9.66		
123	2		ELECTRIC			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00		
124	2		OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$22.32	$22.77	$45.09	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	130	$6.24	$6.36	$12.60	$16.08	$16.40	$32.48		
125	2		HALL			3500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	413	$19.82	$14.44	$34.27	R2ANL	RETRO (1) FIX. W/ (2) 4' LED LAMPS NEW LENS	2	52	182	$8.74	$6.36	$15.10	$11.09	$8.08	$19.17		
126	2		STORAGE			1000	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	118	$5.66	$14.44	$20.11	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.50	$6.36	$8.86	$3.17	$8.08	$11.25		
127	2		STORAGE			1000	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	118	$5.66	$14.44	$20.11	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.50	$6.36	$8.86	$3.17	$8.08	$11.25		
128	2																										
129	2		SUPPLIES			2500	12	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	708	1770	$84.96	$86.66	$171.62	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	12	312	780	$37.44	$38.19	$75.63	$47.52	$48.47	$95.99		
130	2		SUPPLIES			2500	4	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	236	590	$28.32	$28.89	$57.21	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$12.48	$12.73	$25.21	$15.84	$16.16	$32.00		
131	2		PASSAGE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00		
132	2		STORAGE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00		
133	2		OFFICE			2500	1	A4WT8	4' 4L WRAP FIXTURE W/ 32W T8'S	112	280	$13.44	$13.71	$27.15	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	1	52	130	$6.24	$6.36	$12.60	$7.20	$7.34	$14.54		
134	2		HALL			3500	21	A2TT8	4' 2L TROFFER FIXTURE W/T8S	1239	4337	$208.15	$151.65	$359.81	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	21	546	1911	$91.73	$66.83	$158.56	$116.42	$84.82	$201.25		
135	2		WAITING			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$14.16	$14.44	$28.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00		
136	2		OFFICE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00		
137	2		OFFICE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00		
138	2		OFFICE			2500	4	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	236	590	$28.32	$28.89	$57.21	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$12.48	$12.73	$25.21	$15.84	$16.16	$32.00		
139	1		LOBBY			8760	4	A2BT8	4' 2L BOX FIXTURE W/T8S	236	2067	$99.23	$28.89	$128.12	R2ANL	RETRO (1) FIX. W/ (2) 4' LED LAMPS NEW LENS	4	104	911	$43.73	$12.73	$56.46	$55.50	$16.16	$71.66		
140	1		STORAGE			500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	59	$2.83	$14.44	$17.28	R2ANL	RETRO (1) FIX. W/ (2) 4' LED LAMPS NEW LENS	2	52	26	$1.25	$6.36	$7.61	$1.58	$8.08	$9.66		
141	1		STORAGE			500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	59	$2.83	$14.44	$17.28	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.25	$6.36	$7.61	$1.58	$8.08	$9.66		
142	1		RECEPTION			2500	7	A2TT8	4' 2L TROFFER FIXTURE W/T8S	413	1033	$49.56	$50.55	$100.11	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	7	182	455	$21.84	$22.28	$44.12	$27.72	$28.27	$55.99		
143	1		SLOP SINK			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.42	$7.22	$8.64	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.62	$3.18	$3.81	$0.79	$4.04	$4.83	WS	1
144	1		TOILET			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00	WS	1
145	1		OFFICE			1000	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	236	$11.33	$28.89	$40.21	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	104	$4.99	$12.73	$17.72	$6.34	$16.16	$22.49	CP	1
146	1		BACK AREA			2500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	590	$28.32	$28.89	$57.21	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$12.48	$12.73	$25.21	$15.84	$16.16	$32.00	CP	1
147	1		BACK AREA			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.16	$14.44	$28.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00	CP	1
148	1		SIDE ROOM			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.16	$14.44	$28.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00		
149	1		BACK EXIT			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00		
150	1		HALL			3500	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	1239	$59.47	$43.33	$102.80	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	546	$26.21	$19.09	$45.30	$33.26	$24.24	$57.50		
151	1		OFFICE			2500	1	A2BT8	4' 2L BOX FIXTURE W/T8S	59	148	$7.08	$7.22	$14.30	R2ANL	RETRO (1) FIX. W/ (2) 4' LED LAMPS NEW LENS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00		
152	1		STORAGE			1000	6	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	354	354	$16.99	$43.33	$60.32	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	156	$7.49	$19.09	$26.58	$9.50	$24.24	$33.74		

ENHANCED LIGHTING SURVEY LOG

Project Name: 134 WEST EAGLE

Months: 12

Hours: 2500 **Multipliers:** **0.048** **10.2**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
153	1		STAIRS			8760	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	517	$24.81	$7.22	$32.03	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$10.93	$3.18	$14.11	$13.88	$4.04	$17.92		
154	1		OFFICE			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$14.16	$14.44	$28.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00		
155	1		STORAGE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00		
156	1		HALL			3500	3	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	177	620	$29.74	$21.66	$51.40	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	273	$13.10	$9.55	$22.65	$16.63	$12.12	$28.75		
157	1		TOILET			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$14.16	$14.44	$28.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00		
158	1		PLUMBER OPEN			2500	10	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	590	1475	$70.80	$72.22	$143.02	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	10	260	650	$31.20	$31.82	$63.02	$39.60	$40.39	$79.99		
159	1		PLUMBER OFFICE			2500	1	A4WT8	4' 4L WRAP FIXTURE W/ 32W T8'S	112	280	$13.44	$13.71	$27.15	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	1	52	130	$6.24	$6.36	$12.60	$7.20	$7.34	$14.54		
160	1		HALL			3500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	413	$19.82	$14.44	$34.27	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	182	$8.74	$6.36	$15.10	$11.09	$8.08	$19.17		
161	1		OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.16	$14.44	$28.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00		
162	1		STORAGE			500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	30	$1.42	$7.22	$8.64	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.62	$3.18	$3.81	$0.79	$4.04	$4.83		
163	1		OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.16	$14.44	$28.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00		
164	1		STORAGE			500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	30	$1.42	$7.22	$8.64	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.62	$3.18	$3.81	$0.79	$4.04	$4.83		
165	1		TOILET			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$14.16	$14.44	$28.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.24	$6.36	$12.60	$7.92	$8.08	$16.00		
166	1		SLOP SINK			500	1	D2VT8	2' 2L VANITY	33	17	$0.79	$4.04	$4.83	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	1	18	9	$0.43	$2.20	$2.64	$0.36	$1.84	$2.20		
167	1		LITTLE STAIRS			8760	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	517	$24.81	$7.22	$32.03	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$10.93	$3.18	$14.11	$13.88	$4.04	$17.92		
168	1		STAIRS			8760	1	A1ST8	4' 1L STRIP FIXTURE W/ 32W T8'S	32	280	$13.46	$3.92	$17.37	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	114	$5.47	$1.59	$7.06	$7.99	$2.33	$10.31		
169	1		STAIRS			8760	8	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	472	4135	$198.47	$57.77	$256.24	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	1822	$87.46	$25.46	$112.92	$111.01	$32.31	$143.32		
170	1		STAIRS			8760	6	I60	60W INCANDESCENT	360	3154	$151.37	$44.06	$195.44	LED17WP	NEW 17W LED WALLPACK FIXTURE	6	102	894	$42.89	$12.48	$55.37	$108.48	$31.58	$140.06		
171	B		UPPER GARAGE			8760	12	MH250	250W METAL HALIDE	3540	31010	$1,488.50	$433.30	$1,921.80	NAI	REMOVE FIX. & INSTALL NEW 4 LED' INDUSTRIAL	12	432	3784	$181.65	$52.88	$234.52	$1,306.85	$380.42	$1,687.27		
172	B		UPPER GARAGE			8760	11	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	649	5685	$272.89	$79.44	$352.33	NAI	REMOVE FIX. & INSTALL NEW 4 LED' INDUSTRIAL	11	396	3469	$166.51	$48.47	$214.98	$106.38	$30.97	$137.35		
173	B		STORAGE			1000	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	59	$2.83	$7.22	$10.05	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.25	$3.18	$4.43	$1.58	$4.04	$5.62		
174	B		HALL			8760	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	1034	$49.62	$14.44	$64.06	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$21.86	$6.36	$28.23	$27.75	$8.08	$35.83		
175	B		TOILET			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.08	$7.22	$14.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.12	$3.18	$6.30	$3.96	$4.04	$8.00		
176	B		BREAK AREA			8760	6	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	354	3101	$148.85	$43.33	$192.18	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	1367	$65.59	$19.09	$84.69	$83.26	$24.24	$107.49		
177	B		SUPPLY ROOM			2500	3	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	177	443	$21.24	$21.66	$42.90	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$9.36	$9.55	$18.91	$11.88	$12.12	$24.00		
178	B		SUPPLY ROOM			2500	1	MH250	250W METAL HALIDE	295	738	$35.40	$36.11	$71.51	ELIM	REMOVE FIXTURE	1						$35.40	$36.11	$71.51		
179	B		BOILER			8760	8	MH250	250W METAL HALIDE	2360	20674	$992.33	$288.86	$1,281.20	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	8	800	7008	$336.38	$97.92	$434.30	$655.95	$190.94	$846.89		
180	B		BOILER			8760	24	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	1416	12404	$595.40	$173.32	$768.72	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	24	624	5466	$262.38	$76.38	$338.76	$333.02	$96.94	$429.96		
181	B		GARAGE			8760	3	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	177	1551	$74.42	$21.66	$96.09	NAI	REMOVE FIX. & INSTALL NEW 4 LED' INDUSTRIAL	3	108	946	$45.41	$13.22	$58.63	$29.01	$8.45	$37.46		
182	B		GARAGE			8760	10	HPS100	250W HIGH PRESSURE SODIUM	1250	10950	$525.60	$153.00	$678.60	NAI	REMOVE FIX. & INSTALL NEW 4 LED' INDUSTRIAL	10	360	3154	$151.37	$44.06	$195.44	$374.23	$108.94	$483.16		
183	B		GARAGE			8760	1	42CP	42W COMPACT FLUORESCENT	48	420	$20.18	$5.88	$26.06	NAT	REMOVE FIX. & INSTALL NEW 4' LED 2X4 TROFFER	1	36	315	$15.14	$4.41	$19.54	$5.05	$1.47	$6.51		
184	B		GARAGE			8760	1	I500	500W INCANDESCENT	500	4380	$210.24	$61.20	$271.44	LED50F	NEW 50W LED FLOOD	1	50	438	$21.02	$6.12	$27.14	$189.22	$55.08	$244.30		
185	B		GENERATOR			500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	59	$2.83	$14.44	$17.28	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.25	$6.36	$7.61	$1.58	$8.08	$9.66		
186	B		ELEVATOR MACHINE			500	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	30	$1.42	$7.22	$8.64	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.62	$3.18	$3.81	$0.79	$4.04	$4.83		
187	B		STORAGE			500	9	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	531	266	$12.74	$64.99	$77.74	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	9	234	117	$5.62	$28.64	$34.26	$7.13	$36.35	$43.48		
188			MISC FIXTURES			2500	20	A2TT8	4' 2L TROFFER FIXTURE W/T8S	1180	2950	$141.60	$144.43	$286.03	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	20	520	1300	$62.40	$63.65	$126.05	$79.20	$80.78	$159.98		
189			MISC FIXTURES			2500	20	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	1180	2950	$141.60	$144.43	$286.03	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	20	520	1300	$62.40	$63.65	$126.05	$79.20	$80.78	$159.98		
190			MISC FIXTURES			2500	10	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	590	1475	$70.80	$72.22	$143.02	NAI	REMOVE FIX. & INSTALL NEW 4 LED' INDUSTRIAL	10	360	900	$43.20	$44.06	$87.26	$27.60	$28.15	$55.75		

ENHANCED LIGHTING SURVEY LOG

Project Name: **134 WEST EAGLE**

Months: 12

Hours: 2500 **Multipliers:** **0.048** **10.2**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
191			MISC FIXTURES			2500	5	2-13CP	(2) 13W COMPACT FLUORESCENT	150	375	$18.00	$18.36	$36.36	NDR	INSTALL LED DRUM FIX.	5	75	188	$9.00	$9.18	$18.18	$9.00	$9.18	$18.18		
192			NEW LENS			2500	30								NL	NEW LENS	30	660	1650	$79.20	$80.78	$159.98	-$79.20	-$80.78	-$159.98		
							626.00	**Totals:**		43989	181285	$8,701.69	$5,384.25	$14,085.95			626.00	17903	66060	$3,171	$2,191	$5,362	$5,531	$3,193	$8,724		48
										KW	44							**KW**	18								

ENHANCED LIGHTING SURVEY LOG

Project Name: **120 WEST EAGLE**

Months: 12

Hours: 2500 **Multipliers:** **0.0485** **10.2**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
1	B		STORAGE			2500	4	A2ST8	4' 2L STRIP FIXTURES W/T8S	236	590	$28.62	$28.89	$57.50	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$12.61	$12.73	$25.34	$16.01	$16.16	$32.16		
2	B		STORAGE			2500	1	A4WT8	4' 4L WRAP FIXTURE W/ 32W T8'S	112	280	$13.58	$13.71	$27.29	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	1	72	180	$8.73	$8.81	$17.54	$4.85	$4.90	$9.75		
3	B		HALL			8760	5	A2ST8	4' 2L STRIP FIXTURES W/T8S	295	2584	$125.33	$36.11	$161.44	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	1139	$55.23	$15.91	$71.14	$70.10	$20.20	$90.30		
4	B		STORAGE			2500	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	148	$7.15	$7.22	$14.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.15	$3.18	$6.33	$4.00	$4.04	$8.04		
5	B		SLOP SINK			2500	1	23CP	23W COMPACT FLUORESCENT	25	63	$3.03	$3.06	$6.09	NDR	INSTALL LED DRUM FIX.	1	15	38	$1.82	$1.84	$3.65	$1.21	$1.22	$2.44		
6	B		WOMENS			2500	2	A2ST8	4' 2L STRIP FIXTURES W/T8S	118	295	$14.31	$14.44	$28.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.31	$6.36	$12.67	$8.00	$8.08	$16.08		
7	B		WOMENS			2500	1	23CP	23W COMPACT FLUORESCENT	25	63	$3.03	$3.06	$6.09	NDR	INSTALL LED DRUM FIX.	1	15	38	$1.82	$1.84	$3.65	$1.21	$1.22	$2.44		
8	B		OFFICE			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$14.31	$14.44	$28.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.31	$6.36	$12.67	$8.00	$8.08	$16.08		
9	B		OFFICE			2500	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	148	$7.15	$7.22	$14.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.15	$3.18	$6.33	$4.00	$4.04	$8.04		
10	B		SIDE			2500	2	A2ST8	4' 2L STRIP FIXTURES W/T8S	118	295	$14.31	$14.44	$28.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.31	$6.36	$12.67	$8.00	$8.08	$16.08		
11	B		STORAGE			500	1	A4BT8	4' 4L BOX FIXTURE W/T8S	112	56	$2.72	$13.71	$16.42	NAI	REMOVE FIX. & INSTALL NEW 4 LED' INDUSTRIAL	1	36	18	$0.87	$4.41	$5.28	$1.84	$9.30	$11.15		
12	B		STORAGE			2500	1	I60	60W INCANDESCENT	60	150	$7.28	$7.34	$14.62	NDR	INSTALL LED DRUM FIX.	1	15	38	$1.82	$1.84	$3.65	$5.46	$5.51	$10.96		
13	B		CHILLER			2500	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	148	$7.15	$7.22	$14.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.15	$3.18	$6.33	$4.00	$4.04	$8.04		
14	B		CHILLER			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$14.31	$14.44	$28.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.31	$6.36	$12.67	$8.00	$8.08	$16.08		
15	B		LUNCH			2500	6	A2ST8	4' 2L STRIP FIXTURES W/T8S	354	885	$42.92	$43.33	$86.25	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	390	$18.92	$19.09	$38.01	$24.01	$24.24	$48.24		
16	B		MENS			2500	1	D2VT8	2' 2L VANITY	33	83	$4.00	$4.04	$8.04	NDV	INSTALL 2' VANITY FIX.	1	22	55	$2.67	$2.69	$5.36	$1.33	$1.35	$2.68		
17	B		MENS			2500	2	A2ST8	4' 2L STRIP FIXTURES W/T8S	118	295	$14.31	$14.44	$28.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.31	$6.36	$12.67	$8.00	$8.08	$16.08		
18	B		MENS			2500	2	I52	52W INCANDESCENT	104	260	$12.61	$12.73	$25.34	NDR	INSTALL LED DRUM FIX.	2	30	75	$3.64	$3.67	$7.31	$8.97	$9.06	$18.03		
19	B		STORAGE			2500	2	A2ST8	4' 2L STRIP FIXTURES W/T8S	118	295	$14.31	$14.44	$28.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.31	$6.36	$12.67	$8.00	$8.08	$16.08		
20	B		STORAGE			2500	4	A2ST8	4' 2L STRIP FIXTURES W/T8S	236	590	$28.62	$28.89	$57.50	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$12.61	$12.73	$25.34	$16.01	$16.16	$32.16		
21	B		PASSAGE			2500	2	2-13CP	(2) 13W COMPACT FLUORESCENT	60	150	$7.28	$7.34	$14.62	NDR	INSTALL LED DRUM FIX.	2	30	75	$3.64	$3.67	$7.31	$3.64	$3.67	$7.31	CP	1
22	1		OFFICE			2500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	443	$21.46	$21.66	$43.13	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$9.46	$9.55	$19.00	$12.00	$12.12	$24.12	WS	1
23	1		OFFICE			2500	1	A4T	4' 4L RECESSED TROFFER	144	360	$17.46	$17.63	$35.09	RR3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS, DELAMP KIT	1	48	120	$5.82	$5.88	$11.70	$11.64	$11.75	$23.39	WS	1
24	1	103	COPY			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.15	$7.22	$14.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.15	$3.18	$6.33	$4.00	$4.04	$8.04	WS	1
25	1		OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.31	$14.44	$28.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.31	$6.36	$12.67	$8.00	$8.08	$16.08		
26	1		ELEVATOR			8760	2	A2ST8	4' 2L STRIP FIXTURES W/T8S	118	1034	$50.13	$14.44	$64.58	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$22.09	$6.36	$28.46	$28.04	$8.08	$36.12		
27	1		SLOP SINK			2500	1	23CP	23W COMPACT FLUORESCENT	25	63	$3.03	$3.06	$6.09	NDR	INSTALL LED DRUM FIX.	1	15	38	$1.82	$1.84	$3.65	$1.21	$1.22	$2.44		
28	1		WOMENS			2500	2	A2ST8	4' 2L STRIP FIXTURES W/T8S	118	295	$14.31	$14.44	$28.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.31	$6.36	$12.67	$8.00	$8.08	$16.08		
29	1		WOMENS			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.15	$7.22	$14.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.15	$3.18	$6.33	$4.00	$4.04	$8.04	WS	1
30	1		WOMENS			2500	1	I60	60W INCANDESCENT	60	150	$7.28	$7.34	$14.62	LED14CAN	NEW 14W LED CAN	1	14	35	$1.70	$1.71	$3.41	$5.58	$5.63	$11.21	INCL	1
31	1	107	OFFICE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.15	$7.22	$14.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.15	$3.18	$6.33	$4.00	$4.04	$8.04		
32	1	108	OFFICE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.15	$7.22	$14.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.15	$3.18	$6.33	$4.00	$4.04	$8.04	WS	1
33	1	109	OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.31	$14.44	$28.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.31	$6.36	$12.67	$8.00	$8.08	$16.08		
34	1	111	OFFICE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.15	$7.22	$14.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.15	$3.18	$6.33	$4.00	$4.04	$8.04		
35	1	104	TRAINING			2500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	443	$21.46	$21.66	$43.13	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$9.46	$9.55	$19.00	$12.00	$12.12	$24.12	WS	1
36	1		OFFICE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.15	$7.22	$14.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.15	$3.18	$6.33	$4.00	$4.04	$8.04	WS	1
37	1		OFFICE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.15	$7.22	$14.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.15	$3.18	$6.33	$4.00	$4.04	$8.04	WS	1
38	1		ELEVATOR			8760	2	A2ST8	4' 2L STRIP FIXTURES W/T8S	118	1034	$50.13	$14.44	$64.58	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$22.09	$6.36	$28.46	$28.04	$8.08	$36.12		

ENHANCED LIGHTING SURVEY LOG

Project Name: **120 WEST EAGLE**

Months: 12

Hours: 2500 **Multipliers:** **0.0485** **10.2**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
39	1		STAIRS			8760	1	18CP	15W COMPACT FLUORESCENT	20	175	$8.50	$2.45	$10.95	LED17WP	NEW 17W LED WALLPACK FIXTURE	1	17	149	$7.22	$2.08	$9.30	$1.27	$0.37	$1.64		
40	1		STAIRS			8760	1	I60	60W INCANDESCENT	60	526	$25.49	$7.34	$32.84	LED17WP	NEW 17W LED WALLPACK FIXTURE	1	17	149	$7.22	$2.08	$9.30	$18.27	$5.26	$23.53		
41	1		ENTRANCE			8760	1	23CP	23W COMPACT FLUORESCENT	25	219	$10.62	$3.06	$13.68	LED14CAN	NEW 14W LED CAN	1	14	123	$5.95	$1.71	$7.66	$4.67	$1.35	$6.02		
42	1		HALL			3500	7	A2TT8	4' 2L TROFFER FIXTURE W/T8S	413	1446	$70.11	$50.55	$120.66	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	7	182	637	$30.89	$22.28	$53.17	$39.21	$28.27	$67.49		
43	1		HALL			3500	5	D4TT8	2' 4L TROFFER W/T8S	330	1155	$56.02	$40.39	$96.41	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	5	90	315	$15.28	$11.02	$26.29	$40.74	$29.38	$70.12		
44	1		PASSAGE			3500	1	I60	60W INCANDESCENT	60	210	$10.19	$7.34	$17.53	LED14CAN	NEW 14W LED CAN	1	14	49	$2.38	$1.71	$4.09	$7.81	$5.63	$13.44		
45	2	210	OFFICE			2500	4	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	236	590	$28.62	$28.89	$57.50	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$12.61	$12.73	$25.34	$16.01	$16.16	$32.16		
46	2	200	OFFICE			2500	3	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	177	443	$21.46	$21.66	$43.13	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$9.46	$9.55	$19.00	$12.00	$12.12	$24.12		
47	2	201	OFFICE			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$14.31	$14.44	$28.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.31	$6.36	$12.67	$8.00	$8.08	$16.08		
48	2		OFFICE			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$14.31	$14.44	$28.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.31	$6.36	$12.67	$8.00	$8.08	$16.08		
49	2		OFFICE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.15	$7.22	$14.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.15	$3.18	$6.33	$4.00	$4.04	$8.04		
50	2		OFFICE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.15	$7.22	$14.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.15	$3.18	$6.33	$4.00	$4.04	$8.04		
51	2		MENS			2500	1	2-13CP	(2) 13W COMPACT FLUORESCENT	30	75	$3.64	$3.67	$7.31	NDR	INSTALL LED DRUM FIX.	1	15	38	$1.82	$1.84	$3.65	$1.82	$1.84	$3.65		
52	2		MENS			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.15	$7.22	$14.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.15	$3.18	$6.33	$4.00	$4.04	$8.04		
53	2	202	OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.31	$14.44	$28.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.31	$6.36	$12.67	$8.00	$8.08	$16.08		
54	2	203	OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.31	$14.44	$28.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.31	$6.36	$12.67	$8.00	$8.08	$16.08		
55	2	204	OFFICE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.15	$7.22	$14.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.15	$3.18	$6.33	$4.00	$4.04	$8.04		
56	2	205	OFFICE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.15	$7.22	$14.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.15	$3.18	$6.33	$4.00	$4.04	$8.04		
57	2	206	TELEPHONE CLOSET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.43	$7.22	$8.65	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.63	$3.18	$3.81	$0.80	$4.04	$4.84		
58	2	207	OFFICE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.15	$7.22	$14.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.15	$3.18	$6.33	$4.00	$4.04	$8.04		
59	2	208	STORAGE			500	1	A4TT8	4' 4L RECESSED TROFFER W/T8S	112	56	$2.72	$13.71	$16.42	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	13	$0.63	$3.18	$3.81	$2.09	$10.53	$12.61		
60	2	209	STORAGE			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.43	$7.22	$8.65	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.63	$3.18	$3.81	$0.80	$4.04	$4.84		
61	2		HALL			3500	7	A2TT8	4' 2L TROFFER FIXTURE W/T8S	413	1446	$70.11	$50.55	$120.66	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	7	182	637	$30.89	$22.28	$53.17	$39.21	$28.27	$67.49		
62	3							NR	NO RETROFIT REQUIRED																		
63	4	403	STORAGE			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.43	$7.22	$8.65	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.63	$3.18	$3.81	$0.80	$4.04	$4.84	WS	1
64	4	402	STORAGE			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.43	$7.22	$8.65	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.63	$3.18	$3.81	$0.80	$4.04	$4.84		
65	4	401	STORAGE			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.43	$7.22	$8.65	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.63	$3.18	$3.81	$0.80	$4.04	$4.84		
66	4		STORAGE			500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	59	$2.86	$14.44	$17.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.26	$6.36	$7.63	$1.60	$8.08	$9.68	WS	1
67	4		STORAGE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.15	$7.22	$14.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.15	$3.18	$6.33	$4.00	$4.04	$8.04	WS	1
68	4		TOILET			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.15	$7.22	$14.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.15	$3.18	$6.33	$4.00	$4.04	$8.04	WS	1
69	4		SLOP SINK			1000	1	2-13CP	(2) 13W COMPACT FLUORESCENT	30	30	$1.46	$3.67	$5.13	NDR	INSTALL LED DRUM FIX.	1	15	15	$0.73	$1.84	$2.56	$0.73	$1.84	$2.56		
70	4		WOMENS			2500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	443	$21.46	$21.66	$43.13	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$9.46	$9.55	$19.00	$12.00	$12.12	$24.12	CP	1
71	4		WOMENS			2500	1	D4TT8	2' 4L TROFFER W/T8S	66	165	$8.00	$8.08	$16.08	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	45	$2.18	$2.20	$4.39	$5.82	$5.88	$11.70	INCL	1
72	4	409	PASSAGE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.31	$14.44	$28.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.31	$6.36	$12.67	$8.00	$8.08	$16.08		
73	4		OFFICE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.15	$7.22	$14.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.15	$3.18	$6.33	$4.00	$4.04	$8.04		
74	4		OFFICE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.15	$7.22	$14.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.15	$3.18	$6.33	$4.00	$4.04	$8.04		
75	4	408	PASSAGE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.15	$7.22	$14.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.15	$3.18	$6.33	$4.00	$4.04	$8.04		
76	4		LUNCH			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.31	$14.44	$28.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.31	$6.36	$12.67	$8.00	$8.08	$16.08		

ENHANCED LIGHTING SURVEY LOG

Project Name: **120 WEST EAGLE**

Months: 12

Hours: 2500 **Multipliers:** **0.0485** **10.2**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
77	4		OFFICE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.15	$7.22	$14.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.15	$3.18	$6.33	$4.00	$4.04	$8.04		
78	4	401	OFFICE			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.43	$7.22	$8.65	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.63	$3.18	$3.81	$0.80	$4.04	$4.84	WS	1
79	4	406	OFFICE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.15	$7.22	$14.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.15	$3.18	$6.33	$4.00	$4.04	$8.04		
80	4	405	OFFICE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.15	$7.22	$14.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.15	$3.18	$6.33	$4.00	$4.04	$8.04		
81	4		HALL			3500	8	A2TT8	4' 2L TROFFER FIXTURE W/T8S	472	1652	$80.12	$57.77	$137.89	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	728	$35.31	$25.46	$60.77	$44.81	$32.31	$77.13		
82	5		HALL			3500	5	A2TT8	4' 2L TROFFER FIXTURE W/T8S	295	1033	$50.08	$36.11	$86.18	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	455	$22.07	$15.91	$37.98	$28.01	$20.20	$48.20		
83			STAIRS			8760	7	A2ST8	4' 2L STRIP FIXTURES W/T8S	413	3618	$175.47	$50.55	$226.02	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	7	182	1594	$77.32	$22.28	$99.60	$98.14	$28.27	$126.42		
84			STAIRS			8760	7	A2VT8	4' 2L VANITY W/ 32W T8'S	413	3618	$175.47	$50.55	$226.02	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	7	182	1594	$77.32	$22.28	$99.60	$98.14	$28.27	$126.42		
85			MISC FIXTURES			2500	20	A2TT8	4' 2L TROFFER FIXTURE W/T8S	1180	2950	$143.08	$144.43	$287.51	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	20	520	1300	$63.05	$63.65	$126.70	$80.03	$80.78	$160.81		
							188.00	**Totals:**		11051	37326	$1,810.29	$1,352.64	$3,162.93			188.00	4750	16162	$784	$581	$1,365	$1,026	$771	$1,798		17
										KW	11							**KW**	5								

ENHANCED LIGHTING SURVEY LOG

Project Name: **FIRE TRAINING**

Months: 12

Hours: 2500 **Multipliers:** **0.0509** **9.257**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
1			OPEN AREA			8760	3	D2BI	2' 2L FIXTURE W/ BIAX LAMPS	216	1892	$96.31	$23.99	$120.31	R2DT5	RETRO (1) FIX. W/ (2) 2' LED LAMPS	3	54	473	$24.08	$6.00	$30.08	$72.23	$18.00	$90.23		
2			OPEN AREA			2500		NR	NO RETROFIT REQUIRED																		
3			HIGH BAY			4000	21	MH1000	1000W METAL HALIDE	22575	90300	$4,596.27	$2,507.72	$7,103.99	LED400HB	INSTALL 400 W LED HIGHBAY	21	8400	33600	$1,710.24	$933.11	$2,643.35	$2,886.03	$1,574.62	$4,460.65		
4			TOWER			2000	20	I60	60W INCANDESCENT	1200	2400	$122.16	$133.30	$255.46	LED9SI	NEW 9W LED SCREW IN	20	180	360	$18.32	$20.00	$38.32	$103.84	$113.31	$217.14		
5			OPEN AREA			2500	13	A3TT8	4' 3L TROFFER W/ T8S	1209	3023	$153.85	$134.30	$288.15	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	13	507	1268	$64.52	$56.32	$120.84	$89.33	$77.98	$167.31	CP	2
6			OFFICE			2000	2	A3TT8	4' 3L TROFFER W/ T8S	186	372	$18.93	$20.66	$39.60	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	156	$7.94	$8.66	$16.60	$10.99	$12.00	$22.99	WS	1
7			OFFICE			2000	2	A3TT8	4' 3L TROFFER W/ T8S	186	372	$18.93	$20.66	$39.60	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	156	$7.94	$8.66	$16.60	$10.99	$12.00	$22.99	WS	1
8			OFFICE			2000	2	A3TT8	4' 3L TROFFER W/ T8S	186	372	$18.93	$20.66	$39.60	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	156	$7.94	$8.66	$16.60	$10.99	$12.00	$22.99	WS	1
9			STORAGE			2000	7	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	413	826	$42.04	$45.88	$87.92	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	7	182	364	$18.53	$20.22	$38.74	$23.52	$25.66	$49.18	CP	1
10			HALL			8760	2	42CP	42W COMPACT FLUORESCENT	96	841	$42.80	$10.66	$53.47	LED25CAN	NEW 25W LED CAN	2	50	438	$22.29	$5.55	$27.85	$20.51	$5.11	$25.62		
11			HALL			8760	20	D2BI	2' 2L FIXTURE W/ BIAX LAMPS	1440	12614	$642.07	$159.96	$802.03	R2DT5	RETRO (1) FIX. W/ (2) 2' LED LAMPS	20	360	3154	$160.52	$39.99	$200.51	$481.55	$119.97	$601.53		
12			SOFFITS			8760	12	A1ST8	4' 1L STRIP FIXTURE W/ 32W T8'S	384	3364	$171.22	$42.66	$213.88	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	12	156	1367	$69.56	$17.33	$86.89	$101.66	$25.33	$126.99		
13			SOFFITS			8760	12	C1ST8	3' 1L STRIP FIXTURE W/T8S	300	2628	$133.77	$33.33	$167.09	R1C	RETRO (1) FIX. W/ (1) 3' LED LAMP	12	168	1472	$74.91	$18.66	$93.57	$58.86	$14.66	$73.52		
14			CLASSROOM			2500	12	A3TT8	4' 3L TROFFER W/ T8S	1116	2790	$142.01	$123.97	$265.98	R3AD	RETRO (1) FIX. W/ (2) 4'DIMMABLE LED LAMPS	12	540	1350	$68.72	$59.99	$128.70	$73.30	$63.98	$137.28		
15			AUDITORIUM			3500	40	A3TT8	4' 3L TROFFER W/ T8S	3720	13020	$662.72	$413.23	$1,075.95	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	40	1560	5460	$277.91	$173.29	$451.21	$384.80	$239.94	$624.75		
16			AUDITORIUM			3500	2	D2BI	2' 2L FIXTURE W/ BIAX LAMPS	144	504	$25.65	$16.00	$41.65	R2DT5	RETRO (1) FIX. W/ (2) 2' LED LAMPS	2	36	126	$6.41	$4.00	$10.41	$19.24	$12.00	$31.24		
17			AUDITORIUM			3500	11	42CP	42W COMPACT FLUORESCENT	528	1848	$94.06	$58.65	$152.72	LED25CAN	NEW 25W LED CAN	11	275	963	$48.99	$30.55	$79.54	$45.07	$28.10	$73.18		
18			CLASSROOM			2500	12	A3TT8	4' 3L TROFFER W/ T8S	1116	2790	$142.01	$123.97	$265.98	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	12	468	1170	$59.55	$51.99	$111.54	$82.46	$71.98	$154.44	CP	2
19			WOMENS LOCKER			2500	3	D2BI	2' 2L FIXTURE W/ BIAX LAMPS	216	540	$27.49	$23.99	$51.48	R2DT5	RETRO (1) FIX. W/ (2) 2' LED LAMPS	3	54	135	$6.87	$6.00	$12.87	$20.61	$18.00	$38.61		
20			WOMENS LOCKER			2500	3	42CP	42W COMPACT FLUORESCENT	144	360	$18.32	$16.00	$34.32	LED25CAN	NEW 25W LED CAN	3	75	188	$9.54	$8.33	$17.88	$8.78	$7.66	$16.45		
21			WOMENS LOCKER			2500	3	A2ST8	4' 2L STRIP FIXTURES W/T8S	177	443	$22.52	$19.66	$42.19	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$9.93	$8.66	$18.59	$12.60	$11.00	$23.60		
22			MENS LOCKER			2500	3	D2BI	2' 2L FIXTURE W/ BIAX LAMPS	216	540	$27.49	$23.99	$51.48	R2DT5	RETRO (1) FIX. W/ (2) 2' LED LAMPS	3	54	135	$6.87	$6.00	$12.87	$20.61	$18.00	$38.61		
23			MENS LOCKER			2500	3	42CP	42W COMPACT FLUORESCENT	144	360	$18.32	$16.00	$34.32	LED25CAN	NEW 25W LED CAN	3	75	188	$9.54	$8.33	$17.88	$8.78	$7.66	$16.45		
24			MENS LOCKER			2500	2	A2ST8	4' 2L STRIP FIXTURES W/T8S	118	295	$15.02	$13.11	$28.12	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.62	$5.78	$12.39	$8.40	$7.33	$15.73		
25			KITCHEN			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$23.67	$20.66	$44.33	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	130	$6.62	$5.78	$12.39	$17.05	$14.89	$31.94	WS	1
26			MENS			3500	3	D2BI	2' 2L FIXTURE W/ BIAX LAMPS	216	756	$38.48	$23.99	$62.47	R2DT5	RETRO (1) FIX. W/ (2) 2' LED LAMPS	3	54	189	$9.62	$6.00	$15.62	$28.86	$18.00	$46.86	CP	1
27			MENS			3500	4	A2ST8	4' 2L STRIP FIXTURES W/T8S	236	826	$42.04	$26.22	$68.26	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	364	$18.53	$11.55	$30.08	$23.52	$14.66	$38.18	INCL	1
28			MENS			3500	1	42CP	42W COMPACT FLUORESCENT	48	168	$8.55	$5.33	$13.88	LED25CAN	NEW 25W LED CAN	1	25	88	$4.45	$2.78	$7.23	$4.10	$2.55	$6.65		
29			HOT WATER			500	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	30	$1.50	$6.55	$8.06	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.66	$2.89	$3.55	$0.84	$3.67	$4.51	WS	1
30			WOMENS			3500	3	D2BI	2' 2L FIXTURE W/ BIAX LAMPS	216	756	$38.48	$23.99	$62.47	R2DT5	RETRO (1) FIX. W/ (2) 2' LED LAMPS	3	54	189	$9.62	$6.00	$15.62	$28.86	$18.00	$46.86	CP	1
31			WOMENS			3500	4	A2ST8	4' 2L STRIP FIXTURES W/T8S	236	826	$42.04	$26.22	$68.26	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	364	$18.53	$11.55	$30.08	$23.52	$14.66	$38.18	INCL	1
32			WOMENS			3500	1	42CP	42W COMPACT FLUORESCENT	48	168	$8.55	$5.33	$13.88	LED25CAN	NEW 25W LED CAN	1	25	88	$4.45	$2.78	$7.23	$4.10	$2.55	$6.65		
33			ELECTRIC			500	2	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	118	59	$3.00	$13.11	$16.11	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.32	$5.78	$7.10	$1.68	$7.33	$9.01		
34		135	CLASSROOM			2500	12	A3TT8	4' 3L TROFFER W/ T8S	1116	2790	$142.01	$123.97	$265.98	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	12	468	1170	$59.55	$51.99	$111.54	$82.46	$71.98	$154.44		
35		135	CLASSROOM			2500		NR	NO RETROFIT REQUIRED																		
36		133	CLASSROOM			2500	12	A3TT8	4' 3L TROFFER W/ T8S	1116	2790	$142.01	$123.97	$265.98	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	12	468	1170	$59.55	$51.99	$111.54	$82.46	$71.98	$154.44		
37		133	CLASSROOM			2500		NR	NO RETROFIT REQUIRED																		
38			OFFICE			2500	8	A4TT8	4' 4L RECESSED TROFFER W/T8S	896	2240	$114.02	$99.53	$213.55	RR3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS, DELAMP KIT	8	384	960	$48.86	$42.66	$91.52	$65.15	$56.88	$122.03	CP	1

ENHANCED LIGHTING SURVEY LOG

Project Name: **FIRE TRAINING**

Months: 12

Hours: 2500 **Multipliers:** **0.0509** **9.257**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
39			OFFICE			2500	2	A4TT8	4' 4L RECESSED TROFFER W/T8S	224	560	$28.50	$24.88	$53.39	RR3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS, DELAMP KIT	2	96	240	$12.22	$10.66	$22.88	$16.29	$14.22	$30.51	WSDS	1
40			OFFICE			2500	6	A4TT8	4' 4L RECESSED TROFFER W/T8S	672	1680	$85.51	$74.65	$160.16	RR3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS, DELAMP KIT	6	288	720	$36.65	$31.99	$68.64	$48.86	$42.66	$91.52	CP	1
41			OFFICE			2500	2	A4TT8	4' 4L RECESSED TROFFER W/T8S	224	560	$28.50	$24.88	$53.39	RR3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS, DELAMP KIT	2	96	240	$12.22	$10.66	$22.88	$16.29	$14.22	$30.51	WSDS	1
42			OFFICE			2500	2	A4TT8	4' 4L RECESSED TROFFER W/T8S	224	560	$28.50	$24.88	$53.39	RR3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS, DELAMP KIT	2	96	240	$12.22	$10.66	$22.88	$16.29	$14.22	$30.51	CP	1
43			OFFICE			2500	2	A4TT8	4' 4L RECESSED TROFFER W/T8S	224	560	$28.50	$24.88	$53.39	RR3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS, DELAMP KIT	2	96	240	$12.22	$10.66	$22.88	$16.29	$14.22	$30.51	WSDS	1
44			OFFICE			2500	4	I60	60W INCANDESCENT	240	600	$30.54	$26.66	$57.20	LED25CAN	NEW 25W LED CAN	4	100	250	$12.73	$11.11	$23.83	$17.82	$15.55	$33.37		
45			STORAGE			2500	2	A4TT8	4' 4L RECESSED TROFFER W/T8S	224	560	$28.50	$24.88	$53.39	RR3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS, DELAMP KIT	2	96	240	$12.22	$10.66	$22.88	$16.29	$14.22	$30.51	WS	1
46			HAZMAT BUILDING			2500																					
47			HIGH BAY			1000	54	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	3186	3186	$162.17	$353.91	$516.08	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	54	1404	1404	$71.46	$155.96	$227.43	$90.70	$197.95	$288.66		
48			OFFICE			500	2	A3TT8	4' 3L TROFFER W/ T8S	186	93	$4.73	$20.66	$25.40	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	26	$1.32	$5.78	$7.10	$3.41	$14.89	$18.30		
49			RESTROOM			500	1	A3TT8	4' 3L TROFFER W/ T8S	93	47	$2.37	$10.33	$12.70	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	13	$0.66	$2.89	$3.55	$1.71	$7.44	$9.15	WS	1
50			ELECTRIC			500	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	30	$1.50	$6.55	$8.06	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.66	$2.89	$3.55	$0.84	$3.67	$4.51	WS	1
51			STORAGE			1000	6	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	354	354	$18.02	$39.32	$57.34	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	156	$7.94	$17.33	$25.27	$10.08	$21.99	$32.07		
52			EMS BUILDING			2500																					
53			STAGE			500	2	A3BT8	4' 3L BOX W/ T8S	186	93	$4.73	$20.66	$25.40	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	26	$1.32	$5.78	$7.10	$3.41	$14.89	$18.30		
54			TOILET			500	2	A3BT8	4' 3L BOX W/ T8S	186	93	$4.73	$20.66	$25.40	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	26	$1.32	$5.78	$7.10	$3.41	$14.89	$18.30		
55			TOILET			500	2	A3BT8	4' 3L BOX W/ T8S	186	93	$4.73	$20.66	$25.40	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	39	$1.99	$8.66	$10.65	$2.75	$12.00	$14.75		
56			HOT WATER			500	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	30	$1.50	$6.55	$8.06	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.66	$2.89	$3.55	$0.84	$3.67	$4.51	WS	1
57			HALL			1000	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	59	$3.00	$6.55	$9.56	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.32	$2.89	$4.21	$1.68	$3.67	$5.35		
58			STORAGE			1000	8	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	472	472	$24.02	$52.43	$76.46	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	208	$10.59	$23.11	$33.69	$13.44	$29.33	$42.76		
59			UPSTAIRS			1000	8	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	472	472	$24.02	$52.43	$76.46	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	208	$10.59	$23.11	$33.69	$13.44	$29.33	$42.76		
60			HIGH BAY			1000	24	A6HB	HIGH BAY FIX. W/ (6) 4' HO T8 LAMPS, HIGH POWER FACTOR EB	5376	5376	$273.64	$597.19	$870.83	R6A22	RETRO (1) FIX. W/ (6) 4' 22W LED LAMPS	24	3168	3168	$161.25	$351.91	$513.17	$112.39	$245.27	$357.66		
61			GARAGE			500	4	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	236	118	$6.01	$26.22	$32.22	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	52	$2.65	$11.55	$14.20	$3.36	$14.66	$18.02		
62			MISC FIXTURES			2500	5	D2BI	2' 2L FIXTURE W/ BIAX LAMPS	360	900	$45.81	$39.99	$85.80	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	5	90	225	$11.45	$10.00	$21.45	$34.36	$29.99	$64.35		
63			MISC FIXTURES			2500	10	A3TT8	4' 3L TROFFER W/ T8S	930	2325	$118.34	$103.31	$221.65	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	10	390	975	$49.63	$43.32	$92.95	$68.72	$59.99	$128.70		
64			MISC FIXTURES			2500	10	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	590	1475	$75.08	$65.54	$140.62	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	10	260	650	$33.09	$28.88	$61.97	$41.99	$36.66	$78.65		
							424.00	**Totals:**		55543	174661	$8,890.26	$6,169.94	$15,060.20			424.00	22568	67149	$3,418	$2,507	$5,925	$5,472	$3,663	$9,135		24
										KW	56							**KW**	23								

ENHANCED LIGHTING SURVEY LOG

Project Name: **FIRE TRAINING EXTERIOR**

Months: 5

Hours: 4200 **Multipliers:** **0.0509** **9.257**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	ProposedWatts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
1			EXTERIOR			4200	8	42CP	42W COMPACT FLUORESCENT	384	1613	$82.09	$17.77	$99.86	LED18SI	NEW 18W LED SCREW IN	8	144	605	$30.78	$6.67	$37.45	$51.31	$11.11	$62.42	
2			EXTERIOR			4200	4	MH150	150W METAL HALIDE	700	2940	$149.65	$32.40	$182.05	LED93CH	NEW 93W COBRA HEAD	4	372	1562	$79.53	$17.22	$96.74	$70.12	$15.18	$85.30	
3			EXTERIOR			1500	6	MH400	400W METAL HALIDE	2748	4122	$209.81	$127.19	$337.00	LED150F	NEW 150W LED FLOOD	6	900	1350	$68.72	$41.66	$110.37	$141.09	$85.53	$226.63	
4			EXTERIOR			4200	10	MH400	400W METAL HALIDE	4580	19236	$979.11	$211.99	$1,191.10	LED150SB	NEW 150W LED SHOEBOX FIXTURE	10	1500	6300	$320.67	$69.43	$390.10	$658.44	$142.56	$801.00	
5			EXTERIOR			4200	12	HPS150	150W HIGH PRESSURE SODIUM	2100	8820	$448.94	$97.20	$546.14	LED70WP	NEW 70W LED WALLPACK FIXTURE	12	840	3528	$179.58	$38.88	$218.45	$269.36	$58.32	$327.68	
6			EXTERIOR			4200	2	HPS100	250W HIGH PRESSURE SODIUM	250	1050	$53.45	$11.57	$65.02	LED45WP	NEW 45W LED WALLPACK FIXTURE	2	90	378	$19.24	$4.17	$23.41	$34.20	$7.41	$41.61	
7			EXTERIOR			4200	7	42CP	42W COMPACT FLUORESCENT	336	1411	$71.83	$15.55	$87.38	LED25CAN	NEW 25W LED CAN	7	175	735	$37.41	$8.10	$45.51	$34.42	$7.45	$41.87	
							49.00	**Totals:**		11098	39192	$1,994.87	$513.67	$2,508.54			49.00	4021	14458	$736	$186	$922	$1,259	$328	$1,587	
										KW	11							**KW**	4							

ENHANCED LIGHTING SURVEY LOG

Project Name: YOUTH DETENTION

Months: 12

Hours: 2500 **Multipliers:** **0.053** **10.229**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	Existing Watts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
1			OPEN AREA			2500	8	A3TT8	4' 3L TROFFER W/ T8S	744	1860	$98.58	$91.32	$189.90	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	8	312	780	$41.34	$38.30	$79.64	$57.24	$53.03	$110.27	
2			CONFERENCE			1500	6	A3TT8	4' 3L TROFFER W/ T8S	558	837	$44.36	$68.49	$112.85	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	6	234	351	$18.60	$28.72	$47.33	$25.76	$39.77	$65.53	
3			WOMENS			1000	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	60	$3.18	$7.36	$10.54	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	18	$0.95	$2.21	$3.16	$2.23	$5.16	$7.38	
4			WOMENS			1000	1	D1VT8	2' 1L VANITY FIXTURE W/T8	17	17	$0.90	$2.09	$2.99	R1D	RETRO (1) FIX. W/ (1) 2'LED LAMPS	1	9	9	$0.48	$1.10	$1.58	$0.42	$0.98	$1.41	
5			MENS			1000	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	60	$3.18	$7.36	$10.54	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	18	$0.95	$2.21	$3.16	$2.23	$5.16	$7.38	
6			MENS			1000	1	D1VT8	2' 1L VANITY FIXTURE W/T8	17	17	$0.90	$2.09	$2.99	R1D	RETRO (1) FIX. W/ (1) 2'LED LAMPS	1	9	9	$0.48	$1.10	$1.58	$0.42	$0.98	$1.41	
7			SERVER			500	2	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	118	59	$3.13	$14.48	$17.61	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.38	$6.38	$7.76	$1.75	$8.10	$9.85	
8			CAMERA			500	1	A3TT8	4' 3L TROFFER W/ T8S	93	47	$2.46	$11.42	$13.88	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	20	$1.03	$4.79	$5.82	$1.43	$6.63	$8.06	
9			OFFICE			1500	2	D3TUT8	2' 3L TROFFER W/U-TUBES	186	279	$14.79	$22.83	$37.62	RR3D	RETRO (1) FIX. W/ (3) 2' LED LAMPS, RELOCATION KIT	2	54	81	$4.29	$6.63	$10.92	$10.49	$16.20	$26.70	
10			OFFICE			1500	2	D3TUT8	2' 3L TROFFER W/U-TUBES	186	279	$14.79	$22.83	$37.62	RR3D	RETRO (1) FIX. W/ (3) 2' LED LAMPS, RELOCATION KIT	2	54	81	$4.29	$6.63	$10.92	$10.49	$16.20	$26.70	
11			OFFICE			1500	2	D3TUT8	2' 3L TROFFER W/U-TUBES	186	279	$14.79	$22.83	$37.62	RR3D	RETRO (1) FIX. W/ (3) 2' LED LAMPS, RELOCATION KIT	2	54	81	$4.29	$6.63	$10.92	$10.49	$16.20	$26.70	
12			OFFICE			1500	2	D3TUT8	2' 3L TROFFER W/U-TUBES	186	279	$14.79	$22.83	$37.62	RR3D	RETRO (1) FIX. W/ (3) 2' LED LAMPS, RELOCATION KIT	2	54	81	$4.29	$6.63	$10.92	$10.49	$16.20	$26.70	
13			OFFICE			1500	2	D3TUT8	2' 3L TROFFER W/U-TUBES	186	279	$14.79	$22.83	$37.62	RR3D	RETRO (1) FIX. W/ (3) 2' LED LAMPS, RELOCATION KIT	2	54	81	$4.29	$6.63	$10.92	$10.49	$16.20	$26.70	
14			OFFICE			1500	2	D3TUT8	2' 3L TROFFER W/U-TUBES	186	279	$14.79	$22.83	$37.62	RR3D	RETRO (1) FIX. W/ (3) 2' LED LAMPS, RELOCATION KIT	2	54	81	$4.29	$6.63	$10.92	$10.49	$16.20	$26.70	
15			STORAGE			1000	1	A3TT8	4' 3L TROFFER W/ T8S	93	93	$4.93	$11.42	$16.34	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	39	$2.07	$4.79	$6.85	$2.86	$6.63	$9.49	
16			KITCHEN			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.79	$22.83	$37.62	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$6.20	$9.57	$15.78	$8.59	$13.26	$21.84	
17			CONFERENCE			2000	6	A3TT8	4' 3L TROFFER W/ T8S	558	1116	$59.15	$68.49	$127.64	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	6	234	468	$24.80	$28.72	$53.53	$34.34	$39.77	$74.11	
18			HALL			3000	12	A3TT8	4' 3L TROFFER W/ T8S	1116	3348	$177.44	$136.99	$314.43	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	12	468	1404	$74.41	$57.45	$131.86	$103.03	$79.54	$182.57	
19			HALL			1500	2	D3TT8	2' 3L TROFFER W/ T8S	154	231	$12.24	$18.90	$31.15	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	2	36	54	$2.86	$4.42	$7.28	$9.38	$14.48	$23.87	
20			RECEPTION			6000	19	42CP	42W COMPACT FLUORESCENT	912	5472	$290.02	$111.95	$401.96	LED25CAN	NEW 25W LED CAN	19	475	2850	$151.05	$58.31	$209.36	$138.97	$53.64	$192.61	
21			ENTRANCE			8760	2	MH100	100W METAL HALIDE	250	2190	$116.07	$30.69	$146.76	LED22SI	NEW 22W LED SCREW IN	2	44	385	$20.43	$5.40	$25.83	$95.64	$25.29	$120.93	
22			WOMENS LOCKER			3500	3	D2TUT8	2' 2L TROFFER WT8/U-TUBES	180	630	$33.39	$22.09	$55.48	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	3	54	189	$10.02	$6.63	$16.65	$23.37	$15.47	$38.84	
23			WOMENS LOCKER			8760	3	D2TUT8	2' 2L TROFFER WT8/U-TUBES	180	1577	$83.57	$22.09	$105.67	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	3	54	473	$25.07	$6.63	$31.70	$58.50	$15.47	$73.97	
24			HALL			3500	3	A3TT8	4' 3L TROFFER W/ T8S	279	977	$51.75	$34.25	$86.00	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	410	$21.70	$14.36	$36.07	$30.05	$19.89	$49.94	
25			MENS LOCKER			8760	1	A3TT8	4' 3L TROFFER W/ T8S	93	815	$43.18	$11.42	$54.59	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	342	$18.11	$4.79	$22.89	$25.07	$6.63	$31.70	
26			MENS LOCKER			8760	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	526	$27.86	$7.36	$35.22	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	158	$8.36	$2.21	$10.57	$19.50	$5.16	$24.66	
27			MENS LOCKER			3500	7	D2TUT8	2' 2L TROFFER WT8/U-TUBES	420	1470	$77.91	$51.55	$129.46	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	7	126	441	$23.37	$15.47	$38.84	$54.54	$36.09	$90.62	
28			MENS LOCKER			3500	1	D1VT8	2' 1L VANITY FIXTURE W/T8	17	60	$3.15	$2.09	$5.24	R1D	RETRO (1) FIX. W/ (1) 2'LED LAMPS	1	9	32	$1.67	$1.10	$2.77	$1.48	$0.98	$2.47	
29			CLOSET			500	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	30	$1.59	$7.36	$8.95	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	9	$0.48	$2.21	$2.69	$1.11	$5.16	$6.27	
30			TOILET			3500	1	2-13CP	(2) 13W COMPACT FLUORESCENT	30	105	$5.57	$3.68	$9.25	LED6P-2	(2) LED 6 PIN LAMPS	1	12	42	$2.23	$1.47	$3.70	$3.34	$2.21	$5.55	
31			TOILET			3500	1	D1VT8	2' 1L VANITY FIXTURE W/T8	17	60	$3.15	$2.09	$5.24	R1D	RETRO (1) FIX. W/ (1) 2'LED LAMPS	1	9	32	$1.67	$1.10	$2.77	$1.48	$0.98	$2.47	
32			CLOSET			2000	1	A3TT8	4' 3L TROFFER W/ T8S	93	186	$9.86	$11.42	$21.27	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	52	$2.76	$3.19	$5.95	$7.10	$8.22	$15.33	
33			PASSAGE			2500	2	A3BT8	4' 3L BOX W/ T8S	186	465	$24.65	$22.83	$47.48	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	130	$6.89	$6.38	$13.27	$17.76	$16.45	$34.20	
34			VISITING			2500	5	A3BT8	4' 3L BOX W/ T8S	465	1163	$61.61	$57.08	$118.69	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	5	130	325	$17.23	$15.96	$33.18	$44.39	$41.12	$85.51	
35			PHONE			2500	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	150	$7.95	$7.36	$15.31	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	45	$2.39	$2.21	$4.59	$5.57	$5.16	$10.72	
36			CONFERENCE			2500	2	A3BT8	4' 3L BOX W/ T8S	186	465	$24.65	$22.83	$47.48	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	130	$6.89	$6.38	$13.27	$17.76	$16.45	$34.20	
37			CONFERENCE			2500	2	A3BT8	4' 3L BOX W/ T8S	186	465	$24.65	$22.83	$47.48	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	130	$6.89	$6.38	$13.27	$17.76	$16.45	$34.20	
38			CONFERENCE			2500	2	A3BT8	4' 3L BOX W/ T8S	186	465	$24.65	$22.83	$47.48	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	130	$6.89	$6.38	$13.27	$17.76	$16.45	$34.20	
39			CONFERENCE			2500	2	A3BT8	4' 3L BOX W/ T8S	186	465	$24.65	$22.83	$47.48	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	130	$6.89	$6.38	$13.27	$17.76	$16.45	$34.20	
40			CONFERENCE			2500	2	A3BT8	4' 3L BOX W/ T8S	186	465	$24.65	$22.83	$47.48	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	130	$6.89	$6.38	$13.27	$17.76	$16.45	$34.20	
41			SERVER			500	2	A3TT8	4' 3L TROFFER W/ T8S	186	93	$4.93	$22.83	$27.76	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	26	$1.38	$6.38	$7.76	$3.55	$16.45	$20.00	
42			OFFICE			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$12.32	$11.42	$23.74	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	98	$5.17	$4.79	$9.95	$7.16	$6.63	$13.78	
43		1	CAFETERIA			1000	4	A3TT8	4' 3L TROFFER W/ T8S	372	372	$19.72	$45.66	$65.38	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	156	$8.27	$19.15	$27.42	$11.45	$26.51	$37.96	

ENHANCED LIGHTING SURVEY LOG

Project Name: YOUTH DETENTION

Months: 12

Hours: 2500 **Multipliers:** **0.053** **10.229**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	Existing Watts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
44		2	CAFETERIA			1000	4	A3TT8	4' 3L TROFFER W/ T8S	372	372	$19.72	$45.66	$65.38	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	156	$8.27	$19.15	$27.42	$11.45	$26.51	$37.96	
45		3	CAFETERIA			1000	4	A3TT8	4' 3L TROFFER W/ T8S	372	372	$19.72	$45.66	$65.38	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	156	$8.27	$19.15	$27.42	$11.45	$26.51	$37.96	
46		4	CAFETERIA			1000	4	A3TT8	4' 3L TROFFER W/ T8S	372	372	$19.72	$45.66	$65.38	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	156	$8.27	$19.15	$27.42	$11.45	$26.51	$37.96	
47			RESTROOM			1000	1	2-13CP	(2) 13W COMPACT FLUORESCENT	30	30	$1.59	$3.68	$5.27	LED6P-2	(2) LED 6 PIN LAMPS	1	12	12	$0.64	$1.47	$2.11	$0.95	$2.21	$3.16	
48			RESTROOM			1000	1	D2VT8	2' 2L VANITY	33	33	$1.75	$4.05	$5.80	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	1	18	18	$0.95	$2.21	$3.16	$0.80	$1.84	$2.64	
49			KITCHEN			5000	13	A3TT8	4' 3L TROFFER W/ T8S	1209	6045	$320.39	$148.40	$468.79	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	13	338	1690	$89.57	$41.49	$131.06	$230.82	$106.91	$337.73	
50			HOODS			5000	4	A2RT8	4' 2L RECESSED FIXTURE W/T8S	236	1180	$62.54	$28.97	$91.51	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	520	$27.56	$12.77	$40.33	$34.98	$16.20	$51.18	
51			OFFICE			5000	1	A3TT8	4' 3L TROFFER W/ T8S	93	465	$24.65	$11.42	$36.06	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	130	$6.89	$3.19	$10.08	$17.76	$8.22	$25.98	
52			TOILET			5000	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	300	$15.90	$7.36	$23.26	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	90	$4.77	$2.21	$6.98	$11.13	$5.16	$16.29	
53			TOILET			5000	1	D1VT8	2' 1L VANITY FIXTURE W/T8	17	85	$4.51	$2.09	$6.59	R1D	RETRO (1) FIX. W/ (1) 2'LED LAMPS	1	9	45	$2.39	$1.10	$3.49	$2.12	$0.98	$3.10	
54			CLOSET			5000	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	300	$15.90	$7.36	$23.26	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	90	$4.77	$2.21	$6.98	$11.13	$5.16	$16.29	
55			HALL			3000	10	A3TT8	4' 3L TROFFER W/ T8S	930	2790	$147.87	$114.16	$262.03	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	10	260	780	$41.34	$31.91	$73.25	$106.53	$82.24	$188.77	
56			CLOSET			500	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	30	$1.56	$7.24	$8.81	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.69	$3.19	$3.88	$0.87	$4.05	$4.93	
57			ELECTRIC			500	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	30	$1.56	$7.24	$8.81	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.69	$3.19	$3.88	$0.87	$4.05	$4.93	
58			OFFICE			1500	3	A3TT8	4' 3L TROFFER W/ T8S	279	419	$22.18	$34.25	$56.43	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	3	78	117	$6.20	$9.57	$15.78	$15.98	$24.67	$40.65	
59			WAREHOUSE			1000	1	A3TT8	4' 3L TROFFER W/ T8S	93	93	$4.93	$11.42	$16.34	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	26	$1.38	$3.19	$4.57	$3.55	$8.22	$11.78	
60			HALL			8760	2	A3TT8	4' 3L TROFFER W/ T8S	186	1629	$86.36	$22.83	$109.19	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	456	$24.14	$6.38	$30.53	$62.21	$16.45	$78.66	
61			STORAGE			1500	3	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	177	266	$14.07	$21.73	$35.80	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	117	$6.20	$9.57	$15.78	$7.87	$12.15	$20.02	
62			LAUNDRY			8760	6	A3TT8	4' 3L TROFFER W/ T8S	558	4888	$259.07	$68.49	$327.56	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	6	156	1367	$72.43	$19.15	$91.58	$186.64	$49.34	$235.99	
63			TOILET			1500	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	90	$4.77	$7.36	$12.13	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	27	$1.43	$2.21	$3.64	$3.34	$5.16	$8.49	
64			TOILET			1500	1	D2VT8	2' 2L VANITY	33	50	$2.62	$4.05	$6.67	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	1	18	27	$1.43	$2.21	$3.64	$1.19	$1.84	$3.03	
65			OFFICE			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$12.32	$11.42	$23.74	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	65	$3.45	$3.19	$6.64	$8.88	$8.22	$17.10	
66			PUMP ROOM			4500	5	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	295	1328	$70.36	$36.21	$106.57	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	585	$31.01	$15.96	$46.96	$39.35	$20.25	$59.61	
67			LOADING DOCK			4500	4	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	236	1062	$56.29	$28.97	$85.25	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	468	$24.80	$12.77	$37.57	$31.48	$16.20	$47.68	
68			WAREHOUSE			4500	12	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	708	3186	$168.86	$86.91	$255.76	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	12	312	1404	$74.41	$38.30	$112.71	$94.45	$48.61	$143.05	
69			GREEN POD			500	2	D3TUT8	2' 3L TROFFER W/U-TUBES	186	93	$4.93	$22.83	$27.76	RR3D	RETRO (1) FIX. W/ (3) 2' LED LAMPS, RELOCATION KIT	2	54	27	$1.43	$6.63	$8.06	$3.50	$16.20	$19.70	
70			GREEN POD			2000	8	A3TT8	4' 3L TROFFER W/ T8S	744	1488	$78.86	$91.32	$170.19	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	8	312	624	$33.07	$38.30	$71.37	$45.79	$53.03	$98.82	HIGH CEILING
71			SLOP SINK			1000	1	2-13CP	(2) 13W COMPACT FLUORESCENT	30	30	$1.59	$3.68	$5.27	LED6P-2	(2) LED 6 PIN LAMPS	1	12	12	$0.64	$1.47	$2.11	$0.95	$2.21	$3.16	
72			TOILET			1000	1	2-13CP	(2) 13W COMPACT FLUORESCENT	30	30	$1.59	$3.68	$5.27	LED6P-2	(2) LED 6 PIN LAMPS	1	12	12	$0.64	$1.47	$2.11	$0.95	$2.21	$3.16	
73			TOILET			1000	1	D2VT8	2' 2L VANITY	33	33	$1.75	$4.05	$5.80	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	1	18	18	$0.95	$2.21	$3.16	$0.80	$1.84	$2.64	
74			SOFFIT			8760	5	2-13CP	(2) 13W COMPACT FLUORESCENT	150	1314	$69.64	$18.41	$88.05	LED6P-2	(2) LED 6 PIN LAMPS	5	60	526	$27.86	$7.36	$35.22	$41.79	$11.05	$52.83	
75			STORAGE			1000	2	D3TUT8	2' 3L TROFFER W/U-TUBES	186	186	$9.86	$22.83	$32.69	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	2	36	36	$1.91	$4.42	$6.33	$7.95	$18.41	$26.36	
76			CLOSET			1000	1	D3TUT8	2' 3L TROFFER W/U-TUBES	93	93	$4.93	$11.42	$16.34	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	18	$0.95	$2.21	$3.16	$3.98	$9.21	$13.18	
77			TOILET			500	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	30	$1.59	$7.36	$8.95	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	9	$0.48	$2.21	$2.69	$1.11	$5.16	$6.27	
78			TOILET			2500	1	D1VT8	2' 1L VANITY FIXTURE W/T8	17	43	$2.25	$2.09	$4.34	R1D	RETRO (1) FIX. W/ (1) 2'LED LAMPS	1	9	23	$1.19	$1.10	$2.30	$1.06	$0.98	$2.04	
79			CELLS			4760	8	A2BT8	4' 2L BOX FIXTURE W/T8S	472	2247	$119.08	$57.94	$177.01	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	990	$52.47	$25.53	$78.01	$66.60	$32.41	$99.01	
80			NIGHT LIGHTS			4000	8	7CP	7W COMPACT FLUORESCENT	72	288	$15.26	$8.84	$24.10	LED3	3W LED RETROFIT	8	24	96	$5.09	$2.95	$8.03	$10.18	$5.89	$16.07	
81			OFFICE			2000	1	A3TT8	4' 3L TROFFER W/ T8S	93	186	$9.86	$11.42	$21.27	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	52	$2.76	$3.19	$5.95	$7.10	$8.22	$15.33	
82			LIGHT BLUE POD			500	2	D3TUT8	2' 3L TROFFER W/U-TUBES	186	93	$4.93	$22.83	$27.76	RR3D	RETRO (1) FIX. W/ (3) 2' LED LAMPS, RELOCATION KIT	2	54	27	$1.43	$6.63	$8.06	$3.50	$16.20	$19.70	
83			LIGHT BLUE POD			2000	8	A3TT8	4' 3L TROFFER W/ T8S	744	1488	$78.86	$91.32	$170.19	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	8	312	624	$33.07	$38.30	$71.37	$45.79	$53.03	$98.82	HIGH CEILING
84			SLOP SINK			1000	1	2-13CP	(2) 13W COMPACT FLUORESCENT	30	30	$1.59	$3.68	$5.27	LED6P-2	(2) LED 6 PIN LAMPS	1	12	12	$0.64	$1.47	$2.11	$0.95	$2.21	$3.16	
85			TOILET			1000	1	2-13CP	(2) 13W COMPACT FLUORESCENT	30	30	$1.59	$3.68	$5.27	LED6P-2	(2) LED 6 PIN LAMPS	1	12	12	$0.64	$1.47	$2.11	$0.95	$2.21	$3.16	
86			TOILET			1000	1	D2VT8	2' 2L VANITY	33	33	$1.75	$4.05	$5.80	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	1	18	18	$0.95	$2.21	$3.16	$0.80	$1.84	$2.64	

ENHANCED LIGHTING SURVEY LOG

Project Name: YOUTH DETENTION

Months: 12

Hours: 2500 **Multipliers:** **0.053** **10.229**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	Existing Watts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
87			SOFFIT			8760	5	2-13CP	(2) 13W COMPACT FLUORESCENT	150	1314	$69.64	$18.41	$88.05	LED6P-2	(2) LED 6 PIN LAMPS	5	60	526	$27.86	$7.36	$35.22	$41.79	$11.05	$52.83	
88			STORAGE			1000	2	D3TUT8	2' 3L TROFFER W/U-TUBES	186	186	$9.86	$22.83	$32.69	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	2	36	36	$1.91	$4.42	$6.33	$7.95	$18.41	$26.36	
89			CLOSET			1000	1	D3TUT8	2' 3L TROFFER W/U-TUBES	93	93	$4.93	$11.42	$16.34	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	18	$0.95	$2.21	$3.16	$3.98	$9.21	$13.18	
90			TOILET			500	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	30	$1.59	$7.36	$8.95	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	9	$0.48	$2.21	$2.69	$1.11	$5.16	$6.27	
91			TOILET			2500	1	D1VT8	2' 1L VANITY FIXTURE W/T8	17	43	$2.25	$2.09	$4.34	R1D	RETRO (1) FIX. W/ (1) 2'LED LAMPS	1	9	23	$1.19	$1.10	$2.30	$1.06	$0.98	$2.04	
92			CELLS			4760	8	A2BT8	4' 2L BOX FIXTURE W/T8S	472	2247	$119.08	$57.94	$177.01	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	990	$52.47	$25.53	$78.01	$66.60	$32.41	$99.01	
93			NIGHT LIGHTS			4000	8	7CP	7W COMPACT FLUORESCENT	72	288	$15.26	$8.84	$24.10	LED3	3W LED RETROFIT	8	24	96	$5.09	$2.95	$8.03	$10.18	$5.89	$16.07	
94			OFFICE			2000	1	A3TT8	4' 3L TROFFER W/ T8S	93	186	$9.86	$11.42	$21.27	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	52	$2.76	$3.19	$5.95	$7.10	$8.22	$15.33	
95			CLOSET			1000	1	2-13CP	(2) 13W COMPACT FLUORESCENT	30	30	$1.59	$3.68	$5.27	LED6P-2	(2) LED 6 PIN LAMPS	1	12	12	$0.64	$1.47	$2.11	$0.95	$2.21	$3.16	
96			CLOSET			500	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	30	$1.56	$7.24	$8.81	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.69	$3.19	$3.88	$0.87	$4.05	$4.93	
97			STORAGE			500	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	30	$1.56	$7.24	$8.81	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.69	$3.19	$3.88	$0.87	$4.05	$4.93	
98			PASSAGE			500	1	A3TT8	4' 3L TROFFER W/ T8S	93	47	$2.46	$11.42	$13.88	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	13	$0.69	$3.19	$3.88	$1.78	$8.22	$10.00	
99			SCIENCE			3000	9	A3TT8	4' 3L TROFFER W/ T8S	837	2511	$133.08	$102.74	$235.82	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	9	351	1053	$55.81	$43.08	$98.89	$77.27	$59.66	$136.93	
100			MENS			1000	1	D2VT8	2' 2L VANITY	33	33	$1.75	$4.05	$5.80	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	1	18	18	$0.95	$2.21	$3.16	$0.80	$1.84	$2.64	
101			MENS			1000	1	2-13CP	(2) 13W COMPACT FLUORESCENT	30	30	$1.59	$3.68	$5.27	LED6P-2	(2) LED 6 PIN LAMPS	1	12	12	$0.64	$1.47	$2.11	$0.95	$2.21	$3.16	
102			WOMENS			1000	1	D2VT8	2' 2L VANITY	33	33	$1.75	$4.05	$5.80	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	1	18	18	$0.95	$2.21	$3.16	$0.80	$1.84	$2.64	
103			WOMENS			1000	1	2-13CP	(2) 13W COMPACT FLUORESCENT	30	30	$1.59	$3.68	$5.27	LED6P-2	(2) LED 6 PIN LAMPS	1	12	12	$0.64	$1.47	$2.11	$0.95	$2.21	$3.16	
104			ELECTRIC			500	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	30	$1.56	$7.24	$8.81	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.69	$3.19	$3.88	$0.87	$4.05	$4.93	
105			LIFE SKILLS			2500	12	A3TT8	4' 3L TROFFER W/ T8S	1116	2790	$147.87	$136.99	$284.86	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	12	468	1170	$62.01	$57.45	$119.46	$85.86	$79.54	$165.40	
106			KILN			500	1	A3TT8	4' 3L TROFFER W/ T8S	93	47	$2.46	$11.42	$13.88	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	13	$0.69	$3.19	$3.88	$1.78	$8.22	$10.00	
107			CLOSET			500	1	A3TT8	4' 3L TROFFER W/ T8S	93	47	$2.46	$11.42	$13.88	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	13	$0.69	$3.19	$3.88	$1.78	$8.22	$10.00	
108			DARK BLUE			3000	12	A3TT8	4' 3L TROFFER W/ T8S	1116	3348	$177.44	$136.99	$314.43	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	12	468	1404	$74.41	$57.45	$131.86	$103.03	$79.54	$182.57	
109			SOFFIT			8760	9	2-13CP	(2) 13W COMPACT FLUORESCENT	270	2365	$125.36	$33.14	$158.50	LED6P-2	(2) LED 6 PIN LAMPS	9	108	946	$50.14	$13.26	$63.40	$75.21	$19.89	$95.10	
110			CELLS			4760	16	A2VT8	4' 2L VANITY W/ 32W T8'S	944	4493	$238.15	$115.87	$354.03	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	16	416	1980	$104.95	$51.06	$156.01	$133.20	$64.81	$198.01	
111			NIGHT LIGHTS			4000	16	7CP	7W COMPACT FLUORESCENT	144	576	$30.53	$17.68	$48.20	LED3	3W LED RETROFIT	16	48	192	$10.18	$5.89	$16.07	$20.35	$11.78	$32.14	
112			TOILET			3500	4	2-13CP	(2) 13W COMPACT FLUORESCENT	120	420	$22.26	$14.73	$36.99	LED6P-2	(2) LED 6 PIN LAMPS	4	48	168	$8.90	$5.89	$14.80	$13.36	$8.84	$22.19	
113			TOILET			3500	4	D2VT8	2' 2L VANITY	132	462	$24.49	$16.20	$40.69	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	4	72	252	$13.36	$8.84	$22.19	$11.13	$7.36	$18.49	
114			STORAGE			2000	2	A3TT8	4' 3L TROFFER W/ T8S	186	372	$19.72	$22.83	$42.55	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	104	$5.51	$6.38	$11.89	$14.20	$16.45	$30.65	
115			GUARD AREA			4000	5	D2TUT8	2' 2L TROFFER WT8/U-TUBES	300	1200	$63.60	$36.82	$100.42	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	5	90	360	$19.08	$11.05	$30.13	$44.52	$25.78	$70.30	
116			OFFICE			2000	2	A3TT8	4' 3L TROFFER W/ T8S	186	372	$19.72	$22.83	$42.55	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	104	$5.51	$6.38	$11.89	$14.20	$16.45	$30.65	
117			TOILET			1000	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	60	$3.18	$7.36	$10.54	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	18	$0.95	$2.21	$3.16	$2.23	$5.16	$7.38	
118			TOILET			1000	1	2-13CP	(2) 13W COMPACT FLUORESCENT	30	30	$1.59	$3.68	$5.27	LED6P-2	(2) LED 6 PIN LAMPS	1	12	12	$0.64	$1.47	$2.11	$0.95	$2.21	$3.16	
119			SLOP SINK			1000	1	2-13CP	(2) 13W COMPACT FLUORESCENT	30	30	$1.59	$3.68	$5.27	LED6P-2	(2) LED 6 PIN LAMPS	1	12	12	$0.64	$1.47	$2.11	$0.95	$2.21	$3.16	
120			CONFERENCE			3000	1	A3TT8	4' 3L TROFFER W/ T8S	93	279	$14.79	$11.42	$26.20	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	78	$4.13	$3.19	$7.33	$10.65	$8.22	$18.88	
121			PIPE CHASE			500	3	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	177	89	$4.69	$21.73	$26.42	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	39	$2.07	$9.57	$11.64	$2.62	$12.15	$14.78	
122			ELECTRIC			500	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	30	$1.56	$7.24	$8.81	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.69	$3.19	$3.88	$0.87	$4.05	$4.93	
123			ENTRANCE			1000	1	A3TT8	4' 3L TROFFER W/ T8S	93	93	$4.93	$11.42	$16.34	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	26	$1.38	$3.19	$4.57	$3.55	$8.22	$11.78	
124			GYM			5000	12	MH400	400W METAL HALIDE	5496	27480	$1,456.44	$674.62	$2,131.06	LED200HB	INSTALL 200W LED HIGH BAY	12	2400	12000	$636.00	$294.60	$930.60	$820.44	$380.03	$1,200.47	
125			TOILET			500	1	D1VT8	2' 1L VANITY FIXTURE W/T8	17	9	$0.45	$2.09	$2.54	R1D	RETRO (1) FIX. W/ (1) 2'LED LAMPS	1	9	5	$0.24	$1.10	$1.34	$0.21	$0.98	$1.19	
126			TOILET			500	1	2-13CP	(2) 13W COMPACT FLUORESCENT	30	15	$0.80	$3.68	$4.48	LED6P-2	(2) LED 6 PIN LAMPS	1	12	6	$0.32	$1.47	$1.79	$0.48	$2.21	$2.69	
127			BOILER			1500	12	A3IT8	4' 3L INDUSTRIAL SHADE W/ 32W T8S	1116	1674	$88.72	$136.99	$225.71	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	12	468	702	$37.21	$57.45	$94.65	$51.52	$79.54	$131.06	
128			STAIRS			8760	1	D1VT8	2' 1L VANITY FIXTURE W/T8	17	149	$7.89	$2.09	$9.98	R1D	RETRO (1) FIX. W/ (1) 2'LED LAMPS	1	9	79	$4.18	$1.10	$5.28	$3.71	$0.98	$4.70	
129			ELECTRIC			500	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	30	$1.56	$7.24	$8.81	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.69	$3.19	$3.88	$0.87	$4.05	$4.93	

ENHANCED LIGHTING SURVEY LOG

Project Name: YOUTH DETENTION

Months: 12

Hours: 2500 **Multipliers:** **0.053** **10.229**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	Existing Watts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
130			PIPE CHASE			500	3	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	177	89	$4.69	$21.73	$26.42	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	39	$2.07	$9.57	$11.64	$2.62	$12.15	$14.78	
131			MATH			2500	9	A3TT8	4' 3L TROFFER W/ T8S	837	2093	$110.90	$102.74	$213.64	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	9	234	585	$31.01	$28.72	$59.73	$79.90	$74.02	$153.91	
132			CLOSET			500	1	A3TT8	4' 3L TROFFER W/ T8S	93	47	$2.46	$11.42	$13.88	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	13	$0.69	$3.19	$3.88	$1.78	$8.22	$10.00	
133			PASSAGE			5000	1	A3TT8	4' 3L TROFFER W/ T8S	93	465	$24.65	$11.42	$36.06	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	130	$6.89	$3.19	$10.08	$17.76	$8.22	$25.98	
134			PIPE CHASE			500	3	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	177	89	$4.69	$21.73	$26.42	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	39	$2.07	$9.57	$11.64	$2.62	$12.15	$14.78	
135			ELECTRIC			500	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	30	$1.56	$7.24	$8.81	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.69	$3.19	$3.88	$0.87	$4.05	$4.93	
136			OFFICE			1000	1	A3TT8	4' 3L TROFFER W/ T8S	93	93	$4.93	$11.42	$16.34	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	26	$1.38	$3.19	$4.57	$3.55	$8.22	$11.78	
137			SERVER			500	2	A3TT8	4' 3L TROFFER W/ T8S	186	93	$4.93	$22.83	$27.76	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	26	$1.38	$6.38	$7.76	$3.55	$16.45	$20.00	
138			HALL			8760	4	A3BT8	4' 3L BOX W/ T8S	372	3259	$172.71	$45.66	$218.37	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	4	104	911	$48.29	$12.77	$61.05	$124.43	$32.90	$157.32	
139			STORAGE			500	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	30	$1.59	$7.36	$8.95	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	9	$0.48	$2.21	$2.69	$1.11	$5.16	$6.27	
140			INTAKE			8760	6	A3TT8	4' 3L TROFFER W/ T8S	558	4888	$259.07	$68.49	$327.56	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	6	234	2050	$108.64	$28.72	$137.36	$150.43	$39.77	$190.20	
141			INTAKE			8760	4	A3TT8	4' 3L TROFFER W/ T8S	372	3259	$172.71	$45.66	$218.37	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	4	104	911	$48.29	$12.77	$61.05	$124.43	$32.90	$157.32	
142			STORAGE			8760	1	A3TT8	4' 3L TROFFER W/ T8S	93	815	$43.18	$11.42	$54.59	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	228	$12.07	$3.19	$15.26	$31.11	$8.22	$39.33	
143			STORAGE			8760	1	A3TT8	4' 3L TROFFER W/ T8S	93	815	$43.18	$11.42	$54.59	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	228	$12.07	$3.19	$15.26	$31.11	$8.22	$39.33	
144			STORAGE			8760	5	A3TT8	4' 3L TROFFER W/ T8S	465	4073	$215.89	$57.08	$272.97	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	5	130	1139	$60.36	$15.96	$76.31	$155.53	$41.12	$196.65	
145			PASSAGE			8760	1	A3TT8	4' 3L TROFFER W/ T8S	93	815	$43.18	$11.42	$54.59	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	228	$12.07	$3.19	$15.26	$31.11	$8.22	$39.33	
146			GARAGE			8760	2	MH400	400W METAL HALIDE	916	8024	$425.28	$112.44	$537.72	NAI	REMOVE FIX. & INSTALL NEW 4 LED' INDUSTRIAL	2	72	631	$33.43	$8.84	$42.27	$391.85	$103.60	$495.45	
147			TOILET			8760	1	2-13CP	(2) 13W COMPACT FLUORESCENT	30	263	$13.93	$3.68	$17.61	LED6P-2	(2) LED 6 PIN LAMPS	1	12	105	$5.57	$1.47	$7.04	$8.36	$2.21	$10.57	
148			TOILET			8760	1	D1VT8	2' 1L VANITY FIXTURE W/T8	17	149	$7.89	$2.09	$9.98	R1D	RETRO (1) FIX. W/ (1) 2'LED LAMPS	1	9	79	$4.18	$1.10	$5.28	$3.71	$0.98	$4.70	
149			LAUNDRY			8760	1	2-13CP	(2) 13W COMPACT FLUORESCENT	30	263	$13.93	$3.68	$17.61	LED6P-2	(2) LED 6 PIN LAMPS	1	12	105	$5.57	$1.47	$7.04	$8.36	$2.21	$10.57	
150			CELLS			4760	3	A2VT8	4' 2L VANITY W/ 32W T8'S	177	843	$44.65	$21.73	$66.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	371	$19.68	$9.57	$29.25	$24.98	$12.15	$37.13	
151			NIGHT LIGHTS			4000	3	7CP	7W COMPACT FLUORESCENT	27	108	$5.72	$3.31	$9.04	LED3	3W LED RETROFIT	3	9	36	$1.91	$1.10	$3.01	$3.82	$2.21	$6.03	
152			CONTROLL			8760	4	32CP	32W COMPACT FLUORESCENT	136	1191	$63.14	$16.69	$79.84	LED12P	LED 12 PIN LAMP	4	48	420	$22.29	$5.89	$28.18	$40.86	$10.80	$51.66	
153			CONTROLL			1000	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	60	$3.18	$7.36	$10.54	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	18	$0.95	$2.21	$3.16	$2.23	$5.16	$7.38	
154			HALL			8760	70	32CP	32W COMPACT FLUORESCENT	2380	20849	$1,104.99	$292.14	$1,397.13	LED12P	LED 12 PIN LAMP	70	840	7358	$390.00	$103.11	$493.10	$714.99	$189.03	$904.02	
155			HALL			8760	26	42CP	42W COMPACT FLUORESCENT	1248	10932	$579.42	$153.19	$732.61	LED25CAN	NEW 25W LED CAN	26	650	5694	$301.78	$79.79	$381.57	$277.64	$73.40	$351.04	
156			NURSES			2000	7	A3TT8	4' 3L TROFFER W/ T8S	651	1302	$69.01	$79.91	$148.91	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	7	182	364	$19.29	$22.34	$41.63	$49.71	$57.57	$107.28	
157			HALL			1000	10	A3TT8	4' 3L TROFFER W/ T8S	930	930	$49.29	$114.16	$163.45	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	10	260	260	$13.78	$31.91	$45.69	$35.51	$82.24	$117.75	
158			TOILET			1500	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	90	$4.77	$7.36	$12.13	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	27	$1.43	$2.21	$3.64	$3.34	$5.16	$8.49	
159			TOILET			1500	1	D2VT8	2' 2L VANITY	33	50	$2.62	$4.05	$6.67	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	1	18	27	$1.43	$2.21	$3.64	$1.19	$1.84	$3.03	
160			STORAGE			500	1	D3TUT8	2' 3L TROFFER W/U-TUBES	93	47	$2.46	$11.42	$13.88	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	9	$0.48	$2.21	$2.69	$1.99	$9.21	$11.19	
161			DRUGS			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$12.32	$11.42	$23.74	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	65	$3.45	$3.19	$6.64	$8.88	$8.22	$17.10	
162			CELLS			4000	2	A2VT8	4' 2L VANITY W/ 32W T8'S	118	472	$25.02	$14.48	$39.50	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	208	$11.02	$6.38	$17.41	$13.99	$8.10	$22.09	
163			OFFICE			2000	1	A3TT8	4' 3L TROFFER W/ T8S	93	186	$9.86	$11.42	$21.27	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	52	$2.76	$3.19	$5.95	$7.10	$8.22	$15.33	
164			RECORDS			2000	1	A3TT8	4' 3L TROFFER W/ T8S	93	186	$9.86	$11.42	$21.27	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	52	$2.76	$3.19	$5.95	$7.10	$8.22	$15.33	
165			OFFICE			2000	1	A3TT8	4' 3L TROFFER W/ T8S	93	186	$9.86	$11.42	$21.27	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	52	$2.76	$3.19	$5.95	$7.10	$8.22	$15.33	
166			OFFICE			2000	1	A3TT8	4' 3L TROFFER W/ T8S	93	186	$9.86	$11.42	$21.27	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	52	$2.76	$3.19	$5.95	$7.10	$8.22	$15.33	
167			KITCHEN			3500	2	A3TT8	4' 3L TROFFER W/ T8S	186	651	$34.50	$22.83	$57.33	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	182	$9.65	$6.38	$16.03	$24.86	$16.45	$41.31	
168			TOILET			1000	1	A3TT8	4' 3L TROFFER W/ T8S	93	93	$4.93	$11.42	$16.34	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	26	$1.38	$3.19	$4.57	$3.55	$8.22	$11.78	
169			TOILET			1000	1	D1VT8	2' 1L VANITY FIXTURE W/T8	17	17	$0.90	$2.09	$2.99	R1D	RETRO (1) FIX. W/ (1) 2'LED LAMPS	1	9	9	$0.48	$1.10	$1.58	$0.42	$0.98	$1.41	
170			EXAM			3500	1	A3TT8	4' 3L TROFFER W/ T8S	93	326	$17.25	$11.42	$28.67	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	91	$4.82	$3.19	$8.01	$12.43	$8.22	$20.65	
171			EXAM			3500	1	A3TT8	4' 3L TROFFER W/ T8S	93	326	$17.25	$11.42	$28.67	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	91	$4.82	$3.19	$8.01	$12.43	$8.22	$20.65	
172			HALL			8760	14	A3TT8	4' 3L TROFFER W/ T8S	1302	11406	$604.49	$159.82	$764.31	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	14	364	3189	$169.00	$44.68	$213.68	$435.49	$115.14	$550.63	

ENHANCED LIGHTING SURVEY LOG

Project Name: YOUTH DETENTION

Months: 12

Hours: 2500 **Multipliers:** **0.053** **10.229**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	Existing Watts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
173			OFFICE			2000	1	A3TT8	4' 3L TROFFER W/ T8S	93	186	$9.86	$11.42	$21.27	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	52	$2.76	$3.19	$5.95	$7.10	$8.22	$15.33	
174			OFFICE			2000	1	A3TT8	4' 3L TROFFER W/ T8S	93	186	$9.86	$11.42	$21.27	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	52	$2.76	$3.19	$5.95	$7.10	$8.22	$15.33	
175			OFFICE			2000	2	A3TT8	4' 3L TROFFER W/ T8S	186	372	$19.72	$22.83	$42.55	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	104	$5.51	$6.38	$11.89	$14.20	$16.45	$30.65	
176			OFFICE			2000	1	A3TT8	4' 3L TROFFER W/ T8S	93	186	$9.86	$11.42	$21.27	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	52	$2.76	$3.19	$5.95	$7.10	$8.22	$15.33	
177			OFFICE			2000	2	A3TT8	4' 3L TROFFER W/ T8S	186	372	$19.72	$22.83	$42.55	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	104	$5.51	$6.38	$11.89	$14.20	$16.45	$30.65	
178			OFFICE			2000	2	A3TT8	4' 3L TROFFER W/ T8S	186	372	$19.72	$22.83	$42.55	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	104	$5.51	$6.38	$11.89	$14.20	$16.45	$30.65	
179			OFFICE			2000	2	A3TT8	4' 3L TROFFER W/ T8S	186	372	$19.72	$22.83	$42.55	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	104	$5.51	$6.38	$11.89	$14.20	$16.45	$30.65	
180			STORAGE			500	2	A3TT8	4' 3L TROFFER W/ T8S	186	93	$4.93	$22.83	$27.76	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	26	$1.38	$6.38	$7.76	$3.55	$16.45	$20.00	
181			BREAK AREA			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.29	$45.66	$94.95	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	4	104	260	$13.78	$12.77	$26.55	$35.51	$32.90	$68.41	
182			MENS			1000	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	60	$3.18	$7.36	$10.54	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	18	$0.95	$2.21	$3.16	$2.23	$5.16	$7.38	
183			MENS			1000	1	D1VT8	2' 1L VANITY FIXTURE W/T8	17	17	$0.90	$2.09	$2.99	R1D	RETRO (1) FIX. W/ (1) 2'LED LAMPS	1	9	9	$0.48	$1.10	$1.58	$0.42	$0.98	$1.41	
184			WOMENS			1000	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	60	$3.18	$7.36	$10.54	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	18	$0.95	$2.21	$3.16	$2.23	$5.16	$7.38	
185			WOMENS			1000	1	D1VT8	2' 1L VANITY FIXTURE W/T8	17	17	$0.90	$2.09	$2.99	R1D	RETRO (1) FIX. W/ (1) 2'LED LAMPS	1	9	9	$0.48	$1.10	$1.58	$0.42	$0.98	$1.41	
186			COMPUTER			2500	9	A3TT8	4' 3L TROFFER W/ T8S	837	2093	$110.90	$102.74	$213.64	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	9	234	585	$31.01	$28.72	$59.73	$79.90	$74.02	$153.91	
187			OUTSIDE ROOM			1000	2	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	118	118	$6.25	$14.48	$20.74	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.76	$6.38	$9.14	$3.50	$8.10	$11.60	
188			ELECTRIC			1000	2	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	118	118	$6.25	$14.48	$20.74	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.76	$6.38	$9.14	$3.50	$8.10	$11.60	
189			YELLOW POD			2500		NR	NO RETROFIT REQUIRED																	REMODELED TO LED
190			ORANGE POD			2500		NR	NO RETROFIT REQUIRED																	REMODELED TO LED
191			MENS			1000	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	60	$3.18	$7.36	$10.54	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	18	$0.95	$2.21	$3.16	$2.23	$5.16	$7.38	
192			MENS			1000	1	D1VT8	2' 1L VANITY FIXTURE W/T8	17	17	$0.90	$2.09	$2.99	R1D	RETRO (1) FIX. W/ (1) 2'LED LAMPS	1	9	9	$0.48	$1.10	$1.58	$0.42	$0.98	$1.41	
193			WOMENS			1000	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	60	$3.18	$7.36	$10.54	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	18	$0.95	$2.21	$3.16	$2.23	$5.16	$7.38	
194			WOMENS			1000	1	D1VT8	2' 1L VANITY FIXTURE W/T8	17	17	$0.90	$2.09	$2.99	R1D	RETRO (1) FIX. W/ (1) 2'LED LAMPS	1	9	9	$0.48	$1.10	$1.58	$0.42	$0.98	$1.41	
195			STORAGE			500	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	30	$1.59	$7.36	$8.95	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	9	$0.48	$2.21	$2.69	$1.11	$5.16	$6.27	
196			STORAGE			500	1	A3TT8	4' 3L TROFFER W/ T8S	93	47	$2.46	$11.42	$13.88	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	13	$0.69	$3.19	$3.88	$1.78	$8.22	$10.00	
197			LIBRARY			2500	8	A3TT8	4' 3L TROFFER W/ T8S	744	1860	$98.58	$91.32	$189.90	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	8	208	520	$27.56	$25.53	$53.09	$71.02	$65.79	$136.81	
198			ENGLISH			2500	9	A3TT8	4' 3L TROFFER W/ T8S	837	2093	$110.90	$102.74	$213.64	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	9	234	585	$31.01	$28.72	$59.73	$79.90	$74.02	$153.91	
199			SOCIAL STUDIES			2500	9	A3TT8	4' 3L TROFFER W/ T8S	837	2093	$110.90	$102.74	$213.64	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	9	234	585	$31.01	$28.72	$59.73	$79.90	$74.02	$153.91	
200			BUILDING 5			500	12	B4I4T8	8' 4L INDUSTRIAL FIXTURE (4' TUBES),T8'S	1344	672	$35.62	$164.97	$200.59	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	12	864	432	$22.90	$106.05	$128.95	$12.72	$58.92	$71.64	
201			ELECTRIC			500	1	A4TT8	4' 4L RECESSED TROFFER W/T8S	112	56	$2.97	$13.75	$16.72	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	13	$0.69	$3.19	$3.88	$2.28	$10.56	$12.84	
202			HOT WATER			500	1	A3TT8	4' 3L TROFFER W/ T8S	93	47	$2.46	$11.42	$13.88	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	13	$0.69	$3.19	$3.88	$1.78	$8.22	$10.00	
203			TOILET			500	1	A3TT8	4' 3L TROFFER W/ T8S	93	47	$2.46	$11.42	$13.88	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	13	$0.69	$3.19	$3.88	$1.78	$8.22	$10.00	
204			KITCHEN			500	2	A4TT8	4' 4L RECESSED TROFFER W/T8S	224	112	$5.94	$27.50	$33.43	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	26	$1.38	$6.38	$7.76	$4.56	$21.11	$25.67	
205			STORAGE			500	2	A3TT8	4' 3L TROFFER W/ T8S	186	93	$4.93	$22.83	$27.76	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	26	$1.38	$6.38	$7.76	$3.55	$16.45	$20.00	
206			HALL			500	2	A3TT8	4' 3L TROFFER W/ T8S	186	93	$4.93	$22.83	$27.76	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	26	$1.38	$6.38	$7.76	$3.55	$16.45	$20.00	
207			PLANS			2500	2	A4TT8	4' 4L RECESSED TROFFER W/T8S	224	560	$29.68	$27.50	$57.18	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	130	$6.89	$6.38	$13.27	$22.79	$21.11	$43.90	
208			TOILET			500	1	A3TT8	4' 3L TROFFER W/ T8S	93	47	$2.46	$11.42	$13.88	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	13	$0.69	$3.19	$3.88	$1.78	$8.22	$10.00	
209			MISC FIXTURES			2500	10	A2TT8	4' 2L TROFFER FIXTURE W/T8S	590	1475	$78.18	$72.42	$150.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	10	260	650	$34.45	$31.91	$66.36	$43.73	$40.51	$84.23	
210			MISC FIXTURES			2500	5	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	295	738	$39.09	$36.21	$75.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	325	$17.23	$15.96	$33.18	$21.86	$20.25	$42.12	
211			MISC FIXTURES			2500	10	A3TT8	4' 3L TROFFER W/ T8S	930	2325	$123.23	$114.16	$237.38	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	10	260	650	$34.45	$31.91	$66.36	$88.78	$82.24	$171.02	
212			MISC FIXTURES			2500	5	A3TT8	4' 3L TROFFER W/ T8S	465	1163	$61.61	$57.08	$118.69	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	5	195	488	$25.84	$23.94	$49.77	$35.78	$33.14	$68.92	
						753.00		**Totals:**		57309	215186	$11,404.85	$7,034.57	$18,439.41			753.00	20808	77257	$4,095	$2,554	$6,649	$7,310	$4,480	$11,791	
										KW	57							**KW**	21							

ENHANCED LIGHTING SURVEY LOG

Project Name: **YOUTH DETENTION EXTERIOR**

Months: 5

Hours: 4200 **Multipliers:** **0.053** **10.229**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	ProposedWatts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
1			EXTERIOR			4200	11	MH400	400W METAL HALIDE	5038	21160	$1,121.46	$257.67	$1,379.13	LED150SB	NEW 150W LED SHOEBOX FIXTURE	11	1650	6930	$367.29	$84.39	$451.68	$754.17	$173.28	$927.45	
2			EXTERIOR			4200	2	HPS50	70W HIGH PRESSURE SODIUM	140	588	$31.16	$7.16	$38.32	LED17WP	NEW 17W LED WALLPACK FIXTURE	2	34	143	$7.57	$1.74	$9.31	$23.60	$5.42	$29.02	
3			EXTERIOR			4200	5	MH400	400W METAL HALIDE	2290	9618	$509.75	$117.12	$626.88	LED22SI	NEW 22W LED SCREW IN	5	110	462	$24.49	$5.63	$30.11	$485.27	$111.50	$596.76	
4			EXTERIOR			4200	47	MH100	100W METAL HALIDE	5875	24675	$1,307.78	$300.48	$1,608.25	LED45WP	NEW 45W LED WALLPACK FIXTURE	47	2115	8883	$470.80	$108.17	$578.97	$836.98	$192.31	$1,029.28	
5			ROOF			500	3	MH70	70W METAL HALIDE	285	143	$7.55	$14.58	$22.13	LED22SI	NEW 22W LED SCREW IN	3	66	33	$1.75	$3.38	$5.12	$5.80	$11.20	$17.00	
							68.00	**Totals:**		13628	56183	$2,977.70	$697.00	$3,674.71			68.00	3975	16451	$872	$203	$1,075	$2,106	$494	$2,600	
										KW	14							**KW**	4							

ENHANCED LIGHTING SURVEY LOG

Project Name: PUBLIC SAFETY

Months: 12

Hours: 2500 **Multipliers:** **0.051** **10.587**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	ProposedWatts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
1	5		LOBBY			8760	7	A2ST5	4' 2L STRIP FIXTURE W/T5S	413	3618	$184.51	$52.47	$236.98	R2AT5	RETRO (1) FIX. W/ (2) 4' T5 LED LAMPS	7	182	1594	$81.31	$23.12	$104.43	$103.20	$29.35	$132.55	
2	5		LOBBY			8760	1	2-26CP	(2) 26W COMPACT FLUORESCENT	56	491	$25.02	$7.11	$32.13	LED25CAN	NEW 25W LED CAN	1	25	219	$11.17	$3.18	$14.35	$13.85	$3.94	$17.79	
3	5		LOBBY			8760	5	26CP	26W COMPACT FLUORESCENT	140	1226	$62.55	$17.79	$80.33	LED10CAN	NEW 10W LED CAN	5	50	438	$22.34	$6.35	$28.69	$40.21	$11.43	$51.64	
4	5		HALL			4000	32	2-26CP	(2) 26W COMPACT FLUORESCENT	1792	7168	$365.57	$227.66	$593.23	LED25CAN	NEW 25W LED CAN	32	800	3200	$163.20	$101.64	$264.84	$202.37	$126.03	$328.40	
5	5		HALL			4000	14	26CP	26W COMPACT FLUORESCENT	392	1568	$79.97	$49.80	$129.77	LED10CAN	NEW 10W LED CAN	14	140	560	$28.56	$17.79	$46.35	$51.41	$32.02	$83.42	
6	5		JANITOR			500	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	30	$1.50	$7.50	$9.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.66	$3.30	$3.97	$0.84	$4.19	$5.03	
7	5	511B	LAB			2500	9	A4TT8	4' 4L RECESSED TROFFER W/T8S	1008	2520	$128.52	$128.06	$256.58	RR3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS, DELAMP KIT	9	351	878	$44.75	$44.59	$89.34	$83.77	$83.47	$167.24	
8	5		HALL			3500	3	2-26CP	(2) 26W COMPACT FLUORESCENT	168	588	$29.99	$21.34	$51.33	LED25CAN	NEW 25W LED CAN	3	75	263	$13.39	$9.53	$22.92	$16.60	$11.82	$28.42	
9	5	511C	LAB			1000	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	118	$6.02	$14.99	$21.01	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.65	$6.61	$9.26	$3.37	$8.38	$11.75	
10	5	511E	PASSAGE			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$35.57	$35.45	$71.02	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	3	78	195	$9.95	$9.91	$19.85	$25.63	$25.54	$51.16	
11	5	511E	LAB			2500	6	A2RT8	4' 2L RECESSED FIXTURE W/T8S	354	885	$45.14	$44.97	$90.11	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	390	$19.89	$19.82	$39.71	$25.25	$25.15	$50.40	
12	5	511F	LAB			2500	6	A2RT8	4' 2L RECESSED FIXTURE W/T8S	354	885	$45.14	$44.97	$90.11	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	390	$19.89	$19.82	$39.71	$25.25	$25.15	$50.40	
13	5	511H	LAB			1000	2	A3TT8	4' 3L TROFFER W/ T8S	186	186	$9.49	$23.63	$33.12	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	52	$2.65	$6.61	$9.26	$6.83	$17.02	$23.86	
14	5	511H	PICTURE AREA			1000	4	A4TT8	4' 4L RECESSED TROFFER W/T8S	448	448	$22.85	$56.92	$79.76	R4AD	RELAMP (1) FIX. W/ (4) DIMMABLE 4' LED LAMPS	4	240	240	$12.24	$30.49	$42.73	$10.61	$26.43	$37.03	
15	5	511K	LAB			1000	2	A3TT8	4' 3L TROFFER W/ T8S	186	186	$9.49	$23.63	$33.12	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	52	$2.65	$6.61	$9.26	$6.83	$17.02	$23.86	
16	5	511K	PICTURE AREA			1000	4	A4TT8	4' 4L RECESSED TROFFER W/T8S	448	448	$22.85	$56.92	$79.76	R4AD	RELAMP (1) FIX. W/ (4) DIMMABLE 4' LED LAMPS	4	240	240	$12.24	$30.49	$42.73	$10.61	$26.43	$37.03	
17	5	511M	LAB			1000	2	A4TT8	4' 4L RECESSED TROFFER W/T8S	224	224	$11.42	$28.46	$39.88	R4AD	RELAMP (1) FIX. W/ (4) DIMMABLE 4' LED LAMPS	2	120	120	$6.12	$15.25	$21.37	$5.30	$13.21	$18.52	
18	5	511N	STORAGE			500	1	A3TT8	4' 3L TROFFER W/ T8S	93	47	$2.37	$11.82	$14.19	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	13	$0.66	$3.30	$3.97	$1.71	$8.51	$10.22	
19	5	511P	STORAGE			1000	2	A4TT8	4' 4L RECESSED TROFFER W/T8S	224	224	$11.42	$28.46	$39.88	R4AD	RELAMP (1) FIX. W/ (4) DIMMABLE 4' LED LAMPS	2	120	120	$6.12	$15.25	$21.37	$5.30	$13.21	$18.52	
20	5	511Q	LAB			1000	2	A4TT8	4' 4L RECESSED TROFFER W/T8S	224	224	$11.42	$28.46	$39.88	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	2	144	144	$7.34	$18.29	$25.64	$4.08	$10.16	$14.24	
21	5	511	PASSAGE			1000	4	2-26CP	(2) 26W COMPACT FLUORESCENT	224	224	$11.42	$28.46	$39.88	LED25CAN	NEW 25W LED CAN	4	100	100	$5.10	$12.70	$17.80	$6.32	$15.75	$22.08	
22	5	511	OPEN AREA			2500	68	A2RT8	4' 2L RECESSED FIXTURE W/T8S	4012	10030	$511.53	$509.70	$1,021.23	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	68	1768	4420	$225.42	$224.61	$450.03	$286.11	$285.09	$571.20	
23	5		MENS			2500	9	A2ST8	4' 2L STRIP FIXTURES W/T8S	531	1328	$67.70	$67.46	$135.16	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	9	234	585	$29.84	$29.73	$59.56	$37.87	$37.73	$75.60	
24	5		WOMENS			2500	9	A2ST8	4' 2L STRIP FIXTURES W/T8S	531	1328	$67.70	$67.46	$135.16	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	9	234	585	$29.84	$29.73	$59.56	$37.87	$37.73	$75.60	
25	5	506	OPEN AREA			2500	10	A3TT8	4' 3L TROFFER W/ T8S	930	2325	$118.58	$118.15	$236.73	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	10	390	975	$49.73	$49.55	$99.27	$68.85	$68.60	$137.45	
26	5	506	OPEN AREA			2500	12	2-26CP	(2) 26W COMPACT FLUORESCENT	672	1680	$85.68	$85.37	$171.05	LED25CAN	NEW 25W LED CAN	12	300	750	$38.25	$38.11	$76.36	$47.43	$47.26	$94.69	
27	5	506A	OFFICE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$47.43	$47.26	$94.69	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$19.89	$19.82	$39.71	$27.54	$27.44	$54.98	
28	5		BREAK AREA			2500	9	2-26CP	(2) 26W COMPACT FLUORESCENT	504	1260	$64.26	$64.03	$128.29	LED25CAN	NEW 25W LED CAN	9	225	563	$28.69	$28.58	$57.27	$35.57	$35.45	$71.02	
29	5	506C	SERVER			500	2	A3TT8	4' 3L TROFFER W/ T8S	186	93	$4.74	$23.63	$28.37	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	39	$1.99	$9.91	$11.90	$2.75	$13.72	$16.47	
30	5	507	ELECTRIC			500	2	A3TT8	4' 3L TROFFER W/ T8S	186	93	$4.74	$23.63	$28.37	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	39	$1.99	$9.91	$11.90	$2.75	$13.72	$16.47	
31	5	508	COMMUNICATION			500	2	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	118	59	$3.01	$14.99	$18.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.33	$6.61	$7.93	$1.68	$8.38	$10.07	
32	5	509	OPEN AREA			2500	7	A3TT8	4' 3L TROFFER W/ T8S	651	1628	$83.00	$82.71	$165.71	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	7	273	683	$34.81	$34.68	$69.49	$48.20	$48.02	$96.22	
33	5	509	OPEN AREA			2500	8	2-26CP	(2) 26W COMPACT FLUORESCENT	448	1120	$57.12	$56.92	$114.04	LED25CAN	NEW 25W LED CAN	8	200	500	$25.50	$25.41	$50.91	$31.62	$31.51	$63.13	
34	5	509A	CONFERENCE			1000	9	2-26CP	(2) 26W COMPACT FLUORESCENT	504	504	$25.70	$64.03	$89.73	LED25CAN	NEW 25W LED CAN	9	225	225	$11.48	$28.58	$40.06	$14.23	$35.45	$49.67	
35	5	510	PASSAGE			1500	4	2-26CP	(2) 26W COMPACT FLUORESCENT	224	336	$17.14	$28.46	$45.59	LED25CAN	NEW 25W LED CAN	4	100	150	$7.65	$12.70	$20.35	$9.49	$15.75	$25.24	
36	5	510	OPEN AREA			2500	40	A2RT8	4' 2L RECESSED FIXTURE W/T8S	2360	5900	$300.90	$299.82	$600.72	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	40	1040	2600	$132.60	$132.13	$264.73	$168.30	$167.70	$336.00	
37	5	510	OPEN AREA			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$23.72	$23.63	$47.35	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	130	$6.63	$6.61	$13.24	$17.09	$17.02	$34.11	
38	5	510	OPEN AREA			2500	2	2-26CP	(2) 26W COMPACT FLUORESCENT	112	280	$14.28	$14.23	$28.51	LED25CAN	NEW 25W LED CAN	2	50	125	$6.38	$6.35	$12.73	$7.91	$7.88	$15.78	
39	5	510	PASSAGE			2500	3	2-26CP	(2) 26W COMPACT FLUORESCENT	168	420	$21.42	$21.34	$42.76	LED25CAN	NEW 25W LED CAN	3	75	188	$9.56	$9.53	$19.09	$11.86	$11.82	$23.67	
40	5		LAB			1000	6	A2RT8	4' 2L RECESSED FIXTURE W/T8S	354	354	$18.05	$44.97	$63.03	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	156	$7.96	$19.82	$27.77	$10.10	$25.15	$35.25	
41	5		COMPUTERS			2500	6	2-26CP	(2) 26W COMPACT FLUORESCENT	336	840	$42.84	$42.69	$85.53	LED25CAN	NEW 25W LED CAN	6	150	375	$19.13	$19.06	$38.18	$23.72	$23.63	$47.35	
42	5	510F	LAB			1000	4	A3TT8	4' 3L TROFFER W/ T8S	372	372	$18.97	$47.26	$66.23	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	4	104	104	$5.30	$13.21	$18.52	$13.67	$34.05	$47.72	
43	5	510G	LAB			2500	5	A3TT8	4' 3L TROFFER W/ T8S	465	1163	$59.29	$59.08	$118.36	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	5	195	488	$24.86	$24.77	$49.64	$34.43	$34.30	$68.73	

ENHANCED LIGHTING SURVEY LOG

Project Name: PUBLIC SAFETY

Months: 12

Hours: 2500 **Multipliers:** **0.051** **10.587**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	ProposedWatts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
44	5	510H	BALLISTIC TEST			1000	6	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	354	354	$18.05	$44.97	$63.03	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	156	$7.96	$19.82	$27.77	$10.10	$25.15	$35.25	
45	PH		PENT HOUSE			2500																				
46	PH		OUTSIDE			4200	19	A1ST5	4' 1L STRIP FIXTURE W/T5S	570	2394	$122.09	$72.42	$194.51	R1AT5	RETRO (1) FIX. W/ (1) 4' T5 LED LAMPS	19	247	1037	$52.91	$31.38	$84.29	$69.19	$41.04	$110.22	
47	PH		MECHANICAL			8760	44	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	2596	22741	$1,159.79	$329.81	$1,489.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	44	1144	10021	$511.09	$145.34	$656.43	$648.70	$184.47	$833.16	
48	PH		MECHANICAL			8760	4	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	236	2067	$105.44	$29.98	$135.42	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	911	$46.46	$13.21	$59.68	$58.97	$16.77	$75.74	
49	PH		MECHANICAL			8760	2	26CP	26W COMPACT FLUORESCENT	56	491	$25.02	$7.11	$32.13	LED8P	LED 8 PIN LAMP	2	16	140	$7.15	$2.03	$9.18	$17.87	$5.08	$22.95	
50	PH		AIR HANDELER			1000	10	I60	60W INCANDESCENT	600	600	$30.60	$76.23	$106.83	LED9SI	NEW 9W LED SCREW IN	10	90	90	$4.59	$11.43	$16.02	$26.01	$64.79	$90.80	
51	PH		MECHANICAL			1000	19	A2VTHO	4' 2L VANITY W/ HO LAMPS	1520	1520	$77.52	$193.11	$270.63	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	19	494	494	$25.19	$62.76	$87.95	$52.33	$130.35	$182.67	
52	PH		POWER AREA			8760	9	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	531	4652	$237.23	$67.46	$304.69	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	9	234	2050	$104.54	$29.73	$134.27	$132.69	$37.73	$170.42	
53	PH		HALL			8760	7	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	413	3618	$184.51	$52.47	$236.98	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	7	182	1594	$81.31	$23.12	$104.43	$103.20	$29.35	$132.55	
54	PH		ELEVATORS			8760	8	A2ST8	4' 2L STRIP FIXTURES W/T8S	472	4135	$210.87	$59.96	$270.84	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	1822	$92.93	$26.43	$119.35	$117.94	$33.54	$151.48	
55	4		LOBBY POLES			4200	28	A1ST8	4' 1L STRIP FIXTURE W/ 32W T8'S	896	3763	$191.92	$113.83	$305.75	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	28	364	1529	$77.97	$46.24	$124.21	$113.95	$67.59	$181.54	
56	4		ELEVATOR SOFFIT			8760	7	A2ST5	4' 2L STRIP FIXTURE W/T5S	413	3618	$184.51	$52.47	$236.98	R2AT5	RETRO (1) FIX. W/ (2) 4' T5 LED LAMPS	7	182	1594	$81.31	$23.12	$104.43	$103.20	$29.35	$132.55	
57	4		LOBBY			8760	2	2-26CP	(2) 26W COMPACT FLUORESCENT	112	981	$50.04	$14.23	$64.27	LED25CAN	NEW 25W LED CAN	2	50	438	$22.34	$6.35	$28.69	$27.70	$7.88	$35.58	
58	4		LOBBY			8760	5	26CP	26W COMPACT FLUORESCENT	140	1226	$62.55	$17.79	$80.33	LED10CAN	NEW 10W LED CAN	5	50	438	$22.34	$6.35	$28.69	$40.21	$11.43	$51.64	
59	4		JANITOR			1000	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	59	$3.01	$7.50	$10.50	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.33	$3.30	$4.63	$1.68	$4.19	$5.88	
60	4		MENS			2500	9	A2ST8	4' 2L STRIP FIXTURES W/T8S	531	1328	$67.70	$67.46	$135.16	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	9	234	585	$29.84	$29.73	$59.56	$37.87	$37.73	$75.60	
61	4		WOMENS			2500	9	A2ST8	4' 2L STRIP FIXTURES W/T8S	531	1328	$67.70	$67.46	$135.16	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	9	234	585	$29.84	$29.73	$59.56	$37.87	$37.73	$75.60	
62	4	417A	CONFERENCE			1500	8	A3RT8	4' 3L RECESSED FIXTURE W/T8S	744	1116	$56.92	$94.52	$151.44	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	8	312	468	$23.87	$39.64	$63.51	$33.05	$54.88	$87.93	
63	4		CONFERENCE			1000	10	2-26CP	(2) 26W COMPACT FLUORESCENT	560	560	$28.56	$71.14	$99.70	LED25CAN	NEW 25W LED CAN	10	250	250	$12.75	$31.76	$44.51	$15.81	$39.38	$55.19	ON DIMMERS
64	4		PASSAGE			1500	3	2-26CP	(2) 26W COMPACT FLUORESCENT	168	252	$12.85	$21.34	$34.20	LED25CAN	NEW 25W LED CAN	3	75	113	$5.74	$9.53	$15.27	$7.11	$11.82	$18.93	
65	4	417C	OFFICE			1500	9	A3TT8	4' 3L TROFFER W/ T8S	837	1256	$64.03	$106.34	$170.37	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	9	351	527	$26.85	$44.59	$71.44	$37.18	$61.74	$98.92	
66	4	417D	OFFICE			1500	4	A3TT8	4' 3L TROFFER W/ T8S	372	558	$28.46	$47.26	$75.72	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	234	$11.93	$19.82	$31.75	$16.52	$27.44	$43.97	
67	4	417E	OFFICE			1500	4	A3TT8	4' 3L TROFFER W/ T8S	372	558	$28.46	$47.26	$75.72	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	234	$11.93	$19.82	$31.75	$16.52	$27.44	$43.97	
68	4	417F	FILES			1500	4	A3TT8	4' 3L TROFFER W/ T8S	372	558	$28.46	$47.26	$75.72	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	234	$11.93	$19.82	$31.75	$16.52	$27.44	$43.97	
69	4		OPEN AREA			2500	4	2-26CP	(2) 26W COMPACT FLUORESCENT	224	560	$28.56	$28.46	$57.02	LED25CAN	NEW 25W LED CAN	4	100	250	$12.75	$12.70	$25.45	$15.81	$15.75	$31.56	
70	4		OPEN AREA			2500	9	A3TT8	4' 3L TROFFER W/ T8S	837	2093	$106.72	$106.34	$213.05	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	9	351	878	$44.75	$44.59	$89.34	$61.97	$61.74	$123.71	
71	4	415B	OPEN AREA			2500	6	A3TT8	4' 3L TROFFER W/ T8S	558	1395	$71.15	$70.89	$142.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	6	234	585	$29.84	$29.73	$59.56	$41.31	$41.16	$82.47	
72	4	415D	DRUG			1000	9	A3TT8	4' 3L TROFFER W/ T8S	837	837	$42.69	$106.34	$149.02	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	9	234	234	$11.93	$29.73	$41.66	$30.75	$76.61	$107.36	
73	4	415	STORAGE			1000	2	A4TT8	4' 4L RECESSED TROFFER W/T8S	224	224	$11.42	$28.46	$39.88	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	2	144	144	$7.34	$18.29	$25.64	$4.08	$10.16	$14.24	
74	4	415C	STORAGE			1000	2	A4TT8	4' 4L RECESSED TROFFER W/T8S	224	224	$11.42	$28.46	$39.88	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	52	$2.65	$6.61	$9.26	$8.77	$21.85	$30.62	
75	4	415D	REFRIGERATION			1000	2	A3TT8	4' 3L TROFFER W/ T8S	186	186	$9.49	$23.63	$33.12	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	52	$2.65	$6.61	$9.26	$6.83	$17.02	$23.86	
76	4	415F	STORAGE			1000	2	A3TT8	4' 3L TROFFER W/ T8S	186	186	$9.49	$23.63	$33.12	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	52	$2.65	$6.61	$9.26	$6.83	$17.02	$23.86	
77	4	4156	STORAGE			1000	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	354	$18.05	$44.97	$63.03	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	156	$7.96	$19.82	$27.77	$10.10	$25.15	$35.25	
78	4		HALL			3500	7	2-26CP	(2) 26W COMPACT FLUORESCENT	392	1372	$69.97	$49.80	$119.77	LED25CAN	NEW 25W LED CAN	7	175	613	$31.24	$22.23	$53.47	$38.73	$27.57	$66.30	
79	4	414A	STORAGE			2000	1	A3TT8	4' 3L TROFFER W/ T8S	93	186	$9.49	$11.82	$21.30	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	52	$2.65	$3.30	$5.96	$6.83	$8.51	$15.35	
80	4		HALL			3500	7	2-26CP	(2) 26W COMPACT FLUORESCENT	392	1372	$69.97	$49.80	$119.77	LED25CAN	NEW 25W LED CAN	7	175	613	$31.24	$22.23	$53.47	$38.73	$27.57	$66.30	
81	4	414B	CHEMISTRY			1500	12	A2RT8	4' 2L RECESSED FIXTURE W/T8S	708	1062	$54.16	$89.95	$144.11	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	12	312	468	$23.87	$39.64	$63.51	$30.29	$50.31	$80.60	
82	4	414D	CHEMISTRY			2500	60	A2RT8	4' 2L RECESSED FIXTURE W/T8S	3540	8850	$451.35	$449.74	$901.09	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	60	1560	3900	$198.90	$198.19	$397.09	$252.45	$251.55	$504.00	
83	4	414D	CHEMISTRY			2500	7	A3TT8	4' 3L TROFFER W/ T8S	651	1628	$83.00	$82.71	$165.71	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	7	273	683	$34.81	$34.68	$69.49	$48.20	$48.02	$96.22	
84	4	414C	CHEMISTRY			1500	10	A2RT8	4' 2L RECESSED FIXTURE W/T8S	590	885	$45.14	$74.96	$120.09	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	10	260	390	$19.89	$33.03	$52.92	$25.25	$41.92	$67.17	
85	4	412	OPEN AREA			2500	7	A3TT8	4' 3L TROFFER W/ T8S	651	1628	$83.00	$82.71	$165.71	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	7	273	683	$34.81	$34.68	$69.49	$48.20	$48.02	$96.22	
86	4	412	OPEN AREA			2500	7	2-26CP	(2) 26W COMPACT FLUORESCENT	392	980	$49.98	$49.80	$99.78	LED25CAN	NEW 25W LED CAN	7	175	438	$22.31	$22.23	$44.55	$27.67	$27.57	$55.24	

ENHANCED LIGHTING SURVEY LOG

Project Name: PUBLIC SAFETY

Months: 12

Hours: 2500 **Multipliers:** **0.051** **10.587**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	ProposedWatts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
87	4	412A	CONFERENCE			1000	9	2-26CP	(2) 26W COMPACT FLUORESCENT	504	504	$25.70	$64.03	$89.73	LED25CAN	NEW 25W LED CAN	9	225	225	$11.48	$28.58	$40.06	$14.23	$35.45	$49.67	
88	4		HALL			3500	13	2-26CP	(2) 26W COMPACT FLUORESCENT	728	2548	$129.95	$92.49	$222.44	LED25CAN	NEW 25W LED CAN	13	325	1138	$58.01	$41.29	$99.30	$71.94	$51.20	$123.13	
89	4		HALL			3500	4	2-26CP	(2) 26W COMPACT FLUORESCENT	224	784	$39.98	$28.46	$68.44	LED25CAN	NEW 25W LED CAN	4	100	350	$17.85	$12.70	$30.55	$22.13	$15.75	$37.89	
90	4		COMMUNICATION			1000	2	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	118	118	$6.02	$14.99	$21.01	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.65	$6.61	$9.26	$3.37	$8.38	$11.75	
91	4		ELECTRIC			1000	2	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	118	118	$6.02	$14.99	$21.01	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.65	$6.61	$9.26	$3.37	$8.38	$11.75	
92	4	407G	OFFICE			1500	2	A4TT8	4' 4L RECESSED TROFFER W/T8S	224	336	$17.14	$28.46	$45.59	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	2	144	216	$11.02	$18.29	$29.31	$6.12	$10.16	$16.28	
93	4		STORAGE			500	1	A4TT8	4' 4L RECESSED TROFFER W/T8S	112	56	$2.86	$14.23	$17.08	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	1	72	36	$1.84	$9.15	$10.98	$1.02	$5.08	$6.10	
94	4		OPEN AREA			2500	29	A3TT8	4' 3L TROFFER W/ T8S	2697	6743	$343.87	$342.64	$686.51	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	29	1131	2828	$144.20	$143.69	$287.89	$199.67	$198.95	$398.62	
95	4		OPEN AREA			2500	3	A4TT8	4' 4L RECESSED TROFFER W/T8S	336	840	$42.84	$42.69	$85.53	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	3	216	540	$27.54	$27.44	$54.98	$15.30	$15.25	$30.55	
96	4		OPEN AREA			2500	4	2-26CP	(2) 26W COMPACT FLUORESCENT	224	560	$28.56	$28.46	$57.02	LED25CAN	NEW 25W LED CAN	4	100	250	$12.75	$12.70	$25.45	$15.81	$15.75	$31.56	
97	4	407A	OFFICE			1000	2	A3TT8	4' 3L TROFFER W/ T8S	186	186	$9.49	$23.63	$33.12	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	78	$3.98	$9.91	$13.89	$5.51	$13.72	$19.23	
98	3		ELEVATOR LOBBY			8760	7	A2ST5	4' 2L STRIP FIXTURE W/T5S	413	3618	$184.51	$52.47	$236.98	R2AT5	RETRO (1) FIX. W/ (2) 4' T5 LED LAMPS	7	182	1594	$81.31	$23.12	$104.43	$103.20	$29.35	$132.55	
99	3		ELEVATOR LOBBY			8760	1	2-26CP	(2) 26W COMPACT FLUORESCENT	56	491	$25.02	$7.11	$32.13	LED25CAN	NEW 25W LED CAN	1	25	219	$11.17	$3.18	$14.35	$13.85	$3.94	$17.79	
100	3		ELEVATOR LOBBY			8760	4	26CP	26W COMPACT FLUORESCENT	112	981	$50.04	$14.23	$64.27	LED10CAN	NEW 10W LED CAN	4	40	350	$17.87	$5.08	$22.95	$32.17	$9.15	$41.31	
101	3	302	JANITOR			1000	1	A3TT8	4' 3L TROFFER W/ T8S	93	93	$4.74	$11.82	$16.56	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	26	$1.33	$3.30	$4.63	$3.42	$8.51	$11.93	
102	3		HALL			3500	30	2-26CP	(2) 26W COMPACT FLUORESCENT	1680	5880	$299.88	$213.43	$513.31	LED25CAN	NEW 25W LED CAN	30	750	2625	$133.88	$95.28	$229.16	$166.01	$118.15	$284.16	
103	3		MENS			2500	9	A2ST8	4' 2L STRIP FIXTURES W/T8S	531	1328	$67.70	$67.46	$135.16	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	9	234	585	$29.84	$29.73	$59.56	$37.87	$37.73	$75.60	
104	3		WOMENS			2500	9	A2ST8	4' 2L STRIP FIXTURES W/T8S	531	1328	$67.70	$67.46	$135.16	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	9	234	585	$29.84	$29.73	$59.56	$37.87	$37.73	$75.60	
105	3	306B	LOCKERS			8760	4	A3TT8	4' 3L TROFFER W/ T8S	372	3259	$166.19	$47.26	$213.46	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	4	104	911	$46.46	$13.21	$59.68	$119.73	$34.05	$153.78	
106	3	306B	LOCKERS			1500	8	A3TT8	4' 3L TROFFER W/ T8S	744	1116	$56.92	$94.52	$151.44	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	8	208	312	$15.91	$26.43	$42.34	$41.00	$68.10	$109.10	
107	3		TOILET			1000	2	A2ST8	4' 2L STRIP FIXTURES W/T8S	118	118	$6.02	$14.99	$21.01	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.65	$6.61	$9.26	$3.37	$8.38	$11.75	
108	3		TOILET			1000	1	2-26CP	(2) 26W COMPACT FLUORESCENT	56	56	$2.86	$7.11	$9.97	LED25CAN	NEW 25W LED CAN	1	25	25	$1.28	$3.18	$4.45	$1.58	$3.94	$5.52	
109	3		TOILET			1000	2	A2ST8	4' 2L STRIP FIXTURES W/T8S	118	118	$6.02	$14.99	$21.01	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.65	$6.61	$9.26	$3.37	$8.38	$11.75	
110	3		TOILET			1000	1	2-26CP	(2) 26W COMPACT FLUORESCENT	56	56	$2.86	$7.11	$9.97	LED25CAN	NEW 25W LED CAN	1	25	25	$1.28	$3.18	$4.45	$1.58	$3.94	$5.52	
111	3	306A	BREAK AREA			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$47.43	$47.26	$94.69	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$19.89	$19.82	$39.71	$27.54	$27.44	$54.98	
112	3	306A	BREAK AREA			1500	4	2-26CP	(2) 26W COMPACT FLUORESCENT	224	336	$17.14	$28.46	$45.59	LED25CAN	NEW 25W LED CAN	4	100	150	$7.65	$12.70	$20.35	$9.49	$15.75	$25.24	
113	3	307	OFFICE			2500	5	A3RT8	4' 3L RECESSED FIXTURE W/T8S	465	1163	$59.29	$59.08	$118.36	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	5	195	488	$24.86	$24.77	$49.64	$34.43	$34.30	$68.73	
114	3	310	ELECTRIC			1000	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	59	$3.01	$7.50	$10.50	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.33	$3.30	$4.63	$1.68	$4.19	$5.88	
115	3	311	LOCKERS			1000	2	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	118	118	$6.02	$14.99	$21.01	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.65	$6.61	$9.26	$3.37	$8.38	$11.75	ESTIMATE NO ACCESS
116	3	312	COMMUNICATION			500	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	30	$1.50	$7.50	$9.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.66	$3.30	$3.97	$0.84	$4.19	$5.03	
117	3	317E	OFFICE			1500	17	2-26CP	(2) 26W COMPACT FLUORESCENT	952	1428	$72.83	$120.95	$193.77	LED25CAN	NEW 25W LED CAN	17	425	638	$32.51	$53.99	$86.51	$40.32	$66.95	$107.27	ESTIMATE NO ACCESS
118	3	317E	STORAGE			500	1	A3TT8	4' 3L TROFFER W/ T8S	93	47	$2.37	$11.82	$14.19	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	13	$0.66	$3.30	$3.97	$1.71	$8.51	$10.22	ESTIMATE NO ACCESS
119	3		TOILET			1000	2	A2ST8	4' 2L STRIP FIXTURES W/T8S	118	118	$6.02	$14.99	$21.01	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.65	$6.61	$9.26	$3.37	$8.38	$11.75	
120	3		TOILET			1000	1	2-26CP	(2) 26W COMPACT FLUORESCENT	56	56	$2.86	$7.11	$9.97	LED25CAN	NEW 25W LED CAN	1	25	25	$1.28	$3.18	$4.45	$1.58	$3.94	$5.52	
121	3		TOILET			1000	2	A2ST8	4' 2L STRIP FIXTURES W/T8S	118	118	$6.02	$14.99	$21.01	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.65	$6.61	$9.26	$3.37	$8.38	$11.75	
122	3		TOILET			1000	1	2-26CP	(2) 26W COMPACT FLUORESCENT	56	56	$2.86	$7.11	$9.97	LED25CAN	NEW 25W LED CAN	1	25	25	$1.28	$3.18	$4.45	$1.58	$3.94	$5.52	
123	3		HALL			3500	5	2-26CP	(2) 26W COMPACT FLUORESCENT	280	980	$49.98	$35.57	$85.55	LED25CAN	NEW 25W LED CAN	5	125	438	$22.31	$15.88	$38.19	$27.67	$19.69	$47.36	
124	3		DISPATCH			3000	8	2-26CP	(2) 26W COMPACT FLUORESCENT	448	1344	$68.54	$56.92	$125.46	LED25CAN	NEW 25W LED CAN	8	200	600	$30.60	$25.41	$56.01	$37.94	$31.51	$69.45	ON DIMMER
125	3		COPY			3500	2	A3TT8	4' 3L TROFFER W/ T8S	186	651	$33.20	$23.63	$56.83	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	273	$13.92	$9.91	$23.83	$19.28	$13.72	$33.00	
126	3		LOUNGE			3500	2	A3RT8	4' 3L RECESSED FIXTURE W/T8S	186	651	$33.20	$23.63	$56.83	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	273	$13.92	$9.91	$23.83	$19.28	$13.72	$33.00	
127	3		UPLIGHTS			1000	28	A2BT8	4' 2L BOX FIXTURE W/T8S	1652	1652	$84.25	$209.88	$294.13	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	28	728	728	$37.13	$92.49	$129.62	$47.12	$117.39	$164.51	
128	3		DISPATCH			3500	27	2-26CP	(2) 26W COMPACT FLUORESCENT	1512	5292	$269.89	$192.09	$461.98	LED25CAN	NEW 25W LED CAN	27	675	2363	$120.49	$85.75	$206.24	$149.40	$106.34	$255.74	ON DIMMER
129	3		HALL			2500	16	2-26CP	(2) 26W COMPACT FLUORESCENT	896	2240	$114.24	$113.83	$228.07	LED25CAN	NEW 25W LED CAN	16	400	1000	$51.00	$50.82	$101.82	$63.24	$63.01	$126.25	

ENHANCED LIGHTING SURVEY LOG

Project Name: PUBLIC SAFETY

Months: 12

Hours: 2500 **Multipliers:** **0.051** **10.587**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	ProposedWatts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
130	3	315A	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$23.72	$23.63	$47.35	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$9.95	$9.91	$19.85	$13.77	$13.72	$27.49	
131	3	315B	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$23.72	$23.63	$47.35	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$9.95	$9.91	$19.85	$13.77	$13.72	$27.49	
132	3		OPEN AREA			3500	2	A3TT8	4' 3L TROFFER W/ T8S	186	651	$33.20	$23.63	$56.83	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	273	$13.92	$9.91	$23.83	$19.28	$13.72	$33.00	
133	3	315C	OFFICE			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$35.57	$35.45	$71.02	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$14.92	$14.86	$29.78	$20.66	$20.58	$41.24	
134	3	315D	OFFICE			2500	9	A3TT8	4' 3L TROFFER W/ T8S	837	2093	$106.72	$106.34	$213.05	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	9	351	878	$44.75	$44.59	$89.34	$61.97	$61.74	$123.71	
135	3	315H	STORAGE			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$11.86	$11.82	$23.67	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	65	$3.32	$3.30	$6.62	$8.54	$8.51	$17.05	
136	3	315G	REFRIGERATION			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$23.72	$23.63	$47.35	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$9.95	$9.91	$19.85	$13.77	$13.72	$27.49	
137	3	315F	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$23.72	$23.63	$47.35	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$9.95	$9.91	$19.85	$13.77	$13.72	$27.49	
138	3		TOILET			1000	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	59	$3.01	$7.50	$10.50	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.33	$3.30	$4.63	$1.68	$4.19	$5.88	
139	3		TOILET			1000	1	C2ST8	3' 2L STRIP FIXTURE, T8S EB	46	46	$2.35	$5.84	$8.19	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	1	28	28	$1.43	$3.56	$4.99	$0.92	$2.29	$3.20	
140	3		TOILET			1000	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	59	$3.01	$7.50	$10.50	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.33	$3.30	$4.63	$1.68	$4.19	$5.88	
141	3		TOILET			1000	1	C2ST8	3' 2L STRIP FIXTURE, T8S EB	46	46	$2.35	$5.84	$8.19	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	1	28	28	$1.43	$3.56	$4.99	$0.92	$2.29	$3.20	
142	3		PASSAGE			3500	2	2-26CP	(2) 26W COMPACT FLUORESCENT	112	392	$19.99	$14.23	$34.22	LED25CAN	NEW 25W LED CAN	2	50	175	$8.93	$6.35	$15.28	$11.07	$7.88	$18.94	
143	3	313	PASSAGE			2500	4	2-26CP	(2) 26W COMPACT FLUORESCENT	224	560	$28.56	$28.46	$57.02	LED25CAN	NEW 25W LED CAN	4	100	250	$12.75	$12.70	$25.45	$15.81	$15.75	$31.56	
144	3	313B	STORAGE			500	1	A3TT8	4' 3L TROFFER W/ T8S	93	47	$2.37	$11.82	$14.19	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	20	$0.99	$4.95	$5.95	$1.38	$6.86	$8.24	
145	3	313D	EXCERSIZE			1500	6	A3TT8	4' 3L TROFFER W/ T8S	558	837	$42.69	$70.89	$113.58	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	6	234	351	$17.90	$29.73	$47.63	$24.79	$41.16	$65.95	
146	3	313C	SERVER			1000	7	A3TT8	4' 3L TROFFER W/ T8S	651	651	$33.20	$82.71	$115.91	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	7	182	182	$9.28	$23.12	$32.40	$23.92	$59.58	$83.50	
147	3	313A	COMPUTERS			1500	4	A3TT8	4' 3L TROFFER W/ T8S	372	558	$28.46	$47.26	$75.72	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	234	$11.93	$19.82	$31.75	$16.52	$27.44	$43.97	
148	2		HALL			3500	30	2-26CP	(2) 26W COMPACT FLUORESCENT	1680	5880	$299.88	$213.43	$513.31	LED25CAN	NEW 25W LED CAN	30	750	2625	$133.88	$95.28	$229.16	$166.01	$118.15	$284.16	
149	2		HALL			2500	8	26CP	26W COMPACT FLUORESCENT	224	560	$28.56	$28.46	$57.02	LED10CAN	NEW 10W LED CAN	8	80	200	$10.20	$10.16	$20.36	$18.36	$18.29	$36.65	
150	2		LOBBY POLES			4200	24	A1ST8	4' 1L STRIP FIXTURE W/ 32W T8'S	768	3226	$164.51	$97.57	$262.08	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	24	312	1310	$66.83	$39.64	$106.47	$97.68	$57.93	$155.61	
151	2		ELEVATOR SOFFIT			8760	7	A2ST5	4' 2L STRIP FIXTURE W/T5S	413	3618	$184.51	$52.47	$236.98	R2AT5	RETRO (1) FIX. W/ (2) 4' T5 LED LAMPS	7	182	1594	$81.31	$23.12	$104.43	$103.20	$29.35	$132.55	
152	2		LOBBY			8760	4	26CP	26W COMPACT FLUORESCENT	112	981	$50.04	$14.23	$64.27	LED10CAN	NEW 10W LED CAN	4	40	350	$17.87	$5.08	$22.95	$32.17	$9.15	$41.31	
153	2		LOBBY			8760	1	2-26CP	(2) 26W COMPACT FLUORESCENT	56	491	$25.02	$7.11	$32.13	LED25CAN	NEW 25W LED CAN	1	25	219	$11.17	$3.18	$14.35	$13.85	$3.94	$17.79	
154	2	202	JANITOR			1000	1	A3TT8	4' 3L TROFFER W/ T8S	93	93	$4.74	$11.82	$16.56	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	26	$1.33	$3.30	$4.63	$3.42	$8.51	$11.93	
155	2	216	COPY			2500	2	A4TT8	4' 4L RECESSED TROFFER W/T8S	224	560	$28.56	$28.46	$57.02	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	2	144	360	$18.36	$18.29	$36.65	$10.20	$10.16	$20.36	
156	2	217C	OFFICE			1500	4	A3TT8	4' 3L TROFFER W/ T8S	372	558	$28.46	$47.26	$75.72	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	234	$11.93	$19.82	$31.75	$16.52	$27.44	$43.97	
157	2	217B	OFFICE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.23	$23.63	$37.86	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$5.97	$9.91	$15.88	$8.26	$13.72	$21.98	
158	2	217A	OFFICE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.23	$23.63	$37.86	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$5.97	$9.91	$15.88	$8.26	$13.72	$21.98	
159	2		OPEN AREA			2500	11	A3TT8	4' 3L TROFFER W/ T8S	1023	2558	$130.43	$129.97	$260.40	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	11	429	1073	$54.70	$54.50	$109.20	$75.74	$75.46	$151.20	
160	2		OPEN AREA			2500	8	2-26CP	(2) 26W COMPACT FLUORESCENT	448	1120	$57.12	$56.92	$114.04	LED25CAN	NEW 25W LED CAN	8	200	500	$25.50	$25.41	$50.91	$31.62	$31.51	$63.13	
161	2		TASK LIGHTS			1000	3	D1VT8	2' 1L VANITY FIXTURE W/T8	51	51	$2.60	$6.48	$9.08	R1D	RETRO (1) FIX. W/ (1) 2'LED LAMPS	3	27	27	$1.38	$3.43	$4.81	$1.22	$3.05	$4.27	
162	2		CONFERENCE			2500	5	A2ST8	4' 2L STRIP FIXTURES W/T8S	295	738	$37.61	$37.48	$75.09	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	325	$16.58	$16.52	$33.09	$21.04	$20.96	$42.00	
163	2		CONFERENCE			2500	2	C2ST8	3' 2L STRIP FIXTURE, T8S EB	92	230	$11.73	$11.69	$23.42	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	2	56	140	$7.14	$7.11	$14.25	$4.59	$4.57	$9.16	
164	2		CONFERENCE			1000	6	2-26CP	(2) 26W COMPACT FLUORESCENT	336	336	$17.14	$42.69	$59.82	LED25CAN	NEW 25W LED CAN	6	150	150	$7.65	$19.06	$26.71	$9.49	$23.63	$33.12	
165	2	215	STORAGE			1000	3	A3TT8	4' 3L TROFFER W/ T8S	279	279	$14.23	$35.45	$49.67	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	3	78	78	$3.98	$9.91	$13.89	$10.25	$25.54	$35.79	
166	2	213H	OFFICE			1500	4	A3TT8	4' 3L TROFFER W/ T8S	372	558	$28.46	$47.26	$75.72	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	234	$11.93	$19.82	$31.75	$16.52	$27.44	$43.97	
167	2	213G	OFFICE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.23	$23.63	$37.86	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$5.97	$9.91	$15.88	$8.26	$13.72	$21.98	
168	2		OPEN AREA			2500	3	2-26CP	(2) 26W COMPACT FLUORESCENT	168	420	$21.42	$21.34	$42.76	LED25CAN	NEW 25W LED CAN	3	75	188	$9.56	$9.53	$19.09	$11.86	$11.82	$23.67	
169	2		OPEN AREA			2500	210	A3TT8	4' 3L TROFFER W/ T8S	19530	48825	$2,490.08	$2,481.17	$4,971.24	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	210	8190	20475	$1,044.23	$1,040.49	$2,084.72	$1,445.85	$1,440.68	$2,886.53	
170	2		SOFFIT			3500	21	A2ST8	4' 2L STRIP FIXTURES W/T8S	1239	4337	$221.16	$157.41	$378.57	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	21	546	1911	$97.46	$69.37	$166.83	$123.70	$88.04	$211.74	
171	2	213I	OFFICE			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$35.57	$35.45	$71.02	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$14.92	$14.86	$29.78	$20.66	$20.58	$41.24	
172	2	213E	COMPUTERS			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$35.57	$35.45	$71.02	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$14.92	$14.86	$29.78	$20.66	$20.58	$41.24	

ENHANCED LIGHTING SURVEY LOG

Project Name: PUBLIC SAFETY

Months: 12

Hours: 2500 **Multipliers:** **0.051** **10.587**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	ProposedWatts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
173	2	213D	OFFICE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.23	$23.63	$37.86	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$5.97	$9.91	$15.88	$8.26	$13.72	$21.98	
174	2	213C	OFFICE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.23	$23.63	$37.86	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$5.97	$9.91	$15.88	$8.26	$13.72	$21.98	
175	2	213B	OFFICE			1500	6	A3TT8	4' 3L TROFFER W/ T8S	558	837	$42.69	$70.89	$113.58	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	6	234	351	$17.90	$29.73	$47.63	$24.79	$41.16	$65.95	
176	2	213J	OFFICE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.23	$23.63	$37.86	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$5.97	$9.91	$15.88	$8.26	$13.72	$21.98	
177	2	213A	OFFICE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.23	$23.63	$37.86	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$5.97	$9.91	$15.88	$8.26	$13.72	$21.98	
178	2	213A	OFFICE			1000	4	2-26CP	(2) 26W COMPACT FLUORESCENT	224	224	$11.42	$28.46	$39.88	LED25CAN	NEW 25W LED CAN	4	100	100	$5.10	$12.70	$17.80	$6.32	$15.75	$22.08	
179	2	212	OFFICE			1500	2	A4TT8	4' 4L RECESSED TROFFER W/T8S	224	336	$17.14	$28.46	$45.59	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	2	144	216	$11.02	$18.29	$29.31	$6.12	$10.16	$16.28	
180	2	212A	OFFICE			1500	4	A4TT8	4' 4L RECESSED TROFFER W/T8S	448	672	$34.27	$56.92	$91.19	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	4	288	432	$22.03	$36.59	$58.62	$12.24	$20.33	$32.57	
181	2	212A	OFFICE			1000	4	2-26CP	(2) 26W COMPACT FLUORESCENT	224	224	$11.42	$28.46	$39.88	LED25CAN	NEW 25W LED CAN	4	100	100	$5.10	$12.70	$17.80	$6.32	$15.75	$22.08	
182	2	211	STORAGE			500	2	A3TT8	4' 3L TROFFER W/ T8S	186	93	$4.74	$23.63	$28.37	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	39	$1.99	$9.91	$11.90	$2.75	$13.72	$16.47	
183	2	209	OFFICE			2500	14	2-26CP	(2) 26W COMPACT FLUORESCENT	784	1960	$99.96	$99.60	$199.56	LED25CAN	NEW 25W LED CAN	14	350	875	$44.63	$44.47	$89.09	$55.34	$55.14	$110.47	
184	2	209A	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$23.72	$23.63	$47.35	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$9.95	$9.91	$19.85	$13.77	$13.72	$27.49	
185	2	209A	OFFICE			2500	4	2-26CP	(2) 26W COMPACT FLUORESCENT	224	560	$28.56	$28.46	$57.02	LED25CAN	NEW 25W LED CAN	4	100	250	$12.75	$12.70	$25.45	$15.81	$15.75	$31.56	
186	2	209B	STORAGE			500	1	A3TT8	4' 3L TROFFER W/ T8S	93	47	$2.37	$11.82	$14.19	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	13	$0.66	$3.30	$3.97	$1.71	$8.51	$10.22	
187	2	210	COMMUNICATION			500	2	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	118	59	$3.01	$14.99	$18.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.33	$6.61	$7.93	$1.68	$8.38	$10.07	
188	2	208	ELECTRIC			500	2	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	118	59	$3.01	$14.99	$18.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.33	$6.61	$7.93	$1.68	$8.38	$10.07	
189	2	214	EQUIPMENT			8760	22	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	1298	11370	$579.89	$164.90	$744.80	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	22	572	5011	$255.55	$72.67	$328.22	$324.35	$92.23	$416.58	
190	2	214	EQUIPMENT			8760	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	517	$26.36	$7.50	$33.85	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$11.62	$3.30	$14.92	$14.74	$4.19	$18.94	
191	2	207	CONFERENCE			2500	8	A3RT8	4' 3L RECESSED FIXTURE W/T8S	744	1860	$94.86	$94.52	$189.38	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	8	312	780	$39.78	$39.64	$79.42	$55.08	$54.88	$109.96	
192	2	207	CONFERENCE			2500	13	A2ST8	4' 2L STRIP FIXTURES W/T8S	767	1918	$97.79	$97.44	$195.24	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	13	338	845	$43.10	$42.94	$86.04	$54.70	$54.50	$109.20	
193	2	207	CONFERENCE			2500	13	C2ST8	3' 2L STRIP FIXTURE, T8S EB	598	1495	$76.25	$75.97	$152.22	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	13	364	910	$46.41	$46.24	$92.65	$29.84	$29.73	$59.56	
194	2	207	CONFERENCE			2500	13	D1ST8	2' 1L STRIP FIXTURE W/T8	221	553	$28.18	$28.08	$56.25	R1D	RETRO (1) FIX. W/ (1) 2'LED LAMPS	13	117	293	$14.92	$14.86	$29.78	$13.26	$13.21	$26.47	
195	2	207	CONFERENCE			2500	9	2-26CP	(2) 26W COMPACT FLUORESCENT	504	1260	$64.26	$64.03	$128.29	LED25CAN	NEW 25W LED CAN	9	225	563	$28.69	$28.58	$57.27	$35.57	$35.45	$71.02	ON DIMMERS
196	2		RECEPTION			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$23.72	$23.63	$47.35	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$9.95	$9.91	$19.85	$13.77	$13.72	$27.49	
197	2		RECEPTION			1000	7	2-26CP	(2) 26W COMPACT FLUORESCENT	392	392	$19.99	$49.80	$69.79	LED25CAN	NEW 25W LED CAN	7	175	175	$8.93	$22.23	$31.16	$11.07	$27.57	$38.64	
198	2	206A	OFFICE			1500	3	A3TT8	4' 3L TROFFER W/ T8S	279	419	$21.34	$35.45	$56.79	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	176	$8.95	$14.86	$23.81	$12.39	$20.58	$32.97	
199	2	206B	OFFICE			1500	3	A3TT8	4' 3L TROFFER W/ T8S	279	419	$21.34	$35.45	$56.79	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	176	$8.95	$14.86	$23.81	$12.39	$20.58	$32.97	
200	2	206B	STORAGE			500	1	A3TT8	4' 3L TROFFER W/ T8S	93	47	$2.37	$11.82	$14.19	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	13	$0.66	$3.30	$3.97	$1.71	$8.51	$10.22	
201	2	206B	TOILET			500	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	59	$3.01	$14.99	$18.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.33	$6.61	$7.93	$1.68	$8.38	$10.07	
202	2	206B	TOILET			500	1	2-26CP	(2) 26W COMPACT FLUORESCENT	56	28	$1.43	$7.11	$8.54	LED25CAN	NEW 25W LED CAN	1	25	13	$0.64	$3.18	$3.81	$0.79	$3.94	$4.73	
203	2		MENS			2500	9	A2ST8	4' 2L STRIP FIXTURES W/T8S	531	1328	$67.70	$67.46	$135.16	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	9	234	585	$29.84	$29.73	$59.56	$37.87	$37.73	$75.60	
204	2		WOMENS			2500	9	A2ST8	4' 2L STRIP FIXTURES W/T8S	531	1328	$67.70	$67.46	$135.16	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	9	234	585	$29.84	$29.73	$59.56	$37.87	$37.73	$75.60	
205	1	115F	GARAGE			2500	30	A2VTHO	4' 2L VANITY W/ HO LAMPS	2400	6000	$306.00	$304.91	$610.91	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	30	780	1950	$99.45	$99.09	$198.54	$206.55	$205.81	$412.36	
206	1	115H	STORAGE			1000	4	A3TT8	4' 3L TROFFER W/ T8S	372	372	$18.97	$47.26	$66.23	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	4	104	104	$5.30	$13.21	$18.52	$13.67	$34.05	$47.72	ESTIMATE NO ACCESS
207	1	115G	STORAGE			1000	2	A3TT8	4' 3L TROFFER W/ T8S	186	186	$9.49	$23.63	$33.12	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	52	$2.65	$6.61	$9.26	$6.83	$17.02	$23.86	
208	1	115E	STORAGE			1000	4	A4TT8	4' 4L RECESSED TROFFER W/T8S	448	448	$22.85	$56.92	$79.76	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	4	288	288	$14.69	$36.59	$51.28	$8.16	$20.33	$28.49	
209	1		LOCKERS			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$47.43	$47.26	$94.69	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	4	104	260	$13.26	$13.21	$26.47	$34.17	$34.05	$68.22	
210	1		TOILET			1500	2	A2ST8	4' 2L STRIP FIXTURES W/T8S	118	177	$9.03	$14.99	$24.02	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$3.98	$6.61	$10.58	$5.05	$8.38	$13.43	
211	1		TOILET			1500	1	2-26CP	(2) 26W COMPACT FLUORESCENT	56	84	$4.28	$7.11	$11.40	LED25CAN	NEW 25W LED CAN	1	25	38	$1.91	$3.18	$5.09	$2.37	$3.94	$6.31	
212	1		TOILET			1500	2	A2ST8	4' 2L STRIP FIXTURES W/T8S	118	177	$9.03	$14.99	$24.02	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$3.98	$6.61	$10.58	$5.05	$8.38	$13.43	
213	1		TOILET			1500	1	2-26CP	(2) 26W COMPACT FLUORESCENT	56	84	$4.28	$7.11	$11.40	LED25CAN	NEW 25W LED CAN	1	25	38	$1.91	$3.18	$5.09	$2.37	$3.94	$6.31	
214	1		ELEVATOR LOBBY			8760	2	2-26CP	(2) 26W COMPACT FLUORESCENT	112	981	$50.04	$14.23	$64.27	LED25CAN	NEW 25W LED CAN	2	50	438	$22.34	$6.35	$28.69	$27.70	$7.88	$35.58	
215	1		HALL			3500	3	2-26CP	(2) 26W COMPACT FLUORESCENT	168	588	$29.99	$21.34	$51.33	LED25CAN	NEW 25W LED CAN	3	75	263	$13.39	$9.53	$22.92	$16.60	$11.82	$28.42	

ENHANCED LIGHTING SURVEY LOG

Project Name: PUBLIC SAFETY

Months: 12

Hours: 2500

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	Existing Watts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
																							Multipliers:	0.051	10.587	
216	1	115A	DROP			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$23.72	$23.63	$47.35	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	130	$6.63	$6.61	$13.24	$17.09	$17.02	$34.11	
217	1		LOBBY			8760	7	A2ST5	4' 2L STRIP FIXTURE W/T5S	413	3618	$184.51	$52.47	$236.98	R2AT5	RETRO (1) FIX. W/ (2) 4' T5 LED LAMPS	7	182	1594	$81.31	$23.12	$104.43	$103.20	$29.35	$132.55	
218	1		LOBBY			8760	1	2-26CP	(2) 26W COMPACT FLUORESCENT	56	491	$25.02	$7.11	$32.13	LED25CAN	NEW 25W LED CAN	1	25	219	$11.17	$3.18	$14.35	$13.85	$3.94	$17.79	
219	1		LOBBY			8760	3	26CP	26W COMPACT FLUORESCENT	84	736	$37.53	$10.67	$48.20	LED10CAN	NEW 10W LED CAN	3	30	263	$13.40	$3.81	$17.21	$24.13	$6.86	$30.99	
220	1		JANITOR			1500	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	89	$4.51	$7.50	$12.01	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	39	$1.99	$3.30	$5.29	$2.52	$4.19	$6.72	
221	1	114	OFFICE			2500	8	A3TT8	4' 3L TROFFER W/ T8S	744	1860	$94.86	$94.52	$189.38	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	8	312	780	$39.78	$39.64	$79.42	$55.08	$54.88	$109.96	SOME EMERGENCY BALLASTS
222	1		MENS			2500	9	A2ST8	4' 2L STRIP FIXTURES W/T8S	531	1328	$67.70	$67.46	$135.16	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	9	234	585	$29.84	$29.73	$59.56	$37.87	$37.73	$75.60	
223	1		WOMENS			2500	9	A2ST8	4' 2L STRIP FIXTURES W/T8S	531	1328	$67.70	$67.46	$135.16	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	9	234	585	$29.84	$29.73	$59.56	$37.87	$37.73	$75.60	
224	1	106	CSV			2500	15	A3TT8	4' 3L TROFFER W/ T8S	1395	3488	$177.86	$177.23	$355.09	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	15	585	1463	$74.59	$74.32	$148.91	$103.28	$102.91	$206.18	
225	1		GARAGE			1500	16	A2VTHO	4' 2L VANITY W/ HO LAMPS	1280	1920	$97.92	$162.62	$260.54	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	16	416	624	$31.82	$52.85	$84.67	$66.10	$109.77	$175.86	
226	1		HALL			3500	7	2-26CP	(2) 26W COMPACT FLUORESCENT	392	1372	$69.97	$49.80	$119.77	LED25CAN	NEW 25W LED CAN	7	175	613	$31.24	$22.23	$53.47	$38.73	$27.57	$66.30	
227	1	111	RECEIVING			3500	27	A2VTHO	4' 2L VANITY W/ HO LAMPS	2160	7560	$385.56	$274.42	$659.98	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	27	702	2457	$125.31	$89.18	$214.49	$260.25	$185.23	$445.48	
228	1	110	OPEN AREA			2500	9	A3TT8	4' 3L TROFFER W/ T8S	837	2093	$106.72	$106.34	$213.05	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	9	234	585	$29.84	$29.73	$59.56	$76.88	$76.61	$153.49	
229	1	110	OPEN AREA			1000	3	2-26CP	(2) 26W COMPACT FLUORESCENT	168	168	$8.57	$21.34	$29.91	LED25CAN	NEW 25W LED CAN	3	75	75	$3.83	$9.53	$13.35	$4.74	$11.82	$16.56	
230	1	110A	OFFICE			1000	2	A3TT8	4' 3L TROFFER W/ T8S	186	186	$9.49	$23.63	$33.12	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	78	$3.98	$9.91	$13.89	$5.51	$13.72	$19.23	
231	1	107D	OFFICE			3500	3	A3TT8	4' 3L TROFFER W/ T8S	279	977	$49.80	$35.45	$85.25	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	410	$20.88	$14.86	$35.75	$28.92	$20.58	$49.50	
232	1	107B	OFFICE			1000	2	A3TT8	4' 3L TROFFER W/ T8S	186	186	$9.49	$23.63	$33.12	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	78	$3.98	$9.91	$13.89	$5.51	$13.72	$19.23	
233	1	107E	OFFICE			1000	1	A3TT8	4' 3L TROFFER W/ T8S	93	93	$4.74	$11.82	$16.56	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	39	$1.99	$4.95	$6.94	$2.75	$6.86	$9.61	
234	1	108	ELECTRIC			500	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	30	$1.50	$7.50	$9.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.66	$3.30	$3.97	$0.84	$4.19	$5.03	
235	1	113	OPEN AREA			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$47.43	$47.26	$94.69	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$19.89	$19.82	$39.71	$27.54	$27.44	$54.98	
236	1	113	OPEN AREA			1000	8	2-26CP	(2) 26W COMPACT FLUORESCENT	448	448	$22.85	$56.92	$79.76	LED25CAN	NEW 25W LED CAN	8	200	200	$10.20	$25.41	$35.61	$12.65	$31.51	$44.15	
237	1	113A	BREAK AREA			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$23.72	$23.63	$47.35	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$9.95	$9.91	$19.85	$13.77	$13.72	$27.49	
238	1	113B	OFFICE			1500	1	A3TT8	4' 3L TROFFER W/ T8S	93	140	$7.11	$11.82	$18.93	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	59	$2.98	$4.95	$7.94	$4.13	$6.86	$10.99	
239	1	113	TASK LIGHTS			2500	1	C1ST8	3' 1L STRIP FIXTURE W/T8S	25	63	$3.19	$3.18	$6.36	R1C	RETRO (1) FIX. W/ (1) 3' LED LAMP	1	14	35	$1.79	$1.78	$3.56	$1.40	$1.40	$2.80	
240	1	113C	OFFICE			1500	1	A3TT8	4' 3L TROFFER W/ T8S	93	140	$7.11	$11.82	$18.93	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	39	$1.99	$3.30	$5.29	$5.13	$8.51	$13.64	
241	1		PASSAGE			2500	3	2-26CP	(2) 26W COMPACT FLUORESCENT	168	420	$21.42	$21.34	$42.76	LED25CAN	NEW 25W LED CAN	3	75	188	$9.56	$9.53	$19.09	$11.86	$11.82	$23.67	
242	1	113	LAB			2500	16	A3TT8	4' 3L TROFFER W/ T8S	1488	3720	$189.72	$189.04	$378.76	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	16	624	1560	$79.56	$79.28	$158.84	$110.16	$109.77	$219.93	
243	1	113E	REFRIGERATION			1000	1	A3TT8	4' 3L TROFFER W/ T8S	93	93	$4.74	$11.82	$16.56	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	26	$1.33	$3.30	$4.63	$3.42	$8.51	$11.93	
244	1	113F	FILES			1000	2	A3TT8	4' 3L TROFFER W/ T8S	186	186	$9.49	$23.63	$33.12	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	52	$2.65	$6.61	$9.26	$6.83	$17.02	$23.86	
245	1		DISPLAY			8760	1	A1ST8	4' 1L STRIP FIXTURE W/ 32W T8'S	32	280	$14.30	$4.07	$18.36	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	114	$5.81	$1.65	$7.46	$8.49	$2.41	$10.90	
246	1		HALL			3500	24	2-26CP	(2) 26W COMPACT FLUORESCENT	1344	4704	$239.90	$170.75	$410.65	LED25CAN	NEW 25W LED CAN	24	600	2100	$107.10	$76.23	$183.33	$132.80	$94.52	$227.32	
247	1		HALL			3500	10	26CP	26W COMPACT FLUORESCENT	280	980	$49.98	$35.57	$85.55	LED10CAN	NEW 10W LED CAN	10	100	350	$17.85	$12.70	$30.55	$32.13	$22.87	$55.00	
248	1	107	OPEN AREA			2500	11	A3TT8	4' 3L TROFFER W/ T8S	1023	2558	$130.43	$129.97	$260.40	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	11	286	715	$36.47	$36.33	$72.80	$93.97	$93.63	$187.60	
249	1	107	OPEN AREA			1000	2	2-26CP	(2) 26W COMPACT FLUORESCENT	112	112	$5.71	$14.23	$19.94	LED25CAN	NEW 25W LED CAN	2	50	50	$2.55	$6.35	$8.90	$3.16	$7.88	$11.04	
250	1	107A	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$23.72	$23.63	$47.35	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$9.95	$9.91	$19.85	$13.77	$13.72	$27.49	
251	1		STORAGE			1000	4	2-26CP	(2) 26W COMPACT FLUORESCENT	224	224	$11.42	$28.46	$39.88	LED25CAN	NEW 25W LED CAN	4	100	100	$5.10	$12.70	$17.80	$6.32	$15.75	$22.08	
252	B		VENDING			3500	4	2-26CP	(2) 26W COMPACT FLUORESCENT	224	784	$39.98	$28.46	$68.44	LED25CAN	NEW 25W LED CAN	4	100	350	$17.85	$12.70	$30.55	$22.13	$15.75	$37.89	
253			LOBBY POLES			4200	28	A1ST8	4' 1L STRIP FIXTURE W/ 32W T8'S	896	3763	$191.92	$113.83	$305.75	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	28	364	1529	$77.97	$46.24	$124.21	$113.95	$67.59	$181.54	
254			SOFFIT			8760	2	A2ST8	4' 2L STRIP FIXTURES W/T8S	118	1034	$52.72	$14.99	$67.71	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$23.23	$6.61	$29.84	$29.49	$8.38	$37.87	
255			SOFFIT			8760	2	C2ST8	3' 2L STRIP FIXTURE, T8S EB	92	806	$41.10	$11.69	$52.79	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	2	56	491	$25.02	$7.11	$32.13	$16.08	$4.57	$20.66	
256			ELEVATOR SOFFIT			8760	7	A2ST5	4' 2L STRIP FIXTURE W/T5S	413	3618	$184.51	$52.47	$236.98	R2AT5	RETRO (1) FIX. W/ (2) 4' T5 LED LAMPS	7	182	1594	$81.31	$23.12	$104.43	$103.20	$29.35	$132.55	
257			LOBBY			8760	1	2-26CP	(2) 26W COMPACT FLUORESCENT	56	491	$25.02	$7.11	$32.13	LED25CAN	NEW 25W LED CAN	1	25	219	$11.17	$3.18	$14.35	$13.85	$3.94	$17.79	
258			LOBBY			8760	3	26CP	26W COMPACT FLUORESCENT	84	736	$37.53	$10.67	$48.20	LED10CAN	NEW 10W LED CAN	3	30	263	$13.40	$3.81	$17.21	$24.13	$6.86	$30.99	

ENHANCED LIGHTING SURVEY LOG

Project Name: PUBLIC SAFETY

Months: 12

Hours: 2500 **Multipliers:** **0.051** **10.587**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	Existing Watts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
259		2	JANITOR			1000	1	A3TT8	4' 3L TROFFER W/ T8S	93	93	$4.74	$11.82	$16.56	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	26	$1.33	$3.30	$4.63	$3.42	$8.51	$11.93	
260			MENS			2500	9	A2ST8	4' 2L STRIP FIXTURES W/T8S	531	1328	$67.70	$67.46	$135.16	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	9	234	585	$29.84	$29.73	$59.56	$37.87	$37.73	$75.60	
261			WOMENS			2500	9	A2ST8	4' 2L STRIP FIXTURES W/T8S	531	1328	$67.70	$67.46	$135.16	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	9	234	585	$29.84	$29.73	$59.56	$37.87	$37.73	$75.60	
262		15	OPEN AREA			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$47.43	$47.26	$94.69	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$19.89	$19.82	$39.71	$27.54	$27.44	$54.98	SOME EMERGENCY
263			OPEN AREA			2500	6	2-26CP	(2) 26W COMPACT FLUORESCENT	336	840	$42.84	$42.69	$85.53	LED25CAN	NEW 25W LED CAN	6	150	375	$19.13	$19.06	$38.18	$23.72	$23.63	$47.35	
264			TOILET			1000	1	2-26CP	(2) 26W COMPACT FLUORESCENT	56	56	$2.86	$7.11	$9.97	LED25CAN	NEW 25W LED CAN	1	25	25	$1.28	$3.18	$4.45	$1.58	$3.94	$5.52	
265			TOILET			1000	1	C2ST8	3' 2L STRIP FIXTURE, T8S EB	46	46	$2.35	$5.84	$8.19	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	1	28	28	$1.43	$3.56	$4.99	$0.92	$2.29	$3.20	
266			TOILET			1000	1	D2ST8	2' 2L STRIP FIXTURE	33	33	$1.68	$4.19	$5.88	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	1	18	18	$0.92	$2.29	$3.20	$0.77	$1.91	$2.67	
267		15A	CONFERENCE			2500	6	A3RT8	4' 3L RECESSED FIXTURE W/T8S	558	1395	$71.15	$70.89	$142.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	6	234	585	$29.84	$29.73	$59.56	$41.31	$41.16	$82.47	
268		15A	CONFERENCE			2500	8	2-26CP	(2) 26W COMPACT FLUORESCENT	448	1120	$57.12	$56.92	$114.04	LED25CAN	NEW 25W LED CAN	8	200	500	$25.50	$25.41	$50.91	$31.62	$31.51	$63.13	ON DIMMER
269		15D	STORAGE			1000	6	2-26CP	(2) 26W COMPACT FLUORESCENT	336	336	$17.14	$42.69	$59.82	LED25CAN	NEW 25W LED CAN	6	150	150	$7.65	$19.06	$26.71	$9.49	$23.63	$33.12	
270		15E	STORAGE			500	2	A4TT8	4' 4L RECESSED TROFFER W/T8S	224	112	$5.71	$28.46	$34.17	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	2	144	72	$3.67	$18.29	$21.97	$2.04	$10.16	$12.20	
271		15F	OFFICE			1000	6	A3RT8	4' 3L RECESSED FIXTURE W/T8S	558	558	$28.46	$70.89	$99.35	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	6	234	234	$11.93	$29.73	$41.66	$16.52	$41.16	$57.69	
272		15F	OFFICE			500	8	2-26CP	(2) 26W COMPACT FLUORESCENT	448	224	$11.42	$56.92	$68.34	LED25CAN	NEW 25W LED CAN	8	200	100	$5.10	$25.41	$30.51	$6.32	$31.51	$37.83	ON DIMMER
273		15G	OFFICE			1000	2	A3TT8	4' 3L TROFFER W/ T8S	186	186	$9.49	$23.63	$33.12	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	78	$3.98	$9.91	$13.89	$5.51	$13.72	$19.23	
274		15H	OFFICE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.23	$23.63	$37.86	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$5.97	$9.91	$15.88	$8.26	$13.72	$21.98	
275		15J	OFFICE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.23	$23.63	$37.86	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$5.97	$9.91	$15.88	$8.26	$13.72	$21.98	
276		15K	OFFICE			1000	2	A3TT8	4' 3L TROFFER W/ T8S	186	186	$9.49	$23.63	$33.12	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	78	$3.98	$9.91	$13.89	$5.51	$13.72	$19.23	
277		15L	OFFICE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.23	$23.63	$37.86	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$5.97	$9.91	$15.88	$8.26	$13.72	$21.98	
278		15M	OFFICE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.23	$23.63	$37.86	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$5.97	$9.91	$15.88	$8.26	$13.72	$21.98	
279			SINK			2500	1	A1VT8	4' 1L VANITY W/T8S	32	80	$4.08	$4.07	$8.15	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	33	$1.66	$1.65	$3.31	$2.42	$2.41	$4.84	
280		15P	STORAGE			1000	1	A3TT8	4' 3L TROFFER W/ T8S	93	93	$4.74	$11.82	$16.56	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	26	$1.33	$3.30	$4.63	$3.42	$8.51	$11.93	
281		15Q	OFFICE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.23	$23.63	$37.86	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$5.97	$9.91	$15.88	$8.26	$13.72	$21.98	
282			HALL			2500	14	2-26CP	(2) 26W COMPACT FLUORESCENT	784	1960	$99.96	$99.60	$199.56	LED25CAN	NEW 25W LED CAN	14	350	875	$44.63	$44.47	$89.09	$55.34	$55.14	$110.47	
283			TASK LIGHTS			1000	1	C1ST8	3' 1L STRIP FIXTURE W/T8S	25	25	$1.28	$3.18	$4.45	R1C	RETRO (1) FIX. W/ (1) 3' LED LAMP	1	14	14	$0.71	$1.78	$2.49	$0.56	$1.40	$1.96	
284			TASK LIGHTS			1000	1	D1VT8	2' 1L VANITY FIXTURE W/T8	17	17	$0.87	$2.16	$3.03	R1D	RETRO (1) FIX. W/ (1) 2'LED LAMPS	1	9	9	$0.46	$1.14	$1.60	$0.41	$1.02	$1.42	
285		14	ENGINEER			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$23.72	$23.63	$47.35	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$9.95	$9.91	$19.85	$13.77	$13.72	$27.49	
286		14	ENGINEER			2500	3	2-26CP	(2) 26W COMPACT FLUORESCENT	168	420	$21.42	$21.34	$42.76	LED25CAN	NEW 25W LED CAN	3	75	188	$9.56	$9.53	$19.09	$11.86	$11.82	$23.67	
287		14	TOILET			500	2	A2ST8	4' 2L STRIP FIXTURES W/T8S	118	59	$3.01	$14.99	$18.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.33	$6.61	$7.93	$1.68	$8.38	$10.07	
288		14	TOILET			500	3	2-26CP	(2) 26W COMPACT FLUORESCENT	168	84	$4.28	$21.34	$25.63	LED25CAN	NEW 25W LED CAN	3	75	38	$1.91	$9.53	$11.44	$2.37	$11.82	$14.19	
289		6	STORAGE			500	5	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	295	148	$7.52	$37.48	$45.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	65	$3.32	$16.52	$19.83	$4.21	$20.96	$25.17	
290		7	STORAGE			500	5	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	295	148	$7.52	$37.48	$45.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	65	$3.32	$16.52	$19.83	$4.21	$20.96	$25.17	
291		13	TRAINING			1500	25	A3TT8	4' 3L TROFFER W/ T8S	2325	3488	$177.86	$295.38	$473.24	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	25	975	1463	$74.59	$123.87	$198.46	$103.28	$171.51	$274.78	EMERGENCY BALLASTS
292			KITCHEN			1000	6	2-26CP	(2) 26W COMPACT FLUORESCENT	336	336	$17.14	$42.69	$59.82	LED25CAN	NEW 25W LED CAN	6	150	150	$7.65	$19.06	$26.71	$9.49	$23.63	$33.12	
293		13D	OFFICE			1000	4	A3TT8	4' 3L TROFFER W/ T8S	372	372	$18.97	$47.26	$66.23	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	156	$7.96	$19.82	$27.77	$11.02	$27.44	$38.46	
294			SINK			500	1	C1ST8	3' 1L STRIP FIXTURE W/T8S	25	13	$0.64	$3.18	$3.81	R1C	RETRO (1) FIX. W/ (1) 3' LED LAMP	1	14	7	$0.36	$1.78	$2.14	$0.28	$1.40	$1.68	
295		8	ELECTRIC			8760	7	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	413	3618	$184.51	$52.47	$236.98	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	7	182	1594	$81.31	$23.12	$104.43	$103.20	$29.35	$132.55	
296		8	ELECTRIC			500	15	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	885	443	$22.57	$112.43	$135.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	15	390	195	$9.95	$49.55	$59.49	$12.62	$62.89	$75.51	
297		11	UPS			2500	12	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	708	1770	$90.27	$89.95	$180.22	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	12	312	780	$39.78	$39.64	$79.42	$50.49	$50.31	$100.80	
298		12	FBI EVIDENCE			8760	14	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	826	7236	$369.02	$104.94	$473.96	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	14	364	3189	$162.62	$46.24	$208.86	$206.40	$58.69	$265.10	ESTIMATE NO ACCESS
299		9	COMMUNICATION			8760	15	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	885	7753	$395.38	$112.43	$507.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	15	390	3416	$174.24	$49.55	$223.78	$221.15	$62.89	$284.03	
300		9	COMMUNICATION			500	9	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	531	266	$13.54	$67.46	$81.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	9	234	117	$5.97	$29.73	$35.70	$7.57	$37.73	$45.31	
301		10	MAINTENANCE			8760	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	517	$26.36	$7.50	$33.85	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$11.62	$3.30	$14.92	$14.74	$4.19	$18.94	

ENHANCED LIGHTING SURVEY LOG

Project Name: PUBLIC SAFETY

Months: 12

Hours: 2500 **Multipliers:** **0.051** **10.587**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	Existing Watts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
302		10	MAINTENANCE			8760	9	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	531	4652	$237.23	$67.46	$304.69	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	9	234	2050	$104.54	$29.73	$134.27	$132.69	$37.73	$170.42	
303		10B	OFFICE			5000	2	A3TT8	4' 3L TROFFER W/ T8S	186	930	$47.43	$23.63	$71.06	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	390	$19.89	$9.91	$29.80	$27.54	$13.72	$41.26	
304			OFFICE			5000	2	A4TT8	4' 4L RECESSED TROFFER W/T8S	224	1120	$57.12	$28.46	$85.58	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	2	144	720	$36.72	$18.29	$55.01	$20.40	$10.16	$30.56	
305			HALL			3500	33	2-26CP	(2) 26W COMPACT FLUORESCENT	1848	6468	$329.87	$234.78	$564.65	LED25CAN	NEW 25W LED CAN	33	825	2888	$147.26	$104.81	$252.07	$182.61	$129.97	$312.57	
306			ELEVATOR			8760	2	A2ST8	4' 2L STRIP FIXTURES W/T8S	118	1034	$52.72	$14.99	$67.71	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$23.23	$6.61	$29.84	$29.49	$8.38	$37.87	
307			STAIRS			8760	2	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	118	1034	$52.72	$14.99	$67.71	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$23.23	$6.61	$29.84	$29.49	$8.38	$37.87	
308			STAIRS			8760	18	A1VT8	4' 1L VANITY W/T8S	576	5046	$257.33	$73.18	$330.51	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	18	234	2050	$104.54	$29.73	$134.27	$152.79	$43.45	$196.24	
309			STAIRS			8760	40	2-26CP	(2) 26W COMPACT FLUORESCENT	2240	19622	$1,000.74	$284.58	$1,285.32	LED25CAN	NEW 25W LED CAN	40	1000	8760	$446.76	$127.04	$573.80	$553.98	$157.53	$711.52	
310			STAIRS			8760	2	A4TT8	4' 4L RECESSED TROFFER W/T8S	224	1962	$100.07	$28.46	$128.53	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	456	$23.23	$6.61	$29.84	$76.84	$21.85	$98.69	
311			FUME HOODS			1000	24	C2ST8	3' 2L STRIP FIXTURE, T8S EB	1104	1104	$56.30	$140.26	$196.56	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	24	672	672	$34.27	$85.37	$119.65	$22.03	$54.88	$76.92	
312			MISC FIXTURES			2500	30	2-26CP	(2) 26W COMPACT FLUORESCENT	1680	4200	$214.20	$213.43	$427.63	LED25CAN	NEW 25W LED CAN	30	750	1875	$95.63	$95.28	$190.91	$118.58	$118.15	$236.73	
313			MISC FIXTURES			2500	20	A3TT8	4' 3L TROFFER W/ T8S	1860	4650	$237.15	$236.30	$473.45	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	20	780	1950	$99.45	$99.09	$198.54	$137.70	$137.21	$274.91	
314			MISC FIXTURES			2500	20	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	1180	2950	$150.45	$149.91	$300.36	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	20	520	1300	$66.30	$66.06	$132.36	$84.15	$83.85	$168.00	
315			MISC FIXTURES			2500	10	A3TT8	4' 3L TROFFER W/ T8S	930	2325	$118.58	$118.15	$236.73	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	10	260	650	$33.15	$33.03	$66.18	$85.43	$85.12	$170.54	
316			EMERGENCY BACK UP			2500	100								EBU	EMERGENCY BACK UP	100									
						2,460.00	**Totals:**			158862	465042	$23,717.14	$20,182.46	$43,899.60			2,460.00	67120	197518	$10,073	$8,527	$18,601	$13,644	$11,655	$25,299	
										KW	159							**KW**	67							

ENHANCED LIGHTING SURVEY LOG

Project Name: **PUBLIC SAFETY EXTERIOR**

Months: 5

Hours: 4200 **Multipliers:** **0.051** **10.587**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	ProposedWatts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
1			EXTERIOR			4200	16	MH150	150W METAL HALIDE	2800	11760	$599.76	$148.22	$747.98	LED22SI	NEW 22W LED SCREW IN	16	352	1478	$75.40	$18.63	$94.03	$524.36	$129.58	$653.95	
2			BOLLARDS			4200	18	MH70	70W METAL HALIDE	1710	7182	$366.28	$90.52	$456.80	LED22SI	NEW 22W LED SCREW IN	18	396	1663	$84.82	$20.96	$105.79	$281.46	$69.56	$351.02	
3			EXTERIOR			4200	4	MH150	150W METAL HALIDE	700	2940	$149.94	$37.05	$186.99	LED60BLOCK	INSTALL 30 LED LAMP	4	240	1008	$51.41	$12.70	$64.11	$98.53	$24.35	$122.88	
4			EXTERIOR			4200	15	MH100	100W METAL HALIDE	1875	7875	$401.63	$99.25	$500.88	LED25CAN	NEW 25W LED CAN	15	375	1575	$80.33	$19.85	$100.18	$321.30	$79.40	$400.70	
5			EXTERIOR			4200	2	MH70	70W METAL HALIDE	190	798	$40.70	$10.06	$50.76	LED22SI	NEW 22W LED SCREW IN	2	44	185	$9.42	$2.33	$11.75	$31.27	$7.73	$39.00	
							55.00	**Totals:**		7275	30555	$1,558.31	$385.10	$1,943.41			55.00	1407	5909	$301	$74	$376	$1,257	$311	$1,568	
										KW	7							**KW**	1							

ENHANCED LIGHTING SURVEY LOG

Project Name: ALDEN CORRECTIONAL

Months: 12

Hours: 2500 **Multipliers:** **0.0482** **6.75**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
1	1		KITCHEN STORAGE			5000	4	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	236	1180	$56.88	$19.12	$75.99	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	520	$25.06	$8.42	$33.49	$31.81	$10.69	$42.50		
2	1		TOILET			5000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	295	$14.22	$4.78	$19.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.27	$2.11	$8.37	$7.95	$2.67	$10.63		
3	1		OFFICE			5000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	590	$28.44	$9.56	$38.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	260	$12.53	$4.21	$16.74	$15.91	$5.35	$21.25		
4	1		STORAGE			500	1	A3TT8	4' 3L TROFFER W/ T8S	93	47	$2.24	$7.53	$9.77	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	13	$0.63	$2.11	$2.73	$1.61	$5.43	$7.04		
5	1		KITCHEN			5000	20	A2TT8	4' 2L TROFFER FIXTURE W/T8S	1180	5900	$284.38	$95.58	$379.96	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	20	520	2600	$125.32	$42.12	$167.44	$159.06	$53.46	$212.52		
6	1		HOODS			5000	8	A2RT8	4' 2L RECESSED FIXTURE W/T8S	472	2360	$113.75	$38.23	$151.98	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	1040	$50.13	$16.85	$66.98	$63.62	$21.38	$85.01		
7	1		BACK KITCHEN			5000	15	A2TT8	4' 2L TROFFER FIXTURE W/T8S	885	4425	$213.29	$71.69	$284.97	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	15	390	1950	$93.99	$31.59	$125.58	$119.30	$40.10	$159.39		
8	1		ROOM			5000	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	1770	$85.31	$28.67	$113.99	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	780	$37.60	$12.64	$50.23	$47.72	$16.04	$63.76		
9	1		TOILET			5000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	295	$14.22	$4.78	$19.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.27	$2.11	$8.37	$7.95	$2.67	$10.63		
10	1		OFFICE			5000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	295	$14.22	$4.78	$19.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.27	$2.11	$8.37	$7.95	$2.67	$10.63		
11	1		STORAGE			5000	14	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	826	4130	$199.07	$66.91	$265.97	NAVT	REMOVE FIX. & INSTALL NEW 4' LED VAPOR TIGHT	14	504	2520	$121.46	$40.82	$162.29	$77.60	$26.08	$103.68		
12	1	1126	LINE UP			5000	11	A2TT8	4' 2L TROFFER FIXTURE W/T8S	649	3245	$156.41	$52.57	$208.98	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	11	286	1430	$68.93	$23.17	$92.09	$87.48	$29.40	$116.89		
13	1		OFFICE			5000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	590	$28.44	$9.56	$38.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	260	$12.53	$4.21	$16.74	$15.91	$5.35	$21.25		
14	1		OFFICE			5000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	590	$28.44	$9.56	$38.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	260	$12.53	$4.21	$16.74	$15.91	$5.35	$21.25		
15	1		HALL			8760	10	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	320	2803	$135.11	$25.92	$161.03	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	10	130	1139	$54.89	$10.53	$65.42	$80.22	$15.39	$95.61		
16	1	1031	MENS LOCKER			5000	15	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	480	2400	$115.68	$38.88	$154.56	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	15	195	975	$47.00	$15.80	$62.79	$68.69	$23.09	$91.77		
17	1	1031	SHOWER			5000	1	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	59	295	$14.22	$4.78	$19.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.27	$2.11	$8.37	$7.95	$2.67	$10.63		
18	1	1031	TOILET			5000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	295	$14.22	$4.78	$19.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.27	$2.11	$8.37	$7.95	$2.67	$10.63		
19	1	1034	SLOP SINK			5000	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	295	$14.22	$4.78	$19.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.27	$2.11	$8.37	$7.95	$2.67	$10.63	WS	1
20	1	1035	WOMENS LOCKER			5000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	295	$14.22	$4.78	$19.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.27	$2.11	$8.37	$7.95	$2.67	$10.63		
21	1	1035	WOMENS LOCKER			5000	2	A2VT8	4' 2L VANITY W/ 32W T8'S	118	590	$28.44	$9.56	$38.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	260	$12.53	$4.21	$16.74	$15.91	$5.35	$21.25		
22	1	1035	SHOWER			5000	1	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	59	295	$14.22	$4.78	$19.00	NAVT	REMOVE FIX. & INSTALL NEW 4' LED VAPOR TIGHT	1	36	180	$8.68	$2.92	$11.59	$5.54	$1.86	$7.41		
23	1		HALL			8760	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	517	$24.91	$4.78	$29.69	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$10.98	$2.11	$13.08	$13.93	$2.67	$16.61		
24	1	1010	OPEN AREA			3000	18	A2TT8	4' 2L TROFFER FIXTURE W/T8S	1062	3186	$153.57	$86.02	$239.59	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	18	468	1404	$67.67	$37.91	$105.58	$85.89	$48.11	$134.01		
25	1	1010	OPEN AREA			3000	6	A2VT8	4' 2L VANITY W/ 32W T8'S	354	1062	$51.19	$28.67	$79.86	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	468	$22.56	$12.64	$35.19	$28.63	$16.04	$44.67		
26	1	1010	HALL			3000	4	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	128	384	$18.51	$10.37	$28.88	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	4	52	156	$7.52	$4.21	$11.73	$10.99	$6.16	$17.15		
27	1	1011	OFFICE			2000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	236	$11.38	$9.56	$20.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	104	$5.01	$4.21	$9.22	$6.36	$5.35	$11.71		
28	1	1013	OFFICE			2000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	118	$5.69	$4.78	$10.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	52	$2.51	$2.11	$4.61	$3.18	$2.67	$5.85		
29	1	1013	OFFICE			2000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	118	$5.69	$4.78	$10.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	52	$2.51	$2.11	$4.61	$3.18	$2.67	$5.85		
30	1	1015	OFFICE			2000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	118	$5.69	$4.78	$10.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	52	$2.51	$2.11	$4.61	$3.18	$2.67	$5.85		
31	1	1015	OFFICE			2000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	118	$5.69	$4.78	$10.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	52	$2.51	$2.11	$4.61	$3.18	$2.67	$5.85		
32	1	1018	VAULT			2000	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	236	$11.38	$9.56	$20.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	104	$5.01	$4.21	$9.22	$6.36	$5.35	$11.71		
33	1	1019	STORAGE			2000	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	118	$5.69	$4.78	$10.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	52	$2.51	$2.11	$4.61	$3.18	$2.67	$5.85		
34	1	1020	TOILET			2000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	118	$5.69	$4.78	$10.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	52	$2.51	$2.11	$4.61	$3.18	$2.67	$5.85		
35	1	1014	OFFICE			2000	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	354	$17.06	$14.34	$31.40	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	156	$7.52	$6.32	$13.84	$9.54	$8.02	$17.56		
36	1		OFFICE			2000	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	472	$22.75	$19.12	$41.87	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	208	$10.03	$8.42	$18.45	$12.72	$10.69	$23.42		
37	1	1016	LOUNGE			8760	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	1034	$49.82	$9.56	$59.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$21.96	$4.21	$26.17	$27.87	$5.35	$33.21	WS	1
38	1	1023	OFFICE			2000	2	A2VT8	4' 2L VANITY W/ 32W T8'S	118	236	$11.38	$9.56	$20.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	104	$5.01	$4.21	$9.22	$6.36	$5.35	$11.71		
39	1	1021	TOILET			2000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	118	$5.69	$4.78	$10.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	52	$2.51	$2.11	$4.61	$3.18	$2.67	$5.85		
40	1	1045	CONFERENCE			2000	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	472	$22.75	$19.12	$41.87	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	208	$10.03	$8.42	$18.45	$12.72	$10.69	$23.42		

ENHANCED LIGHTING SURVEY LOG

Project Name: ALDEN CORRECTIONAL

Months: 12

Hours: 2500 **Multipliers:** **0.0482** **6.75**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
41	1	1045	CONFERENCE			2000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	236	$11.38	$9.56	$20.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	104	$5.01	$4.21	$9.22	$6.36	$5.35	$11.71		
42	1		HALL			8760	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	517	$24.91	$4.78	$29.69	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$10.98	$2.11	$13.08	$13.93	$2.67	$16.61		
43	1		HALL			8760	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	517	$24.91	$4.78	$29.69	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$10.98	$2.11	$13.08	$13.93	$2.67	$16.61		
44	1		LOBBY			8760	24	MV175	175W MERCURY VAPOR	4920	43099	$2,077.38	$398.52	$2,475.90	LED40CAN	NEW 40W LED CAN	24	960	8410	$405.34	$77.76	$483.10	$1,672.04	$320.76	$1,992.80		
45	1		LOBBY			8760	15	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	480	4205	$202.67	$38.88	$241.55	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	15	195	1708	$82.34	$15.80	$98.13	$120.34	$23.09	$143.42		
46	1		DISPLAY			8760	4	A1VT8	4' 1L VANITY W/T8S	128	1121	$54.05	$10.37	$64.41	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	4	52	456	$21.96	$4.21	$26.17	$32.09	$6.16	$38.25		
47	1		MENS			8760	2	A2VT8	4' 2L VANITY W/ 32W T8'S	118	1034	$49.82	$9.56	$59.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$21.96	$4.21	$26.17	$27.87	$5.35	$33.21		
48	1		WOMENS			8760	2	A2VT8	4' 2L VANITY W/ 32W T8'S	118	1034	$49.82	$9.56	$59.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$21.96	$4.21	$26.17	$27.87	$5.35	$33.21		
49	1		VISITORS			8760	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	280	$13.51	$2.59	$16.10	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	114	$5.49	$1.05	$6.54	$8.02	$1.54	$9.56		
50	1	1008	TOILET			2000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	118	$5.69	$4.78	$10.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	52	$2.51	$2.11	$4.61	$3.18	$2.67	$5.85		
51	1	1009	CONTROL			2000	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	354	$17.06	$14.34	$31.40	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	156	$7.52	$6.32	$13.84	$9.54	$8.02	$17.56		
52	1		VISITORS			2000	27	A2TT8	4' 2L TROFFER FIXTURE W/T8S	1593	3186	$153.57	$129.03	$282.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	27	702	1404	$67.67	$56.86	$124.53	$85.89	$72.17	$158.06		
53	1		LAWYERS ROOMS			2000	6	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	192	384	$18.51	$15.55	$34.06	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	6	78	156	$7.52	$6.32	$13.84	$10.99	$9.23	$20.22		
54	1		SLOP SINK			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.42	$4.78	$6.20	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.63	$2.11	$2.73	$0.80	$2.67	$3.47	WS	1
55	1	1432	CONFERENCE			2000	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	472	$22.75	$19.12	$41.87	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	208	$10.03	$8.42	$18.45	$12.72	$10.69	$23.42		
56	1		CHAPEL			1500	15	MV175	175W MERCURY VAPOR	3075	4613	$222.32	$249.08	$471.40	LED40CAN	NEW 40W LED CAN	15	600	900	$43.38	$48.60	$91.98	$178.94	$200.48	$379.42		
57	1		CHAPEL			8760	4	MV175	175W MERCURY VAPOR	820	7183	$346.23	$66.42	$412.65	LED40CAN	NEW 40W LED CAN	4	160	1402	$67.56	$12.96	$80.52	$278.67	$53.46	$332.13		
58	1	1426	VISITORS			2000	6	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	354	708	$34.13	$28.67	$62.80	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	312	$15.04	$12.64	$27.67	$19.09	$16.04	$35.13		
59	1	1445	HALL			8760	6	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	192	1682	$81.07	$15.55	$96.62	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	6	78	683	$32.93	$6.32	$39.25	$48.13	$9.23	$57.37		
60	1	1428	SEARCH			2000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	236	$11.38	$9.56	$20.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	104	$5.01	$4.21	$9.22	$6.36	$5.35	$11.71		
61	1	1404	OFFICE			2000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	118	$5.69	$4.78	$10.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	52	$2.51	$2.11	$4.61	$3.18	$2.67	$5.85		
62	1	1408	OFFICE			2000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	118	$5.69	$4.78	$10.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	52	$2.51	$2.11	$4.61	$3.18	$2.67	$5.85		
63	1	1410	STORAGE			2000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	118	$5.69	$4.78	$10.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	52	$2.51	$2.11	$4.61	$3.18	$2.67	$5.85		
64	1	1411	OFFICE			2000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	118	$5.69	$4.78	$10.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	52	$2.51	$2.11	$4.61	$3.18	$2.67	$5.85		
65	1	1412	OFFICE			2000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	118	$5.69	$4.78	$10.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	52	$2.51	$2.11	$4.61	$3.18	$2.67	$5.85		
66	1		HALL			8760	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	2067	$99.65	$19.12	$118.76	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	911	$43.91	$8.42	$52.34	$55.73	$10.69	$66.43		
67	1	1423	VOCATIONAL			2000	27	A4IT8	4' 4L INDUSTRIAL SHADE W/T8S	3024	6048	$291.51	$244.94	$536.46	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	27	1404	2808	$135.35	$113.72	$249.07	$156.17	$131.22	$287.39		
68	1	1422	OFFICE			2000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	118	$5.69	$4.78	$10.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	52	$2.51	$2.11	$4.61	$3.18	$2.67	$5.85		
69	1	1421	TOILET			2000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	118	$5.69	$4.78	$10.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	52	$2.51	$2.11	$4.61	$3.18	$2.67	$5.85		
70	1	1425	OFFICE			2000	2	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	118	236	$11.38	$9.56	$20.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	104	$5.01	$4.21	$9.22	$6.36	$5.35	$11.71		
71	1	1424	OFFICE			2000	3	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	177	354	$17.06	$14.34	$31.40	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	156	$7.52	$6.32	$13.84	$9.54	$8.02	$17.56		
72	1	1424A	OFFICE			2000	2	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	64	128	$6.17	$5.18	$11.35	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	52	$2.51	$2.11	$4.61	$3.66	$3.08	$6.74		
73	1		HALL			8760	11	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	352	3084	$148.63	$28.51	$177.14	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	11	143	1253	$60.38	$11.58	$71.96	$88.25	$16.93	$105.18		
74	1	1420	TOILET			2000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	118	$5.69	$4.78	$10.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	52	$2.51	$2.11	$4.61	$3.18	$2.67	$5.85		
75	1	1419	OFFICE			2000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	118	$5.69	$4.78	$10.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	52	$2.51	$2.11	$4.61	$3.18	$2.67	$5.85		
76	1	1418	BARBER SHOP			2000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	236	$11.38	$9.56	$20.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	104	$5.01	$4.21	$9.22	$6.36	$5.35	$11.71		
77	1	1414	CLASSROOM			2000	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	472	$22.75	$19.12	$41.87	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	208	$10.03	$8.42	$18.45	$12.72	$10.69	$23.42		
78	1		CLASSROOM			2000	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	472	$22.75	$19.12	$41.87	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	208	$10.03	$8.42	$18.45	$12.72	$10.69	$23.42		
79	1	1416	OFFICE			2000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	118	$5.69	$4.78	$10.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	52	$2.51	$2.11	$4.61	$3.18	$2.67	$5.85		
80	1	1416	OFFICE			2000	1	C2VT8	3' 2L VANITY FIXTURE W/T8S	46	92	$4.43	$3.73	$8.16	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	1	28	56	$2.70	$2.27	$4.97	$1.74	$1.46	$3.19		

ENHANCED LIGHTING SURVEY LOG

Project Name: ALDEN CORRECTIONAL

Months: 12

Hours: 2500 **Multipliers:** **0.0482** **6.75**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
81	1	1416	HALL			8760	15	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	480	4205	$202.67	$38.88	$241.55	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	15	420	3679	$177.34	$34.02	$211.36	$25.33	$4.86	$30.19		
82	1	1425	OFFICE			2000	2	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	64	128	$6.17	$5.18	$11.35	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	52	$2.51	$2.11	$4.61	$3.66	$3.08	$6.74		
83	1	1430	WEIGHT ROOM			2000	4	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	128	256	$12.34	$10.37	$22.71	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	4	52	104	$5.01	$4.21	$9.22	$7.33	$6.16	$13.48		
84	1	1433	TOILET			2000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	64	$3.08	$2.59	$5.68	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	26	$1.25	$1.05	$2.31	$1.83	$1.54	$3.37		
85	1	1433	TOILET			2000	1	C2VT8	3' 2L VANITY FIXTURE W/T8S	46	92	$4.43	$3.73	$8.16	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	1	28	56	$2.70	$2.27	$4.97	$1.74	$1.46	$3.19		
86	1	1434	TOILET			2000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	64	$3.08	$2.59	$5.68	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	26	$1.25	$1.05	$2.31	$1.83	$1.54	$3.37		
87	1	1434	TOILET			2000	1	C2VT8	3' 2L VANITY FIXTURE W/T8S	46	92	$4.43	$3.73	$8.16	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	1	28	56	$2.70	$2.27	$4.97	$1.74	$1.46	$3.19		
88	1		TOILET			2000	1	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	59	118	$5.69	$4.78	$10.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	52	$2.51	$2.11	$4.61	$3.18	$2.67	$5.85		
89	1	1436	TOILET			2000	1	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	59	118	$5.69	$4.78	$10.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	52	$2.51	$2.11	$4.61	$3.18	$2.67	$5.85		
90	1		SLOP SINK			1000	1	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	59	59	$2.84	$4.78	$7.62	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.25	$2.11	$3.36	$1.59	$2.67	$4.26		
91	1		OFFICE			2000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	236	$11.38	$9.56	$20.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	104	$5.01	$4.21	$9.22	$6.36	$5.35	$11.71		
92	1		GYM			5000	15	MH400	400W METAL HALIDE	6870	34350	$1,655.67	$556.47	$2,212.14	LED150BLOCK	RETROFIT W/ 150W BLOCK	15	2250	11250	$542.25	$182.25	$724.50	$1,113.42	$374.22	$1,487.64		
93	1		HALL			8760	10	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	320	2803	$135.11	$25.92	$161.03	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	10	130	1139	$54.89	$10.53	$65.42	$80.22	$15.39	$95.61		
94			ELEVATOR			8760	3	A2ST8	4' 2L STRIP FIXTURES W/T8S	177	1551	$74.74	$14.34	$89.07	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	683	$32.93	$6.32	$39.25	$41.80	$8.02	$49.82		
95	2	2022	RECORDS			2000	14	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	826	1652	$79.63	$66.91	$146.53	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	14	364	728	$35.09	$29.48	$64.57	$44.54	$37.42	$81.96		
96	2	2023	ELECTRICAL			2000	4	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	236	472	$22.75	$19.12	$41.87	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	208	$10.03	$8.42	$18.45	$12.72	$10.69	$23.42		
97	2	2018	TOILET			2000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	64	$3.08	$2.59	$5.68	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	26	$1.25	$1.05	$2.31	$1.83	$1.54	$3.37		
98	2	2019	BEUTY SUPPLY			2000	4	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	128	256	$12.34	$10.37	$22.71	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	4	52	104	$5.01	$4.21	$9.22	$7.33	$6.16	$13.48		
99	2	2021	AIR HANDELER			500	5	A2VT8	4' 2L VANITY W/ 32W T8'S	295	148	$7.11	$23.90	$31.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	65	$3.13	$10.53	$13.66	$3.98	$13.37	$17.34		
100	2	2021	AIR HANDELER			500	4	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	236	118	$5.69	$19.12	$24.80	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	52	$2.51	$8.42	$10.93	$3.18	$10.69	$13.87		
101	2		HALL			8760	11	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	352	3084	$148.63	$28.51	$177.14	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	11	143	1253	$60.38	$11.58	$71.96	$88.25	$16.93	$105.18		
102	2	2016	STORAGE			2000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	64	$3.08	$2.59	$5.68	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	26	$1.25	$1.05	$2.31	$1.83	$1.54	$3.37		
103	2		HALL			8760	13	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	416	3644	$175.65	$33.70	$209.34	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	13	169	1480	$71.36	$13.69	$85.05	$104.29	$20.01	$124.30		
104	2	2005A	PROPERTY			2000	9	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	531	1062	$51.19	$43.01	$94.20	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	9	234	468	$22.56	$18.95	$41.51	$28.63	$24.06	$52.69		
105	2	2007	STORAGE			2000	3	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	177	354	$17.06	$14.34	$31.40	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	156	$7.52	$6.32	$13.84	$9.54	$8.02	$17.56		
106	2	2006	STORAGE			2000	4	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	236	472	$22.75	$19.12	$41.87	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	208	$10.03	$8.42	$18.45	$12.72	$10.69	$23.42		
107	2	2003	STORAGE			2000	8	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	472	944	$45.50	$38.23	$83.73	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	416	$20.05	$16.85	$36.90	$25.45	$21.38	$46.83		
108	2		HALL			8760	7	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	224	1962	$94.58	$18.14	$112.72	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	7	91	797	$38.42	$7.37	$45.79	$56.16	$10.77	$66.93		
109	2	2005	AIR HANDELER			500	5	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	295	148	$7.11	$23.90	$31.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	65	$3.13	$10.53	$13.66	$3.98	$13.37	$17.34		
110	2	2001	STORAGE			8760	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	280	$13.51	$2.59	$16.10	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	114	$5.49	$1.05	$6.54	$8.02	$1.54	$9.56		
111	2	2002	STAIRS			8760	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	1034	$49.82	$9.56	$59.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$21.96	$4.21	$26.17	$27.87	$5.35	$33.21		
112	2	2002	STAIRS			8760	1	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	59	517	$24.91	$4.78	$29.69	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$10.98	$2.11	$13.08	$13.93	$2.67	$16.61		
113	2	2008	STAIRS			8760	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	1034	$49.82	$9.56	$59.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$21.96	$4.21	$26.17	$27.87	$5.35	$33.21		
114	2	2008	STAIRS			8760	1	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	59	517	$24.91	$4.78	$29.69	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$10.98	$2.11	$13.08	$13.93	$2.67	$16.61		
115	2		STAIRS			8760	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	1034	$49.82	$9.56	$59.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$21.96	$4.21	$26.17	$27.87	$5.35	$33.21		
116	2		STAIRS			8760	1	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	59	517	$24.91	$4.78	$29.69	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$10.98	$2.11	$13.08	$13.93	$2.67	$16.61		
117	2		HALL			8760	14	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	448	3924	$189.16	$36.29	$225.45	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	14	182	1594	$76.85	$14.74	$91.59	$112.31	$21.55	$133.86		
118	2	2014	HALL			8760	5	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	160	1402	$67.56	$12.96	$80.52	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	5	65	569	$27.45	$5.27	$32.71	$40.11	$7.70	$47.81		
119	2		STAIRS			8760	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	1034	$49.82	$9.56	$59.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$21.96	$4.21	$26.17	$27.87	$5.35	$33.21		
120	2		STAIRS			8760	1	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	59	517	$24.91	$4.78	$29.69	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$10.98	$2.11	$13.08	$13.93	$2.67	$16.61		

ENHANCED LIGHTING SURVEY LOG

Project Name: ALDEN CORRECTIONAL

Months: 12

Hours: 2500 **Multipliers:** **0.0482** **6.75**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
121	1	1123	MAINTAINANCE			8760	6	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	354	3101	$149.47	$28.67	$178.14	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	1367	$65.87	$12.64	$78.50	$83.60	$16.04	$99.64		
122	1	1123	STORAGE			500	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	30	$1.42	$4.78	$6.20	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.63	$2.11	$2.73	$0.80	$2.67	$3.47		
123	1	1123	PIPE CHASE			500	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	30	$1.42	$4.78	$6.20	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.63	$2.11	$2.73	$0.80	$2.67	$3.47		
124	1	1124B	OFFICE			8760	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	1551	$74.74	$14.34	$89.07	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	683	$32.93	$6.32	$39.25	$41.80	$8.02	$49.82		
125	1	1124B	OFFICE			8760	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	526	$25.33	$4.86	$30.19	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	158	$7.60	$1.46	$9.06	$17.73	$3.40	$21.14		
126	1	1124	TOILET			2000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	118	$5.69	$4.78	$10.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	52	$2.51	$2.11	$4.61	$3.18	$2.67	$5.85		
127	1	1124	TOILET			2000	2	I60	60W INCANDESCENT	120	240	$11.57	$9.72	$21.29	NDR	INSTALL LED DRUM FIX.	2	30	60	$2.89	$2.43	$5.32	$8.68	$7.29	$15.97		
128	1	1124	MACHINE ROOM			8760	49	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	2891	25325	$1,220.67	$234.17	$1,454.84	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	49	1274	11160	$537.92	$103.19	$641.12	$682.75	$130.98	$813.73		
129	1	1124	OFFICE			5000	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	885	$42.66	$14.34	$56.99	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	390	$18.80	$6.32	$25.12	$23.86	$8.02	$31.88		
130	1	1124	OFFICE			5000	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	300	$14.46	$4.86	$19.32	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	90	$4.34	$1.46	$5.80	$10.12	$3.40	$13.52		
131	1		TOILET			5000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	295	$14.22	$4.78	$19.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.27	$2.11	$8.37	$7.95	$2.67	$10.63		
132	1		TOILET			5000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	295	$14.22	$4.78	$19.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.27	$2.11	$8.37	$7.95	$2.67	$10.63		
133	1		GARAGE			3000	11	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	649	1947	$93.85	$52.57	$146.41	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	11	286	858	$41.36	$23.17	$64.52	$52.49	$29.40	$81.89		
134	1		GARAGE			3000	2	B2I	8' 2L INDUSTRIAL SHADE SLIM LINE LAMPS	246	738	$35.57	$19.93	$55.50	RR4AB	RETRO (1) FIX. W/ (4) 4' LED LAMPS RELOCATION KIT	2	104	312	$15.04	$8.42	$23.46	$20.53	$11.50	$32.04		
135	1		GARAGE HOT WATER			500	2	I60	60W INCANDESCENT	120	60	$2.89	$9.72	$12.61	LED9SI	NEW 9W LED SCREW IN	2	18	9	$0.43	$1.46	$1.89	$2.46	$8.26	$10.72		
136	1		PUMP ROOM			2000	9	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	531	1062	$51.19	$43.01	$94.20	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	9	234	468	$22.56	$18.95	$41.51	$28.63	$24.06	$52.69		
137	1		LITTLE BARN			2000	4	HPS250	250W HIGH PRESSURE SODIUM	1180	2360	$113.75	$95.58	$209.33	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	4	400	800	$38.56	$32.40	$70.96	$75.19	$63.18	$138.37		
138	1		OFFICE			2000	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	118	$5.69	$4.78	$10.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	52	$2.51	$2.11	$4.61	$3.18	$2.67	$5.85		
139	1		K UNIT PIPE CHASE			500	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	30	$1.42	$4.78	$6.20	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.63	$2.11	$2.73	$0.80	$2.67	$3.47		
140	1		PHARMACY			5000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	590	$28.44	$9.56	$38.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	260	$12.53	$4.21	$16.74	$15.91	$5.35	$21.25		
141	1		PHARMACY			5000	2	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	64	320	$15.42	$5.18	$20.61	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	130	$6.27	$2.11	$8.37	$9.16	$3.08	$12.24		
142	1		PHARMACY			5000	4	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	236	1180	$56.88	$19.12	$75.99	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	520	$25.06	$8.42	$33.49	$31.81	$10.69	$42.50		
143			WAITING AREA			5000	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	1770	$85.31	$28.67	$113.99	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	780	$37.60	$12.64	$50.23	$47.72	$16.04	$63.76		
144	1	1204	SLOP SINK			500	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	30	$1.42	$4.78	$6.20	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.63	$2.11	$2.73	$0.80	$2.67	$3.47		
145	1	1203	TOILET			1000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	59	$2.84	$4.78	$7.62	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.25	$2.11	$3.36	$1.59	$2.67	$4.26		
146	1	1202	TOILET			1000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	59	$2.84	$4.78	$7.62	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.25	$2.11	$3.36	$1.59	$2.67	$4.26		
147	1	1220	CONTROL ROOM			1000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	118	$5.69	$9.56	$15.25	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.51	$4.21	$6.72	$3.18	$5.35	$8.53		
148	1	1220	TOILET			1000	1	A1VT8	4' 1L VANITY W/T8S	32	32	$1.54	$2.59	$4.13	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	13	$0.63	$1.05	$1.68	$0.92	$1.54	$2.45		
149	1		HALL			8760	6	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	192	1682	$81.07	$15.55	$96.62	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	6	78	683	$32.93	$6.32	$39.25	$48.13	$9.23	$57.37		
150	1	1206	OFFICE			2000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	236	$11.38	$9.56	$20.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	104	$5.01	$4.21	$9.22	$6.36	$5.35	$11.71		
151	1	1208	OFFICE			2000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	236	$11.38	$9.56	$20.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	104	$5.01	$4.21	$9.22	$6.36	$5.35	$11.71		
152	1	1210	PATIENT ROOM			2000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	236	$11.38	$9.56	$20.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	104	$5.01	$4.21	$9.22	$6.36	$5.35	$11.71		
153	1	1210	TOILET			2000	1	C2VT8	3' 2L VANITY FIXTURE W/T8S	46	92	$4.43	$3.73	$8.16	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	1	28	56	$2.70	$2.27	$4.97	$1.74	$1.46	$3.19		
154	1	1213	PATIENT ROOM			2000	2	A2VT8	4' 2L VANITY W/ 32W T8'S	118	236	$11.38	$9.56	$20.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	104	$5.01	$4.21	$9.22	$6.36	$5.35	$11.71		
155	1	1213	PATIENT ROOM			2000	1	D2VT8	2' 2L VANITY	33	66	$3.18	$2.67	$5.85	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	1	18	36	$1.74	$1.46	$3.19	$1.45	$1.22	$2.66		
156	1	1212	OFFICE			2000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	118	$5.69	$4.78	$10.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	52	$2.51	$2.11	$4.61	$3.18	$2.67	$5.85		
157	1	1211	OFFICE			2000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	236	$11.38	$9.56	$20.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	104	$5.01	$4.21	$9.22	$6.36	$5.35	$11.71		
158	1	1209	OFFICE			2000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	236	$11.38	$9.56	$20.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	104	$5.01	$4.21	$9.22	$6.36	$5.35	$11.71		
159	1	1207	DENTAL			2000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	236	$11.38	$9.56	$20.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	104	$5.01	$4.21	$9.22	$6.36	$5.35	$11.71		
160	1	1215B	OFFICE			2000	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	354	$17.06	$14.34	$31.40	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	156	$7.52	$6.32	$13.84	$9.54	$8.02	$17.56		

ENHANCED LIGHTING SURVEY LOG

Project Name: ALDEN CORRECTIONAL

Months: 12

Hours: 2500 **Multipliers:** **0.0482** **6.75**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
161	1	1215C	OFFICE			2000	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	472	$22.75	$19.12	$41.87	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	208	$10.03	$8.42	$18.45	$12.72	$10.69	$23.42		
162	1		MEDICAL CELLS			5000	6	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	354	1770	$85.31	$28.67	$113.99	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	780	$37.60	$12.64	$50.23	$47.72	$16.04	$63.76		
163	1		SHOWERS			2000	1	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	59	118	$5.69	$4.78	$10.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	52	$2.51	$2.11	$4.61	$3.18	$2.67	$5.85		
164	1		SLOP SINK			2000	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	118	$5.69	$4.78	$10.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	52	$2.51	$2.11	$4.61	$3.18	$2.67	$5.85		
165	1		OPEN AREA			1000	7	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	224	224	$10.80	$18.14	$28.94	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	7	91	91	$4.39	$7.37	$11.76	$6.41	$10.77	$17.18		
166	1		NIGHT LIGHTS			7000	13	8T5	8W T5 FLUORESCENT	130	910	$43.86	$10.53	$54.39	LED3	INSTALL 3W LED RETROFIT	13	39	273	$13.16	$3.16	$16.32	$30.70	$7.37	$38.07		
167	1		HALL			5000	2	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	64	320	$15.42	$5.18	$20.61	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	130	$6.27	$2.11	$8.37	$9.16	$3.08	$12.24		
168	1		DAY AREA			1000	13	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	416	416	$20.05	$33.70	$53.75	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	13	169	169	$8.15	$13.69	$21.83	$11.91	$20.01	$31.91		
169	1		NIGHT LIGHTS			3760	27	8T5	8W T5 FLUORESCENT	270	1015	$48.93	$21.87	$70.80	LED3	INSTALL 3W LED RETROFIT	27	81	305	$14.68	$6.56	$21.24	$34.25	$15.31	$49.56		
170	1		CELLS			5000	14	A2VT	4' 2L VAPOR TIGHT	1008	5040	$242.93	$81.65	$324.58	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	14	364	1820	$87.72	$29.48	$117.21	$155.20	$52.16	$207.37		
171	1		CELLS			5000	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	590	$28.44	$9.56	$38.00	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	2	26	130	$6.27	$2.11	$8.37	$22.17	$7.45	$29.62		
172	1		TOILET			5000	1	D2VT8	2' 2L VANITY	33	165	$7.95	$2.67	$10.63	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	1	18	90	$4.34	$1.46	$5.80	$3.62	$1.22	$4.83		
173	1		SLOP SINK			1000	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	59	$2.84	$4.78	$7.62	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.25	$2.11	$3.36	$1.59	$2.67	$4.26		
174	1		SHOWERS			5000	2	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	118	590	$28.44	$9.56	$38.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	260	$12.53	$4.21	$16.74	$15.91	$5.35	$21.25		
175	1		HALL			8760	11	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	352	3084	$148.63	$28.51	$177.14	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	11	143	1253	$60.38	$11.58	$71.96	$88.25	$16.93	$105.18		
176	1	1259	OFFICE			2000	10	A2TT8	4' 2L TROFFER FIXTURE W/T8S	590	1180	$56.88	$47.79	$104.67	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	10	260	520	$25.06	$21.06	$46.12	$31.81	$26.73	$58.54		
177	1		HALL			8760	11	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	352	3084	$148.63	$28.51	$177.14	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	11	143	1253	$60.38	$11.58	$71.96	$88.25	$16.93	$105.18		
178	1		RECEIVING			5000	4	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	128	640	$30.85	$10.37	$41.22	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	4	52	260	$12.53	$4.21	$16.74	$18.32	$6.16	$24.47		
179	1		STOCK AREA			5000	20	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	1180	5900	$284.38	$95.58	$379.96	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	20	520	2600	$125.32	$42.12	$167.44	$159.06	$53.46	$212.52		
180	1		RECEIVING			5000	7	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	413	2065	$99.53	$33.45	$132.99	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	7	182	910	$43.86	$14.74	$58.60	$55.67	$18.71	$74.38		
181	1		STAFF			5000	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	1770	$85.31	$28.67	$113.99	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	780	$37.60	$12.64	$50.23	$47.72	$16.04	$63.76		
182	1		MENS			5000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	295	$14.22	$4.78	$19.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.27	$2.11	$8.37	$7.95	$2.67	$10.63		
183	1		WOMENS			5000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	295	$14.22	$4.78	$19.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.27	$2.11	$8.37	$7.95	$2.67	$10.63		
184	1		CONTROL ROOM			1000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	118	$5.69	$9.56	$15.25	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.51	$4.21	$6.72	$3.18	$5.35	$8.53		
185	1		CONTROL ROOM			1000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	32	$1.54	$2.59	$4.13	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	13	$0.63	$1.05	$1.68	$0.92	$1.54	$2.45		
186	1		TOILET			5000	1	C2VT8	3' 2L VANITY FIXTURE W/T8S	46	230	$11.09	$3.73	$14.81	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	1	28	140	$6.75	$2.27	$9.02	$4.34	$1.46	$5.80		
187	1		HALL			8760	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	280	$13.51	$2.59	$16.10	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	114	$5.49	$1.05	$6.54	$8.02	$1.54	$9.56		
188	1		HALL			8760	12	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	384	3364	$162.14	$31.10	$193.24	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	12	156	1367	$65.87	$12.64	$78.50	$96.27	$18.47	$114.74		
189	1		SALLYPORT			5000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	160	$7.71	$2.59	$10.30	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	65	$3.13	$1.05	$4.19	$4.58	$1.54	$6.12		
190	1		SALLYPORT			5000	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	1180	$56.88	$19.12	$75.99	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	520	$25.06	$8.42	$33.49	$31.81	$10.69	$42.50		
191	1		GARAGE			8760	10	MH250	250W METAL HALIDE	2950	25842	$1,245.58	$238.95	$1,484.53	LED100BLOCK	RETROFIT W/ 150W BLOCK	10	1000	8760	$422.23	$81.00	$503.23	$823.35	$157.95	$981.30		
192	1		ARMORY			8760	1	A4IT8	4' 4L INDUSTRIAL SHADE W/T8S	112	981	$47.29	$9.07	$56.36	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	1	52	456	$21.96	$4.21	$26.17	$25.33	$4.86	$30.19		
193	1		TOILET			5000	1	D2VT8	2' 2L VANITY	33	165	$7.95	$2.67	$10.63	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	1	18	90	$4.34	$1.46	$5.80	$3.62	$1.22	$4.83		
194	1		INTAKE			5000	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	1180	$56.88	$19.12	$75.99	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	520	$25.06	$8.42	$33.49	$31.81	$10.69	$42.50		
195	1	1310	TOILET			5000	1	D2VT8	2' 2L VANITY	33	165	$7.95	$2.67	$10.63	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	1	18	90	$4.34	$1.46	$5.80	$3.62	$1.22	$4.83		
196	1		STORAGE			1000	2	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	118	118	$5.69	$9.56	$15.25	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.51	$4.21	$6.72	$3.18	$5.35	$8.53		
197	1		PROCESSING			5000	5	A2TT8	4' 2L TROFFER FIXTURE W/T8S	295	1475	$71.10	$23.90	$94.99	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	650	$31.33	$10.53	$41.86	$39.77	$13.37	$53.13		
198	1		PROCESSING			5000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	160	$7.71	$2.59	$10.30	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	65	$3.13	$1.05	$4.19	$4.58	$1.54	$6.12		
199	1		I.D.			5000	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	1770	$85.31	$28.67	$113.99	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	780	$37.60	$12.64	$50.23	$47.72	$16.04	$63.76		
200	1		PHOTO			5000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	590	$28.44	$9.56	$38.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	260	$12.53	$4.21	$16.74	$15.91	$5.35	$21.25		

ENHANCED LIGHTING SURVEY LOG

Project Name: ALDEN CORRECTIONAL

Months: 12

Hours: 2500 **Multipliers:** **0.0482** **6.75**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
201	1	1316	STORAGE			5000	2	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	118	590	$28.44	$9.56	$38.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	260	$12.53	$4.21	$16.74	$15.91	$5.35	$21.25		
202	1		OFFICE			5000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	590	$28.44	$9.56	$38.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	260	$12.53	$4.21	$16.74	$15.91	$5.35	$21.25		
203	1		OFFICE			5000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	160	$7.71	$2.59	$10.30	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	65	$3.13	$1.05	$4.19	$4.58	$1.54	$6.12		
204	1	1315	TOILET			5000	1	C2VT8	3' 2L VANITY FIXTURE W/T8S	46	230	$11.09	$3.73	$14.81	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	1	28	140	$6.75	$2.27	$9.02	$4.34	$1.46	$5.80		
205	1		CELLS			5000	4	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	236	1180	$56.88	$19.12	$75.99	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	520	$25.06	$8.42	$33.49	$31.81	$10.69	$42.50		
206	1		NIGHT LIGHTS			3760	4	8T5	8W T5 FLUORESCENT	40	150	$7.25	$3.24	$10.49	LED3	INSTALL 3W LED RETROFIT	4	12	45	$2.17	$0.97	$3.15	$5.07	$2.27	$7.34		
207	1	1323	SLOP SINK			1000	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	59	$2.84	$4.78	$7.62	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.25	$2.11	$3.36	$1.59	$2.67	$4.26		
208	1		PROPERTY			5000	11	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	649	3245	$156.41	$52.57	$208.98	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	11	286	1430	$68.93	$23.17	$92.09	$87.48	$29.40	$116.89		
209	1		HALL			8760	9	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	288	2523	$121.60	$23.33	$144.93	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	9	117	1025	$49.40	$9.48	$58.88	$72.20	$13.85	$86.05		
210	1		OPERATIONS			8760	10	A2TT8	4' 2L TROFFER FIXTURE W/T8S	590	5168	$249.12	$47.79	$296.91	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	10	260	2278	$109.78	$21.06	$130.84	$139.34	$26.73	$166.07		
211	1	1326	BREAK AREA			8760	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	1551	$74.74	$14.34	$89.07	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	683	$32.93	$6.32	$39.25	$41.80	$8.02	$49.82		
212	1	1328	OFFICE			2000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	236	$11.38	$9.56	$20.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	104	$5.01	$4.21	$9.22	$6.36	$5.35	$11.71		
213	1	1330	OFFICE			2000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	236	$11.38	$9.56	$20.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	104	$5.01	$4.21	$9.22	$6.36	$5.35	$11.71		
214	1	1332	OFFICE			2000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	236	$11.38	$9.56	$20.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	104	$5.01	$4.21	$9.22	$6.36	$5.35	$11.71		
215	1	1334	SLOP SINK			1000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	59	$2.84	$4.78	$7.62	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.25	$2.11	$3.36	$1.59	$2.67	$4.26		
216	1	1329A	OFFICE			2000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	118	$5.69	$4.78	$10.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	52	$2.51	$2.11	$4.61	$3.18	$2.67	$5.85		
217	1	1329	OFFICE			2000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	118	$5.69	$4.78	$10.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	52	$2.51	$2.11	$4.61	$3.18	$2.67	$5.85		
218	1	1327	STORAGE			2000	2	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	64	128	$6.17	$5.18	$11.35	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	52	$2.51	$2.11	$4.61	$3.66	$3.08	$6.74		
219	1	1335	MENS			8760	1	C2VT8	3' 2L VANITY FIXTURE W/T8S	46	403	$19.42	$3.73	$23.15	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	1	28	245	$11.82	$2.27	$14.09	$7.60	$1.46	$9.06		
220	1	1336	WOMENS			8760	1	C2VT8	3' 2L VANITY FIXTURE W/T8S	46	403	$19.42	$3.73	$23.15	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	1	28	245	$11.82	$2.27	$14.09	$7.60	$1.46	$9.06		
221	1	1337	OFFICE			2000	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	354	$17.06	$14.34	$31.40	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	156	$7.52	$6.32	$13.84	$9.54	$8.02	$17.56		
222	1	1339	ELEVATOR MACHINE			1000	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	59	$2.84	$4.78	$7.62	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.25	$2.11	$3.36	$1.59	$2.67	$4.26		
223	1	1340	OFFICE			2000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	236	$11.38	$9.56	$20.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	104	$5.01	$4.21	$9.22	$6.36	$5.35	$11.71		
224	1	1341	OFFICE			2000	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	472	$22.75	$19.12	$41.87	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	208	$10.03	$8.42	$18.45	$12.72	$10.69	$23.42		
225	1	1342	CONFERENCE			2000	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	472	$22.75	$19.12	$41.87	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	208	$10.03	$8.42	$18.45	$12.72	$10.69	$23.42		
226	1		HALL			8760	14	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	448	3924	$189.16	$36.29	$225.45	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	14	182	1594	$76.85	$14.74	$91.59	$112.31	$21.55	$133.86		
227	1		LIBRARY			5000	6	C2ST8	3' 2L STRIP FIXTURE, T8S EB	276	1380	$66.52	$22.36	$88.87	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	6	168	840	$40.49	$13.61	$54.10	$26.03	$8.75	$34.78		
228	1		LIBRARY			5000	3	A2ST8	4' 2L STRIP FIXTURES W/T8S	177	885	$42.66	$14.34	$56.99	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	390	$18.80	$6.32	$25.12	$23.86	$8.02	$31.88		
229	1		LIBRARY			5000	12	2-18CP	(2) 18W COMPACT FLUORESCENT	480	2400	$115.68	$38.88	$154.56	LED25CAN	NEW 25W LED CAN	12	300	1500	$72.30	$24.30	$96.60	$43.38	$14.58	$57.96		
230	1		LIBRARY			5000	12	MH400	400W METAL HALIDE	5496	27480	$1,324.54	$445.18	$1,769.71	LED150BLOCK	RETROFIT W/ 150W BLOCK	12	1800	9000	$433.80	$145.80	$579.60	$890.74	$299.38	$1,190.11		
231	1		SHOWERS			2000	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	236	$11.38	$9.56	$20.93	LED150BLOCK	RETROFIT W/ 150W BLOCK	2	300	600	$28.92	$24.30	$53.22	-$17.54	-$14.74	-$32.29		
232	1	1405	OFFICE			2000	6	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	354	708	$34.13	$28.67	$62.80	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	312	$15.04	$12.64	$27.67	$19.09	$16.04	$35.13		
233	1	1402	TOILET			2000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	118	$5.69	$4.78	$10.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	52	$2.51	$2.11	$4.61	$3.18	$2.67	$5.85		
234	1		HALL			8760	4	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	128	1121	$54.05	$10.37	$64.41	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	4	52	456	$21.96	$4.21	$26.17	$32.09	$6.16	$38.25		
235	1		HALL			8760	6	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	354	3101	$149.47	$28.67	$178.14	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	1367	$65.87	$12.64	$78.50	$83.60	$16.04	$99.64		
236	1		HALL			8760	4	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	128	1121	$54.05	$10.37	$64.41	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	4	52	456	$21.96	$4.21	$26.17	$32.09	$6.16	$38.25		
237	1		HALL			8760	6	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	354	3101	$149.47	$28.67	$178.14	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	1367	$65.87	$12.64	$78.50	$83.60	$16.04	$99.64		
238	1		HALL			8760	16	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	944	8269	$398.59	$76.46	$475.05	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	16	416	3644	$175.65	$33.70	$209.34	$222.94	$42.77	$265.71		
239	1		ALPHA CELLS			5000	24	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	1416	7080	$341.26	$114.70	$455.95	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	24	624	3120	$150.38	$50.54	$200.93	$190.87	$64.15	$255.02		
240	1		NIGHT LIGHTS			3760	34	8T5	8W T5 FLUORESCENT	340	1278	$61.62	$27.54	$89.16	LED3	INSTALL 3W LED RETROFIT	34	102	384	$18.49	$8.26	$26.75	$43.13	$19.28	$62.41		

ENHANCED LIGHTING SURVEY LOG

Project Name: ALDEN CORRECTIONAL

Months: 12

Hours: 2500 **Multipliers:** **0.0482** **6.75**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
241	1		OPEN AREA			5000	6	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	192	960	$46.27	$15.55	$61.82	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	6	78	390	$18.80	$6.32	$25.12	$27.47	$9.23	$36.71		
242	1		OPEN AREA			5000	5	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	160	800	$38.56	$12.96	$51.52	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	5	65	325	$15.67	$5.27	$20.93	$22.90	$7.70	$30.59		
243	1		OPEN AREA			5000	1	C2VT8	3' 2L VANITY FIXTURE W/T8S	46	230	$11.09	$3.73	$14.81	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	1	28	140	$6.75	$2.27	$9.02	$4.34	$1.46	$5.80		
244	1		OPEN AREA			5000	8	MV175	175W MERCURY VAPOR	1640	8200	$395.24	$132.84	$528.08	LED40CAN	NEW 40W LED CAN	8	320	1600	$77.12	$25.92	$103.04	$318.12	$106.92	$425.04		
245	1		SLOP SINK			1000	1	C2VT8	3' 2L VANITY FIXTURE W/T8S	46	46	$2.22	$3.73	$5.94	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	1	28	28	$1.35	$2.27	$3.62	$0.87	$1.46	$2.33		
246	1		LAUNDRY			5000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	160	$7.71	$2.59	$10.30	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	65	$3.13	$1.05	$4.19	$4.58	$1.54	$6.12		
247	2		TOILET			5000	2	C2VT8	3' 2L VANITY FIXTURE W/T8S	92	460	$22.17	$7.45	$29.62	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	2	56	280	$13.50	$4.54	$18.03	$8.68	$2.92	$11.59		
248	2		2ND FLOOR			5000	8	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	256	1280	$61.70	$20.74	$82.43	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	8	104	520	$25.06	$8.42	$33.49	$36.63	$12.31	$48.94		
249	1		SEG AREA			5000	6	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	192	960	$46.27	$15.55	$61.82	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	6	78	390	$18.80	$6.32	$25.12	$27.47	$9.23	$36.71		
250	1		SHOWERS			5000	2	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	64	320	$15.42	$5.18	$20.61	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	130	$6.27	$2.11	$8.37	$9.16	$3.08	$12.24		
251	1		OPEN AREA			5000	4	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	236	1180	$56.88	$19.12	$75.99	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	520	$25.06	$8.42	$33.49	$31.81	$10.69	$42.50		
252	1		OPEN AREA			5000	4	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	128	640	$30.85	$10.37	$41.22	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	4	52	260	$12.53	$4.21	$16.74	$18.32	$6.16	$24.47		
253	1		OPEN AREA			5000	1	C2VT8	3' 2L VANITY FIXTURE W/T8S	46	230	$11.09	$3.73	$14.81	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	1	28	140	$6.75	$2.27	$9.02	$4.34	$1.46	$5.80		
254	1		BRAVO CELLS			5000	47	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	2773	13865	$668.29	$224.61	$892.91	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	47	1222	6110	$294.50	$98.98	$393.48	$373.79	$125.63	$499.42		
255	1		NIGHT LIGHTS			3760	68	8T5	8W T5 FLUORESCENT	680	2557	$123.24	$55.08	$178.32	LED3	INSTALL 3W LED RETROFIT	68	204	767	$36.97	$16.52	$53.50	$86.27	$38.56	$124.82		
256	1		SHOWERS			5000	5	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	160	800	$38.56	$12.96	$51.52	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	5	65	325	$15.67	$5.27	$20.93	$22.90	$7.70	$30.59		
257	1		SEG AREA			5000	12	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	384	1920	$92.54	$31.10	$123.65	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	12	156	780	$37.60	$12.64	$50.23	$54.95	$18.47	$73.42		
258	1		OPEN AREA			5000	14	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	826	4130	$199.07	$66.91	$265.97	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	14	364	1820	$87.72	$29.48	$117.21	$111.34	$37.42	$148.76		
259	1	B241	TOILET			5000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	160	$7.71	$2.59	$10.30	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	65	$3.13	$1.05	$4.19	$4.58	$1.54	$6.12		
260	1		SLOP SINK			1000	1	C2VT8	3' 2L VANITY FIXTURE W/T8S	46	46	$2.22	$3.73	$5.94	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	1	28	28	$1.35	$2.27	$3.62	$0.87	$1.46	$2.33		
261	1		STORAGE			500	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	16	$0.77	$2.59	$3.36	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	7	$0.31	$1.05	$1.37	$0.46	$1.54	$2.00		
262	1		LAUNDRY			5000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	160	$7.71	$2.59	$10.30	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	65	$3.13	$1.05	$4.19	$4.58	$1.54	$6.12		
263	1		OPEN AREA			5000	1	C2VT8	3' 2L VANITY FIXTURE W/T8S	46	230	$11.09	$3.73	$14.81	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	1	28	140	$6.75	$2.27	$9.02	$4.34	$1.46	$5.80		
264	1		OPEN AREA			5000	8	MV175	175W MERCURY VAPOR	1640	8200	$395.24	$132.84	$528.08	LED40CAN	NEW 40W LED CAN	8	320	1600	$77.12	$25.92	$103.04	$318.12	$106.92	$425.04		
265	1		TOILET			5000	2	C2VT8	3' 2L VANITY FIXTURE W/T8S	92	460	$22.17	$7.45	$29.62	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	2	56	280	$13.50	$4.54	$18.03	$8.68	$2.92	$11.59		
266	1		OPEN AREA			5000	7	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	413	2065	$99.53	$33.45	$132.99	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	7	182	910	$43.86	$14.74	$58.60	$55.67	$18.71	$74.38		
267	1		OPEN AREA			5000	5	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	160	800	$38.56	$12.96	$51.52	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	5	65	325	$15.67	$5.27	$20.93	$22.90	$7.70	$30.59		
268	1		HALL			8760	2	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	64	561	$27.02	$5.18	$32.21	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	228	$10.98	$2.11	$13.08	$16.04	$3.08	$19.12		
269	1		CONTROL ROOM			1000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	32	$1.54	$2.59	$4.13	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	13	$0.63	$1.05	$1.68	$0.92	$1.54	$2.45		
270	1		CHARLEY CELLS			5000	48	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	2832	14160	$682.51	$229.39	$911.90	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	48	1248	6240	$300.77	$101.09	$401.86	$381.74	$128.30	$510.05		
271	1		NIGHT LIGHTS			3760	62	8T5	8W T5 FLUORESCENT	620	2331	$112.36	$50.22	$162.58	LED3	INSTALL 3W LED RETROFIT	62	186	699	$33.71	$15.07	$48.78	$78.65	$35.15	$113.81		
272	1		SHOWERS			5000	4	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	128	640	$30.85	$10.37	$41.22	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	4	52	260	$12.53	$4.21	$16.74	$18.32	$6.16	$24.47		
273	1		OPEN AREA			5000	14	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	826	4130	$199.07	$66.91	$265.97	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	14	364	1820	$87.72	$29.48	$117.21	$111.34	$37.42	$148.76		
274	1		OPEN AREA			5000	10	MV175	175W MERCURY VAPOR	2050	10250	$494.05	$166.05	$660.10	LED40CAN	NEW 40W LED CAN	10	400	2000	$96.40	$32.40	$128.80	$397.65	$133.65	$531.30		
275	1		OPEN AREA			5000	10	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	320	1600	$77.12	$25.92	$103.04	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	10	130	650	$31.33	$10.53	$41.86	$45.79	$15.39	$61.18		
276	1		OPEN AREA			5000	2	C2VT8	3' 2L VANITY FIXTURE W/T8S	92	460	$22.17	$7.45	$29.62	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	2	56	280	$13.50	$4.54	$18.03	$8.68	$2.92	$11.59		
277	1		TOILETS			5000	4	C2VT8	3' 2L VANITY FIXTURE W/T8S	184	920	$44.34	$14.90	$59.25	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	4	112	560	$26.99	$9.07	$36.06	$17.35	$5.83	$23.18		
278	1		LAUNDRYS			5000	2	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	64	320	$15.42	$5.18	$20.61	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	130	$6.27	$2.11	$8.37	$9.16	$3.08	$12.24		
279	1		CONTROL ROOM			1000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	32	$1.54	$2.59	$4.13	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	13	$0.63	$1.05	$1.68	$0.92	$1.54	$2.45		
280	1		SLOP SINK			1000	1	C2VT8	3' 2L VANITY FIXTURE W/T8S	46	46	$2.22	$3.73	$5.94	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	1	28	28	$1.35	$2.27	$3.62	$0.87	$1.46	$2.33		

ENHANCED LIGHTING SURVEY LOG

Project Name: ALDEN CORRECTIONAL

Months: 12

Hours: 2500 **Multipliers:** **0.0482** **6.75**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
281	1		DELTA CELLS			5000	48	A2VT	4' 2L VAPOR TIGHT	3456	17280	$832.90	$279.94	$1,112.83	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	48	1248	6240	$300.77	$101.09	$401.86	$532.13	$178.85	$710.98		
282	1		NIGHT LIGHTS			3760	60	8T5	8W T5 FLUORESCENT	600	2256	$108.74	$48.60	$157.34	LED3	INSTALL 3W LED RETROFIT	60	180	677	$32.62	$14.58	$47.20	$76.12	$34.02	$110.14		
283	1		SHOWERS			5000	4	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	128	640	$30.85	$10.37	$41.22	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	4	52	260	$12.53	$4.21	$16.74	$18.32	$6.16	$24.47		
284	1		LAUNDRY			5000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	160	$7.71	$2.59	$10.30	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	65	$3.13	$1.05	$4.19	$4.58	$1.54	$6.12		
285	1		OPEN AREA			5000	12	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	708	3540	$170.63	$57.35	$227.98	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	12	312	1560	$75.19	$25.27	$100.46	$95.44	$32.08	$127.51		
286	1		PASSAGE			8760	3	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	96	841	$40.53	$7.78	$48.31	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	3	39	342	$16.47	$3.16	$19.63	$24.07	$4.62	$28.68		
287	1		OPEN AREA			5000	10	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	320	1600	$77.12	$25.92	$103.04	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	10	130	650	$31.33	$10.53	$41.86	$45.79	$15.39	$61.18		
288	1		OPEN AREA			5000	8	MV175	175W MERCURY VAPOR	1640	8200	$395.24	$132.84	$528.08	LED40CAN	NEW 40W LED CAN	8	320	1600	$77.12	$25.92	$103.04	$318.12	$106.92	$425.04		
289	1		OPEN AREA			5000	2	C2VT8	3' 2L VANITY FIXTURE W/T8S	92	460	$22.17	$7.45	$29.62	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	2	56	280	$13.50	$4.54	$18.03	$8.68	$2.92	$11.59		
290	1		CLOSET			1000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	32	$1.54	$2.59	$4.13	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	13	$0.63	$1.05	$1.68	$0.92	$1.54	$2.45		
291	1		CONTROL ROOM			1000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	32	$1.54	$2.59	$4.13	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	13	$0.63	$1.05	$1.68	$0.92	$1.54	$2.45		
292	1		TOILETS			5000	2	C2VT8	3' 2L VANITY FIXTURE W/T8S	92	460	$22.17	$7.45	$29.62	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	2	56	280	$13.50	$4.54	$18.03	$8.68	$2.92	$11.59		
293	1		SLOP SINK			1000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	32	$1.54	$2.59	$4.13	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	13	$0.63	$1.05	$1.68	$0.92	$1.54	$2.45		
294	1		CONFERENCE			5000	6	A2RT8	4' 2L RECESSED FIXTURE W/T8S	354	1770	$85.31	$28.67	$113.99	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	6	78	390	$18.80	$6.32	$25.12	$66.52	$22.36	$88.87		
295	2		2ND FLOOR CONFERENCE			5000	6	A2RT8	4' 2L RECESSED FIXTURE W/T8S	354	1770	$85.31	$28.67	$113.99	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	6	78	390	$18.80	$6.32	$25.12	$66.52	$22.36	$88.87		
296	1		PASSAGE			8760	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	280	$13.51	$2.59	$16.10	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	114	$5.49	$1.05	$6.54	$8.02	$1.54	$9.56		
297	1		ECO CELLS			5000	48	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	2832	14160	$682.51	$229.39	$911.90	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	48	1248	6240	$300.77	$101.09	$401.86	$381.74	$128.30	$510.05		
298	1		NIGHT LIGHTS			3760	60	8T5	8W T5 FLUORESCENT	600	2256	$108.74	$48.60	$157.34	LED3	INSTALL 3W LED RETROFIT	60	180	677	$32.62	$14.58	$47.20	$76.12	$34.02	$110.14		
299	1		SHOWERS			5000	4	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	128	640	$30.85	$10.37	$41.22	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	4	52	260	$12.53	$4.21	$16.74	$18.32	$6.16	$24.47		
300	1		LAUNDRY			5000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	160	$7.71	$2.59	$10.30	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	65	$3.13	$1.05	$4.19	$4.58	$1.54	$6.12		
301	1		OPEN AREA			5000	12	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	708	3540	$170.63	$57.35	$227.98	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	12	312	1560	$75.19	$25.27	$100.46	$95.44	$32.08	$127.51		
302	1		PASSAGE			8760	3	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	96	841	$40.53	$7.78	$48.31	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	3	39	342	$16.47	$3.16	$19.63	$24.07	$4.62	$28.68		
303	1		OPEN AREA			5000	10	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	320	1600	$77.12	$25.92	$103.04	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	10	130	650	$31.33	$10.53	$41.86	$45.79	$15.39	$61.18		
304	1		OPEN AREA			5000	8	MV175	175W MERCURY VAPOR	1640	8200	$395.24	$132.84	$528.08	LED40CAN	NEW 40W LED CAN	8	320	1600	$77.12	$25.92	$103.04	$318.12	$106.92	$425.04		
305	1		OPEN AREA			5000	2	C2VT8	3' 2L VANITY FIXTURE W/T8S	92	460	$22.17	$7.45	$29.62	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	2	56	280	$13.50	$4.54	$18.03	$8.68	$2.92	$11.59		
306	1		CLOSET			1000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	32	$1.54	$2.59	$4.13	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	13	$0.63	$1.05	$1.68	$0.92	$1.54	$2.45		
307	1		CONTROL ROOM			1000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	32	$1.54	$2.59	$4.13	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	13	$0.63	$1.05	$1.68	$0.92	$1.54	$2.45		
308	1		TOILETS			5000	2	C2VT8	3' 2L VANITY FIXTURE W/T8S	92	460	$22.17	$7.45	$29.62	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	2	56	280	$13.50	$4.54	$18.03	$8.68	$2.92	$11.59		
309	1		SLOP SINK			1000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	32	$1.54	$2.59	$4.13	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	13	$0.63	$1.05	$1.68	$0.92	$1.54	$2.45		
310	1		CONFERENCE			5000	6	A2RT8	4' 2L RECESSED FIXTURE W/T8S	354	1770	$85.31	$28.67	$113.99	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	6	78	390	$18.80	$6.32	$25.12	$66.52	$22.36	$88.87		
311	2		2ND FLOOR CONFERENCE			5000	6	A2RT8	4' 2L RECESSED FIXTURE W/T8S	354	1770	$85.31	$28.67	$113.99	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	6	78	390	$18.80	$6.32	$25.12	$66.52	$22.36	$88.87		
312	1		PASSAGE			8760	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	280	$13.51	$2.59	$16.10	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	114	$5.49	$1.05	$6.54	$8.02	$1.54	$9.56		
313	1		FOX CELLS			5000	48	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	2832	14160	$682.51	$229.39	$911.90	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	48	1248	6240	$300.77	$101.09	$401.86	$381.74	$128.30	$510.05		
314	1		NIGHT LIGHTS			3760	60	8T5	8W T5 FLUORESCENT	600	2256	$108.74	$48.60	$157.34	LED3	INSTALL 3W LED RETROFIT	60	180	677	$32.62	$14.58	$47.20	$76.12	$34.02	$110.14		
315	1		SHOWERS			5000	4	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	128	640	$30.85	$10.37	$41.22	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	4	52	260	$12.53	$4.21	$16.74	$18.32	$6.16	$24.47		
316	1		LAUNDRY			5000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	160	$7.71	$2.59	$10.30	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	65	$3.13	$1.05	$4.19	$4.58	$1.54	$6.12		
317	1		OPEN AREA			5000	12	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	708	3540	$170.63	$57.35	$227.98	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	12	312	1560	$75.19	$25.27	$100.46	$95.44	$32.08	$127.51		
318	1		PASSAGE			8760	3	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	96	841	$40.53	$7.78	$48.31	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	3	39	342	$16.47	$3.16	$19.63	$24.07	$4.62	$28.68		
319	1		OPEN AREA			5000	10	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	320	1600	$77.12	$25.92	$103.04	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	10	130	650	$31.33	$10.53	$41.86	$45.79	$15.39	$61.18		
320	1		OPEN AREA			5000	8	MV175	175W MERCURY VAPOR	1640	8200	$395.24	$132.84	$528.08	LED40CAN	NEW 40W LED CAN	8	320	1600	$77.12	$25.92	$103.04	$318.12	$106.92	$425.04		

ENHANCED LIGHTING SURVEY LOG

Project Name: ALDEN CORRECTIONAL

Months: 12

Hours: 2500 **Multipliers:** **0.0482** **6.75**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
321	1		OPEN AREA			5000	2	C2VT8	3' 2L VANITY FIXTURE W/T8S	92	460	$22.17	$7.45	$29.62	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	2	56	280	$13.50	$4.54	$18.03	$8.68	$2.92	$11.59		
322	1		CLOSET			1000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	32	$1.54	$2.59	$4.13	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	13	$0.63	$1.05	$1.68	$0.92	$1.54	$2.45		
323	1		CONTROL ROOM			1000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	32	$1.54	$2.59	$4.13	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	13	$0.63	$1.05	$1.68	$0.92	$1.54	$2.45		
324	1		TOILETS			5000	2	C2VT8	3' 2L VANITY FIXTURE W/T8S	92	460	$22.17	$7.45	$29.62	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	2	56	280	$13.50	$4.54	$18.03	$8.68	$2.92	$11.59		
325	1		SLOP SINK			1000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	32	$1.54	$2.59	$4.13	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	13	$0.63	$1.05	$1.68	$0.92	$1.54	$2.45		
326	1		CONFERENCE			5000	6	A2RT8	4' 2L RECESSED FIXTURE W/T8S	354	1770	$85.31	$28.67	$113.99	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	6	78	390	$18.80	$6.32	$25.12	$66.52	$22.36	$88.87		
327	2		2ND FLOOR CONFERENCE			5000	6	A2RT8	4' 2L RECESSED FIXTURE W/T8S	354	1770	$85.31	$28.67	$113.99	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	6	78	390	$18.80	$6.32	$25.12	$66.52	$22.36	$88.87		
328	1		PASSAGE			8760	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	280	$13.51	$2.59	$16.10	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	114	$5.49	$1.05	$6.54	$8.02	$1.54	$9.56		
329	1		GOLF CELLS			5000	48	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	2832	14160	$682.51	$229.39	$911.90	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	48	1248	6240	$300.77	$101.09	$401.86	$381.74	$128.30	$510.05		
330	1		NIGHT LIGHTS			3760	60	8T5	8W T5 FLUORESCENT	600	2256	$108.74	$48.60	$157.34	LED3	INSTALL 3W LED RETROFIT	60	180	677	$32.62	$14.58	$47.20	$76.12	$34.02	$110.14		
331	1		SHOWERS			5000	4	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	128	640	$30.85	$10.37	$41.22	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	4	52	260	$12.53	$4.21	$16.74	$18.32	$6.16	$24.47		
332	1		LAUNDRY			5000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	160	$7.71	$2.59	$10.30	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	65	$3.13	$1.05	$4.19	$4.58	$1.54	$6.12		
333	1		OPEN AREA			5000	12	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	708	3540	$170.63	$57.35	$227.98	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	12	312	1560	$75.19	$25.27	$100.46	$95.44	$32.08	$127.51		
334	1		PASSAGE			8760	3	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	96	841	$40.53	$7.78	$48.31	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	3	39	342	$16.47	$3.16	$19.63	$24.07	$4.62	$28.68		
335	1		OPEN AREA			5000	10	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	320	1600	$77.12	$25.92	$103.04	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	10	130	650	$31.33	$10.53	$41.86	$45.79	$15.39	$61.18		
336	1		OPEN AREA			5000	8	MV175	175W MERCURY VAPOR	1640	8200	$395.24	$132.84	$528.08	LED40CAN	NEW 40W LED CAN	8	320	1600	$77.12	$25.92	$103.04	$318.12	$106.92	$425.04		
337	1		OPEN AREA			5000	2	C2VT8	3' 2L VANITY FIXTURE W/T8S	92	460	$22.17	$7.45	$29.62	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	2	56	280	$13.50	$4.54	$18.03	$8.68	$2.92	$11.59		
338	1		CLOSET			1000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	32	$1.54	$2.59	$4.13	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	13	$0.63	$1.05	$1.68	$0.92	$1.54	$2.45		
339	1		CONTROL ROOM			1000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	32	$1.54	$2.59	$4.13	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	13	$0.63	$1.05	$1.68	$0.92	$1.54	$2.45		
340	1		TOILETS			5000	2	C2VT8	3' 2L VANITY FIXTURE W/T8S	92	460	$22.17	$7.45	$29.62	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	2	56	280	$13.50	$4.54	$18.03	$8.68	$2.92	$11.59		
341	1		SLOP SINK			1000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	32	$1.54	$2.59	$4.13	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	13	$0.63	$1.05	$1.68	$0.92	$1.54	$2.45		
342	1		CONFERENCE			5000	6	A2RT8	4' 2L RECESSED FIXTURE W/T8S	354	1770	$85.31	$28.67	$113.99	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	6	78	390	$18.80	$6.32	$25.12	$66.52	$22.36	$88.87		
343	2		2ND FLOOR CONFERENCE			5000	6	A2RT8	4' 2L RECESSED FIXTURE W/T8S	354	1770	$85.31	$28.67	$113.99	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	6	78	390	$18.80	$6.32	$25.12	$66.52	$22.36	$88.87		
344	1		PASSAGE			8760	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	280	$13.51	$2.59	$16.10	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	114	$5.49	$1.05	$6.54	$8.02	$1.54	$9.56		
345	1		HOTEL CELLS			5000	48	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	2832	14160	$682.51	$229.39	$911.90	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	48	1248	6240	$300.77	$101.09	$401.86	$381.74	$128.30	$510.05		
346	1		NIGHT LIGHTS			3760	60	8T5	8W T5 FLUORESCENT	600	2256	$108.74	$48.60	$157.34	LED3	INSTALL 3W LED RETROFIT	60	180	677	$32.62	$14.58	$47.20	$76.12	$34.02	$110.14		
347	1		SHOWERS			5000	4	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	128	640	$30.85	$10.37	$41.22	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	4	52	260	$12.53	$4.21	$16.74	$18.32	$6.16	$24.47		
348	1		LAUNDRY			5000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	160	$7.71	$2.59	$10.30	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	65	$3.13	$1.05	$4.19	$4.58	$1.54	$6.12		
349	1		OPEN AREA			5000	12	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	708	3540	$170.63	$57.35	$227.98	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	12	312	1560	$75.19	$25.27	$100.46	$95.44	$32.08	$127.51		
350	1		PASSAGE			8760	3	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	96	841	$40.53	$7.78	$48.31	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	3	39	342	$16.47	$3.16	$19.63	$24.07	$4.62	$28.68		
351	1		OPEN AREA			5000	10	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	320	1600	$77.12	$25.92	$103.04	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	10	130	650	$31.33	$10.53	$41.86	$45.79	$15.39	$61.18		
352	1		OPEN AREA			5000	8	MV175	175W MERCURY VAPOR	1640	8200	$395.24	$132.84	$528.08	LED40CAN	NEW 40W LED CAN	8	320	1600	$77.12	$25.92	$103.04	$318.12	$106.92	$425.04		
353	1		OPEN AREA			5000	2	C2VT8	3' 2L VANITY FIXTURE W/T8S	92	460	$22.17	$7.45	$29.62	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	2	56	280	$13.50	$4.54	$18.03	$8.68	$2.92	$11.59		
354	1		CLOSET			1000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	32	$1.54	$2.59	$4.13	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	13	$0.63	$1.05	$1.68	$0.92	$1.54	$2.45		
355	1		CONTROL ROOM			1000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	32	$1.54	$2.59	$4.13	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	13	$0.63	$1.05	$1.68	$0.92	$1.54	$2.45		
356	1		TOILETS			5000	2	C2VT8	3' 2L VANITY FIXTURE W/T8S	92	460	$22.17	$7.45	$29.62	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	2	56	280	$13.50	$4.54	$18.03	$8.68	$2.92	$11.59		
357	1		SLOP SINK			1000	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	32	$1.54	$2.59	$4.13	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	13	$0.63	$1.05	$1.68	$0.92	$1.54	$2.45		
358	1		CONFERENCE			5000	6	A2RT8	4' 2L RECESSED FIXTURE W/T8S	354	1770	$85.31	$28.67	$113.99	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	6	78	390	$18.80	$6.32	$25.12	$66.52	$22.36	$88.87		
359	2		2ND FLOOR CONFERENCE			5000	6	A2RT8	4' 2L RECESSED FIXTURE W/T8S	354	1770	$85.31	$28.67	$113.99	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	6	78	390	$18.80	$6.32	$25.12	$66.52	$22.36	$88.87		
360	1		PASSAGE			8760	1	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	32	280	$13.51	$2.59	$16.10	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	114	$5.49	$1.05	$6.54	$8.02	$1.54	$9.56		

ENHANCED LIGHTING SURVEY LOG

Project Name: ALDEN CORRECTIONAL

Months: 12

Hours: 2500 **Multipliers:** **0.0482** **6.75**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
361			NEWER AREA			2500																					
362			HALL			3000	6	A2RT8	4' 2L RECESSED FIXTURE W/T8S	354	1062	$51.19	$28.67	$79.86	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	6	78	234	$11.28	$6.32	$17.60	$39.91	$22.36	$62.27		
363			N UNIT			5000	35	A2TT8	4' 2L TROFFER FIXTURE W/T8S	2065	10325	$497.67	$167.27	$664.93	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	35	910	4550	$219.31	$73.71	$293.02	$278.36	$93.56	$371.91		
364			STORAGE			2500	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	295	$14.22	$9.56	$23.78	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	2	26	65	$3.13	$2.11	$5.24	$11.09	$7.45	$18.54		
365			SHOWERS			5000	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	885	$42.66	$14.34	$56.99	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	3	78	390	$18.80	$6.32	$25.12	$23.86	$8.02	$31.88		
366			TOILETS			8760	7	A2VT8	4' 2L VANITY W/ 32W T8'S	413	3618	$174.38	$33.45	$207.83	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	7	182	1594	$76.85	$14.74	$91.59	$97.54	$18.71	$116.25		
367			PIPE CHASE			500	6	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	354	177	$8.53	$28.67	$37.21	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	78	$3.76	$12.64	$16.40	$4.77	$16.04	$20.81		
368			LAUNDRY			5000	1	A2RT8	4' 2L RECESSED FIXTURE W/T8S	59	295	$14.22	$4.78	$19.00	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	1	13	65	$3.13	$1.05	$4.19	$11.09	$3.73	$14.81		
369			PASSAGE			5000	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	590	$28.44	$9.56	$38.00	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	2	26	130	$6.27	$2.11	$8.37	$22.17	$7.45	$29.62		
370			TOILET			5000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	295	$14.22	$4.78	$19.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.27	$2.11	$8.37	$7.95	$2.67	$10.63		
371			L UNIT			5000	35	A2TT8	4' 2L TROFFER FIXTURE W/T8S	2065	10325	$497.67	$167.27	$664.93	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	35	910	4550	$219.31	$73.71	$293.02	$278.36	$93.56	$371.91		
372			STORAGE			2500	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	295	$14.22	$9.56	$23.78	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	2	26	65	$3.13	$2.11	$5.24	$11.09	$7.45	$18.54		
373			SHOWERS			5000	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	885	$42.66	$14.34	$56.99	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	3	78	390	$18.80	$6.32	$25.12	$23.86	$8.02	$31.88		
374			TOILETS			8760	7	A2VT8	4' 2L VANITY W/ 32W T8'S	413	3618	$174.38	$33.45	$207.83	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	7	182	1594	$76.85	$14.74	$91.59	$97.54	$18.71	$116.25		
375			PIPE CHASE			500	6	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	354	177	$8.53	$28.67	$37.21	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	78	$3.76	$12.64	$16.40	$4.77	$16.04	$20.81		
376			LAUNDRY			5000	1	A2RT8	4' 2L RECESSED FIXTURE W/T8S	59	295	$14.22	$4.78	$19.00	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	1	13	65	$3.13	$1.05	$4.19	$11.09	$3.73	$14.81		
377			PASSAGE			5000	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	590	$28.44	$9.56	$38.00	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	2	26	130	$6.27	$2.11	$8.37	$22.17	$7.45	$29.62		
378			TOILET			5000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	295	$14.22	$4.78	$19.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.27	$2.11	$8.37	$7.95	$2.67	$10.63		
379			O UNIT			5000	35	A2TT8	4' 2L TROFFER FIXTURE W/T8S	2065	10325	$497.67	$167.27	$664.93	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	35	910	4550	$219.31	$73.71	$293.02	$278.36	$93.56	$371.91		
380			STORAGE			2500	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	295	$14.22	$9.56	$23.78	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	2	26	65	$3.13	$2.11	$5.24	$11.09	$7.45	$18.54		
381			SHOWERS			5000	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	885	$42.66	$14.34	$56.99	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	3	78	390	$18.80	$6.32	$25.12	$23.86	$8.02	$31.88		
382			TOILETS			8760	7	A2VT8	4' 2L VANITY W/ 32W T8'S	413	3618	$174.38	$33.45	$207.83	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	7	182	1594	$76.85	$14.74	$91.59	$97.54	$18.71	$116.25		
383			PIPE CHASE			500	6	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	354	177	$8.53	$28.67	$37.21	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	78	$3.76	$12.64	$16.40	$4.77	$16.04	$20.81		
384			LAUNDRY			5000	1	A2RT8	4' 2L RECESSED FIXTURE W/T8S	59	295	$14.22	$4.78	$19.00	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	1	13	65	$3.13	$1.05	$4.19	$11.09	$3.73	$14.81		
385			PASSAGE			5000	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	590	$28.44	$9.56	$38.00	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	2	26	130	$6.27	$2.11	$8.37	$22.17	$7.45	$29.62		
386			TOILET			5000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	295	$14.22	$4.78	$19.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.27	$2.11	$8.37	$7.95	$2.67	$10.63		
387			P UNIT			5000	35	A2TT8	4' 2L TROFFER FIXTURE W/T8S	2065	10325	$497.67	$167.27	$664.93	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	35	910	4550	$219.31	$73.71	$293.02	$278.36	$93.56	$371.91		
388			STORAGE			2500	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	295	$14.22	$9.56	$23.78	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	2	26	65	$3.13	$2.11	$5.24	$11.09	$7.45	$18.54		
389			SHOWERS			5000	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	885	$42.66	$14.34	$56.99	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	3	78	390	$18.80	$6.32	$25.12	$23.86	$8.02	$31.88		
390			TOILETS			8760	7	A2VT8	4' 2L VANITY W/ 32W T8'S	413	3618	$174.38	$33.45	$207.83	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	7	182	1594	$76.85	$14.74	$91.59	$97.54	$18.71	$116.25		
391			PIPE CHASE			500	6	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	354	177	$8.53	$28.67	$37.21	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	78	$3.76	$12.64	$16.40	$4.77	$16.04	$20.81		
392			LAUNDRY			5000	1	A2RT8	4' 2L RECESSED FIXTURE W/T8S	59	295	$14.22	$4.78	$19.00	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	1	13	65	$3.13	$1.05	$4.19	$11.09	$3.73	$14.81		
393			PASSAGE			5000	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	590	$28.44	$9.56	$38.00	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	2	26	130	$6.27	$2.11	$8.37	$22.17	$7.45	$29.62		
394			TOILET			5000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	295	$14.22	$4.78	$19.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.27	$2.11	$8.37	$7.95	$2.67	$10.63		
395			HALL			8760	15	A2RT8	4' 2L RECESSED FIXTURE W/T8S	885	7753	$373.68	$71.69	$445.36	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	15	195	1708	$82.34	$15.80	$98.13	$291.34	$55.89	$347.23		
396			R UNIT			5000	35	A2TT8	4' 2L TROFFER FIXTURE W/T8S	2065	10325	$497.67	$167.27	$664.93	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	35	910	4550	$219.31	$73.71	$293.02	$278.36	$93.56	$371.91		
397			STORAGE			2500	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	295	$14.22	$9.56	$23.78	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	2	26	65	$3.13	$2.11	$5.24	$11.09	$7.45	$18.54		
398			SHOWERS			5000	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	885	$42.66	$14.34	$56.99	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	3	78	390	$18.80	$6.32	$25.12	$23.86	$8.02	$31.88		
399			TOILETS			8760	7	A2VT8	4' 2L VANITY W/ 32W T8'S	413	3618	$174.38	$33.45	$207.83	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	7	182	1594	$76.85	$14.74	$91.59	$97.54	$18.71	$116.25		
400			PIPE CHASE			500	6	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	354	177	$8.53	$28.67	$37.21	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	78	$3.76	$12.64	$16.40	$4.77	$16.04	$20.81		

ENHANCED LIGHTING SURVEY LOG

Project Name: ALDEN CORRECTIONAL

Months: 12

Hours: 2500 **Multipliers:** **0.0482** **6.75**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
401			LAUNDRY			5000	1	A2RT8	4' 2L RECESSED FIXTURE W/T8S	59	295	$14.22	$4.78	$19.00	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	1	13	65	$3.13	$1.05	$4.19	$11.09	$3.73	$14.81		
402			PASSAGE			5000	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	590	$28.44	$9.56	$38.00	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	2	26	130	$6.27	$2.11	$8.37	$22.17	$7.45	$29.62		
403			TOILET			5000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	295	$14.22	$4.78	$19.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.27	$2.11	$8.37	$7.95	$2.67	$10.63		
404			ELECTRICAL			500	1	A3TT8	4' 3L TROFFER W/ T8S	93	47	$2.24	$7.53	$9.77	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	13	$0.63	$2.11	$2.73	$1.61	$5.43	$7.04		
405			SLOP SINK			1000	1	A2RT8	4' 2L RECESSED FIXTURE W/T8S	59	59	$2.84	$4.78	$7.62	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	1	13	13	$0.63	$1.05	$1.68	$2.22	$3.73	$5.94		
406			S UNIT			2500																					
407			PASSAGE			8760	1	A4TT8	4' 4L RECESSED TROFFER W/T8S	112	981	$47.29	$9.07	$56.36	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	228	$10.98	$2.11	$13.08	$36.31	$6.97	$43.28		
408			SLOP SINK			1000	1	A2RT8	4' 2L RECESSED FIXTURE W/T8S	59	59	$2.84	$4.78	$7.62	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	1	13	13	$0.63	$1.05	$1.68	$2.22	$3.73	$5.94		
409			OPEN AREA			5000	8	A4TT8	4' 4L RECESSED TROFFER W/T8S	896	4480	$215.94	$72.58	$288.51	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	8	208	1040	$50.13	$16.85	$66.98	$165.81	$55.73	$221.54		
410			CELLS			5000	6	A2VT8	4' 2L VANITY W/ 32W T8'S	354	1770	$85.31	$28.67	$113.99	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	780	$37.60	$12.64	$50.23	$47.72	$16.04	$63.76		
411			PIPE CHASE			500	1	I60	60W INCANDESCENT	60	30	$1.45	$4.86	$6.31	LED9SI	NEW 9W LED SCREW IN	1	9	5	$0.22	$0.73	$0.95	$1.23	$4.13	$5.36		
412			PIPE CHASE			500	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	30	$1.42	$4.78	$6.20	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.63	$2.11	$2.73	$0.80	$2.67	$3.47		
413			SHOWERS			5000	1	2-13CP	(2) 13W COMPACT FLUORESCENT	30	150	$7.23	$2.43	$9.66	LED6P-2	(2) LED 6 PIN LAMPS	1	12	60	$2.89	$0.97	$3.86	$4.34	$1.46	$5.80		
414			SHOWERS			5000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	295	$14.22	$4.78	$19.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.27	$2.11	$8.37	$7.95	$2.67	$10.63		
415			PIPE CHASE			500	3	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	177	89	$4.27	$14.34	$18.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	39	$1.88	$6.32	$8.20	$2.39	$8.02	$10.40		
416			HALL			8760	8	A2RT8	4' 2L RECESSED FIXTURE W/T8S	472	4135	$199.29	$38.23	$237.53	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	8	104	911	$43.91	$8.42	$52.34	$155.38	$29.81	$185.19		
417			MENTAL HEALTH			2500																					
418			PASSAGE			8760	1	A2RT8	4' 2L RECESSED FIXTURE W/T8S	59	517	$24.91	$4.78	$29.69	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	1	13	114	$5.49	$1.05	$6.54	$19.42	$3.73	$23.15		
419			HALL			2500	4	A2RT8	4' 2L RECESSED FIXTURE W/T8S	236	590	$28.44	$19.12	$47.55	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	4	52	130	$6.27	$4.21	$10.48	$22.17	$14.90	$37.08		
420			HALL			2500		NR	NO RETROFIT REQUIRED																		
421			OFFICE			2500		NR	NO RETROFIT REQUIRED																		
422			TOILETS			2500	2	A2VT8	4' 2L VANITY W/ 32W T8'S	118	295	$14.22	$9.56	$23.78	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.27	$4.21	$10.48	$7.95	$5.35	$13.30		
423			HALL			8760	7	A2RT8	4' 2L RECESSED FIXTURE W/T8S	413	3618	$174.38	$33.45	$207.83	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	7	91	797	$38.42	$7.37	$45.79	$135.96	$26.08	$162.04		
424			OUTSIDE MECHANICAL			2500	9	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	531	1328	$63.99	$43.01	$107.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	9	234	585	$28.20	$18.95	$47.15	$35.79	$24.06	$59.85		
425			K UNIT			2500																					
426			OFFICE			5000	3	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	177	885	$42.66	$14.34	$56.99	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	390	$18.80	$6.32	$25.12	$23.86	$8.02	$31.88		
427			PASSAGE			8760	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	1034	$49.82	$9.56	$59.38	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	456	$21.96	$4.21	$26.17	$27.87	$5.35	$33.21		
428			SLOP SINK			1000	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	59	$2.84	$4.78	$7.62	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.25	$2.11	$3.36	$1.59	$2.67	$4.26		
429			OPEN AREA			5000	29	A2TT8	4' 2L TROFFER FIXTURE W/T8S	1711	8555	$412.35	$138.59	$550.94	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	29	754	3770	$181.71	$61.07	$242.79	$230.64	$77.52	$308.15		
430			TOILET			8760	6	A2RT8	4' 2L RECESSED FIXTURE W/T8S	354	3101	$149.47	$28.67	$178.14	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	6	78	683	$32.93	$6.32	$39.25	$116.54	$22.36	$138.89		
431			SHOWERS			5000	3	A2RT8	4' 2L RECESSED FIXTURE W/T8S	177	885	$42.66	$14.34	$56.99	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	3	39	195	$9.40	$3.16	$12.56	$33.26	$11.18	$44.44		
432			TOILET			5000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	295	$14.22	$4.78	$19.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.27	$2.11	$8.37	$7.95	$2.67	$10.63		
433			PIPE CHASE			500	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	30	$1.42	$4.78	$6.20	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.63	$2.11	$2.73	$0.80	$2.67	$3.47		
434			PASSAGE			8760	2	A3TT8	4' 3L TROFFER W/ T8S	186	1629	$78.54	$15.07	$93.60	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	456	$21.96	$4.21	$26.17	$56.58	$10.85	$67.43		
435			PASSAGE			8760	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	517	$24.91	$4.78	$29.69	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$10.98	$2.11	$13.08	$13.93	$2.67	$16.61		
436			TOILET			2500	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	148	$7.11	$4.78	$11.89	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.13	$2.11	$5.24	$3.98	$2.67	$6.65		
437			OPEN AREA			5000	25	A2TT8	4' 2L TROFFER FIXTURE W/T8S	1475	7375	$355.48	$119.48	$474.95	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	25	650	3250	$156.65	$52.65	$209.30	$198.83	$66.83	$265.65		
438			SHOWERS			5000	5	A2RT8	4' 2L RECESSED FIXTURE W/T8S	295	1475	$71.10	$23.90	$94.99	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	5	65	325	$15.67	$5.27	$20.93	$55.43	$18.63	$74.06		
439			TOILETS			8760	7	A2RT8	4' 2L RECESSED FIXTURE W/T8S	413	3618	$174.38	$33.45	$207.83	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	7	91	797	$38.42	$7.37	$45.79	$135.96	$26.08	$162.04		
440			NEW LENSES			2500	50								NL	NEW LENSES	50										

ENHANCED LIGHTING SURVEY LOG

Project Name: **ALDEN CORRECTIONAL**

Months: 12

Hours: 2500 **Multipliers:** **0.0482** **6.75**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	Existing Watts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
441			MISC FIXTURES			5000	20	8T5	8W T5 FLUORESCENT	200	1000	$48.20	$16.20	$64.40	LED3	INSTALL 3W LED RETROFIT	20	60	300	$14.46	$4.86	$19.32	$33.74	$11.34	$45.08		
442			MISC FIXTURES			5000	30	A2TT8	4' 2L TROFFER FIXTURE W/T8S	1770	8850	$426.57	$143.37	$569.94	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	30	780	3900	$187.98	$63.18	$251.16	$238.59	$80.19	$318.78		
443			MISC FIXTURES			5000	40	A2TT8	4' 2L TROFFER FIXTURE W/T8S	2360	11800	$568.76	$191.16	$759.92	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	40	1040	5200	$250.64	$84.24	$334.88	$318.12	$106.92	$425.04		
444			MISC FIXTURES			5000	40	A1RT8	4' 1L RECESSED FIXTURE W/ T8S	1280	6400	$308.48	$103.68	$412.16	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	40	520	2600	$125.32	$42.12	$167.44	$183.16	$61.56	$244.72		
445			MISC FIXTURES			5000	20	A2RT8	4' 2L RECESSED FIXTURE W/T8S	1180	5900	$284.38	$95.58	$379.96	RR1A	RETRO (1) FIX. W/ (1) 4' LED LAMP, RELOCATION KIT	20	260	1300	$62.66	$21.06	$83.72	$221.72	$74.52	$296.24		
446			EXIT LIGHTS			8760	20	X20	20W EXIT SIGN	400	3504	$168.89	$32.40	$201.29	NX	NEW EXIT LIGHT	20	60	526	$25.33	$4.86	$30.19	$143.56	$27.54	$171.10		
							3,028.00	**Totals:**		167622	841384	$40,554.71	$13,577.38	$54,132.09			3,028.00	63393	313279	$15,100	$5,135	$20,235	$25,455	$8,443	$33,897		3
										KW	168							**KW**	63								

ENHANCED LIGHTING SURVEY LOG

Project Name: **ALDEN CORRECTIONAL EXTERIOR**

Months: 5

Hours: 4200 **Multipliers:** **0.0482** **6.75**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	Existing Watts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
1			RECREATION EXTERIOR			4200	14	HPS250	250W HIGH PRESSURE SODIUM	4130	17346	$836.08	$139.39	$975.46	LED150F	NEW 150W LED FLOOD	14	2100	8820	$425.12	$70.88	$496.00	$410.95	$68.51	$479.47	SLIP FITTER
2			EXTERIOR			4200	6	HPS250	250W HIGH PRESSURE SODIUM	1770	7434	$358.32	$59.74	$418.06	LED45WP	NEW 45W LED WALLPACK FIXTURE	6	270	1134	$54.66	$9.11	$63.77	$303.66	$50.63	$354.29	
3			EXTERIOR			4200	3	HPS100	250W HIGH PRESSURE SODIUM	375	1575	$75.92	$12.66	$88.57	LED22SI	NEW 22W LED SCREW IN	3	66	277	$13.36	$2.23	$15.59	$62.55	$10.43	$72.98	
4			EXTERIOR			4200	10	HPS250	250W HIGH PRESSURE SODIUM	2950	12390	$597.20	$99.56	$696.76	LED150F	NEW 150W LED FLOOD	10	1500	6300	$303.66	$50.63	$354.29	$293.54	$48.94	$342.48	
5			SHOE BOX ATTACHED TO BLD.			4200	17	HPS400	400W HIGH PRESSURE SODIUM	7786	32701	$1,576.20	$262.78	$1,838.98	LED150SB	NEW 150W LED SHOEBOX FIXTURE	17	2550	10710	$516.22	$86.06	$602.28	$1,059.98	$176.72	$1,236.69	
6			EXTERIOR			4200	7	MV175	175W MERCURY VAPOR	1435	6027	$290.50	$48.43	$338.93	LED40CAN	NEW 40W LED CAN	7	70	294	$14.17	$2.36	$16.53	$276.33	$46.07	$322.40	
7			EXTERIOR			4200	31	HPS400	400W HIGH PRESSURE SODIUM	14198	59632	$2,874.24	$479.18	$3,353.43	LED150SB	NEW 150W LED SHOEBOX FIXTURE	31	4650	19530	$941.35	$156.94	$1,098.28	$1,932.90	$322.25	$2,255.14	
8			EXTERIOR			4200	4	HPS400	400W HIGH PRESSURE SODIUM	1832	7694	$370.87	$61.83	$432.70	LED150F	NEW 150W LED FLOOD	4	600	2520	$121.46	$20.25	$141.71	$249.41	$41.58	$290.99	
9			EXTERIOR			4200	1	HPS1000	1000W MERCURY VAPOR	1075	4515	$217.62	$36.28	$253.90	LED300F	NEW 300W LED FLOOD	1	300	1260	$60.73	$10.13	$70.86	$156.89	$26.16	$183.05	
							93.00	**Totals:**		35551	149314	$7,196.94	$1,199.85	$8,396.79			93.00	12106	50845	$2,451	$409	$2,859	$4,746	$791	$5,537	
										KW	36							**KW**	12							

ENHANCED LIGHTING SURVEY LOG

Project Name: LAW LIBRARY

Months: 12

Hours: 2500 **Multipliers:** **0.0485** **11.894**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
1	1		LOBBY			2500	15	2-32CP	(2) 32W COMPACT FLUORESCENT	1020	2550	$123.68	$145.58	$269.26	LED25CAN	NEW 25W LED CAN	15	375	938	$45.47	$53.52	$98.99	$78.21	$92.06	$170.27		
2	1		PASSAGE			2500	4	2-32CP	(2) 32W COMPACT FLUORESCENT	272	680	$32.98	$38.82	$71.80	LED25CAN	NEW 25W LED CAN	4	100	250	$12.13	$14.27	$26.40	$20.86	$24.55	$45.40		
3	1	103	FILES			2500	11	A4TT8	4' 4L RECESSED TROFFER W/T8S	1232	3080	$149.38	$175.84	$325.22	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	11	286	715	$34.68	$40.82	$75.50	$114.70	$135.02	$249.72		
4	1	100	STACKS			2500	104	A1WT8	4' 1L WRAP FIXTURE W/ 32W T8'S	3328	8320	$403.52	$475.00	$878.52	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	104	1352	3380	$163.93	$192.97	$356.90	$239.59	$282.03	$521.62		
5	1	100	STACKS			2500	3	2-32CP	(2) 32W COMPACT FLUORESCENT	204	510	$24.74	$29.12	$53.85	LED25CAN	NEW 25W LED CAN	3	75	188	$9.09	$10.70	$19.80	$15.64	$18.41	$34.05		
6	1		MENS			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$2.86	$8.42	$11.28	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.26	$3.71	$4.97	$1.60	$4.71	$6.31		
7	1		WOMENS			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$2.86	$8.42	$11.28	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.26	$3.71	$4.97	$1.60	$4.71	$6.31		
8	1		ELECTRIC			500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	30	$1.43	$8.42	$9.85	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.63	$3.71	$4.34	$0.80	$4.71	$5.51		
9	1		ELEVATOR MACHINE			500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	30	$1.43	$8.42	$9.85	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.63	$3.71	$4.34	$0.80	$4.71	$5.51		
10			ELEVATOR			8760	2	D2ST8	2' 2L STRIP FIXTURE	66	578	$28.04	$9.42	$37.46	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	2	36	315	$15.29	$5.14	$20.43	$12.75	$4.28	$17.03		
11	3		CHANDELIERS			2500	18	4-36CP	(4) 36W PLL FLUORESCENT	2736	6840	$331.74	$390.50	$722.24	4-15PLL	RETROFIT W/ (4) LED 15W PLL	18	1080	2700	$130.95	$154.15	$285.10	$200.79	$236.36	$437.15		
12	3	302	ELECTRIC			500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	30	$1.43	$8.42	$9.85	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.63	$3.71	$4.34	$0.80	$4.71	$5.51		
13	3		PASSAGE			2500	6	2-32CP	(2) 32W COMPACT FLUORESCENT	408	1020	$49.47	$58.23	$107.70	LED25CAN	NEW 25W LED CAN	6	150	375	$18.19	$21.41	$39.60	$31.28	$36.82	$68.11		
14	3	301	OFFICES			2500	11	A3TT8	4' 3L TROFFER W/ T8S	1023	2558	$124.04	$146.01	$270.05	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	11	286	715	$34.68	$40.82	$75.50	$89.36	$105.19	$194.55		
15	3	301	OFFICES			2500	10	2-32CP	(2) 32W COMPACT FLUORESCENT	680	1700	$82.45	$97.06	$179.51	LED25CAN	NEW 25W LED CAN	10	250	625	$30.31	$35.68	$65.99	$52.14	$61.37	$113.51		
16	3	301	OFFICES			2500	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	150	$7.28	$8.56	$15.84	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	45	$2.18	$2.57	$4.75	$5.09	$5.99	$11.09		
17	3		MENS			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$2.86	$8.42	$11.28	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.26	$3.71	$4.97	$1.60	$4.71	$6.31		
18	3		WOMENS			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$2.86	$8.42	$11.28	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.26	$3.71	$4.97	$1.60	$4.71	$6.31		
19	3		OFFICE			1500	4	A3TT8	4' 3L TROFFER W/ T8S	372	558	$27.06	$53.09	$80.16	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	4	104	156	$7.57	$14.84	$22.41	$19.50	$38.25	$57.75		
20	3		OFFICE			1500	4	A3TT8	4' 3L TROFFER W/ T8S	372	558	$27.06	$53.09	$80.16	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	4	104	156	$7.57	$14.84	$22.41	$19.50	$38.25	$57.75		
21	3		OFFICE			1500	4	A3TT8	4' 3L TROFFER W/ T8S	372	558	$27.06	$53.09	$80.16	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	4	104	156	$7.57	$14.84	$22.41	$19.50	$38.25	$57.75		
22	3		OFFICE			1500	4	A3TT8	4' 3L TROFFER W/ T8S	372	558	$27.06	$53.09	$80.16	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	4	104	156	$7.57	$14.84	$22.41	$19.50	$38.25	$57.75		
23	2		OPEN AREA			2500	64	A1WT8	4' 1L WRAP FIXTURE W/ 32W T8'S	2048	5120	$248.32	$292.31	$540.63	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	64	832	2080	$100.88	$118.75	$219.63	$147.44	$173.56	$321.00		
24	2		OFFICE			1000	4	A1WT8	4' 1L WRAP FIXTURE W/ 32W T8'S	128	128	$6.21	$18.27	$24.48	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	4	52	52	$2.52	$7.42	$9.94	$3.69	$10.85	$14.53		
25	2		CONFERENCE			1000	4	A1WT8	4' 1L WRAP FIXTURE W/ 32W T8'S	128	128	$6.21	$18.27	$24.48	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	4	52	52	$2.52	$7.42	$9.94	$3.69	$10.85	$14.53		
26	2		KITCHEN			1000	4	A1WT8	4' 1L WRAP FIXTURE W/ 32W T8'S	128	128	$6.21	$18.27	$24.48	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	4	52	52	$2.52	$7.42	$9.94	$3.69	$10.85	$14.53		
27	2		OFFICE			1000	2	A1WT8	4' 1L WRAP FIXTURE W/ 32W T8'S	64	64	$3.10	$9.13	$12.24	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	26	$1.26	$3.71	$4.97	$1.84	$5.42	$7.27		
28	2		OFFICE			1000	2	A1WT8	4' 1L WRAP FIXTURE W/ 32W T8'S	64	64	$3.10	$9.13	$12.24	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	26	$1.26	$3.71	$4.97	$1.84	$5.42	$7.27		
29	2		OFFICE			1000	2	A1WT8	4' 1L WRAP FIXTURE W/ 32W T8'S	64	64	$3.10	$9.13	$12.24	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	26	$1.26	$3.71	$4.97	$1.84	$5.42	$7.27		
30	2		OFFICE			1000	4	A1WT8	4' 1L WRAP FIXTURE W/ 32W T8'S	128	128	$6.21	$18.27	$24.48	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	4	52	52	$2.52	$7.42	$9.94	$3.69	$10.85	$14.53		
31	2		COMPUTER			1000	12	A1WT8	4' 1L WRAP FIXTURE W/ 32W T8'S	384	384	$18.62	$54.81	$73.43	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	12	156	156	$7.57	$22.27	$29.83	$11.06	$32.54	$43.60		
32	2		STORAGE			500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	30	$1.43	$8.42	$9.85	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.63	$3.71	$4.34	$0.80	$4.71	$5.51		
33	2		TOILET			500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	30	$1.43	$8.42	$9.85	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.63	$3.71	$4.34	$0.80	$4.71	$5.51	WS	1
34	2		TOILET			500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	59	$2.86	$16.84	$19.70	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.26	$7.42	$8.68	$1.60	$9.42	$11.02	WS	1
35	2		TOILET			500	1	D1VT8	2' 1L VANITY FIXTURE W/T8	17	9	$0.41	$2.43	$2.84	R1D	RETRO (1) FIX. W/ (1) 2'LED LAMPS	1	9	5	$0.22	$1.28	$1.50	$0.19	$1.14	$1.34	INCL	1
36	2		TOILET			500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	59	$2.86	$16.84	$19.70	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.26	$7.42	$8.68	$1.60	$9.42	$11.02	WS	1
37	2		TOILET			500	1	D1VT8	2' 1L VANITY FIXTURE W/T8	17	9	$0.41	$2.43	$2.84	R1D	RETRO (1) FIX. W/ (1) 2'LED LAMPS	1	9	5	$0.22	$1.28	$1.50	$0.19	$1.14	$1.34	INCL	1
38	2		STAIRS			8760	12	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	708	6202	$300.80	$101.05	$401.85	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	12	312	2733	$132.56	$44.53	$177.09	$168.24	$56.52	$224.76		

ENHANCED LIGHTING SURVEY LOG

Project Name: LAW LIBRARY

Months: 12

Hours: 2500 **Multipliers:** **0.0485** **11.894**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
39	2		STORAGE			500	18	A1WT8	4' 1L WRAP FIXTURE W/ 32W T8'S	576	288	$13.97	$82.21	$96.18	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	18	234	117	$5.67	$33.40	$39.07	$8.29	$48.81	$57.11		
40			ELEVATOR			8760	2	D2ST8	2' 2L STRIP FIXTURE	66	578	$28.04	$9.42	$37.46	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	2	36	315	$15.29	$5.14	$20.43	$12.75	$4.28	$17.03		
41	G	G10	LAUNDRY			2500	2	A4TT8	4' 4L RECESSED TROFFER W/T8S	224	560	$27.16	$31.97	$59.13	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	130	$6.31	$7.42	$13.73	$20.86	$24.55	$45.40	WS	1
42	G		STORAGE			1000	5	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	295	295	$14.31	$42.10	$56.41	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	130	$6.31	$18.55	$24.86	$8.00	$23.55	$31.55	WS	2
43	G	G09	BOILER			1000	4	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	236	236	$11.45	$33.68	$45.13	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	104	$5.04	$14.84	$19.89	$6.40	$18.84	$25.24	WS	1
44	G	G11	ELECTRIC			500	3	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	177	89	$4.29	$25.26	$29.56	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	39	$1.89	$11.13	$13.02	$2.40	$14.13	$16.53		
45	G		PASSAGE			8760	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	1034	$50.13	$16.84	$66.98	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$22.09	$7.42	$29.51	$28.04	$9.42	$37.46		
46	G		PASSAGE			3000	2	D2TUT8	2' 2L TROFFER WT8/U-TUBES	120	360	$17.46	$17.13	$34.59	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	2	36	108	$5.24	$5.14	$10.38	$12.22	$11.99	$24.21		
47	G		DAY CARE			3000	8	2-32CP	(2) 32W COMPACT FLUORESCENT	544	1632	$79.15	$77.64	$156.80	LED25CAN	NEW 25W LED CAN	8	200	600	$29.10	$28.55	$57.65	$50.05	$49.10	$99.15		
48	G		KITCHEN			3000	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	708	$34.34	$33.68	$68.02	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	312	$15.13	$14.84	$29.98	$19.21	$18.84	$38.05		
49	G		OFFICE			3000	2	A4TT8	4' 4L RECESSED TROFFER W/T8S	224	672	$32.59	$31.97	$64.56	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	156	$7.57	$7.42	$14.99	$25.03	$24.55	$49.58		
50	G		TOILET			1500	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	90	$4.37	$8.56	$12.93	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	27	$1.31	$2.57	$3.88	$3.06	$5.99	$9.05		
51	G		DAY ROOM			1000	6	A3TT8	4' 3L TROFFER W/ T8S	558	558	$27.06	$79.64	$106.71	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	6	234	234	$11.35	$33.40	$44.75	$15.71	$46.24	$61.96		
52	G		TOILET			500	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	30	$1.46	$8.56	$10.02	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	9	$0.44	$2.57	$3.01	$1.02	$5.99	$7.01		
53	G		DAY ROOM			1000	6	A3TT8	4' 3L TROFFER W/ T8S	558	558	$27.06	$79.64	$106.71	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	6	234	234	$11.35	$33.40	$44.75	$15.71	$46.24	$61.96		
54	G		STORAGE			500	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	30	$1.46	$8.56	$10.02	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	9	$0.44	$2.57	$3.01	$1.02	$5.99	$7.01		
55	G		DAY ROOM			1500	7	A3TT8	4' 3L TROFFER W/ T8S	651	977	$47.36	$92.92	$140.28	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	7	273	410	$19.86	$38.96	$58.83	$27.50	$53.95	$81.45		
56	G		TOILET			1000	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	60	$2.91	$8.56	$11.47	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	18	$0.87	$2.57	$3.44	$2.04	$5.99	$8.03		
57	G	G04	CLOSET			500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	30	$1.43	$8.42	$9.85	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.63	$3.71	$4.34	$0.80	$4.71	$5.51		
58	G	G03	DAY ROOM			1500	7	A3TT8	4' 3L TROFFER W/ T8S	651	977	$47.36	$92.92	$140.28	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	7	273	410	$19.86	$38.96	$58.83	$27.50	$53.95	$81.45		
59	G	GO3	TOILET			1000	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	60	$2.91	$8.56	$11.47	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	18	$0.87	$2.57	$3.44	$2.04	$5.99	$8.03		
60	G		DAY ROOM			1500	7	A3TT8	4' 3L TROFFER W/ T8S	651	977	$47.36	$92.92	$140.28	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	7	273	410	$19.86	$38.96	$58.83	$27.50	$53.95	$81.45		
61	G		TOILET			1000	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	60	$2.91	$8.56	$11.47	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	18	$0.87	$2.57	$3.44	$2.04	$5.99	$8.03		
62	G		SEWER PUMP			500	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	30	$1.43	$8.42	$9.85	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.63	$3.71	$4.34	$0.80	$4.71	$5.51		
63	G		PASSAGE			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$11.28	$13.27	$24.55	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	65	$3.15	$3.71	$6.86	$8.12	$9.56	$17.69		
64	G		STAIRS			8760	2	2-32CP	(2) 32W COMPACT FLUORESCENT	136	1191	$57.78	$19.41	$77.19	LED25CAN	NEW 25W LED CAN	2	50	438	$21.24	$7.14	$28.38	$36.54	$12.27	$48.81		
65	1		ELEVATOR LOBBY			8760	2	2-32CP	(2) 32W COMPACT FLUORESCENT	136	1191	$57.78	$19.41	$77.19	LED25CAN	NEW 25W LED CAN	2	50	438	$21.24	$7.14	$28.38	$36.54	$12.27	$48.81		
66	1		ENTRANCE			8760	2	2-32CP	(2) 32W COMPACT FLUORESCENT	136	1191	$57.78	$19.41	$77.19	LED25CAN	NEW 25W LED CAN	2	50	438	$21.24	$7.14	$28.38	$36.54	$12.27	$48.81		
67			MISC FIXTURES			2500	6	2-32CP	(2) 32W COMPACT FLUORESCENT	408	1020	$49.47	$58.23	$107.70	LED25CAN	NEW 25W LED CAN	6	150	375	$18.19	$21.41	$39.60	$31.28	$36.82	$68.11		
68			MISC FIXTURES			2500	6	A1WT8	4' 1L WRAP FIXTURE W/ 32W T8'S	192	480	$23.28	$27.40	$50.68	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	6	78	195	$9.46	$11.13	$20.59	$13.82	$16.27	$30.09		
69			EMERGENCY BACK UP			2500	20								EBU	EMERGENCY BACK UP	20										
							458.00	**Totals:**		24626	59339	$2,877.93	$3,514.82	$6,392.74			458.00	9295	22592	$1,096	$1,327	$2,422	$1,782	$2,188	$3,970		9
										KW	25							**KW**	9								

ENHANCED LIGHTING SURVEY LOG

Project Name: AURORA HIGHWAY

Months: 12

Hours: 3500 **Multipliers:** **0.0537** **7.589**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
1			ENTRANCE			2000	1	I60	60W INCANDESCENT	60	120	$6.44	$5.46	$11.91	LED9SI	NEW 9W LED SCREW IN	1	9	18	$0.97	$0.82	$1.79	$5.48	$4.64	$10.12		
2			OFFICE			2000	2	A4TT8	4' 4L RECESSED TROFFER W/T8S	224	448	$24.06	$20.40	$44.46	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	104	$5.58	$4.74	$10.32	$18.47	$15.66	$34.14	WS	1
3			STORAGE			1000	3	A2T	4' 2L RECESSED TROFFER	216	216	$11.60	$19.67	$31.27	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	78	$4.19	$7.10	$11.29	$7.41	$12.57	$19.98	WS	1
4			MENS			1000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	59	$3.17	$5.37	$8.54	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.40	$2.37	$3.76	$1.77	$3.01	$4.78	WS	1
5			WOMENS			1000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	59	$3.17	$5.37	$8.54	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.40	$2.37	$3.76	$1.77	$3.01	$4.78	WS	1
6			HALL			3500	1	A4T	4' 4L RECESSED TROFFER	144	504	$27.06	$13.11	$40.18	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	91	$4.89	$2.37	$7.25	$22.18	$10.75	$32.92		
7			HALL			3500	3	A2T	4' 2L RECESSED TROFFER	216	756	$40.60	$19.67	$60.27	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	273	$14.66	$7.10	$21.76	$25.94	$12.57	$38.50		
8			OFFICE			1500	4	A4T	4' 4L RECESSED TROFFER	576	864	$46.40	$52.46	$98.85	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	4	104	156	$8.38	$9.47	$17.85	$38.02	$42.98	$81.00	WS	1
9			OFFICE			2000	9	A4T	4' 4L RECESSED TROFFER	1296	2592	$139.19	$118.02	$257.21	RR3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS, DELAMP KIT	9	432	864	$46.40	$39.34	$85.74	$92.79	$78.68	$171.48	CP	1
10			OFFICE			2000	4	A4T	4' 4L RECESSED TROFFER	576	1152	$61.86	$52.46	$114.32	RR3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS, DELAMP KIT	4	192	384	$20.62	$17.49	$38.11	$41.24	$34.97	$76.21	WS	1
11			BREAK AREA			3500	11	A2T	4' 2L RECESSED TROFFER	792	2772	$148.86	$72.13	$220.98	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	11	286	1001	$53.75	$26.05	$79.80	$95.10	$46.08	$141.18	CP	1
12			BREAK AREA			3500	5	D2TU	2' 2L TROFFER W/U-TUBES	360	1260	$67.66	$32.78	$100.45	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	5	90	315	$16.92	$8.20	$25.11	$50.75	$24.59	$75.33	INCL	1
13			DISPATCH			3500	2	A2T	4' 2L RECESSED TROFFER	144	504	$27.06	$13.11	$40.18	NAT	REMOVE FIX. & INSTALL NEW 4' LED 2X4 TROFFER	2	72	252	$13.53	$6.56	$20.09	$13.53	$6.56	$20.09	WS	1
14			ENTRANCE			3500		NR	NO RETROFIT REQUIRED																		
15			MENS			3500	11	A2T	4' 2L RECESSED TROFFER	792	2772	$148.86	$72.13	$220.98	NAT	REMOVE FIX. & INSTALL NEW 4' LED 2X4 TROFFER	11	396	1386	$74.43	$36.06	$110.49	$74.43	$36.06	$110.49	CP	2
16			SLOP SINK			1000	1	I60	60W INCANDESCENT	60	60	$3.22	$5.46	$8.69	NDR	INSTALL LED DRUM FIX.	1	15	15	$0.81	$1.37	$2.17	$2.42	$4.10	$6.51	WS	1
17			WOMENS			2000	2	A2T	4' 2L RECESSED TROFFER	144	288	$15.47	$13.11	$28.58	NAT	REMOVE FIX. & INSTALL NEW 4' LED 2X4 TROFFER	2	72	144	$7.73	$6.56	$14.29	$7.73	$6.56	$14.29	CP	1
18			TRUCK BAY			3500	36	HPS400	400W HIGH PRESSURE SODIUM	16488	57708	$3,098.92	$1,501.53	$4,600.45	LED200UFO	INSTALL 200 W LED UFO HIGHBAY	36	7200	25200	$1,353.24	$655.69	$2,008.93	$1,745.68	$845.84	$2,591.52	HBS	36
19			TRUCK BAY			3500	6	HPS400	400W HIGH PRESSURE SODIUM	2748	9618	$516.49	$250.25	$766.74	LED200UFO	INSTALL 200 W LED UFO HIGHBAY	6	1200	4200	$225.54	$109.28	$334.82	$290.95	$140.97	$431.92		
20			STORAGE			3500	2	B2I	8' 2L INDUSTRIAL SHADE SLIM LINE LAMPS	246	861	$46.24	$22.40	$68.64	RR4AB	RETRO (1) FIX. W/ (4) 4' LED LAMPS RELOCATION KIT	2	104	364	$19.55	$9.47	$29.02	$26.69	$12.93	$39.62		
21			CHAIN SAW			2500	14	B2S	8' 2L STRIP FIXTURE	1722	4305	$231.18	$156.82	$388.00	RR4AB	RETRO (1) FIX. W/ (4) 4' LED LAMPS RELOCATION KIT	14	728	1820	$97.73	$66.30	$164.03	$133.44	$90.52	$223.97		
22			CHAIN SAW			1000	1	A2I	4' 2L INDUSTRIAL SHADE	72	72	$3.87	$6.56	$10.42	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.40	$2.37	$3.76	$2.47	$4.19	$6.66		
23			UPPER STORAGE			1000	1	A2I	4' 2L INDUSTRIAL SHADE	72	72	$3.87	$6.56	$10.42	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	26	$1.40	$2.37	$3.76	$2.47	$4.19	$6.66		
24			UPPER STORAGE			1000	6	B2IHO	8' 2L INDUSTRIAL SHADE, H.O.. LAMPS	1362	1362	$73.14	$124.03	$197.17	RR4AB	RETRO (1) FIX. W/ (4) 4' LED LAMPS RELOCATION KIT	6	312	312	$16.75	$28.41	$45.17	$56.39	$95.62	$152.01		
25			TRUCK REPAIR			3500	35	B2IHO	8' 2L INDUSTRIAL SHADE, H.O.. LAMPS	7945	27808	$1,493.26	$723.54	$2,216.80	RR4AB22	RETRO (1) FIX. W/ (4) 22 W 4' LED LAMPS RELOCATION KIT	35	3080	10780	$578.89	$280.49	$859.38	$914.38	$443.05	$1,357.42		
26			OFFICE			3500	2	B2IHO	8' 2L INDUSTRIAL SHADE, H.O.. LAMPS	454	1589	$85.33	$41.34	$126.67	RR4AB	RETRO (1) FIX. W/ (4) 4' LED LAMPS RELOCATION KIT	2	104	364	$19.55	$9.47	$29.02	$65.78	$31.87	$97.66		
27			OIL STORAGE			3500	4	B2IHO	8' 2L INDUSTRIAL SHADE, H.O.. LAMPS	908	3178	$170.66	$82.69	$253.35	RR4AB	RETRO (1) FIX. W/ (4) 4' LED LAMPS RELOCATION KIT	4	208	728	$39.09	$18.94	$58.04	$131.57	$63.75	$195.31		
28			UPPER STORAGE			1000	6	B2I	8' 2L INDUSTRIAL SHADE SLIM LINE LAMPS	738	738	$39.63	$67.21	$106.84	RR4AB	RETRO (1) FIX. W/ (4) 4' LED LAMPS RELOCATION KIT	6	312	312	$16.75	$28.41	$45.17	$22.88	$38.79	$61.67		
29			PAINT SHOP			1000	5	B2I	8' 2L INDUSTRIAL SHADE SLIM LINE LAMPS	615	615	$33.03	$56.01	$89.03	NBI	REMOVE FIX. & INSTALL NEW 8' LED INDUSTRIAL	5	450	450	$24.17	$40.98	$65.15	$8.86	$15.03	$23.89		
30			WALL FIXTURES			1000	4	B2I	8' 2L INDUSTRIAL SHADE SLIM LINE LAMPS	492	492	$26.42	$44.81	$71.23	RR4AB	RETRO (1) FIX. W/ (4) 4' LED LAMPS RELOCATION KIT	4	208	208	$11.17	$18.94	$30.11	$15.25	$25.86	$41.11		
							183.00	**Totals:**		39580	122844	$6,596.70	$3,604.47	$10,201.17			183.00	15912	49923	$2,681	$1,449	$4,130	$3,916	$2,155	$6,071		50
										KW	40							**KW**	16								

ENHANCED LIGHTING SURVEY LOG

Project Name: **AURORA HIGHWAY EXTERIOR**

Months: 12

Hours: 4200 **Multipliers:** **0.0537** **7.589**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	ProposedWatts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
1			EXTERIOR			4200	1	42CP	42W COMPACT FLUORESCENT	48	202	$10.83	$4.37	$15.20	LED45WP	NEW 45W LED WALLPACK FIXTURE	1	45	189	$10.15	$4.10	$14.25	$0.68	$0.27	$0.95	
2			EXTERIOR			4200	1	MV175	175W MERCURY VAPOR	205	861	$46.24	$18.67	$64.90	LEDBARN	NEW 32W LED BARN FIXTURE	1	32	134	$7.22	$2.91	$10.13	$39.02	$15.75	$54.77	
3			EXTERIOR			4200	9	MH175	175W METAL HALIDE	1845	7749	$416.12	$168.02	$584.14	LED70WP	NEW 70W LED WALLPACK FIXTURE	9	630	2646	$142.09	$57.37	$199.46	$274.03	$110.65	$384.68	
4			GAS PUMP			4200	4	MH250	250W METAL HALIDE	1180	4956	$266.14	$107.46	$373.60	LED100SB	NEW 100W LED SHOEBOX FIXTURE	4	400	1680	$90.22	$36.43	$126.64	$175.92	$71.03	$246.95	
5			EXTERIOR			4200	2	MH400	400W METAL HALIDE	916	3847	$206.59	$83.42	$290.01	LED150SB	NEW 150W LED SHOEBOX FIXTURE	2	300	1260	$67.66	$27.32	$94.98	$138.93	$56.10	$195.03	
							17.00	**Totals:**		4194	17615	$945.91	$381.94	$1,327.85			17.00	1407	5909	$317	$128	$445	$629	$254	$882	
										KW	4							**KW**	1							

ENHANCED LIGHTING SURVEY LOG

Project Name: 92 FRANKLIN

Months: 12

Hours: 2500

Multipliers: 0.0518 | 10.124

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
1	5		MECHANICAL			8760	4	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	236	2067	$107.09	$28.67	$135.76	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	911	$47.19	$12.63	$59.83	$59.90	$16.04	$75.93	TS	1
2	5		MECHANICAL			1000	11	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	649	649	$33.62	$78.85	$112.46	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	11	286	286	$14.81	$34.75	$49.56	$18.80	$44.10	$62.90	TS	1
3	5		MECHANICAL			1000	4	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	236	236	$12.22	$28.67	$40.90	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	104	$5.39	$12.63	$18.02	$6.84	$16.04	$22.87	TS	1
4	5		MECHANICAL			8760	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	517	$26.77	$7.17	$33.94	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$11.80	$3.16	$14.96	$14.97	$4.01	$18.98		
5	5		MECHANICAL			8760	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	517	$26.77	$7.17	$33.94	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$11.80	$3.16	$14.96	$14.97	$4.01	$18.98	TS	1
6	5		MECHANICAL			1000	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	118	$6.11	$14.34	$20.45	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.69	$6.32	$9.01	$3.42	$8.02	$11.44		
7	5		MECHANICAL			1000	10	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	590	590	$30.56	$71.68	$102.24	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	10	260	260	$13.47	$31.59	$45.05	$17.09	$40.09	$57.19		
8	5		MECHANICAL			8760	5	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	295	2584	$133.86	$35.84	$169.70	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	1139	$58.99	$15.79	$74.78	$74.87	$20.05	$94.92	TS	1
9	5		FIRE PUMP			500	1	I60	60W INCANDESCENT	60	30	$1.55	$7.29	$8.84	LED9SI	NEW 9W LED SCREW IN	1	9	5	$0.23	$1.09	$1.33	$1.32	$6.20	$7.52		
10			BELL TOWER			8760	16	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	944	8269	$428.36	$114.68	$543.04	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	16	416	3644	$188.77	$50.54	$239.31	$239.59	$64.15	$303.74		
11	4		STORAGE			500	8	A2BT8	4' 2L BOX FIXTURE W/T8S	472	236	$12.22	$57.34	$69.57	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	104	$5.39	$25.27	$30.66	$6.84	$32.07	$38.91		
12	4		HALL			1000	18	2-18CP	(2) 18W COMPACT FLUORESCENT	720	720	$37.30	$87.47	$124.77	LED14CAN	NEW 14W LED CAN	18	252	252	$13.05	$30.61	$43.67	$24.24	$56.86	$81.10		
13	4		LEGISLATURE			1500	4	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	236	354	$18.34	$28.67	$47.01	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	156	$8.08	$12.63	$20.72	$10.26	$16.04	$26.29		
14	4		OFFICE			1500	6	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	354	531	$27.51	$43.01	$70.51	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	234	$12.12	$18.95	$31.07	$15.38	$24.05	$39.44		
15	4		OFFICE			1000	4	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	236	236	$12.22	$28.67	$40.90	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	104	$5.39	$12.63	$18.02	$6.84	$16.04	$22.87	WS	1
16	4		OFFICE			1000	4	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	236	236	$12.22	$28.67	$40.90	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	104	$5.39	$12.63	$18.02	$6.84	$16.04	$22.87		
17	4		OFFICE			1000	4	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	236	236	$12.22	$28.67	$40.90	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	104	$5.39	$12.63	$18.02	$6.84	$16.04	$22.87		
18	4		OFFICE			1500	2	A3WT8	4' 3L WRAP FIXTURE W/T8S	186	279	$14.45	$22.60	$37.05	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$6.06	$9.48	$15.54	$8.39	$13.12	$21.51	WSDS	1
19	4		OFFICE			1500	2	A3WT8	4' 3L WRAP FIXTURE W/T8S	186	279	$14.45	$22.60	$37.05	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$6.06	$9.48	$15.54	$8.39	$13.12	$21.51	WSDS	1
20	4		OFFICE			1500	2	A3WT8	4' 3L WRAP FIXTURE W/T8S	186	279	$14.45	$22.60	$37.05	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$6.06	$9.48	$15.54	$8.39	$13.12	$21.51	WSDS	1
21	4		OFFICE			1500	2	A3WT8	4' 3L WRAP FIXTURE W/T8S	186	279	$14.45	$22.60	$37.05	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$6.06	$9.48	$15.54	$8.39	$13.12	$21.51	WSDS	1
22	4		OFFICE			1500	3	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	177	266	$13.75	$21.50	$35.26	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	117	$6.06	$9.48	$15.54	$7.69	$12.03	$19.72	WS	1
23	4		CLOSET			500	2	A2ST8	4' 2L STRIP FIXTURES W/T8S	118	59	$3.06	$14.34	$17.39	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.35	$6.32	$7.66	$1.71	$8.02	$9.73		
24	4		PASSAGE			1500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	89	$4.58	$7.17	$11.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	39	$2.02	$3.16	$5.18	$2.56	$4.01	$6.57		
25	4		CONFERENCE			1500	10	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	590	885	$45.84	$71.68	$117.52	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	10	260	390	$20.20	$31.59	$51.79	$25.64	$40.09	$65.73		
26	4		HALL			2500	5	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	295	738	$38.20	$35.84	$74.04	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	325	$16.84	$15.79	$32.63	$21.37	$20.05	$41.41		
27	4		OFFICE			2500	4	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	236	590	$30.56	$28.67	$59.23	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$13.47	$12.63	$26.10	$17.09	$16.04	$33.13		
28	4		WAITING			2500	4	A3WT8	4' 3L WRAP FIXTURE W/T8S	372	930	$48.17	$45.19	$93.37	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.20	$18.95	$39.15	$27.97	$26.24	$54.21		
29	4		OFFICE			2500	3	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	177	443	$22.92	$21.50	$44.42	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$10.10	$9.48	$19.58	$12.82	$12.03	$24.85	WS	1
30	4		OFFICE			1500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	177	$9.17	$14.34	$23.50	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.04	$6.32	$10.36	$5.13	$8.02	$13.15	WS	1
31	4		OFFICE			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$15.28	$14.34	$29.62	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.73	$6.32	$13.05	$8.55	$8.02	$16.57	WS	1
32	4		HALL			2500	4	2-18CP	(2) 18W COMPACT FLUORESCENT	160	400	$20.72	$19.44	$40.16	LED14CAN	NEW 14W LED CAN	4	56	140	$7.25	$6.80	$14.06	$13.47	$12.63	$26.10		
33	4		WOMENS			1000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	118	$6.11	$14.34	$20.45	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.69	$6.32	$9.01	$3.42	$8.02	$11.44		
34	4		JANITOR			500	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	30	$1.53	$7.17	$8.70	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.67	$3.16	$3.83	$0.85	$4.01	$4.86	WS	1
35	4		MENS			1000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	118	$6.11	$14.34	$20.45	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.69	$6.32	$9.01	$3.42	$8.02	$11.44		
36	4		CLOSET			500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	30	$1.53	$7.17	$8.70	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.67	$3.16	$3.83	$0.85	$4.01	$4.86	WS	1
37	4		MEETING ROOM			1000	44	2-32CP	(2) 32W COMPACT FLUORESCENT	2992	2992	$154.99	$363.49	$518.48	LED25CAN	NEW 25W LED CAN	44	1100	1100	$56.98	$133.64	$190.62	$98.01	$229.86	$327.86		
38	4		CHANDILERS			1000	4	4-36PLL	4-36W PLL	608	608	$31.49	$73.86	$105.36	LED18PLL-4	(4) LED 18 PLL LAMPS	4	288	288	$14.92	$34.99	$49.91	$16.58	$38.88	$55.45		
39	4		LOBBY			4500	10	2-32CP	(2) 32W COMPACT FLUORESCENT	680	3060	$158.51	$82.61	$241.12	LED40CAN	NEW 40W LED CAN	10	400	1800	$93.24	$48.60	$141.84	$65.27	$34.02	$99.28		

ENHANCED LIGHTING SURVEY LOG

Project Name: 92 FRANKLIN

Months: 12

Hours: 2500 **Multipliers:** 0.0518 10.124

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
40	4		LOBBY			4500		NR	NO RETROFIT REQUIRED																		
41	4		STORAGE			500	3	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	177	89	$4.58	$21.50	$26.09	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	39	$2.02	$9.48	$11.50	$2.56	$12.03	$14.59		
42	4		OFFICE			1500	6	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	354	531	$27.51	$43.01	$70.51	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	234	$12.12	$18.95	$31.07	$15.38	$24.05	$39.44		
43	4		PASSAGE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.64	$7.17	$14.81	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.37	$3.16	$6.53	$4.27	$4.01	$8.28		
44	4		CLOSET			500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	30	$1.53	$7.17	$8.70	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.67	$3.16	$3.83	$0.85	$4.01	$4.86	WS	1
45	4		CONFERENCE			1500	6	MH175	175W METAL HALIDE	1230	1845	$95.57	$149.43	$245.00	LED60BLOCK	RETRO (1) FIX. W/ 60 LED BLOCK	6	360	540	$27.97	$43.74	$71.71	$67.60	$105.69	$173.29		
46	4		CHANDILERS			2500	2	4-36PLL	4-36W PLL	304	760	$39.37	$36.93	$76.30	LED18PLL-4	(4) LED 18 PLL LAMPS	2	144	360	$18.65	$17.49	$36.14	$20.72	$19.44	$40.16		
47	4		OFFICE			1000	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	59	$3.06	$7.17	$10.22	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.35	$3.16	$4.51	$1.71	$4.01	$5.72	WS	1
48	4		OFFICE			1000	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	118	$6.11	$14.34	$20.45	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.69	$6.32	$9.01	$3.42	$8.02	$11.44	WS	1
49	4		OFFICE			1000	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	118	$6.11	$14.34	$20.45	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.69	$6.32	$9.01	$3.42	$8.02	$11.44	WS	1
50	4		OFFICE			1000	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	118	$6.11	$14.34	$20.45	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.69	$6.32	$9.01	$3.42	$8.02	$11.44	WS	1
51	4		OFFICE			1000	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	118	$6.11	$14.34	$20.45	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.69	$6.32	$9.01	$3.42	$8.02	$11.44	WS	1
52	4		WOMENS			1000	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	59	$3.06	$7.17	$10.22	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.35	$3.16	$4.51	$1.71	$4.01	$5.72		
53	4		WOMENS			1000	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	59	$3.06	$7.17	$10.22	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.35	$3.16	$4.51	$1.71	$4.01	$5.72		
54	4		JANITOR			1000	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	59	$3.06	$7.17	$10.22	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.35	$3.16	$4.51	$1.71	$4.01	$5.72		
55	4		OFFICE			1500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	177	$9.17	$14.34	$23.50	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.04	$6.32	$10.36	$5.13	$8.02	$13.15	WS	1
56	4		HALL			2500	7	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	413	1033	$53.48	$50.17	$103.66	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	7	182	455	$23.57	$22.11	$45.68	$29.91	$28.06	$57.98		
57	4		OFFICE			1500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	177	$9.17	$14.34	$23.50	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.04	$6.32	$10.36	$5.13	$8.02	$13.15	WS	1
58	4		OFFICE			1500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	177	$9.17	$14.34	$23.50	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.04	$6.32	$10.36	$5.13	$8.02	$13.15		
59	4		OFFICE			1500	4	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	236	354	$18.34	$28.67	$47.01	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	156	$8.08	$12.63	$20.72	$10.26	$16.04	$26.29		
60	4		OFFICE			1500	4	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	236	354	$18.34	$28.67	$47.01	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	156	$8.08	$12.63	$20.72	$10.26	$16.04	$26.29		
61	4		LIBRARY			1500	2	4-36PLL	4-36W PLL	304	456	$23.62	$36.93	$60.55	LED18PLL-4	(4) LED 18 PLL LAMPS	2	144	216	$11.19	$17.49	$28.68	$12.43	$19.44	$31.87		
62	4		OFFICE			1500	4	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	236	354	$18.34	$28.67	$47.01	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	156	$8.08	$12.63	$20.72	$10.26	$16.04	$26.29		
63	4		KITCHEN			1500	3	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	177	266	$13.75	$21.50	$35.26	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	117	$6.06	$9.48	$15.54	$7.69	$12.03	$19.72		
64	4		OFFICE			1500	3	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	177	266	$13.75	$21.50	$35.26	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	117	$6.06	$9.48	$15.54	$7.69	$12.03	$19.72		
65	4		OFFICE			1000	10	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	590	590	$30.56	$71.68	$102.24	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	10	260	260	$13.47	$31.59	$45.05	$17.09	$40.09	$57.19		
66	4		TOILET			500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	30	$1.53	$7.17	$8.70	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.67	$3.16	$3.83	$0.85	$4.01	$4.86		
67	4		HALL			2500	8	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	472	1180	$61.12	$57.34	$118.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	520	$26.94	$25.27	$52.21	$34.19	$32.07	$66.26		
68	4		MENS			1500	3	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	177	266	$13.75	$21.50	$35.26	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	117	$6.06	$9.48	$15.54	$7.69	$12.03	$19.72		
69	4		MENS			1500	1	A2VT8	4' 2L VANITY W/ 32W T8'S	59	89	$4.58	$7.17	$11.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	39	$2.02	$3.16	$5.18	$2.56	$4.01	$6.57		
70	4		OFFICE			1500	4	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	236	354	$18.34	$28.67	$47.01	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	156	$8.08	$12.63	$20.72	$10.26	$16.04	$26.29	WS	1
71	4		OFFICE			1500	4	A3TT8	4' 3L TROFFER W/ T8S	372	558	$28.90	$45.19	$74.10	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	234	$12.12	$18.95	$31.07	$16.78	$26.24	$43.02	WSDS	1
72	4		OFFICE			1500	2	2-18CP	(2) 18W COMPACT FLUORESCENT	80	120	$6.22	$9.72	$15.94	LED14CAN	NEW 14W LED CAN	2	28	42	$2.18	$3.40	$5.58	$4.04	$6.32	$10.36		
73	4		OFFICE			1000	2	A3TT8	A3	186	186	$9.63	$22.60	$32.23	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	52	$2.69	$6.32	$9.01	$6.94	$16.28	$23.22		
74	4		OFFICE			1000	3	A3BT8	4' 3L BOX W/ T8S	279	279	$14.45	$33.90	$48.35	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	3	78	78	$4.04	$9.48	$13.52	$10.41	$24.42	$34.83		
75	4		OFFICE			1000	2	A3BT8	4' 3L BOX W/ T8S	186	186	$9.63	$22.60	$32.23	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	52	$2.69	$6.32	$9.01	$6.94	$16.28	$23.22		
76	4		STORAGE			1000	2	A3TT8	4' 3L TROFFER W/ T8S	186	186	$9.63	$22.60	$32.23	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	52	$2.69	$6.32	$9.01	$6.94	$16.28	$23.22	WS	1
77	4		OFFICE			1500	4	A3TT8	4' 3L TROFFER W/ T8S	372	558	$28.90	$45.19	$74.10	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	4	104	156	$8.08	$12.63	$20.72	$20.82	$32.56	$53.38	WS	1
78	4		HALL			2500	10	2-18CP	(2) 18W COMPACT FLUORESCENT	400	1000	$51.80	$48.60	$100.40	LED14CAN	NEW 14W LED CAN	10	140	350	$18.13	$17.01	$35.14	$33.67	$31.59	$65.26		

ENHANCED LIGHTING SURVEY LOG

Project Name: 92 FRANKLIN

Months: 12

Hours: 2500 **Multipliers:** 0.0518 10.124

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
79	4		ATTIC			500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	59	$3.06	$14.34	$17.39	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.35	$6.32	$7.66	$1.71	$8.02	$9.73		
80	3M		MECHANICAL WEST			3000	8	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	472	1416	$73.35	$57.34	$130.69	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	624	$32.32	$25.27	$57.59	$41.03	$32.07	$73.10		
81	3M		MECHANICAL WEST			1500	6	A1WT8	4' 1L WRAP FIXTURE W/ 32W T8'S	192	288	$14.92	$23.33	$38.24	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	6	78	117	$6.06	$9.48	$15.54	$8.86	$13.85	$22.71		
82	3M		MECHANICAL WEST			500	2	I60	60W INCANDESCENT	120	60	$3.11	$14.58	$17.69	LED9SI	NEW 9W LED SCREW IN	2	18	9	$0.47	$2.19	$2.65	$2.64	$12.39	$15.03		
83	3M		STAIRS			8760	3	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	177	1551	$80.32	$21.50	$101.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	683	$35.39	$9.48	$44.87	$44.92	$12.03	$56.95		
84	3M		MECHANICAL EAST			4000	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	472	$24.45	$14.34	$38.79	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	208	$10.77	$6.32	$17.09	$13.68	$8.02	$21.69		
85	3M		HALL			8760	2	A1VT8	4' 1L VANITY W/T8S	64	561	$29.04	$7.78	$36.82	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	228	$11.80	$3.16	$14.96	$17.24	$4.62	$21.86		
86	3M		HALL			1000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	118	$6.11	$14.34	$20.45	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.69	$6.32	$9.01	$3.42	$8.02	$11.44		
87	3M		STORAGE			500	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	177	$9.17	$43.01	$52.18	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	78	$4.04	$18.95	$22.99	$5.13	$24.05	$29.18	WS	1
88	3M		TRAINING			500	6	A3TT8	4' 3L TROFFER W/ T8S	558	279	$14.45	$67.79	$82.24	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	6	156	78	$4.04	$18.95	$22.99	$10.41	$48.84	$59.25	CP	1
89	3M		MEZ			500	2	23CP	23W COMPACT FLUORESCENT	50	25	$1.30	$6.07	$7.37	LED14CAN	NEW 14W LED CAN	2	28	14	$0.73	$3.40	$4.13	$0.57	$2.67	$3.24		
90	3M		STAIRS			1000	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	118	$6.11	$14.34	$20.45	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.69	$6.32	$9.01	$3.42	$8.02	$11.44		
91	3M		MECHANICAL NORTH EAST			1000	2	A1WT8	4' 1L WRAP FIXTURE W/ 32W T8'S	64	64	$3.32	$7.78	$11.09	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	26	$1.35	$3.16	$4.51	$1.97	$4.62	$6.58	TS	1
92	3M		MECHANICAL NORTH EAST			1000	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	59	$3.06	$7.17	$10.22	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.35	$3.16	$4.51	$1.71	$4.01	$5.72	INCL	1
93	3M		MECHANICAL NORTH EAST			8760	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	517	$26.77	$7.17	$33.94	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$11.80	$3.16	$14.96	$14.97	$4.01	$18.98		
94	3M		MECHANICAL NORTH WEST			1000	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	118	$6.11	$14.34	$20.45	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.69	$6.32	$9.01	$3.42	$8.02	$11.44	TS	1
95	3M		MECHANICAL NORTH WEST			8760	4	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	236	2067	$107.09	$28.67	$135.76	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	911	$47.19	$12.63	$59.83	$59.90	$16.04	$75.93		
96	3M		SERVER			1000	3	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	177	177	$9.17	$21.50	$30.67	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	78	$4.04	$9.48	$13.52	$5.13	$12.03	$17.16	TS	1
97	3	310	HALL			2500	3	2-18CP	(2) 18W COMPACT FLUORESCENT	120	300	$15.54	$14.58	$30.12	LED25CAN	NEW 25W LED CAN	3	75	188	$9.71	$9.11	$18.82	$5.83	$5.47	$11.29		
98	3	310	OFFICE			2500	2	A4TT8	4' 4L RECESSED TROFFER W/T8S	224	560	$29.01	$27.21	$56.22	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	130	$6.73	$6.32	$13.05	$22.27	$20.90	$43.17		
99	3		PASSAGE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.28	$14.34	$29.62	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.73	$6.32	$13.05	$8.55	$8.02	$16.57		
100	3		COURT ROOM			2500	18	A4TT8	4' 4L RECESSED TROFFER W/T8S	2016	5040	$261.07	$244.92	$505.99	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	18	936	2340	$121.21	$113.71	$234.92	$139.86	$131.21	$271.07		
101	3		CONFERENCE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$48.17	$45.19	$93.37	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.20	$18.95	$39.15	$27.97	$26.24	$54.21		
102	3		TOILET			1000	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	60	$3.11	$7.29	$10.40	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	18	$0.93	$2.19	$3.12	$2.18	$5.10	$7.28		
103	3	308	PASSAGE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.09	$22.60	$46.68	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.10	$9.48	$19.58	$13.99	$13.12	$27.11		
104	3		COURT ROOM			2500	12	A4TT8	4' 4L RECESSED TROFFER W/T8S	1344	3360	$174.05	$163.28	$337.33	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	12	624	1560	$80.81	$75.81	$156.62	$93.24	$87.47	$180.71		
105	3		CONFERENCE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.45	$22.60	$37.05	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	78	$4.04	$6.32	$10.36	$10.41	$16.28	$26.69		
106	3		TOILET			1000	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	60	$3.11	$7.29	$10.40	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	18	$0.93	$2.19	$3.12	$2.18	$5.10	$7.28	WS	1
107	3	307	OFFICE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$48.17	$45.19	$93.37	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.20	$18.95	$39.15	$27.97	$26.24	$54.21		
108	3	307	OFFICE			2500	1	2-32CP	(2) 32W COMPACT FLUORESCENT	68	170	$8.81	$8.26	$17.07	LED40CAN	NEW 40W LED CAN	1	40	100	$5.18	$4.86	$10.04	$3.63	$3.40	$7.03		
109	3		OFFICE			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$36.13	$33.90	$70.03	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$15.15	$14.21	$29.37	$20.98	$19.68	$40.66		
110	3		OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.09	$22.60	$46.68	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.10	$9.48	$19.58	$13.99	$13.12	$27.11		
111	3	311	PASSAGE			2500	3	2-18CP	(2) 18W COMPACT FLUORESCENT	120	300	$15.54	$14.58	$30.12	LED25CAN	NEW 25W LED CAN	3	75	188	$9.71	$9.11	$18.82	$5.83	$5.47	$11.29		
112	3	311	CONFERENCE			1500	4	A3TT8	4' 3L TROFFER W/ T8S	372	558	$28.90	$45.19	$74.10	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	4	104	156	$8.08	$12.63	$20.72	$20.82	$32.56	$53.38	WSDS	1
113	3	311	TOILET			1000	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	60	$3.11	$7.29	$10.40	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	18	$0.93	$2.19	$3.12	$2.18	$5.10	$7.28		
114	3	311	CONFERENCE			1500	4	A3TT8	4' 3L TROFFER W/ T8S	372	558	$28.90	$45.19	$74.10	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	4	104	156	$8.08	$12.63	$20.72	$20.82	$32.56	$53.38		
115	3	313	COURT ROOM			2500	8	A4TT8	4' 4L RECESSED TROFFER W/T8S	896	2240	$116.03	$108.85	$224.89	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	8	416	1040	$53.87	$50.54	$104.41	$62.16	$58.31	$120.47		
116	3	315	JUDGE			1500	4	A3TT8	4' 3L TROFFER W/ T8S	372	558	$28.90	$45.19	$74.10	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	234	$12.12	$18.95	$31.07	$16.78	$26.24	$43.02		
117	3		PASSAGE			2500	1	2-18CP	(2) 18W COMPACT FLUORESCENT	40	100	$5.18	$4.86	$10.04	LED25CAN	NEW 25W LED CAN	1	25	63	$3.24	$3.04	$6.27	$1.94	$1.82	$3.76		

ENHANCED LIGHTING SURVEY LOG

Project Name: 92 FRANKLIN

Months: 12

Hours: 2500

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
																							Multipliers:	0.0518	10.124		
118	3		TOILET			1000	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	60	$3.11	$7.29	$10.40	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	18	$0.93	$2.19	$3.12	$2.18	$5.10	$7.28		
119	3		PASSAGE			2500	2	2-18CP	(2) 18W COMPACT FLUORESCENT	80	200	$10.36	$9.72	$20.08	LED25CAN	NEW 25W LED CAN	2	50	125	$6.48	$6.07	$12.55	$3.89	$3.64	$7.53		
120	3	315	OFFICE			2500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	590	$30.56	$28.67	$59.23	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$13.47	$12.63	$26.10	$17.09	$16.04	$33.13		
121	3	315	OFFICE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$48.17	$45.19	$93.37	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	4	104	260	$13.47	$12.63	$26.10	$34.71	$32.56	$67.26		
122	3		WOMENS			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.64	$7.17	$14.81	NAW	REMOVE (1) FIX. & INSTALL NEW 4 LED' WRAP FIX.	1	36	90	$4.66	$4.37	$9.04	$2.98	$2.79	$5.77		
123	3		WOMENS			2500	2	A4WT8	4' 4L WRAP FIXTURE W/ 32W T8'S	224	560	$29.01	$27.21	$56.22	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	2	104	260	$13.47	$12.63	$26.10	$15.54	$14.58	$30.12		
124	3		MENS			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.64	$7.17	$14.81	NAW	REMOVE (1) FIX. & INSTALL NEW 4 LED' WRAP FIX.	1	36	90	$4.66	$4.37	$9.04	$2.98	$2.79	$5.77		
125	3		MENS			2500	2	A4WT8	4' 4L WRAP FIXTURE W/ 32W T8'S	224	560	$29.01	$27.21	$56.22	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	2	104	260	$13.47	$12.63	$26.10	$15.54	$14.58	$30.12		
126	3		CONFERENCE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.45	$22.60	$37.05	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$6.06	$9.48	$15.54	$8.39	$13.12	$21.51	WSDS	1
127	3	317	PASSAGE			2500	2	2-18CP	(2) 18W COMPACT FLUORESCENT	80	200	$10.36	$9.72	$20.08	LED25CAN	NEW 25W LED CAN	2	50	125	$6.48	$6.07	$12.55	$3.89	$3.64	$7.53		
128	3		TOILET			500	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	30	$1.55	$7.29	$8.84	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	9	$0.47	$2.19	$2.65	$1.09	$5.10	$6.19		
129	3		CONFERENCE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.45	$22.60	$37.05	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$6.06	$9.48	$15.54	$8.39	$13.12	$21.51	CP	1
130	3	318	COURT ROOM			2500	15	A4TT8	4' 4L RECESSED TROFFER W/T8S	1680	4200	$217.56	$204.10	$421.66	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	15	780	1950	$101.01	$94.76	$195.77	$116.55	$109.34	$225.89		
131	3	319	OFFICE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$48.17	$45.19	$93.37	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.20	$18.95	$39.15	$27.97	$26.24	$54.21		
132	3		OFFICE			2500	4	A4TT8	4' 4L RECESSED TROFFER W/T8S	448	1120	$58.02	$54.43	$112.44	RR3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS, DELAMP KIT	4	192	480	$24.86	$23.33	$48.19	$33.15	$31.10	$64.25		
133	3		PASSAGE			8760	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	517	$26.77	$7.17	$33.94	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$11.80	$3.16	$14.96	$14.97	$4.01	$18.98		
134	3		HALL			4500	7	2-18CP	(2) 18W COMPACT FLUORESCENT	280	1260	$65.27	$34.02	$99.28	LED25CAN	NEW 25W LED CAN	7	175	788	$40.79	$21.26	$62.05	$24.48	$12.76	$37.23		
135	3		PASSAGE			2500	1	A4TT8	4' 4L RECESSED TROFFER W/T8S	112	280	$14.50	$13.61	$28.11	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	65	$3.37	$3.16	$6.53	$11.14	$10.45	$21.58		
136	3		OFFICE			2500	4	A4TT8	4' 4L RECESSED TROFFER W/T8S	448	1120	$58.02	$54.43	$112.44	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	4	208	520	$26.94	$25.27	$52.21	$31.08	$29.16	$60.24		
137	3		PASSAGE			2500	1	A4TT8	4' 4L RECESSED TROFFER W/T8S	112	280	$14.50	$13.61	$28.11	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	65	$3.37	$3.16	$6.53	$11.14	$10.45	$21.58		
138	3		OFFICE			2500	4	A4TT8	4' 4L RECESSED TROFFER W/T8S	448	1120	$58.02	$54.43	$112.44	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	4	208	520	$26.94	$25.27	$52.21	$31.08	$29.16	$60.24		
139	3		OFFICE			2500	4	A4TT8	4' 4L RECESSED TROFFER W/T8S	448	1120	$58.02	$54.43	$112.44	RR3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS, DELAMP KIT	4	192	480	$24.86	$23.33	$48.19	$33.15	$31.10	$64.25		
140	3		OFFICE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$48.17	$45.19	$93.37	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.20	$18.95	$39.15	$27.97	$26.24	$54.21		
141	3	322	CONFERENCE			1500	4	A3TT8	4' 3L TROFFER W/ T8S	372	558	$28.90	$45.19	$74.10	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	234	$12.12	$18.95	$31.07	$16.78	$26.24	$43.02		
142	3	322	PASSAGE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.28	$14.34	$29.62	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.73	$6.32	$13.05	$8.55	$8.02	$16.57		
143	3	322	COURT ROOM			2500	14	A4TT8	4' 4L RECESSED TROFFER W/T8S	1568	3920	$203.06	$190.49	$393.55	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	14	728	1820	$94.28	$88.44	$182.72	$108.78	$102.05	$210.83		
144	3	323	OPEN AREA			2500	20	A3TT8	4' 3L TROFFER W/ T8S	1860	4650	$240.87	$225.97	$466.84	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	20	780	1950	$101.01	$94.76	$195.77	$139.86	$131.21	$271.07		
145	3		OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.09	$22.60	$46.68	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.10	$9.48	$19.58	$13.99	$13.12	$27.11		
146	3		OFFICE			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$36.13	$33.90	$70.03	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$15.15	$14.21	$29.37	$20.98	$19.68	$40.66		
147	3		OFFICE			2500	6	2-18CP	(2) 18W COMPACT FLUORESCENT	240	600	$31.08	$29.16	$60.24	LED14CAN	NEW 14W LED CAN	6	84	210	$10.88	$10.20	$21.08	$20.20	$18.95	$39.15		
148	3		PASSAGE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.64	$7.17	$14.81	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.37	$3.16	$6.53	$4.27	$4.01	$8.28		
149	3		OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.09	$22.60	$46.68	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	130	$6.73	$6.32	$13.05	$17.35	$16.28	$33.63		
150	3		TOILET			500	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	30	$1.55	$7.29	$8.84	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	9	$0.47	$2.19	$2.65	$1.09	$5.10	$6.19		
151	3		PASSAGE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.64	$7.17	$14.81	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.37	$3.16	$6.53	$4.27	$4.01	$8.28		
152	3		OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.09	$22.60	$46.68	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	130	$6.73	$6.32	$13.05	$17.35	$16.28	$33.63		
153	3	300	OPEN AREA			2500	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	885	$45.84	$43.01	$88.85	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	390	$20.20	$18.95	$39.15	$25.64	$24.05	$49.70		
154	3		OFFICE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$48.17	$45.19	$93.37	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.20	$18.95	$39.15	$27.97	$26.24	$54.21		
155	3		OFFICE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$48.17	$45.19	$93.37	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.20	$18.95	$39.15	$27.97	$26.24	$54.21		
156	3		HALL			2500	2	2-18CP	(2) 18W COMPACT FLUORESCENT	80	200	$10.36	$9.72	$20.08	LED25CAN	NEW 25W LED CAN	2	50	125	$6.48	$6.07	$12.55	$3.89	$3.64	$7.53		

ENHANCED LIGHTING SURVEY LOG

Project Name: 92 FRANKLIN

Months: 12

Hours: 2500 **Multipliers:** 0.0518 10.124

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
157	3		COPY			2500	3	A4TT8	4' 4L RECESSED TROFFER W/T8S	336	840	$43.51	$40.82	$84.33	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	3	78	195	$10.10	$9.48	$19.58	$33.41	$31.34	$64.75		
158	3		WOMENS			500	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	30	$1.55	$7.29	$8.84	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	9	$0.47	$2.19	$2.65	$1.09	$5.10	$6.19		
159	3	301	OPEN AREA			2500	8	A4TT8	4' 4L RECESSED TROFFER W/T8S	896	2240	$116.03	$108.85	$224.89	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	8	416	1040	$53.87	$50.54	$104.41	$62.16	$58.31	$120.47		
160	3	301	OPEN AREA			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$36.13	$33.90	$70.03	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	3	78	195	$10.10	$9.48	$19.58	$26.03	$24.42	$50.45		
161	3	301	OPEN AREA			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.28	$14.34	$29.62	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.73	$6.32	$13.05	$8.55	$8.02	$16.57		
162	3	301	KITCHEN			1000	2	A3TT8	4' 3L TROFFER W/ T8S	186	186	$9.63	$22.60	$32.23	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	78	$4.04	$9.48	$13.52	$5.59	$13.12	$18.72		
163	3	301	DINING			1000	2	A3TT8	4' 3L TROFFER W/ T8S	186	186	$9.63	$22.60	$32.23	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	78	$4.04	$9.48	$13.52	$5.59	$13.12	$18.72		
164	3	306	PASSAGE			2500	2	2-32CP	(2) 32W COMPACT FLUORESCENT	136	340	$17.61	$16.52	$34.13	LED40CAN	NEW 40W LED CAN	2	80	200	$10.36	$9.72	$20.08	$7.25	$6.80	$14.06		
165	3	306	STORAGE			1000	2	A3TT8	4' 3L TROFFER W/ T8S	186	186	$9.63	$22.60	$32.23	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	52	$2.69	$6.32	$9.01	$6.94	$16.28	$23.22		
166	3	306	OPEN AREA			2500	15	A4TT8	4' 4L RECESSED TROFFER W/T8S	1680	4200	$217.56	$204.10	$421.66	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	15	780	1950	$101.01	$94.76	$195.77	$116.55	$109.34	$225.89		
167	3		OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.09	$22.60	$46.68	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	130	$6.73	$6.32	$13.05	$17.35	$16.28	$33.63		
168	3		MAIN LOBBY			4500	20	2-32CP	(2) 32W COMPACT FLUORESCENT	1360	6120	$317.02	$165.22	$482.24	LED40CAN	NEW 40W LED CAN	20	800	3600	$186.48	$97.19	$283.67	$130.54	$68.03	$198.57		
169	3	304	JANITOR			2500	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	148	$7.64	$7.17	$14.81	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.37	$3.16	$6.53	$4.27	$4.01	$8.28	WS	1
170	3		TOILET			2500	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	150	$7.77	$7.29	$15.06	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	45	$2.33	$2.19	$4.52	$5.44	$5.10	$10.54		
171	3		JANITOR			1000	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	59	$3.06	$7.17	$10.22	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.35	$3.16	$4.51	$1.71	$4.01	$5.72		
172	3		PASSAGE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.64	$7.17	$14.81	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.37	$3.16	$6.53	$4.27	$4.01	$8.28		
173	3		LOBBY PASSAGES			4500	4	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	236	1062	$55.01	$28.67	$83.68	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	468	$24.24	$12.63	$36.88	$30.77	$16.04	$46.81		
174	2		CHANDELIERS			2500	12	6-36PLL	6-36W PLL	2736	6840	$354.31	$332.39	$686.70	LED18PLL-6	(6) LED 18 PLL LAMPS	12	1296	3240	$167.83	$157.45	$325.28	$186.48	$174.94	$361.42		
175	2		JUDGE			1500	5	A2BT8	4' 2L BOX FIXTURE W/T8S	295	443	$22.92	$35.84	$58.76	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	195	$10.10	$15.79	$25.89	$12.82	$20.05	$32.87		
176	2	206A	CONFERENCE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$48.17	$45.19	$93.37	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.20	$18.95	$39.15	$27.97	$26.24	$54.21	CP	1
177	2		PASSAGE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.64	$7.17	$14.81	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.37	$3.16	$6.53	$4.27	$4.01	$8.28		
178	2		TOILET			500	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	30	$1.55	$7.29	$8.84	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	9	$0.47	$2.19	$2.65	$1.09	$5.10	$6.19		
179	2		PASSAGE			500	1	A3TT8	4' 3L TROFFER W/ T8S	93	47	$2.41	$11.30	$13.71	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	13	$0.67	$3.16	$3.83	$1.74	$8.14	$9.87		
180	2		PASSAGE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.64	$7.17	$14.81	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.37	$3.16	$6.53	$4.27	$4.01	$8.28		
181	2		OFFICE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$48.17	$45.19	$93.37	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.20	$18.95	$39.15	$27.97	$26.24	$54.21		
182	2		TOILET			500	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	30	$1.55	$7.29	$8.84	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	9	$0.47	$2.19	$2.65	$1.09	$5.10	$6.19		
183	2		OFFICE			1500	4	A3TT8	4' 3L TROFFER W/ T8S	372	558	$28.90	$45.19	$74.10	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	234	$12.12	$18.95	$31.07	$16.78	$26.24	$43.02		
184	2		WAITING			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$48.17	$45.19	$93.37	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.20	$18.95	$39.15	$27.97	$26.24	$54.21		
185	2		CONFERENCE			1500	3	A3TT8	4' 3L TROFFER W/ T8S	279	419	$21.68	$33.90	$55.57	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	176	$9.09	$14.21	$23.30	$12.59	$19.68	$32.27		
186	2		CONFERENCE			1500	9	2-32CP	(2) 32W COMPACT FLUORESCENT	612	918	$47.55	$74.35	$121.90	LED40CAN	NEW 40W LED CAN	9	360	540	$27.97	$43.74	$71.71	$19.58	$30.61	$50.20		
187	2		KITCHEN			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.64	$7.17	$14.81	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.37	$3.16	$6.53	$4.27	$4.01	$8.28	WS	1
188	2		OFFICE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.45	$22.60	$37.05	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$6.06	$9.48	$15.54	$8.39	$13.12	$21.51		
189	2		HALL			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.28	$14.34	$29.62	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.73	$6.32	$13.05	$8.55	$8.02	$16.57	WS	1
190	2	207	TOILET			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$12.04	$11.30	$23.34	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	65	$3.37	$3.16	$6.53	$8.68	$8.14	$16.82		
191	2	207	TOILET			2500	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	150	$7.77	$7.29	$15.06	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	45	$2.33	$2.19	$4.52	$5.44	$5.10	$10.54	CP	1
192	2	208	ELECTRIC			500	2	D2WT8	2' 2L WRAP W/T8S	66	33	$1.71	$8.02	$9.73	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	2	36	18	$0.93	$4.37	$5.31	$0.78	$3.64	$4.42	INCL	1
193	2		HALL			2500	5	D2TUT8	2' 2L TROFFER WT8/U-TUBES	300	750	$38.85	$36.45	$75.30	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	5	90	225	$11.66	$10.93	$22.59	$27.20	$25.51	$52.71		
194	2		HALL			2500	3	2-18CP	(2) 18W COMPACT FLUORESCENT	120	300	$15.54	$14.58	$30.12	LED25CAN	NEW 25W LED CAN	3	75	188	$9.71	$9.11	$18.82	$5.83	$5.47	$11.29		
195	2	203	OFFICE			2500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	590	$30.56	$28.67	$59.23	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$13.47	$12.63	$26.10	$17.09	$16.04	$33.13	WS	1

ENHANCED LIGHTING SURVEY LOG

Project Name: 92 FRANKLIN

Months: 12

Hours: 2500

Multipliers: 0.0518 | 10.124

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
196	2		CONFERENCE			1500	1	A4TT8	4' 4L RECESSED TROFFER W/T8S	112	168	$8.70	$13.61	$22.31	RR3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS, DELAMP KIT	1	48	72	$3.73	$5.83	$9.56	$4.97	$7.78	$12.75	WS	1
197	2		OFFICE			1500	3	A4TT8	4' 4L RECESSED TROFFER W/T8S	336	504	$26.11	$40.82	$66.93	RR3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS, DELAMP KIT	3	144	216	$11.19	$17.49	$28.68	$14.92	$23.33	$38.24		
198	2		PASSAGE			2500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	443	$22.92	$21.50	$44.42	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$10.10	$9.48	$19.58	$12.82	$12.03	$24.85		
199	2	204B	PASSAGE			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$12.04	$11.30	$23.34	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	65	$3.37	$3.16	$6.53	$8.68	$8.14	$16.82		
200	2		CONFERENCE			1500	4	A3TT8	4' 3L TROFFER W/ T8S	372	558	$28.90	$45.19	$74.10	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	234	$12.12	$18.95	$31.07	$16.78	$26.24	$43.02	WS	1
201	2		HEARING ROOM			1500	6	A4TT8	4' 4L RECESSED TROFFER W/T8S	672	1008	$52.21	$81.64	$133.85	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	6	312	468	$24.24	$37.90	$62.15	$27.97	$43.74	$71.71		
202	2		MEZ HALL			2500	2	A4TT8	4' 4L RECESSED TROFFER W/T8S	224	560	$29.01	$27.21	$56.22	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	130	$6.73	$6.32	$13.05	$22.27	$20.90	$43.17		
203	2		MEZ HALL			2500	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	150	$7.77	$7.29	$15.06	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	45	$2.33	$2.19	$4.52	$5.44	$5.10	$10.54		
204	2M	204B	OFFICE			2500	1	A3WT8	4' 3L WRAP FIXTURE W/T8S	93	233	$12.04	$11.30	$23.34	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	98	$5.05	$4.74	$9.79	$6.99	$6.56	$13.55	WS	1
205	2M	204B	OFFICE			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$12.04	$11.30	$23.34	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	98	$5.05	$4.74	$9.79	$6.99	$6.56	$13.55	INCL	1
206	2M		JURY ROOM			1500	5	A3BT8	4' 3L BOX W/ T8S	465	698	$36.13	$56.49	$92.62	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	5	195	293	$15.15	$23.69	$38.84	$20.98	$32.80	$53.78	WS	1
207	2M		CLOSET			500	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	30	$1.53	$7.17	$8.70	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.67	$3.16	$3.83	$0.85	$4.01	$4.86	WS	1
208	2M		CHANDELIERS			1500	2	4-36PLL	4-36W PLL	304	456	$23.62	$36.93	$60.55	LED18PLL-4	(4) LED 18 PLL LAMPS	2	144	216	$11.19	$17.49	$28.68	$12.43	$19.44	$31.87		
209	2M		HALL			2500	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	885	$45.84	$43.01	$88.85	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	390	$20.20	$18.95	$39.15	$25.64	$24.05	$49.70		
210	2M		HALL			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.64	$7.17	$14.81	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.37	$3.16	$6.53	$4.27	$4.01	$8.28		
211	2M		TOILET			1000	1	D2VT8	2' 2L VANITY	33	33	$1.71	$4.01	$5.72	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	1	18	18	$0.93	$2.19	$3.12	$0.78	$1.82	$2.60	WS	1
212	2M		JANITOR			1000	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	59	$3.06	$7.17	$10.22	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.35	$3.16	$4.51	$1.71	$4.01	$5.72	WS	1
213	2M		TOILET			1000	1	D2VT8	2' 2L VANITY	33	33	$1.71	$4.01	$5.72	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	1	18	18	$0.93	$2.19	$3.12	$0.78	$1.82	$2.60	WS	1
214	2M		LACTATION			1000	3	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	177	177	$9.17	$21.50	$30.67	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	78	$4.04	$9.48	$13.52	$5.13	$12.03	$17.16	WS	1
215	2		OFFICE			2500	7	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	413	1033	$53.48	$50.17	$103.66	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	7	182	455	$23.57	$22.11	$45.68	$29.91	$28.06	$57.98		
216	2		OFFICE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.64	$7.17	$14.81	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.37	$3.16	$6.53	$4.27	$4.01	$8.28		
217	2		TOILET			1000	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	60	$3.11	$7.29	$10.40	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	18	$0.93	$2.19	$3.12	$2.18	$5.10	$7.28	WS	1
218	2	201	HELP CENTER			2500	6	A3TT8	4' 3L TROFFER W/ T8S	558	1395	$72.26	$67.79	$140.05	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	6	234	585	$30.30	$28.43	$58.73	$41.96	$39.36	$81.32		
219	2	201	HELP CENTER			2500	2	D2TUT8	2' 2L TROFFER WT8/U-TUBES	120	300	$15.54	$14.58	$30.12	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	2	36	90	$4.66	$4.37	$9.04	$10.88	$10.20	$21.08		
220	2		RECEPTION			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.09	$22.60	$46.68	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.10	$9.48	$19.58	$13.99	$13.12	$27.11		
221	2	201L	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.09	$22.60	$46.68	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.10	$9.48	$19.58	$13.99	$13.12	$27.11		
222	2	201K	OFFICE			2500	2	A4TT8	4' 4L RECESSED TROFFER W/T8S	224	560	$29.01	$27.21	$56.22	RR3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS, DELAMP KIT	2	96	240	$12.43	$11.66	$24.09	$16.58	$15.55	$32.13	CP	1
223	2	201J	OFFICE			2500	2	A4TT8	4' 4L RECESSED TROFFER W/T8S	224	560	$29.01	$27.21	$56.22	RR3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS, DELAMP KIT	2	96	240	$12.43	$11.66	$24.09	$16.58	$15.55	$32.13	CP	1
224	2	201I	OFFICE			2500	2	A4TT8	4' 4L RECESSED TROFFER W/T8S	224	560	$29.01	$27.21	$56.22	RR3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS, DELAMP KIT	2	96	240	$12.43	$11.66	$24.09	$16.58	$15.55	$32.13	WS	1
225	2	201H	OFFICE			2500	2	A4TT8	4' 4L RECESSED TROFFER W/T8S	224	560	$29.01	$27.21	$56.22	RR3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS, DELAMP KIT	2	96	240	$12.43	$11.66	$24.09	$16.58	$15.55	$32.13	WS	1
226	2	201G	OFFICE			2500	4	A4TT8	4' 4L RECESSED TROFFER W/T8S	448	1120	$58.02	$54.43	$112.44	RR3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS, DELAMP KIT	4	192	480	$24.86	$23.33	$48.19	$33.15	$31.10	$64.25		
227	2	201F	OFFICE			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$36.13	$33.90	$70.03	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$15.15	$14.21	$29.37	$20.98	$19.68	$40.66		
228	2	201E	OFFICE			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$15.28	$14.34	$29.62	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.73	$6.32	$13.05	$8.55	$8.02	$16.57	WS	1
229	2	201C	OFFICE			2500	3	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	177	443	$22.92	$21.50	$44.42	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$10.10	$9.48	$19.58	$12.82	$12.03	$24.85	WS	1
230	2		LIBRARY			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$36.13	$33.90	$70.03	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$15.15	$14.21	$29.37	$20.98	$19.68	$40.66	WSDS	1
231	2		KITCHEN			2500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	590	$30.56	$28.67	$59.23	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$13.47	$12.63	$26.10	$17.09	$16.04	$33.13	WS	1
232	2		CLOSET			500	1	D2WT8	2' 2L WRAP W/T8S	33	17	$0.85	$4.01	$4.86	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	1	18	9	$0.47	$2.19	$2.65	$0.39	$1.82	$2.21		
233	2	201B	OFFICE			2500	8	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	472	1180	$61.12	$57.34	$118.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	520	$26.94	$25.27	$52.21	$34.19	$32.07	$66.26	WS	1
234	2		TOILET			500	1	C2VT8	3' 2L VANITY FIXTURE W/T8S	46	23	$1.19	$5.59	$6.78	R2C	RETRO (1) FIX. W/ (2) 3' LED LAMPS	1	28	14	$0.73	$3.40	$4.13	$0.47	$2.19	$2.65		

ENHANCED LIGHTING SURVEY LOG

Project Name: 92 FRANKLIN

Months: 12

Hours: 2500 **Multipliers:** 0.0518 10.124

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
235	2	201A	OFFICE			2500	3	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	177	443	$22.92	$21.50	$44.42	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$10.10	$9.48	$19.58	$12.82	$12.03	$24.85	WS	1
236	2		HALL			2500	3	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	177	443	$22.92	$21.50	$44.42	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$10.10	$9.48	$19.58	$12.82	$12.03	$24.85		
237	2		HALL			2500	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	150	$7.77	$7.29	$15.06	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	45	$2.33	$2.19	$4.52	$5.44	$5.10	$10.54		
238	2		OPEN AREA			2500	6	A3TT8	4' 3L TROFFER W/ T8S	558	1395	$72.26	$67.79	$140.05	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	6	234	585	$30.30	$28.43	$58.73	$41.96	$39.36	$81.32	CP	1
239	2		JUDGE			2500	6	A4TT8	4' 4L RECESSED TROFFER W/T8S	672	1680	$87.02	$81.64	$168.66	RR3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS, DELAMP KIT	6	288	720	$37.30	$34.99	$72.28	$49.73	$46.65	$96.38		
240	2		JUDGE			2500	10	A3TT8	4' 3L TROFFER W/ T8S	930	2325	$120.44	$112.98	$233.42	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	10	390	975	$50.51	$47.38	$97.89	$69.93	$65.60	$135.53		
241	2		TOILET			500	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	30	$1.55	$7.29	$8.84	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	9	$0.47	$2.19	$2.65	$1.09	$5.10	$6.19		
242	2		COPY			1000	1	A4TT8	4' 4L RECESSED TROFFER W/T8S	112	112	$5.80	$13.61	$19.41	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	26	$1.35	$3.16	$4.51	$4.45	$10.45	$14.90	WS	1
243	2		PASSAGE			2500	2	2-32CP	(2) 32W COMPACT FLUORESCENT	136	340	$17.61	$16.52	$34.13	LED40CAN	NEW 40W LED CAN	2	80	200	$10.36	$9.72	$20.08	$7.25	$6.80	$14.06		
244	2		HALL			2500	5	A4TT8	4' 4L RECESSED TROFFER W/T8S	560	1400	$72.52	$68.03	$140.55	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	5	130	325	$16.84	$15.79	$32.63	$55.69	$52.24	$107.92		
245	2		CONFERENCE			1500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	354	$18.34	$28.67	$47.01	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	156	$8.08	$12.63	$20.72	$10.26	$16.04	$26.29		
246	2		TOILET			1000	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	60	$3.11	$7.29	$10.40	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	18	$0.93	$2.19	$3.12	$2.18	$5.10	$7.28	WS	1
247	2		EXCERSIZE			1500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	89	$4.58	$7.17	$11.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	39	$2.02	$3.16	$5.18	$2.56	$4.01	$6.57	WS	1
248	2		PASSAGE			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$7.64	$7.17	$14.81	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.37	$3.16	$6.53	$4.27	$4.01	$8.28		
249	2M		HALL			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$15.28	$14.34	$29.62	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.73	$6.32	$13.05	$8.55	$8.02	$16.57		
250	2M		TOILET			1000	1	I60	60W INCANDESCENT	60	60	$3.11	$7.29	$10.40	N2DV	REMOVE FIX. & INSTALL NEW 2' VANITY W/ (2) 2' LED LAMPS	1	22	22	$1.14	$2.67	$3.81	$1.97	$4.62	$6.58		
251	2M		TOILET			1000	1	D2VT8	2' 2L VANITY	33	33	$1.71	$4.01	$5.72	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	1	18	18	$0.93	$2.19	$3.12	$0.78	$1.82	$2.60		
252	2M		STORAGE			1000	4	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	236	236	$12.22	$28.67	$40.90	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	104	$5.39	$12.63	$18.02	$6.84	$16.04	$22.87	WS	1
253	2		COURT ROOM			2500	18	A4TT8	4' 4L RECESSED TROFFER W/T8S	2016	5040	$261.07	$244.92	$505.99	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	18	936	2340	$121.21	$113.71	$234.92	$139.86	$131.21	$271.07		
254	2		PASSAGE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.64	$7.17	$14.81	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.37	$3.16	$6.53	$4.27	$4.01	$8.28		
255	2		GUARDINSHIP			2500	15	A4TT8	4' 4L RECESSED TROFFER W/T8S	1680	4200	$217.56	$204.10	$421.66	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	15	780	1950	$101.01	$94.76	$195.77	$116.55	$109.34	$225.89		
256	2		OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.09	$22.60	$46.68	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	130	$6.73	$6.32	$13.05	$17.35	$16.28	$33.63		
257	2		RECORDS			2500	6	A3TT8	4' 3L TROFFER W/ T8S	558	1395	$72.26	$67.79	$140.05	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	6	156	390	$20.20	$18.95	$39.15	$52.06	$48.84	$100.90		
258	2		RECORDS			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$15.28	$14.34	$29.62	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.73	$6.32	$13.05	$8.55	$8.02	$16.57		
259	2		OPEN AREA			2500	8	A3TT8	4' 3L TROFFER W/ T8S	744	1860	$96.35	$90.39	$186.74	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	8	312	780	$40.40	$37.90	$78.31	$55.94	$52.48	$108.43		
260	2M		RECORDS			1000	6	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	354	354	$18.34	$43.01	$61.34	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	156	$8.08	$18.95	$27.03	$10.26	$24.05	$34.31		
261	2M		RECORDS			1000	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	177	$9.17	$21.50	$30.67	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	78	$4.04	$9.48	$13.52	$5.13	$12.03	$17.16		
262	2M		SERVER			500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	30	$1.53	$7.17	$8.70	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.67	$3.16	$3.83	$0.85	$4.01	$4.86		
263	2		RECORDS			2500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	443	$22.92	$21.50	$44.42	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$10.10	$9.48	$19.58	$12.82	$12.03	$24.85		
264	2		RECORDS			2500	12	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	708	1770	$91.69	$86.01	$177.70	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	12	312	780	$40.40	$37.90	$78.31	$51.28	$48.11	$99.39		
265	2		OPEN AREA			2500	7	A3TT8	4' 3L TROFFER W/ T8S	651	1628	$84.30	$79.09	$163.39	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	7	273	683	$35.35	$33.17	$68.52	$48.95	$45.92	$94.87		
266	2		RECORDS			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$36.13	$33.90	$70.03	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$15.15	$14.21	$29.37	$20.98	$19.68	$40.66		
267	2		OPEN AREA			2500	12	A3TT8	4' 3L TROFFER W/ T8S	1116	2790	$144.52	$135.58	$280.10	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	12	468	1170	$60.61	$56.86	$117.46	$83.92	$78.72	$162.64		
268	2		OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.09	$22.60	$46.68	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.10	$9.48	$19.58	$13.99	$13.12	$27.11	WSDS	1
269	2		TOILET			1000	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	59	$3.06	$7.17	$10.22	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.35	$3.16	$4.51	$1.71	$4.01	$5.72	WS	1
270	2	209	JANITOR			1000	1	D2VT8	2' 2L VANITY	33	33	$1.71	$4.01	$5.72	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	1	18	18	$0.93	$2.19	$3.12	$0.78	$1.82	$2.60	WS	1
271	2		MAIN LOBBY			4500	26	2-32CP	(2) 32W COMPACT FLUORESCENT	1768	7956	$412.12	$214.79	$626.91	LED40CAN	NEW 40W LED CAN	26	1040	4680	$242.42	$126.35	$368.77	$169.70	$88.44	$258.14		
272	2		MAIN LOBBY			4500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	266	$13.75	$7.17	$20.92	NAW	REMOVE (1) FIX. & INSTALL NEW 4 LED' WRAP FIX.	1	36	162	$8.39	$4.37	$12.77	$5.36	$2.79	$8.16		
273	2		WOMENS			2500	3	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	177	443	$22.92	$21.50	$44.42	NAW	REMOVE (1) FIX. & INSTALL NEW 4 LED' WRAP FIX.	3	108	270	$13.99	$13.12	$27.11	$8.94	$8.38	$17.32		

ENHANCED LIGHTING SURVEY LOG

Project Name: 92 FRANKLIN

Months: 12

Hours: 2500 **Multipliers:** 0.0518 10.124

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
274	2		MENS			2500	3	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	177	443	$22.92	$21.50	$44.42	NAW	REMOVE (1) FIX. & INSTALL NEW 4 LED' WRAP FIX.	3	108	270	$13.99	$13.12	$27.11	$8.94	$8.38	$17.32		
275	2		CONFERENCE			1500	4	A3TT8	4' 3L TROFFER W/ T8S	372	558	$28.90	$45.19	$74.10	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	234	$12.12	$18.95	$31.07	$16.78	$26.24	$43.02	WSDS	1
276	2		TOILET			1000	1	2-32CP	(2) 32W COMPACT FLUORESCENT	68	68	$3.52	$8.26	$11.78	LED25CAN	NEW 25W LED CAN	1	25	25	$1.30	$3.04	$4.33	$2.23	$5.22	$7.45	WS	1
277	2		TOILET			1000	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	60	$3.11	$7.29	$10.40	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	18	$0.93	$2.19	$3.12	$2.18	$5.10	$7.28	INCL	1
278	1		COUNTY CLERK OPEN AREA			2500	7	A4TT8	4' 4L RECESSED TROFFER W/T8S	784	1960	$101.53	$95.25	$196.77	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	7	182	455	$23.57	$22.11	$45.68	$77.96	$73.14	$151.09		
279	1		KITCHEN			2500	1	A4TT8	4' 4L RECESSED TROFFER W/T8S	112	280	$14.50	$13.61	$28.11	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	65	$3.37	$3.16	$6.53	$11.14	$10.45	$21.58	WS	1
280	1		OFFICE			1500	5	A4TT8	4' 4L RECESSED TROFFER W/T8S	560	840	$43.51	$68.03	$111.55	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	5	130	195	$10.10	$15.79	$25.89	$33.41	$52.24	$85.65		
281	1		OFFICE			1500	3	A3TT8	4' 3L TROFFER W/ T8S	279	419	$21.68	$33.90	$55.57	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	176	$9.09	$14.21	$23.30	$12.59	$19.68	$32.27		
282	1		OFFICE			1500	3	A3TT8	4' 3L TROFFER W/ T8S	279	419	$21.68	$33.90	$55.57	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	176	$9.09	$14.21	$23.30	$12.59	$19.68	$32.27		
283	1		OFFICE			1500	4	A4TT8	4' 4L RECESSED TROFFER W/T8S	448	672	$34.81	$54.43	$89.24	RR3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS, DELAMP KIT	4	192	288	$14.92	$23.33	$38.24	$19.89	$31.10	$50.99		
284	1		OFFICE			1500	4	A4TT8	4' 4L RECESSED TROFFER W/T8S	448	672	$34.81	$54.43	$89.24	RR3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS, DELAMP KIT	4	192	288	$14.92	$23.33	$38.24	$19.89	$31.10	$50.99		
285	1		OFFICE			1500	2	A4TT8	4' 4L RECESSED TROFFER W/T8S	224	336	$17.40	$27.21	$44.62	RR3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS, DELAMP KIT	2	96	144	$7.46	$11.66	$19.12	$9.95	$15.55	$25.50		
286	1		HALL			4500	4	A4TT8	4' 4L RECESSED TROFFER W/T8S	448	2016	$104.43	$54.43	$158.86	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	4	104	468	$24.24	$12.63	$36.88	$80.19	$41.79	$121.98		
287	1		CONFERENCE			2000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	236	$12.22	$14.34	$26.56	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	104	$5.39	$6.32	$11.70	$6.84	$8.02	$14.86	WS	1
288	1		HALL			4500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	531	$27.51	$14.34	$41.84	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	234	$12.12	$6.32	$18.44	$15.38	$8.02	$23.40		
289	1		TOILET			1000	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	60	$3.11	$7.29	$10.40	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	18	$0.93	$2.19	$3.12	$2.18	$5.10	$7.28		
290	1		TOILET			1000	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	60	$3.11	$7.29	$10.40	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	18	$0.93	$2.19	$3.12	$2.18	$5.10	$7.28		
291	1		OPEN AREA			2500	34	A3TT8	4' 3L TROFFER W/ T8S	3162	7905	$409.48	$384.15	$793.62	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	34	1326	3315	$171.72	$161.09	$332.81	$237.76	$223.05	$460.81		
292	1		FILES			1000	24	A3TT8	4' 3L TROFFER W/ T8S	2232	2232	$115.62	$271.16	$386.78	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	24	624	624	$32.32	$75.81	$108.13	$83.29	$195.35	$278.65		
293	1		BREAK AREA			2500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	590	$30.56	$28.67	$59.23	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$13.47	$12.63	$26.10	$17.09	$16.04	$33.13		
294	1		TOILET			500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	30	$1.53	$7.17	$8.70	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.67	$3.16	$3.83	$0.85	$4.01	$4.86		
295	1		STORAGE			1000	12	2-18CP	(2) 18W COMPACT FLUORESCENT	480	480	$24.86	$58.31	$83.18	LED14CAN	NEW 14W LED CAN	12	168	168	$8.70	$20.41	$29.11	$16.16	$37.90	$54.07		
296	1		STORAGE			2500	4	A4TT8	4' 4L RECESSED TROFFER W/T8S	448	1120	$58.02	$54.43	$112.44	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	4	104	260	$13.47	$12.63	$26.10	$44.55	$41.79	$86.34	CP	1
297	1		STORAGE			1000	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	59	$3.06	$7.17	$10.22	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.35	$3.16	$4.51	$1.71	$4.01	$5.72	WS	1
298	1		JANITOR			500	1	D2VT8	2' 2L VANITY	33	17	$0.85	$4.01	$4.86	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	1	18	9	$0.47	$2.19	$2.65	$0.39	$1.82	$2.21	WS	1
299	1		CLOSET			500	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	30	$1.53	$7.17	$8.70	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.67	$3.16	$3.83	$0.85	$4.01	$4.86	WS	1
300	1		LOBBY			4500	10	42CP	42W COMPACT FLUORESCENT	480	2160	$111.89	$58.31	$170.20	LED25CAN	NEW 25W LED CAN	10	250	1125	$58.28	$30.37	$88.65	$53.61	$27.94	$81.56		
301	1		CONFERENCE			2000	12	A2BT8	4' 2L BOX FIXTURE W/T8S	708	1416	$73.35	$86.01	$159.36	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	12	312	624	$32.32	$37.90	$70.23	$41.03	$48.11	$89.13		
302	1		PISTOL PERMIT			2500	8	A3TT8	4' 3L TROFFER W/ T8S	744	1860	$96.35	$90.39	$186.74	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	8	312	780	$40.40	$37.90	$78.31	$55.94	$52.48	$108.43		
303	1		OFFICE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$48.17	$45.19	$93.37	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.20	$18.95	$39.15	$27.97	$26.24	$54.21	WS	1
304	1		OFFICE			1000	2	A3TT8	4' 3L TROFFER W/ T8S	186	186	$9.63	$22.60	$32.23	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	52	$2.69	$6.32	$9.01	$6.94	$16.28	$23.22		
305	1		CONCESSION			2500	2	D2TT8	2' 2L TROFFER W/ T8'S	66	165	$8.55	$8.02	$16.57	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	2	36	90	$4.66	$4.37	$9.04	$3.89	$3.64	$7.53		
306	1		STORAGE			2500	1	A4WT8	4' 4L WRAP FIXTURE W/ 32W T8'S	112	280	$14.50	$13.61	$28.11	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	1	52	130	$6.73	$6.32	$13.05	$7.77	$7.29	$15.06	WS	1
307	1		CASH REGISTER			2500	1	A1WT8	4' 1L WRAP FIXTURE W/ 32W T8'S	32	80	$4.14	$3.89	$8.03	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	33	$1.68	$1.58	$3.26	$2.46	$2.31	$4.77		
308	1		CASH REGISTER			2500	1	D1WT8	2' 1L WRAP FIXTURE W/T8	17	43	$2.20	$2.07	$4.27	R1D	RETRO (1) FIX. W/ (1) 2'LED LAMPS	1	9	23	$1.17	$1.09	$2.26	$1.04	$0.97	$2.01		
309	1		CLERK NORTH			2500	15	42CP	42W COMPACT FLUORESCENT	720	1800	$93.24	$87.47	$180.71	LED25CAN	NEW 25W LED CAN	15	375	938	$48.56	$45.56	$94.12	$44.68	$41.91	$86.59		
310	1		CLOSING AREA			2500	20	A3TT8	4' 3L TROFFER W/ T8S	1860	4650	$240.87	$225.97	$466.84	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	20	780	1950	$101.01	$94.76	$195.77	$139.86	$131.21	$271.07		
311	1	105	STORAGE			500	8	A4C	4' 4L T12 EGG CRATE	1152	576	$29.84	$139.95	$169.79	N2BWW	REMOVE (1) FIX. & INSTALL NEW 8' WIDE WRAP W/ (2) 4 ' LED LAMPS	4	104	52	$2.69	$12.63	$15.33	$27.14	$127.32	$154.46		
312	1	105	STORAGE			500	3	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	177	89	$4.58	$21.50	$26.09	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	39	$2.02	$9.48	$11.50	$2.56	$12.03	$14.59		

ENHANCED LIGHTING SURVEY LOG

Project Name: 92 FRANKLIN

Months: 12

Hours: 2500 **Multipliers:** 0.0518 10.124

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
313	1		PASSAGE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.28	$14.34	$29.62	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.73	$6.32	$13.05	$8.55	$8.02	$16.57		
314	1		BREAK AREA			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$36.13	$33.90	$70.03	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	3	78	195	$10.10	$9.48	$19.58	$26.03	$24.42	$50.45	WS	1
315	1		MENS			1500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	177	$9.17	$14.34	$23.50	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.04	$6.32	$10.36	$5.13	$8.02	$13.15		
316	1		WOMENS			1500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	177	$9.17	$14.34	$23.50	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.04	$6.32	$10.36	$5.13	$8.02	$13.15		
317	1		HALL			4500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	1062	$55.01	$28.67	$83.68	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	468	$24.24	$12.63	$36.88	$30.77	$16.04	$46.81		
318	1	101	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.09	$22.60	$46.68	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.10	$9.48	$19.58	$13.99	$13.12	$27.11	WS	1
319	1	102	OPEN AREA			2500	12	A3TT8	4' 3L TROFFER W/ T8S	1116	2790	$144.52	$135.58	$280.10	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	12	468	1170	$60.61	$56.86	$117.46	$83.92	$78.72	$162.64		
320	1	102	OPEN AREA			2500	8	A3TT8	4' 3L TROFFER W/ T8S	744	1860	$96.35	$90.39	$186.74	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	8	208	520	$26.94	$25.27	$52.21	$69.41	$65.12	$134.53		
321	1		UPPER AREA			2500	9	A3TT8	4' 3L TROFFER W/ T8S	837	2093	$108.39	$101.69	$210.08	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	9	234	585	$30.30	$28.43	$58.73	$78.09	$73.26	$151.35		
322	1		CUSTOMER SERVICE			2500	24	A2BT8	4' 2L BOX FIXTURE W/T8S	1416	3540	$183.37	$172.03	$355.40	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	24	624	1560	$80.81	$75.81	$156.62	$102.56	$96.22	$198.78		
323	1		OFFICE			2500	2	A2BT8	4' 2L BOX FIXTURE W/T8S	118	295	$15.28	$14.34	$29.62	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.73	$6.32	$13.05	$8.55	$8.02	$16.57		
324	1		OFFICE			2500	2	A2BT8	4' 2L BOX FIXTURE W/T8S	118	295	$15.28	$14.34	$29.62	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.73	$6.32	$13.05	$8.55	$8.02	$16.57		
325	1	104	OFFICE			2500	3	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	177	443	$22.92	$21.50	$44.42	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$10.10	$9.48	$19.58	$12.82	$12.03	$24.85		
326	1	104	OFFICE			2500	4	D2TUT8	2' 2L TROFFER WT8/U-TUBES	240	600	$31.08	$29.16	$60.24	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	4	72	180	$9.32	$8.75	$18.07	$21.76	$20.41	$42.17		
327	1		SERVER			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$36.13	$33.90	$70.03	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	3	78	195	$10.10	$9.48	$19.58	$26.03	$24.42	$50.45		
328	G		DEEDS			2500	154	A1WT8	4' 1L WRAP FIXTURE W/ 32W T8'S	4928	12320	$638.18	$598.69	$1,236.87	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	154	2002	5005	$259.26	$243.22	$502.48	$378.92	$355.47	$734.39		
329			PAPER STORAGE			8760	8	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	472	4135	$214.18	$57.34	$271.52	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	1822	$94.38	$25.27	$119.65	$119.79	$32.07	$151.87		
330			HALL			4500	7	A2TT8	4' 2L TROFFER FIXTURE W/T8S	413	1859	$96.27	$50.17	$146.44	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	7	182	819	$42.42	$22.11	$64.54	$53.85	$28.06	$81.91		
331		G25	MECHANICAL			1500	7	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	413	620	$32.09	$50.17	$82.26	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	7	182	273	$14.14	$22.11	$36.25	$17.95	$28.06	$46.01	TS	1
332			PASSAGE			8760	1	A4WT8	4' 4L WRAP FIXTURE W/ 32W T8'S	112	981	$50.82	$13.61	$64.43	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$11.80	$3.16	$14.96	$39.02	$10.45	$49.47		
333			PASSAGE			8760	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	517	$26.77	$7.17	$33.94	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$11.80	$3.16	$14.96	$14.97	$4.01	$18.98		
334			WOMENS			3500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	413	$21.39	$14.34	$35.73	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	182	$9.43	$6.32	$15.74	$11.97	$8.02	$19.98	CP	1
335		G03	ELECTRIC			8760	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	1034	$53.54	$14.34	$67.88	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$23.60	$6.32	$29.91	$29.95	$8.02	$37.97		
336		G03	ELECTRIC			1000	6	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	354	354	$18.34	$43.01	$61.34	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	156	$8.08	$18.95	$27.03	$10.26	$24.05	$34.31		
337			JANITOR			1000	1	D2VT8	2' 2L VANITY	33	33	$1.71	$4.01	$5.72	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	1	18	18	$0.93	$2.19	$3.12	$0.78	$1.82	$2.60	WS	1
338			COMMUNICATION			500	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	30	$1.53	$7.17	$8.70	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.67	$3.16	$3.83	$0.85	$4.01	$4.86	WS	1
339			HALL			4500	3	A2VT8	4' 2L VANITY W/ 32W T8'S	177	797	$41.26	$21.50	$62.76	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	351	$18.18	$9.48	$27.66	$23.08	$12.03	$35.10		
340		G00	FILES			2500	16	A1WT8	4' 1L WRAP FIXTURE W/ 32W T8'S	512	1280	$66.30	$62.20	$128.51	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	16	208	520	$26.94	$25.27	$52.21	$39.37	$36.93	$76.30	CP	1
341		G24	ELEVATOR MACHINE			500	2	I60	60W INCANDESCENT	120	60	$3.11	$14.58	$17.69	LED9SI	NEW 9W LED SCREW IN	2	18	9	$0.47	$2.19	$2.65	$2.64	$12.39	$15.03		
342		G23	STORAGE			500	12	A1ST8	4' 1L STRIP FIXTURE W/ 32W T8'S	384	192	$9.95	$46.65	$56.60	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	12	156	78	$4.04	$18.95	$22.99	$5.91	$27.70	$33.60	WS	1
343		G22	STORAGE			500	12	A1ST8	4' 1L STRIP FIXTURE W/ 32W T8'S	384	192	$9.95	$46.65	$56.60	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	12	156	78	$4.04	$18.95	$22.99	$5.91	$27.70	$33.60	WS	1
344		G21	ELEVATOR MACHINE			500	2	I60	60W INCANDESCENT	120	60	$3.11	$14.58	$17.69	LED9SI	NEW 9W LED SCREW IN	2	18	9	$0.47	$2.19	$2.65	$2.64	$12.39	$15.03		
345		G20	STORAGE			500	16	A1WT8	4' 1L WRAP FIXTURE W/ 32W T8'S	512	256	$13.26	$62.20	$75.46	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	16	208	104	$5.39	$25.27	$30.66	$7.87	$36.93	$44.81	WS	1
346		G19	STORAGE			500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	118	$6.11	$28.67	$34.78	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	52	$2.69	$12.63	$15.33	$3.42	$16.04	$19.46		
347		G18	STORAGE			500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	118	$6.11	$28.67	$34.78	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	52	$2.69	$12.63	$15.33	$3.42	$16.04	$19.46		
348		G17	STORAGE			500	1	A1ST8	4' 1L STRIP FIXTURE W/ 32W T8'S	32	16	$0.83	$3.89	$4.72	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	7	$0.34	$1.58	$1.92	$0.49	$2.31	$2.80	WS	1
349		G16	STORAGE			500	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	30	$1.53	$7.17	$8.70	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.67	$3.16	$3.83	$0.85	$4.01	$4.86	WS	1
350		G15	MECHANICAL			8760	8	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	472	4135	$214.18	$57.34	$271.52	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	1822	$94.38	$25.27	$119.65	$119.79	$32.07	$151.87		
351		G14	STORAGE			1000	34	A1WT8	4' 1L WRAP FIXTURE W/ 32W T8'S	1088	1088	$56.36	$132.18	$188.54	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	34	442	442	$22.90	$53.70	$76.59	$33.46	$78.48	$111.94	TS	1

ENHANCED LIGHTING SURVEY LOG

Project Name: 92 FRANKLIN

Months: 12

Hours: 2500 **Multipliers:** 0.0518 10.124

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
352			HALL			8760	2	A4WT8	4' 4L WRAP FIXTURE W/ 32W T8'S	224	1962	$101.64	$27.21	$128.86	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$23.60	$6.32	$29.91	$78.05	$20.90	$98.94		
353			HALL			8760	2	A2VT8	4' 2L VANITY W/ 32W T8'S	118	1034	$53.54	$14.34	$67.88	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$23.60	$6.32	$29.91	$29.95	$8.02	$37.97		
354		G13	STORAGE			1000	31	A1ST8	4' 1L STRIP FIXTURE W/ 32W T8'S	992	992	$51.39	$120.52	$171.90	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	31	403	403	$20.88	$48.96	$69.84	$30.51	$71.56	$102.07		
355		G13A	FIRE PUMP			500	4	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	236	118	$6.11	$28.67	$34.78	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	52	$2.69	$12.63	$15.33	$3.42	$16.04	$19.46		
356			HALL			8760	10	A2TT8	4' 2L TROFFER FIXTURE W/T8S	590	5168	$267.72	$71.68	$339.40	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	10	260	2278	$117.98	$31.59	$149.57	$149.74	$40.09	$189.83		
357		G11	STORAGE			1000	6	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	354	354	$18.34	$43.01	$61.34	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	156	$8.08	$18.95	$27.03	$10.26	$24.05	$34.31	WS	1
358		G10	STORAGE			2500	14	A2C	4' 2L EGG CRATE FIXTURE	1008	2520	$130.54	$122.46	$253.00	N2BWW	REMOVE (1) FIX. & INSTALL NEW 8' WIDE WRAP W/ (2) 4 ' LED LAMPS	7	182	455	$23.57	$22.11	$45.68	$106.97	$100.35	$207.32		
359		G10	STORAGE			2500	2	A2C	4' 2L EGG CRATE FIXTURE	144	360	$18.65	$17.49	$36.14	N1AWW	REMOVE (1) FIX. & INSTALL NEW 4' WIDE WRAP W/ (1) 4' LED LAMP	2	26	65	$3.37	$3.16	$6.53	$15.28	$14.34	$29.62	WS	1
360			STORAGE			1000	3	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	177	177	$9.17	$21.50	$30.67	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	78	$4.04	$9.48	$13.52	$5.13	$12.03	$17.16		
361		G09	STORAGE			2500	12	A1WT8	4' 1L WRAP FIXTURE W/ 32W T8'S	384	960	$49.73	$46.65	$96.38	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	12	156	390	$20.20	$18.95	$39.15	$29.53	$27.70	$57.23	CP	1
362			STAIRS			4500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	531	$27.51	$14.34	$41.84	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	234	$12.12	$6.32	$18.44	$15.38	$8.02	$23.40		
363	G	G08	STORAGE			2500	16	A1WT8	4' 1L WRAP FIXTURE W/ 32W T8'S	512	1280	$66.30	$62.20	$128.51	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	16	208	520	$26.94	$25.27	$52.21	$39.37	$36.93	$76.30	CP	1
364			BASEMENT			8760	10	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	590	5168	$267.72	$71.68	$339.40	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	10	260	2278	$117.98	$31.59	$149.57	$149.74	$40.09	$189.83		
365			PHONE ROOM			1000	5	A1ST8	4' 1L STRIP FIXTURE W/ 32W T8'S	160	160	$8.29	$19.44	$27.73	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	5	65	65	$3.37	$7.90	$11.26	$4.92	$11.54	$16.46		
366			PHONE ROOM			1000	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	118	$6.11	$14.34	$20.45	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.69	$6.32	$9.01	$3.42	$8.02	$11.44		
367		G06	STORAGE			2500	12	A1WT8	4' 1L WRAP FIXTURE W/ 32W T8'S	384	960	$49.73	$46.65	$96.38	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	12	156	390	$20.20	$18.95	$39.15	$29.53	$27.70	$57.23	CP	1
368			ELEVATOR MACHINE			500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	30	$1.53	$7.17	$8.70	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.67	$3.16	$3.83	$0.85	$4.01	$4.86	WS	1
369			OPEN AREA			4500	72	A1WT8	4' 1L WRAP FIXTURE W/ 32W T8'S	2304	10368	$537.06	$279.91	$816.97	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	72	936	4212	$218.18	$113.71	$331.89	$318.88	$166.20	$485.08		
370			OPEN AREA			4500	5	A3TT8	4' 3L TROFFER W/ T8S	465	2093	$108.39	$56.49	$164.88	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	5	195	878	$45.45	$23.69	$69.14	$62.94	$32.80	$95.74		
371			STAIRS			8760	40	A2VT8	4' 2L VANITY W/ 32W T8'S	2360	20674	$1,070.89	$286.71	$1,357.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	40	1040	9110	$471.92	$126.35	$598.27	$598.97	$160.36	$759.34		
372			NEW LENS3S			2500	50								NL	NEW LENS	50	2400	6000	$310.80	$291.57	$602.37	-$310.80	-$291.57	-$602.37		
373			MISC FIXTURES			2500	10	2-18CP	(2) 18W COMPACT FLUORESCENT	400	1000	$51.80	$48.60	$100.40	LED25CAN	NEW 25W LED CAN	10	250	625	$32.38	$30.37	$62.75	$19.43	$18.22	$37.65		
374			MISC FIXTURES			2500	20	A3TT8	4' 3L TROFFER W/ T8S	1860	4650	$240.87	$225.97	$466.84	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	20	780	1950	$101.01	$94.76	$195.77	$139.86	$131.21	$271.07		
375			MISC FIXTURES			2500	20	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	1180	2950	$152.81	$143.36	$296.17	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	20	520	1300	$67.34	$63.17	$130.51	$85.47	$80.18	$165.65		
376			MISC FIXTURES			2500	20	A1WT8	4' 1L WRAP FIXTURE W/ 32W T8'S	640	1600	$82.88	$77.75	$160.63	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	20	260	650	$33.67	$31.59	$65.26	$49.21	$46.17	$95.38		
							2,024.00	**Totals:**		133929	340769	$17,651.85	$16,270.77	$33,922.62			2,013.00	57860	151253	$7,835	$7,029	$14,864	$9,817	$9,241	$19,058		104
										KW	134							**KW**	58								

ENHANCED LIGHTING SURVEY LOG

Project Name: HEALTH MALL

Months: 12

Hours: 2500 **Multipliers:** **0.049** **11.884**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	ProposedWatts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
1	2		MENS			3500	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	413	$20.24	$16.83	$37.06	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	182	$8.92	$7.42	$16.33	$11.32	$9.41	$20.73	
2	2		PASSAGE			3500	1	32CP	32W COMPACT FLUORESCENT	34	119	$5.83	$4.85	$10.68	LED14CAN	NEW 14W LED CAN	1	14	49	$2.40	$2.00	$4.40	$3.43	$2.85	$6.28	
3	2		WOMENS			3500	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	413	$20.24	$16.83	$37.06	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	182	$8.92	$7.42	$16.33	$11.32	$9.41	$20.73	
4	2		WOMENS			3500	1	32CP	32W COMPACT FLUORESCENT	34	119	$5.83	$4.85	$10.68	NR	RETROFIT NOT REQUIRED	1						$5.83	$4.85	$10.68	
5	2		HALL			3500	2	32CP	32W COMPACT FLUORESCENT	68	238	$11.66	$9.70	$21.36	LED14CAN	NEW 14W LED CAN	2	28	98	$4.80	$3.99	$8.80	$6.86	$5.70	$12.56	
6	2		HALL			8760	6	D2TT8	2' 2L TROFFER W/ T8'S	198	1734	$84.99	$28.24	$113.23	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	6	108	946	$46.36	$15.40	$61.76	$38.63	$12.83	$51.47	
7	2	277	STORAGE			1000	3	A3TT8	4' 3L TROFFER W/ T8S	279	279	$13.67	$39.79	$53.46	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	3	78	78	$3.82	$11.12	$14.95	$9.85	$28.66	$38.51	
8	2		STAIRS			2500		NR	NO RETROFIT REQUIRED																	ALREADY LED
9	2	275	OFFICE			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$11.39	$13.26	$24.66	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	65	$3.19	$3.71	$6.89	$8.21	$9.55	$17.76	
10	2		HALL			3500	2	D2TT8	2' 2L TROFFER W/ T8'S	66	231	$11.32	$9.41	$20.73	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	2	36	126	$6.17	$5.13	$11.31	$5.15	$4.28	$9.42	
11	2		CONFERENCE			2000	2	A3TT8	4' 3L TROFFER W/ T8S	186	372	$18.23	$26.53	$44.75	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	156	$7.64	$11.12	$18.77	$10.58	$15.40	$25.99	
12	2		STORAGE			8760	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	517	$25.33	$8.41	$33.74	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$11.16	$3.71	$14.87	$14.16	$4.71	$18.87	
13	2		STORAGE			500	4	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	236	118	$5.78	$33.66	$39.44	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	52	$2.55	$14.83	$17.38	$3.23	$18.82	$22.06	ESTIMATE NO ACCESS
14	2		RECYCLING			500	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	30	$1.45	$8.41	$9.86	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.64	$3.71	$4.34	$0.81	$4.71	$5.51	
15	2		WOMENS			1500	1	A3TT8	4' 3L TROFFER W/ T8S	93	140	$6.84	$13.26	$20.10	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	39	$1.91	$3.71	$5.62	$4.92	$9.55	$14.48	
16	2		STAIRS			2500		NR	NO RETROFIT REQUIRED																	ESTIMATE NO ACCESS
17	2		MENS			1500	1	A3TT8	4' 3L TROFFER W/ T8S	93	140	$6.84	$13.26	$20.10	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	39	$1.91	$3.71	$5.62	$4.92	$9.55	$14.48	
18	2		HALL			8760	4	D2TT8	2' 2L TROFFER W/ T8'S	132	1156	$56.66	$18.82	$75.48	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	4	72	631	$30.91	$10.27	$41.17	$25.75	$8.56	$34.31	
19	2	226	OFFICE			1500	1	A3TT8	4' 3L TROFFER W/ T8S	93	140	$6.84	$13.26	$20.10	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	59	$2.87	$5.56	$8.43	$3.97	$7.70	$11.67	
20	2	227	OFFICE			1500	1	A3TT8	4' 3L TROFFER W/ T8S	93	140	$6.84	$13.26	$20.10	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	59	$2.87	$5.56	$8.43	$3.97	$7.70	$11.67	
21	2		HALL			8760	4	D2TT8	2' 2L TROFFER W/ T8'S	132	1156	$56.66	$18.82	$75.48	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	4	72	631	$30.91	$10.27	$41.17	$25.75	$8.56	$34.31	
22	2	265	OFFICE			1500	1	A3TT8	4' 3L TROFFER W/ T8S	93	140	$6.84	$13.26	$20.10	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	39	$1.91	$3.71	$5.62	$4.92	$9.55	$14.48	
23	2		HALL			8760	4	D2TT8	2' 2L TROFFER W/ T8'S	132	1156	$56.66	$18.82	$75.48	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	4	72	631	$30.91	$10.27	$41.17	$25.75	$8.56	$34.31	
24	2	263	MECHANICAL			500	3	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	177	89	$4.34	$25.24	$29.58	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	39	$1.91	$11.12	$13.03	$2.43	$14.12	$16.54	
25	2	261	EXAM			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$11.39	$13.26	$24.66	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	98	$4.78	$5.56	$10.34	$6.62	$7.70	$14.32	
26	2	258	EXAM			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$11.39	$13.26	$24.66	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	98	$4.78	$5.56	$10.34	$6.62	$7.70	$14.32	
27	2	257	EXAM			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$11.39	$13.26	$24.66	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	98	$4.78	$5.56	$10.34	$6.62	$7.70	$14.32	
28	2	256	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$22.79	$26.53	$49.31	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	130	$6.37	$7.42	$13.79	$16.42	$19.11	$35.52	
29	2	255	EXAM			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$11.39	$13.26	$24.66	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	98	$4.78	$5.56	$10.34	$6.62	$7.70	$14.32	
30	2	253	EXAM			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$11.39	$13.26	$24.66	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	98	$4.78	$5.56	$10.34	$6.62	$7.70	$14.32	
31	2	249	EXAM			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$11.39	$13.26	$24.66	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	98	$4.78	$5.56	$10.34	$6.62	$7.70	$14.32	
32	2	248	EXAM			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$11.39	$13.26	$24.66	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	98	$4.78	$5.56	$10.34	$6.62	$7.70	$14.32	
33	2	247	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$22.79	$26.53	$49.31	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	130	$6.37	$7.42	$13.79	$16.42	$19.11	$35.52	
34	2	246	EXAM			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$11.39	$13.26	$24.66	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	98	$4.78	$5.56	$10.34	$6.62	$7.70	$14.32	
35	2	244	EXAM			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$11.39	$13.26	$24.66	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	98	$4.78	$5.56	$10.34	$6.62	$7.70	$14.32	
36	2	243	EXAM			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$11.39	$13.26	$24.66	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	98	$4.78	$5.56	$10.34	$6.62	$7.70	$14.32	
37	2	239	NURSE			5000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	295	$14.46	$8.41	$22.87	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	130	$6.37	$3.71	$10.08	$8.09	$4.71	$12.79	
38	2	239	NURSE			5000	3	D2TT8	2' 2L TROFFER W/ T8'S	99	495	$24.26	$14.12	$38.37	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	3	54	270	$13.23	$7.70	$20.93	$11.03	$6.42	$17.44	
39	2	240	TOILET			5000	1	D2TT8	2' 2L TROFFER W/ T8'S	33	165	$8.09	$4.71	$12.79	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	1	18	90	$4.41	$2.57	$6.98	$3.68	$2.14	$5.81	
40	2	242	NURSE			5000	3	A3TT8	4' 3L TROFFER W/ T8S	279	1395	$68.36	$39.79	$108.14	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	3	78	390	$19.11	$11.12	$30.23	$49.25	$28.66	$77.91	
41	2	242	PASSAGE			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$11.39	$13.26	$24.66	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	98	$4.78	$5.56	$10.34	$6.62	$7.70	$14.32	
42	2	241	LAB			2500	1	D2TT8	2' 2L TROFFER W/ T8'S	33	83	$4.04	$4.71	$8.75	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	1	18	45	$2.21	$2.57	$4.77	$1.84	$2.14	$3.98	
43	2	245	EXAM			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$11.39	$13.26	$24.66	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	98	$4.78	$5.56	$10.34	$6.62	$7.70	$14.32	

ENHANCED LIGHTING SURVEY LOG

Project Name: HEALTH MALL

Months: 12

Hours: 2500 **Multipliers:** 0.049 11.884

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	Existing Watts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
44	2	251	SOILED LINEN			1000	1	A3TT8	4' 3L TROFFER W/ T8S	93	93	$4.56	$13.26	$17.82	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	26	$1.27	$3.71	$4.98	$3.28	$9.55	$12.84	
45	2	254	EXAM			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$11.39	$13.26	$24.66	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	98	$4.78	$5.56	$10.34	$6.62	$7.70	$14.32	
46	2	262	CONFERENCE			5000	2	A3TT8	4' 3L TROFFER W/ T8S	186	930	$45.57	$26.53	$72.10	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	390	$19.11	$11.12	$30.23	$26.46	$15.40	$41.86	
47	2		HALL			8760	3	D2TT8	2' 2L TROFFER W/ T8'S	99	867	$42.49	$14.12	$56.61	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	3	54	473	$23.18	$7.70	$30.88	$19.32	$6.42	$25.73	
48	2		SCALES			5000	1	D2TT8	2' 2L TROFFER W/ T8'S	33	165	$8.09	$4.71	$12.79	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	1	18	90	$4.41	$2.57	$6.98	$3.68	$2.14	$5.81	
49	2		WAITING			5000	9	D2TT8	2' 2L TROFFER W/ T8'S	297	1485	$72.77	$42.35	$115.12	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	9	162	810	$39.69	$23.10	$62.79	$33.08	$19.25	$52.33	
50	2	238	REGISTRATION			5000	3	D2TT8	2' 2L TROFFER W/ T8'S	99	495	$24.26	$14.12	$38.37	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	3	54	270	$13.23	$7.70	$20.93	$11.03	$6.42	$17.44	
51	2	234	WOMENS			2000	1	A3TT8	4' 3L TROFFER W/ T8S	93	186	$9.11	$13.26	$22.38	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	52	$2.55	$3.71	$6.26	$6.57	$9.55	$16.12	
52	2	234	WOMENS			2000	1	32CP	32W COMPACT FLUORESCENT	34	68	$3.33	$4.85	$8.18	LED14CAN	NEW 14W LED CAN	1	14	28	$1.37	$2.00	$3.37	$1.96	$2.85	$4.81	
53	2	232	JANITOR			1000	1	A2RT8	4' 2L RECESSED FIXTURE W/T8S	59	59	$2.89	$8.41	$11.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.27	$3.71	$4.98	$1.62	$4.71	$6.32	
54	2	235	MENS			2000	1	A3TT8	4' 3L TROFFER W/ T8S	93	186	$9.11	$13.26	$22.38	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	52	$2.55	$3.71	$6.26	$6.57	$9.55	$16.12	
55	2	235	MENS			2000	1	32CP	32W COMPACT FLUORESCENT	34	68	$3.33	$4.85	$8.18	LED14CAN	NEW 14W LED CAN	1	14	28	$1.37	$2.00	$3.37	$1.96	$2.85	$4.81	
56	2	224	NURSE			1000	1	A3TT8	4' 3L TROFFER W/ T8S	93	93	$4.56	$13.26	$17.82	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	26	$1.27	$3.71	$4.98	$3.28	$9.55	$12.84	
57	2		RECEPTION			1000	1	A3TT8	4' 3L TROFFER W/ T8S	93	93	$4.56	$13.26	$17.82	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	26	$1.27	$3.71	$4.98	$3.28	$9.55	$12.84	
58	2	221	NURSE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$22.79	$26.53	$49.31	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	130	$6.37	$7.42	$13.79	$16.42	$19.11	$35.52	
59	2	216	OFFICE			1000	1	A3TT8	4' 3L TROFFER W/ T8S	93	93	$4.56	$13.26	$17.82	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	26	$1.27	$3.71	$4.98	$3.28	$9.55	$12.84	
60	2	212	FILES			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$11.39	$13.26	$24.66	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	65	$3.19	$3.71	$6.89	$8.21	$9.55	$17.76	
61	2	207	OFFICE			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$11.39	$13.26	$24.66	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	65	$3.19	$3.71	$6.89	$8.21	$9.55	$17.76	
62	2	208	OFFICE			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$11.39	$13.26	$24.66	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	65	$3.19	$3.71	$6.89	$8.21	$9.55	$17.76	
63	2	209	OFFICE			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$11.39	$13.26	$24.66	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	65	$3.19	$3.71	$6.89	$8.21	$9.55	$17.76	
64	2	210	GROUP			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$22.79	$26.53	$49.31	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	130	$6.37	$7.42	$13.79	$16.42	$19.11	$35.52	
65	2	211	OFFICE			1000	1	D2TT8	2' 2L TROFFER W/ T8'S	33	33	$1.62	$4.71	$6.32	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	1	18	18	$0.88	$2.57	$3.45	$0.74	$2.14	$2.87	
66	2	214	TOILET			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$11.39	$13.26	$24.66	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	65	$3.19	$3.71	$6.89	$8.21	$9.55	$17.76	
67	2	215	TOILET			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$11.39	$13.26	$24.66	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	65	$3.19	$3.71	$6.89	$8.21	$9.55	$17.76	
68	2	217	OFFICE			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$11.39	$13.26	$24.66	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	65	$3.19	$3.71	$6.89	$8.21	$9.55	$17.76	
69	2	218	GROUP			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$22.79	$26.53	$49.31	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$9.56	$11.12	$20.68	$13.23	$15.40	$28.63	
70	2	219	EXAM			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$11.39	$13.26	$24.66	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	98	$4.78	$5.56	$10.34	$6.62	$7.70	$14.32	
71	2	220	EXAM			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$11.39	$13.26	$24.66	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	98	$4.78	$5.56	$10.34	$6.62	$7.70	$14.32	
72	2	223	EXAM			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$11.39	$13.26	$24.66	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	98	$4.78	$5.56	$10.34	$6.62	$7.70	$14.32	
73	1		HALL			8760	7	D2TT8	2' 2L TROFFER W/ T8'S	231	2024	$99.15	$32.94	$132.10	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	7	126	1104	$54.08	$17.97	$72.05	$45.07	$14.97	$60.04	
74	1		MENS			2000	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	236	$11.56	$16.83	$28.39	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	104	$5.10	$7.42	$12.51	$6.47	$9.41	$15.88	
75	1		PASSAGE			2500	1	32CP	32W COMPACT FLUORESCENT	34	85	$4.17	$4.85	$9.01	LED14CAN	NEW 14W LED CAN	1	14	35	$1.72	$2.00	$3.71	$2.45	$2.85	$5.30	
76	1		ENTRANCE			8760	10	32CP	32W COMPACT FLUORESCENT	340	2978	$145.94	$48.49	$194.43	LED14CAN	NEW 14W LED CAN	10	140	1226	$60.09	$19.97	$80.06	$85.85	$28.52	$114.37	
77	1		RECEPTION			5000	4	32CP	32W COMPACT FLUORESCENT	136	680	$33.32	$19.39	$52.71	LED10CAN	NEW 10W LED CAN	4	40	200	$9.80	$5.70	$15.50	$23.52	$13.69	$37.21	
78	1		RECEPTION			8760	4	D2TT8	2' 2L TROFFER W/ T8'S	132	1156	$56.66	$18.82	$75.48	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	4	72	631	$30.91	$10.27	$41.17	$25.75	$8.56	$34.31	
79	1	112	OFFICE			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$11.39	$13.26	$24.66	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	65	$3.19	$3.71	$6.89	$8.21	$9.55	$17.76	
80	1	113	OFFICE			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$11.39	$13.26	$24.66	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	65	$3.19	$3.71	$6.89	$8.21	$9.55	$17.76	
81	1	114	OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.46	$16.83	$31.28	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.37	$7.42	$13.79	$8.09	$9.41	$17.50	
82	1	115	OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.46	$16.83	$31.28	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.37	$7.42	$13.79	$8.09	$9.41	$17.50	
83	1	116	OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$14.46	$16.83	$31.28	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.37	$7.42	$13.79	$8.09	$9.41	$17.50	
84	1		RECEPTION			3500	2	A3TT8	4' 3L TROFFER W/ T8S	186	651	$31.90	$26.53	$58.42	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	182	$8.92	$7.42	$16.33	$22.98	$19.11	$42.09	
85	1		PASSAGE			3500	2	D2TT8	2' 2L TROFFER W/ T8'S	66	231	$11.32	$9.41	$20.73	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	2	36	126	$6.17	$5.13	$11.31	$5.15	$4.28	$9.42	
86	1	111	ELECTRIC			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$2.89	$8.41	$11.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.27	$3.71	$4.98	$1.62	$4.71	$6.32	

ENHANCED LIGHTING SURVEY LOG

Project Name: HEALTH MALL

Months: 12

Hours: 2500 **Multipliers:** **0.049** **11.884**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	Existing Watts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
87	1		HALL			8760	5	D2TT8	2' 2L TROFFER W/ T8'S	165	1445	$70.82	$23.53	$94.35	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	5	90	788	$38.63	$12.83	$51.47	$32.19	$10.70	$42.89	
88	1	110	RECEPTION			3500	3	D2TT8	2' 2L TROFFER W/ T8'S	99	347	$16.98	$14.12	$31.10	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	3	54	189	$9.26	$7.70	$16.96	$7.72	$6.42	$14.13	
89	1	130	HALL			8760	4	D2TT8	2' 2L TROFFER W/ T8'S	132	1156	$56.66	$18.82	$75.48	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	4	72	631	$30.91	$10.27	$41.17	$25.75	$8.56	$34.31	
90	1	131	JANITOR			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$2.89	$8.41	$11.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.27	$3.71	$4.98	$1.62	$4.71	$6.32	
91	1	132A	WOMENS			1500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	89	$4.34	$8.41	$12.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	39	$1.91	$3.71	$5.62	$2.43	$4.71	$7.13	
92	1	132	RECYCLING			500	1	A2RT8	4' 2L RECESSED FIXTURE W/T8S	59	30	$1.45	$8.41	$9.86	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.64	$3.71	$4.34	$0.81	$4.71	$5.51	
93	1	132B	MENS			2000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	118	$5.78	$8.41	$14.20	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	52	$2.55	$3.71	$6.26	$3.23	$4.71	$7.94	
94	1	133	LOUNGE			2500	6	A3TT8	4' 3L TROFFER W/ T8S	558	1395	$68.36	$79.58	$147.93	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	6	234	585	$28.67	$33.37	$62.04	$39.69	$46.20	$85.89	
95	1	135	MENS			1500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	89	$4.34	$8.41	$12.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	39	$1.91	$3.71	$5.62	$2.43	$4.71	$7.13	
96	1	136	MECHANICAL			1000	2	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	118	118	$5.78	$16.83	$22.61	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.55	$7.42	$9.96	$3.23	$9.41	$12.65	
97	1		PASSAGE			8760	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	517	$25.33	$8.41	$33.74	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$11.16	$3.71	$14.87	$14.16	$4.71	$18.87	
98	1	134	WOMENS			1500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	177	$8.67	$16.83	$25.50	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$3.82	$7.42	$11.24	$4.85	$9.41	$14.26	
99	1	198	TOILET			1500	1	D2TT8	2' 2L TROFFER W/ T8'S	33	50	$2.43	$4.71	$7.13	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	1	18	27	$1.32	$2.57	$3.89	$1.10	$2.14	$3.24	
100	1		HALL			8760	5	D2TT8	2' 2L TROFFER W/ T8'S	165	1445	$70.82	$23.53	$94.35	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	5	90	788	$38.63	$12.83	$51.47	$32.19	$10.70	$42.89	
101	1	189	TOILET			1000	1	D2TT8	2' 2L TROFFER W/ T8'S	33	33	$1.62	$4.71	$6.32	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	1	18	18	$0.88	$2.57	$3.45	$0.74	$2.14	$2.87	
102	1	188	LAB			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$2.89	$8.41	$11.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.27	$3.71	$4.98	$1.62	$4.71	$6.32	
103	1		ELECTRIC			500	1	A2RT8	4' 2L RECESSED FIXTURE W/T8S	59	30	$1.45	$8.41	$9.86	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.64	$3.71	$4.34	$0.81	$4.71	$5.51	CONSTRUCTION AREA
104	1	186	CLOSET			500	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	30	$1.45	$8.41	$9.86	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.64	$3.71	$4.34	$0.81	$4.71	$5.51	CONSTRUCTION AREA
105	1	184	CONFERENCE			500	3	A3TT8	4' 3L TROFFER W/ T8S	279	140	$6.84	$39.79	$46.62	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	3	78	39	$1.91	$11.12	$13.03	$4.92	$28.66	$33.59	CONSTRUCTION AREA
106	1	180	STERILAZATION			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.45	$8.41	$9.86	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.64	$3.71	$4.34	$0.81	$4.71	$5.51	CONSTRUCTION AREA
107	1	178	STERILAZATION			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.45	$8.41	$9.86	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.64	$3.71	$4.34	$0.81	$4.71	$5.51	CONSTRUCTION AREA
108	1	174	ROOM			500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	59	$2.89	$16.83	$19.72	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.27	$7.42	$8.69	$1.62	$9.41	$11.03	CONSTRUCTION AREA
109	1	172	ROOM			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.45	$8.41	$9.86	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.64	$3.71	$4.34	$0.81	$4.71	$5.51	CONSTRUCTION AREA
110	1		RECEPTION			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.45	$8.41	$9.86	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.64	$3.71	$4.34	$0.81	$4.71	$5.51	CONSTRUCTION AREA
111	1		OPEN AREAS			500	10	A2TT8	4' 2L TROFFER FIXTURE W/T8S	590	295	$14.46	$84.14	$98.59	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	10	260	130	$6.37	$37.08	$43.45	$8.09	$47.06	$55.15	CONSTRUCTION AREA
112	1		HALL			1000	8	D2TT8	2' 2L TROFFER W/ T8'S	264	264	$12.94	$37.65	$50.58	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	8	144	144	$7.06	$20.54	$27.59	$5.88	$17.11	$22.99	CONSTRUCTION AREA
113	1	150	RECEPTION			5000	2	D2TT8	2' 2L TROFFER W/ T8'S	66	330	$16.17	$9.41	$25.58	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	2	36	180	$8.82	$5.13	$13.95	$7.35	$4.28	$11.63	
114	1	153	OFFICE			1500	1	A3TT8	4' 3L TROFFER W/ T8S	93	140	$6.84	$13.26	$20.10	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	39	$1.91	$3.71	$5.62	$4.92	$9.55	$14.48	
115	1	155	OFFICE			1500	1	A3TT8	4' 3L TROFFER W/ T8S	93	140	$6.84	$13.26	$20.10	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	39	$1.91	$3.71	$5.62	$4.92	$9.55	$14.48	
116	1	154	OFFICE			1500	1	A3TT8	4' 3L TROFFER W/ T8S	93	140	$6.84	$13.26	$20.10	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	39	$1.91	$3.71	$5.62	$4.92	$9.55	$14.48	
117	1	122	OFFICE			1500	1	A3TT8	4' 3L TROFFER W/ T8S	93	140	$6.84	$13.26	$20.10	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	39	$1.91	$3.71	$5.62	$4.92	$9.55	$14.48	
118	1		HALL			3500	3	D2TT8	2' 2L TROFFER W/ T8'S	99	347	$16.98	$14.12	$31.10	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	3	54	189	$9.26	$7.70	$16.96	$7.72	$6.42	$14.13	
119	1	190	MENS			1500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	89	$4.34	$8.41	$12.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	39	$1.91	$3.71	$5.62	$2.43	$4.71	$7.13	
120	1	190	MENS			1500	1	32CP	32W COMPACT FLUORESCENT	34	51	$2.50	$4.85	$7.35	LED14CAN	NEW 14W LED CAN	1	14	21	$1.03	$2.00	$3.03	$1.47	$2.85	$4.32	
121	1	191	JANITOR			500	1	A2RT8	4' 2L RECESSED FIXTURE W/T8S	59	30	$1.45	$8.41	$9.86	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.64	$3.71	$4.34	$0.81	$4.71	$5.51	
122	1	192	WOMENS			1500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	89	$4.34	$8.41	$12.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	39	$1.91	$3.71	$5.62	$2.43	$4.71	$7.13	
123	1	192	WOMENS			1500	1	32CP	32W COMPACT FLUORESCENT	34	51	$2.50	$4.85	$7.35	LED14CAN	NEW 14W LED CAN	1	14	21	$1.03	$2.00	$3.03	$1.47	$2.85	$4.32	
124	1		HALL			8760	7	D2TT8	2' 2L TROFFER W/ T8'S	231	2024	$99.15	$32.94	$132.10	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	7	126	1104	$54.08	$17.97	$72.05	$45.07	$14.97	$60.04	
125	1		WAITING			500	6	D2TT8	2' 2L TROFFER W/ T8'S	198	99	$4.85	$28.24	$33.09	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	6	108	54	$2.65	$15.40	$18.05	$2.21	$12.83	$15.04	VACANT
126	1		OFFICE			2500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	443	$21.68	$25.24	$46.92	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$9.56	$11.12	$20.68	$12.13	$14.12	$26.25	
127	1	120	PASSAGE			3500	4	D2TT8	2' 2L TROFFER W/ T8'S	132	462	$22.64	$18.82	$41.46	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	4	72	252	$12.35	$10.27	$22.62	$10.29	$8.56	$18.85	
128	1	121	OFFICE			1500	1	A3TT8	4' 3L TROFFER W/ T8S	93	140	$6.84	$13.26	$20.10	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	39	$1.91	$3.71	$5.62	$4.92	$9.55	$14.48	
129	1	122	OFFICE			1500	1	A3TT8	4' 3L TROFFER W/ T8S	93	140	$6.84	$13.26	$20.10	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	59	$2.87	$5.56	$8.43	$3.97	$7.70	$11.67	

ENHANCED LIGHTING SURVEY LOG

Project Name: **HEALTH MALL**

Months: 12

Hours: 2500 **Multipliers:** **0.049** **11.884**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	Existing Watts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
130	1	123	OFFICE			1500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	177	$8.67	$16.83	$25.50	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$3.82	$7.42	$11.24	$4.85	$9.41	$14.26	
131	1	124	OFFICE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$13.67	$26.53	$40.20	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	78	$3.82	$7.42	$11.24	$9.85	$19.11	$28.96	
132	1	125	GROUP			1500	3	A3TT8	4' 3L TROFFER W/ T8S	279	419	$20.51	$39.79	$60.29	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	3	78	117	$5.73	$11.12	$16.86	$14.77	$28.66	$43.44	
133	1	100	WAITING			2500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	443	$21.68	$25.24	$46.92	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$9.56	$11.12	$20.68	$12.13	$14.12	$26.25	
134	1		PASSAGE			3500	2	D2TT8	2' 2L TROFFER W/ T8'S	66	231	$11.32	$9.41	$20.73	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	2	36	126	$6.17	$5.13	$11.31	$5.15	$4.28	$9.42	
135	1	105	TOILET			1500	1	D2TT8	2' 2L TROFFER W/ T8'S	33	50	$2.43	$4.71	$7.13	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	1	18	27	$1.32	$2.57	$3.89	$1.10	$2.14	$3.24	
136	1	104	LAB			1500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	177	$8.67	$16.83	$25.50	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$3.82	$7.42	$11.24	$4.85	$9.41	$14.26	
137	1	103	BLOOD DRAW			1500	1	A3TT8	4' 3L TROFFER W/ T8S	93	140	$6.84	$13.26	$20.10	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	39	$1.91	$3.71	$5.62	$4.92	$9.55	$14.48	
138	1	102	BLOOD DRAW			1500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	89	$4.34	$8.41	$12.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	39	$1.91	$3.71	$5.62	$2.43	$4.71	$7.13	
139	1	101	BLOOD DRAW			1500	1	A3TT8	4' 3L TROFFER W/ T8S	93	140	$6.84	$13.26	$20.10	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	39	$1.91	$3.71	$5.62	$4.92	$9.55	$14.48	
140	B		VACANT BASEMENT			8760	7	2-9CP	(2) 9W COMPACT FLUORESCENT	154	1349	$66.10	$21.96	$88.06	NDR	INSTALL LED DRUM FIX.	7	105	920	$45.07	$14.97	$60.04	$21.03	$6.99	$28.02	
141			VACANT BASEMENT			8760	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	1034	$50.65	$16.83	$67.48	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$22.32	$7.42	$29.74	$28.33	$9.41	$37.74	
142			VACANT BASEMENT			8760	5	D2TUT8	2' 2L TROFFER WT8/U-TUBES	300	2628	$128.77	$42.78	$171.55	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	5	90	788	$38.63	$12.83	$51.47	$90.14	$29.95	$120.09	
143			VACANT BASEMENT			8760	8	A2BT8	4' 2L BOX FIXTURE W/T8S	472	4135	$202.60	$67.31	$269.91	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	1822	$89.28	$29.66	$118.94	$113.32	$37.65	$150.97	
144			VACANT BASEMENT			8760	1	C1ST8	3' 1L STRIP FIXTURE W/T8S	25	219	$10.73	$3.57	$14.30	R1C	RETRO (1) FIX. W/ (1) 3' LED LAMP	1	14	123	$6.01	$2.00	$8.01	$4.72	$1.57	$6.29	
145			VACANT BASEMENT			100	5	2-9CP	(2) 9W COMPACT FLUORESCENT	110	11	$0.54	$15.69	$16.23	NDR	INSTALL LED DRUM FIX.	5	75	8	$0.37	$10.70	$11.06	$0.17	$4.99	$5.16	
146			VACANT BASEMENT			100	45	A2BT8	4' 2L BOX FIXTURE W/T8S	2655	266	$13.01	$378.62	$391.63	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	45	1170	117	$5.73	$166.85	$172.58	$7.28	$211.77	$219.05	
147			VACANT BASEMENT			100	10	D2VT8	2' 2L VANITY	330	33	$1.62	$47.06	$48.68	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	10	180	18	$0.88	$25.67	$26.55	$0.74	$21.39	$22.13	
148			VACANT BASEMENT			100	5	A2ST8	4' 2L STRIP FIXTURES W/T8S	295	30	$1.45	$42.07	$43.51	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	13	$0.64	$18.54	$19.18	$0.81	$23.53	$24.34	
149			VACANT BASEMENT			100	3	D2TUT8	2' 2L TROFFER WT8/U-TUBES	180	18	$0.88	$25.67	$26.55	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	3	54	5	$0.26	$7.70	$7.97	$0.62	$17.97	$18.59	
150			VACANT BASEMENT			100	1	A2RT8	4' 2L RECESSED FIXTURE W/T8S	59	6	$0.29	$8.41	$8.70	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	3	$0.13	$3.71	$3.84	$0.16	$4.71	$4.87	
151			MISC FIXTURES			2000	10	D2TT8	2' 2L TROFFER W/ T8'S	330	660	$32.34	$47.06	$79.40	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	10	180	360	$17.64	$25.67	$43.31	$14.70	$21.39	$36.09	
152			MISC FIXTURES			2500	5	A3TT8	4' 3L TROFFER W/ T8S	465	1163	$56.96	$66.31	$123.28	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	5	195	488	$23.89	$27.81	$51.70	$33.08	$38.50	$71.58	
153			MISC FIXTURES			2500	5	A3TT8	4' 3L TROFFER W/ T8S	465	1163	$56.96	$66.31	$123.28	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	5	130	325	$15.93	$18.54	$34.46	$41.04	$47.77	$88.81	
154			MISC FIXTURES			2500	10	A2TT8	4' 2L TROFFER FIXTURE W/T8S	590	1475	$72.28	$84.14	$156.41	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	10	260	650	$31.85	$37.08	$68.93	$40.43	$47.06	$87.49	
							400.00	**Totals:**		22347	62778	$3,076.13	$3,186.86	$6,262.99			400.00	9338	27757	$1,360	$1,332	$2,692	$1,716	$1,855	$3,571	
										KW	22							**KW**	9							

ENHANCED LIGHTING SURVEY LOG

Project Name: **25 DELAWARE**

Months: 12

Hours: 2500 **Multipliers:** **0.0536** **10.124**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
1	8		MECHANICAL			8760		NR	NO RETROFIT REQUIRED																		
2	8		RECORDS			1000	42	A2RT8	4' 2L RECESSED FIXTURE W/T8S	2478	2478	$132.82	$301.05	$433.87	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	42	1092	1092	$58.53	$132.66	$191.20	$74.29	$168.38	$242.67		
3	8		MISC FIXTURES			8760	20	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	1180	10337	$554.05	$143.36	$697.41	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	20	520	4555	$244.16	$63.17	$307.33	$309.89	$80.18	$390.08		
4	7	746	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
5	7	745	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
6	7	744	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
7	7	743	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
8	7	742	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
9	7	740	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
10	7	734	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
11	7		HALL			4000	8	A2TT8	4' 2L TROFFER FIXTURE W/T8S	472	1888	$101.20	$57.34	$158.54	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	832	$44.60	$25.27	$69.86	$56.60	$32.07	$88.67		
12	7		SERVER			500	2	A2ST8	4' 2L STRIP FIXTURES W/T8S	118	59	$3.16	$14.34	$17.50	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.39	$6.32	$7.71	$1.77	$8.02	$9.79	WS	1
13	7	737	OFFICE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	WS	1
14	7	737	TOILET			1000	1	A3TT8	4' 3L TROFFER W/ T8S	93	93	$4.98	$11.30	$16.28	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	26	$1.39	$3.16	$4.55	$3.59	$8.14	$11.73	WS	1
15	7		OPEN AREA			3500	6	A3TT8	4' 3L TROFFER W/ T8S	558	1953	$104.68	$67.79	$172.47	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	6	156	546	$29.27	$18.95	$48.22	$75.42	$48.84	$124.25	WSDS	1
16	7		OPEN AREA			3500	2	32CP	32W COMPACT FLUORESCENT	68	238	$12.76	$8.26	$21.02	LED25CAN	NEW 25W LED CAN	2	50	175	$9.38	$6.07	$15.45	$3.38	$2.19	$5.56	INCL	1
17	7		OFFICE			2500	8	A3TT8	4' 3L TROFFER W/ T8S	744	1860	$99.70	$90.39	$190.08	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	8	312	780	$41.81	$37.90	$79.71	$57.89	$52.48	$110.37	CP	1
18	7		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89	WS	1
19	7		TOILET			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78	WS	1
20	7		CONFERENCE			1500	4	A3TT8	4' 3L TROFFER W/ T8S	372	558	$29.91	$45.19	$75.10	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	234	$12.54	$18.95	$31.49	$17.37	$26.24	$43.61	CP	1
21	7	735	OFFICE			2500	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	885	$47.44	$43.01	$90.44	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	390	$20.90	$18.95	$39.86	$26.53	$24.05	$50.59	CP	1
22	7	734	CONFERENCE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	WS	1
23	7	733	OFFICE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	WS	1
24	7	732	OFFICE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	WS	1
25	7	731	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
26	7	730	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
27	7	729	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
28	7	728	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
29	7	727	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
30	7	726	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
31	7	725	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
32	7	724	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
33	7	723	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
34	7	722	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
35	7	721	OFFICE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	WSDS	1
36	7	720	OFFICE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	WS	1
37	7	715	OFFICE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	WSDS	1
38	7	714	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1

ENHANCED LIGHTING SURVEY LOG

Project Name: **25 DELAWARE**

Months: 12

Hours: 2500 **Multipliers:** **0.0536** **10.124**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
39	7	713	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
40	7	712	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
41	7	711	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
42	7	709	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
43	7	707	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
44	7	705	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
45	7	704	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
46	7	703	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
47	7	702	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
48	7	701	BREAK AREA			3500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	826	$44.27	$28.67	$72.94	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	364	$19.51	$12.63	$32.15	$24.76	$16.04	$40.80	WS	1
49	7		MENS			1500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	354	$18.97	$28.67	$47.65	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	156	$8.36	$12.63	$21.00	$10.61	$16.04	$26.65		
50	7		WOMENS			1500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	354	$18.97	$28.67	$47.65	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	156	$8.36	$12.63	$21.00	$10.61	$16.04	$26.65		
51	7	706	CONFERENCE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.95	$22.60	$37.55	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$6.27	$9.48	$15.75	$8.68	$13.12	$21.80	WSDS	1
52	7		STORAGE			1000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	118	$6.32	$14.34	$20.66	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.79	$6.32	$9.10	$3.54	$8.02	$11.56	WS	1
53	7		CONFERENCE			1500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32	WS	1
54	7		HALL			4000	7	A2TT8	4' 2L TROFFER FIXTURE W/T8S	413	1652	$88.55	$50.17	$138.72	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	7	182	728	$39.02	$22.11	$61.13	$49.53	$28.06	$77.59		
55	7		OPEN AREA			3500	24	A3TT8	4' 3L TROFFER W/ T8S	2232	7812	$418.72	$271.16	$689.88	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	24	936	3276	$175.59	$113.71	$289.31	$243.13	$157.45	$400.58		
56	7		HALL			4000	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	944	$50.60	$28.67	$79.27	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	416	$22.30	$12.63	$34.93	$28.30	$16.04	$44.34		
57	7		SERVER			1000	2	A2ST8	4' 2L STRIP FIXTURES W/T8S	118	118	$6.32	$14.34	$20.66	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.79	$6.32	$9.10	$3.54	$8.02	$11.56		
58	7		ELEVATOR MACHINE			500	2	A2ST8	4' 2L STRIP FIXTURES W/T8S	118	59	$3.16	$14.34	$17.50	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.39	$6.32	$7.71	$1.77	$8.02	$9.79		
59	7		ELECTRIC			500	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
60	7		HALL			4000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	472	$25.30	$14.34	$39.63	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	208	$11.15	$6.32	$17.47	$14.15	$8.02	$22.17		
61	7		HALL			4000	2	D2TT8	2' 2L TROFFER W/ T8'S	66	264	$14.15	$8.02	$22.17	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	2	36	144	$7.72	$4.37	$12.09	$6.43	$3.64	$10.08		
62	7		COPY			1500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32		
63	7		HALL			4000	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	1416	$75.90	$43.01	$118.90	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	624	$33.45	$18.95	$52.40	$42.45	$24.05	$66.51		
64	7		OPEN AREA			3500	8	A2TT8	4' 2L TROFFER FIXTURE W/T8S	472	1652	$88.55	$57.34	$145.89	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	728	$39.02	$25.27	$64.29	$49.53	$32.07	$81.60		
65	7	700	LIBRARY			2500	12	A2TT8	4' 2L TROFFER FIXTURE W/T8S	708	1770	$94.87	$86.01	$180.89	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	12	312	780	$41.81	$37.90	$79.71	$53.06	$48.11	$101.17	CP	1
66	7		OPEN AREA			3500	40	32CP	32W COMPACT FLUORESCENT	1360	4760	$255.14	$165.22	$420.36	LED25CAN	NEW 25W LED CAN	40	1000	3500	$187.60	$121.49	$309.09	$67.54	$43.74	$111.27		
67	7	762	JANATOR			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78	WS	1
68	7		RECORDS OPEN			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	4	104	260	$13.94	$12.63	$26.57	$35.91	$32.56	$68.47		
69	7		RECORDS OPEN			2500	9	A2TT8	4' 2L TROFFER FIXTURE W/T8S	531	1328	$71.15	$64.51	$135.66	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	9	234	585	$31.36	$28.43	$59.78	$39.80	$36.08	$75.88		
70	7	761	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
71	7	760	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
72	7	759	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
73	7	758	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
74	7	757	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
75	7	756	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
76	7	754	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1

ENHANCED LIGHTING SURVEY LOG

Project Name: **25 DELAWARE**

Months: 12

Hours: 2500 **Multipliers:** **0.0536** **10.124**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
77	7	753	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
78	7	752	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
79	7	751	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
80	7	750	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
81	7	749	OFFICE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	WSDS	1
82	7		OPEN AREA			3500	15	A2TT8	4' 2L TROFFER FIXTURE W/T8S	885	3098	$166.03	$107.52	$273.54	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	15	390	1365	$73.16	$47.38	$120.54	$92.86	$60.14	$153.00		
83	7	748	STORAGE			1500	6	A3TT8	4' 3L TROFFER W/ T8S	558	837	$44.86	$67.79	$112.65	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	6	156	234	$12.54	$18.95	$31.49	$32.32	$48.84	$81.16	WS	1
84	7	747	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WS	1
85	7		HALL			4000	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	1416	$75.90	$43.01	$118.90	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	624	$33.45	$18.95	$52.40	$42.45	$24.05	$66.51		
86	7	755	STORAGE			500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	59	$3.16	$14.34	$17.50	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.39	$6.32	$7.71	$1.77	$8.02	$9.79		
87	7		HALL			4000	12	A2TT8	4' 2L TROFFER FIXTURE W/T8S	708	2832	$151.80	$86.01	$237.81	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	12	312	1248	$66.89	$37.90	$104.80	$84.90	$48.11	$133.01		
88	7		WOMENS			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78	WS	1
89	7		WOMENS			1000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	118	$6.32	$14.34	$20.66	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.79	$6.32	$9.10	$3.54	$8.02	$11.56	WS	1
90	7		MENS			1000	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	177	$9.49	$21.50	$30.99	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	78	$4.18	$9.48	$13.66	$5.31	$12.03	$17.33		
91	7		HALL			1000	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	177	$9.49	$21.50	$30.99	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	78	$4.18	$9.48	$13.66	$5.31	$12.03	$17.33		
92	7		ELEVATOR LOBBY			8760	5	32CP	32W COMPACT FLUORESCENT	170	1489	$79.82	$20.65	$100.47	LED25CAN	NEW 25W LED CAN	5	125	1095	$58.69	$15.19	$73.88	$21.13	$5.47	$26.60		
93	7		ELEVATOR LOBBY			8760	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	517	$27.70	$7.17	$34.87	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$12.21	$3.16	$15.37	$15.49	$4.01	$19.50		
94	7		WOMENS			1500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32		
95	7		MENS			1500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32		
96	7		SOFFITS			8760	16	18PLL	18W PLL FLUORESCENT	352	3084	$165.28	$42.76	$208.04	N1AS	INSTALL NEW 4' STRIP W/ (1) 4' LED LAMP	8	104	911	$48.83	$12.63	$61.47	$116.44	$30.13	$146.57		
97	7		ELEVATORS			8760	8	A2RT8	4' 2L RECESSED FIXTURE W/T8S	472	4135	$221.62	$57.34	$278.96	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	1822	$97.66	$25.27	$122.93	$123.96	$32.07	$156.03		
98	6		ELEVATOR MACHINE			500	2	A2ST8	4' 2L STRIP FIXTURES W/T8S	118	59	$3.16	$14.34	$17.50	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.39	$6.32	$7.71	$1.77	$8.02	$9.79		
99	6	635	CONFERENCE			1500	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	531	$28.46	$43.01	$71.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	234	$12.54	$18.95	$31.49	$15.92	$24.05	$39.97	CP	1
100	6	634	CONFERENCE			1500	4	A3TT8	4' 3L TROFFER W/ T8S	372	558	$29.91	$45.19	$75.10	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	234	$12.54	$18.95	$31.49	$17.37	$26.24	$43.61	WS	1
101	6	633	OFFICE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	WSDS	1
102	6	632	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
103	6	630	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
104	6	629	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
105	6	628	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
106	6	627	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
107	6	626	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
108	6	625	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
109	6	624	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
110	6	623	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
111	6	622	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
112	6	621	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
113	6	620	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
114	6	631	OFFICE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	WSDS	1

ENHANCED LIGHTING SURVEY LOG

Project Name: **25 DELAWARE**

Months: 12

Hours: 2500 **Multipliers:** **0.0536** **10.124**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
115	6		STORAGE			1500	12	A3TT8	4' 3L TROFFER W/ T8S	1116	1674	$89.73	$135.58	$225.31	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	12	312	468	$25.08	$37.90	$62.99	$64.64	$97.68	$162.32	CP	2
116	6	613	OFFICE			2500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	590	$31.62	$28.67	$60.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$13.94	$12.63	$26.57	$17.69	$16.04	$33.72	CP	1
117	6	612	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
118	6	611	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
119	6	610	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
120	6	609	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
121	6	608	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
122	6	607	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
123	6	606	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
124	6	604	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
125	6	603	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
126	6	602	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
127	6	601	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
128	6		BREAK AREA			3500	4	A3TT8	4' 3L TROFFER W/ T8S	372	1302	$69.79	$45.19	$114.98	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	546	$29.27	$18.95	$48.22	$40.52	$26.24	$66.76	WSDS	1
129	6	670	OFFICE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	WSDS	1
130	6	669	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
131	6	668	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
132	6	666	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
133	6	665	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
134	6	664	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
135	6	663	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
136	6	662	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
137	6	661	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
138	6	660	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
139	6	658	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
140	6	657	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
141	6	656	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
142	6	655	OFFICE			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$37.39	$33.90	$71.28	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$15.68	$14.21	$29.89	$21.71	$19.68	$41.39	CP	1
143	6		STORAGE			1000	5	A2TT8	4' 2L TROFFER FIXTURE W/T8S	295	295	$15.81	$35.84	$51.65	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	130	$6.97	$15.79	$22.76	$8.84	$20.05	$28.89		
144	6	647	OFFICE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	WSDS	1
145	6	646	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
146	6	645	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
147	6	644	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
148	6	643	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
149	6	642	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
150	6	641	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
151	6	640	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
152	6	639	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1

ENHANCED LIGHTING SURVEY LOG

Project Name: **25 DELAWARE**

Months: 12

Hours: 2500 **Multipliers:** **0.0536** **10.124**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
153	6	638	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
154	6	637	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
155	6	636	OFFICE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	WSDS	1
156	6		HALL			4000	45	A2TT8	4' 2L TROFFER FIXTURE W/T8S	2655	10620	$569.23	$322.55	$891.78	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	45	1170	4680	$250.85	$142.14	$392.99	$318.38	$180.41	$498.79		
157	6		OPEN AREA			3500	10	A3TT8	4' 3L TROFFER W/ T8S	930	3255	$174.47	$112.98	$287.45	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	10	390	1365	$73.16	$47.38	$120.54	$101.30	$65.60	$166.91		
158	6	649	STORAGE			1000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	118	$6.32	$14.34	$20.66	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.79	$6.32	$9.10	$3.54	$8.02	$11.56	WS	1
159	6	650	SERVER			500	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89	WS	1
160	6		ELEVATOR MACHINE			500	2	A2ST8	4' 2L STRIP FIXTURES W/T8S	118	59	$3.16	$14.34	$17.50	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.39	$6.32	$7.71	$1.77	$8.02	$9.79		
161	6		MENS			1000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	118	$6.32	$14.34	$20.66	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.79	$6.32	$9.10	$3.54	$8.02	$11.56		
162	6		MENS			1000	1	32CP	32W COMPACT FLUORESCENT	34	34	$1.82	$4.13	$5.95	LED25CAN	NEW 25W LED CAN	1	25	25	$1.34	$3.04	$4.38	$0.48	$1.09	$1.58		
163	6	652	ELECTRIC			500	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
164	6		ELEVATOR LOBBY			8760	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	517	$27.70	$7.17	$34.87	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$12.21	$3.16	$15.37	$15.49	$4.01	$19.50		
165	6	653	JANATOR			1000	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78	WS	1
166	6	677	PLAY ROOM			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.95	$22.60	$37.55	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	78	$4.18	$6.32	$10.50	$10.77	$16.28	$27.05	WS	1
167	6		WOMENS			1500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	266	$14.23	$21.50	$35.73	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	117	$6.27	$9.48	$15.75	$7.96	$12.03	$19.99		
168	6	659	STORAGE			1000	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	236	$12.65	$28.67	$41.32	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	104	$5.57	$12.63	$18.21	$7.08	$16.04	$23.11	WS	1
169	6		OPEN AREA			3500	15	A3TT8	4' 3L TROFFER W/ T8S	1395	4883	$261.70	$169.48	$431.18	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	15	585	2048	$109.75	$71.07	$180.82	$151.96	$98.41	$250.36		
170	6		OPEN AREA			3500	40	32CP	32W COMPACT FLUORESCENT	1360	4760	$255.14	$165.22	$420.36	LED25CAN	NEW 25W LED CAN	40	1000	3500	$187.60	$121.49	$309.09	$67.54	$43.74	$111.27		
171	6		OPEN AREA			3500	2	D2TT8	2' 2L TROFFER W/ T8'S	66	231	$12.38	$8.02	$20.40	R2D	RETRO (1) FIX. W/ (2) 2' T5 LED LAMPS	2	36	126	$6.75	$4.37	$11.13	$5.63	$3.64	$9.27		
172	6		OPEN AREA			3500	25	A2TT8	4' 2L TROFFER FIXTURE W/T8S	1475	5163	$276.71	$179.19	$455.90	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	25	650	2275	$121.94	$78.97	$200.91	$154.77	$100.23	$255.00		
173	6	618	COPY			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	130	$6.97	$6.32	$13.29	$17.96	$16.28	$34.24	WS	1
174	6	617	ELECTRIC			500	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89	WS	1
175	6	616	COMMUNICATION			500	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89	WS	1
176	6	615	STORAGE			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78	WS	1
177	6		MENS			1500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	266	$14.23	$21.50	$35.73	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	117	$6.27	$9.48	$15.75	$7.96	$12.03	$19.99		
178	6		WOMENS			1500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	354	$18.97	$28.67	$47.65	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	156	$8.36	$12.63	$21.00	$10.61	$16.04	$26.65		
179	6	610	CONFERENCE			1500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32	WS	1
180	6		ELEVATOR LOBBY			8760	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	517	$27.70	$7.17	$34.87	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$12.21	$3.16	$15.37	$15.49	$4.01	$19.50		
181	6		WOMENS			1500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32		
182	6		MENS			1500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32		
183	6		ELEVATOR LOBBY			8760	5	32CP	32W COMPACT FLUORESCENT	170	1489	$79.82	$20.65	$100.47	LED25CAN	NEW 25W LED CAN	5	125	1095	$58.69	$15.19	$73.88	$21.13	$5.47	$26.60		
184	6		SOFFITS			8760	16	18PLL	18W PLL FLUORESCENT	352	3084	$165.28	$42.76	$208.04	N1AS	INSTALL NEW 4' STRIP W/ (1) 4' LED LAMP	8	104	911	$48.83	$12.63	$61.47	$116.44	$30.13	$146.57		
185	5		KITCHEN			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.81	$14.34	$30.15	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.97	$6.32	$13.29	$8.84	$8.02	$16.86	WS	1
186	5		OPEN AREA			3500	2	A3TT8	4' 3L TROFFER W/ T8S	186	651	$34.89	$22.60	$57.49	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	273	$14.63	$9.48	$24.11	$20.26	$13.12	$33.38		
187	5		WOMENS			1500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	266	$14.23	$21.50	$35.73	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	117	$6.27	$9.48	$15.75	$7.96	$12.03	$19.99		
188	5		MENS			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.91	$7.17	$15.07	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.48	$3.16	$6.64	$4.42	$4.01	$8.43	WS	1
189	5		HALL			4000	7	A2TT8	4' 2L TROFFER FIXTURE W/T8S	413	1652	$88.55	$50.17	$138.72	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	7	182	728	$39.02	$22.11	$61.13	$49.53	$28.06	$77.59		
190	5		STORAGE			1000	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	177	$9.49	$21.50	$30.99	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	78	$4.18	$9.48	$13.66	$5.31	$12.03	$17.33		

ENHANCED LIGHTING SURVEY LOG

Project Name: **25 DELAWARE**

Months: 12

Hours: 2500 **Multipliers:** **0.0536** **10.124**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	Existing Watts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
191	5		OPEN AREA			3500	20	A3TT8	4' 3L TROFFER W/ T8S	1860	6510	$348.94	$225.97	$574.90	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	20	780	2730	$146.33	$94.76	$241.09	$202.61	$131.21	$333.82		
192	5		OFFICE			2500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	443	$23.72	$21.50	$45.22	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$10.45	$9.48	$19.93	$13.27	$12.03	$25.29	WS	1
193	5		OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.81	$14.34	$30.15	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.97	$6.32	$13.29	$8.84	$8.02	$16.86		
194	5		ELEVATOR LOBBY			8760	10	32CP	32W COMPACT FLUORESCENT	340	2978	$159.64	$41.31	$200.95	LED25CAN	NEW 25W LED CAN	10	250	2190	$117.38	$30.37	$147.76	$42.26	$10.93	$53.19		
195	5		SOFFITS			8760	10	18PLL	18W PLL FLUORESCENT	220	1927	$103.30	$26.73	$130.03	N1AS	INSTALL NEW 4' STRIP W/ (1) 4' LED LAMP	4	52	456	$24.42	$6.32	$30.73	$78.88	$20.41	$99.29		
196	5	531	RECEPTION			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	WSDS	1
197	5	531	JUDGE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	CP	1
198	5	531	TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
199	5	531	OFFICE			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$37.39	$33.90	$71.28	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$15.68	$14.21	$29.89	$21.71	$19.68	$41.39	WSDS	1
200	5	530	RECEPTION			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	WSDS	1
201	5	530	JUDGE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	CP	1
202	5	530	TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
203	5	530	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
204	5	529	COPY			2500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	590	$31.62	$28.67	$60.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$13.94	$12.63	$26.57	$17.69	$16.04	$33.72	WS	1
205	5	529	MENS			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78		
206	5	529	WOMENS			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78		
207	5	528	RECEPTION			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	WSDS	1
208	5	528	JUDGE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	CP	1
209	5	528	TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
210	5	528	OFFICE			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$37.39	$33.90	$71.28	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$15.68	$14.21	$29.89	$21.71	$19.68	$41.39	WSDS	1
211	5	527	RECEPTION			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	WSDS	1
212	5	527	JUDGE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	CP	1
213	5	527	TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
214	5	527	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
215	5	526	COMMUNICATION			500	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89	WS	1
216	5	532	JANATOR			1000	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78	WS	1
217	5	525	ELECTRIC			500	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89	WS	1
218	5		TOILET			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78	WS	1
219	5	543	OFFICE			2500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	590	$31.62	$28.67	$60.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$13.94	$12.63	$26.57	$17.69	$16.04	$33.72	WS	1
220	5	542	OFFICE			2500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	590	$31.62	$28.67	$60.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$13.94	$12.63	$26.57	$17.69	$16.04	$33.72	WS	1
221	5	541	OFFICE			2500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	590	$31.62	$28.67	$60.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$13.94	$12.63	$26.57	$17.69	$16.04	$33.72	WS	1
222	5	540	OFFICE			2500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	590	$31.62	$28.67	$60.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$13.94	$12.63	$26.57	$17.69	$16.04	$33.72	WS	1
223	5	537	OFFICE			2500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	590	$31.62	$28.67	$60.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$13.94	$12.63	$26.57	$17.69	$16.04	$33.72	WS	1
224	5	535	CONFERENCE			1500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	354	$18.97	$28.67	$47.65	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	156	$8.36	$12.63	$21.00	$10.61	$16.04	$26.65	CP	1
225	5	536	OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.81	$14.34	$30.15	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.97	$6.32	$13.29	$8.84	$8.02	$16.86	WS	1
226	5	538	OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.81	$14.34	$30.15	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.97	$6.32	$13.29	$8.84	$8.02	$16.86	WS	1
227	5	539	CONFERENCE			1500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32	WS	1
228	5		ELEVATOR LOBBY			8760	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	1034	$55.41	$14.34	$69.74	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$24.42	$6.32	$30.73	$30.99	$8.02	$39.01		

ENHANCED LIGHTING SURVEY LOG

Project Name: **25 DELAWARE**

Months: 12

Hours: 2500

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
																							Multipliers:	0.0536	10.124		
229	5		HALL			4000	14	A2TT8	4' 2L TROFFER FIXTURE W/T8S	826	3304	$177.09	$100.35	$277.44	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	14	364	1456	$78.04	$44.22	$122.26	$99.05	$56.13	$155.18		
230	5		HALL			5000	10	32CP	32W COMPACT FLUORESCENT	340	1700	$91.12	$41.31	$132.43	LED25CAN	NEW 25W LED CAN	10	250	1250	$67.00	$30.37	$97.37	$24.12	$10.93	$35.05		
231	5		ELEVATOR LOBBY			8760	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	1034	$55.41	$14.34	$69.74	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$24.42	$6.32	$30.73	$30.99	$8.02	$39.01		
232	5		MATROMONIAL			2500	20	32CP	32W COMPACT FLUORESCENT	680	1700	$91.12	$82.61	$173.73	LED25CAN	NEW 25W LED CAN	20	500	1250	$67.00	$60.74	$127.74	$24.12	$21.87	$45.99		
233	5		MENS			1000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	118	$6.32	$14.34	$20.66	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.79	$6.32	$9.10	$3.54	$8.02	$11.56		
234	5		MENS			1000	1	32CP	32W COMPACT FLUORESCENT	34	34	$1.82	$4.13	$5.95	LED25CAN	NEW 25W LED CAN	1	25	25	$1.34	$3.04	$4.38	$0.48	$1.09	$1.58		
235	5		WOMENS			1000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	118	$6.32	$14.34	$20.66	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.79	$6.32	$9.10	$3.54	$8.02	$11.56		
236	5		WOMENS			1000	1	32CP	32W COMPACT FLUORESCENT	34	34	$1.82	$4.13	$5.95	LED25CAN	NEW 25W LED CAN	1	25	25	$1.34	$3.04	$4.38	$0.48	$1.09	$1.58		
237	5		RECEPTION			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.81	$14.34	$30.15	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.97	$6.32	$13.29	$8.84	$8.02	$16.86		
238	5		RECEPTION			2500	2	32CP	32W COMPACT FLUORESCENT	68	170	$9.11	$8.26	$17.37	LED25CAN	NEW 25W LED CAN	2	50	125	$6.70	$6.07	$12.77	$2.41	$2.19	$4.60		
239	5	514	HEARING			2500	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	885	$47.44	$43.01	$90.44	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	390	$20.90	$18.95	$39.86	$26.53	$24.05	$50.59	CP	1
240	5	518	OFFICE			2500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	590	$31.62	$28.67	$60.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$13.94	$12.63	$26.57	$17.69	$16.04	$33.72	CP	1
241	5		CONFERENCE			1500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	354	$18.97	$28.67	$47.65	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	156	$8.36	$12.63	$21.00	$10.61	$16.04	$26.65	CP	1
242	5	522	OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.81	$14.34	$30.15	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.97	$6.32	$13.29	$8.84	$8.02	$16.86	WS	1
243	5	523	OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.81	$14.34	$30.15	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.97	$6.32	$13.29	$8.84	$8.02	$16.86	WS	1
244	5		TOILET			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78		
245	5		OPEN AREA			2500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	590	$31.62	$28.67	$60.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$13.94	$12.63	$26.57	$17.69	$16.04	$33.72		
246	5	520	OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.81	$14.34	$30.15	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.97	$6.32	$13.29	$8.84	$8.02	$16.86	WS	1
247	5	519	OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.81	$14.34	$30.15	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.97	$6.32	$13.29	$8.84	$8.02	$16.86	WS	1
248	5	517	OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.81	$14.34	$30.15	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.97	$6.32	$13.29	$8.84	$8.02	$16.86	WS	1
249	5	516	OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.81	$14.34	$30.15	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.97	$6.32	$13.29	$8.84	$8.02	$16.86	WS	1
250	5	515	OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.81	$14.34	$30.15	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.97	$6.32	$13.29	$8.84	$8.02	$16.86	WS	1
251	5	513	OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.81	$14.34	$30.15	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.97	$6.32	$13.29	$8.84	$8.02	$16.86	WS	1
252	5	512	OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.81	$14.34	$30.15	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.97	$6.32	$13.29	$8.84	$8.02	$16.86	WS	1
253	5		HALL			4000	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	944	$50.60	$28.67	$79.27	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	416	$22.30	$12.63	$34.93	$28.30	$16.04	$44.34		
254	5	509	ELECTRIC			500	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89	WS	1
255	5	507	RECEPTION			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	WSDS	1
256	5	507	JUDGE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	CP	1
257	5	507	TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
258	5	507	OFFICE			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$37.39	$33.90	$71.28	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$15.68	$14.21	$29.89	$21.71	$19.68	$41.39	WSDS	1
259	5	506	RECEPTION			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	WSDS	1
260	5	506	JUDGE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	CP	1
261	5	506	TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
262	5	506	OFFICE			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$37.39	$33.90	$71.28	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$15.68	$14.21	$29.89	$21.71	$19.68	$41.39	WSDS	1
263	5	505	COPY			2500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	590	$31.62	$28.67	$60.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$13.94	$12.63	$26.57	$17.69	$16.04	$33.72	WS	1
264	5		MENS			1000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	118	$6.32	$14.34	$20.66	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.79	$6.32	$9.10	$3.54	$8.02	$11.56		
265	5		WOMENS			1000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	118	$6.32	$14.34	$20.66	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.79	$6.32	$9.10	$3.54	$8.02	$11.56		
266	5	504	RECEPTION			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	WSDS	1

ENHANCED LIGHTING SURVEY LOG

Project Name: **25 DELAWARE**

Months: 12

Hours: 2500 **Multipliers:** **0.0536** **10.124**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
267	5	504	JUDGE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	CP	1
268	5	504	TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
269	5	504	OFFICE			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$37.39	$33.90	$71.28	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$15.68	$14.21	$29.89	$21.71	$19.68	$41.39	WSDS	1
270	5	503	RECEPTION			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	WSDS	1
271	5	503	JUDGE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	CP	1
272	5	503	TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
273	5	503	OFFICE			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$37.39	$33.90	$71.28	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$15.68	$14.21	$29.89	$21.71	$19.68	$41.39	WSDS	1
274	5		HALL			4000	15	A2TT8	4' 2L TROFFER FIXTURE W/T8S	885	3540	$189.74	$107.52	$297.26	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	15	390	1560	$83.62	$47.38	$131.00	$106.13	$60.14	$166.26		
275	5		HALL			5000	10	32CP	32W COMPACT FLUORESCENT	340	1700	$91.12	$41.31	$132.43	LED25CAN	NEW 25W LED CAN	10	250	1250	$67.00	$30.37	$97.37	$24.12	$10.93	$35.05		
276	4	416	CONFERENCE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.95	$22.60	$37.55	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$6.27	$9.48	$15.75	$8.68	$13.12	$21.80	WS	1
277	4	417	PASSAGE			2500	1	32CP	32W COMPACT FLUORESCENT	34	85	$4.56	$4.13	$8.69	LED25CAN	NEW 25W LED CAN	1	25	63	$3.35	$3.04	$6.39	$1.21	$1.09	$2.30	WS	1
278	4	417	CONFERENCE			1500	3	A3TT8	4' 3L TROFFER W/ T8S	279	419	$22.43	$33.90	$56.33	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	176	$9.41	$14.21	$23.62	$13.02	$19.68	$32.71	CP	1
279	4	418	CONFERENCE			1500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32	INCL	1
280	4		OPEN AREA			3500	44	32CP	32W COMPACT FLUORESCENT	1496	5236	$280.65	$181.75	$462.40	LED25CAN	NEW 25W LED CAN	44	1100	3850	$206.36	$133.64	$340.00	$74.29	$48.11	$122.40		
281	4	420	CONFERENCE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WS	1
282	4	421	COMMUNICATION			1000	4	A2ST8	4' 2L STRIP FIXTURES W/T8S	236	236	$12.65	$28.67	$41.32	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	104	$5.57	$12.63	$18.21	$7.08	$16.04	$23.11	WS	1
283	4	419	PASSAGE			2500	2	32CP	32W COMPACT FLUORESCENT	68	170	$9.11	$8.26	$17.37	LED25CAN	NEW 25W LED CAN	2	50	125	$6.70	$6.07	$12.77	$2.41	$2.19	$4.60		
284	4		COURT ROOM			2500	33	32CP	32W COMPACT FLUORESCENT	1122	2805	$150.35	$136.31	$286.66	LED25CAN	NEW 25W LED CAN	33	825	2063	$110.55	$100.23	$210.78	$39.80	$36.08	$75.88		
285	4		COURT ROOM			2500	12	A3TT8	4' 3L TROFFER W/ T8S	1116	2790	$149.54	$135.58	$285.12	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	12	468	1170	$62.71	$56.86	$119.57	$86.83	$78.72	$165.56		
286	4		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
287	4		STORAGE			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
288	4		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
289	4		HALL			4000	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	708	$37.95	$21.50	$59.45	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	312	$16.72	$9.48	$26.20	$21.23	$12.03	$33.25		
290	4		JUDGE			2500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	590	$31.62	$28.67	$60.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$13.94	$12.63	$26.57	$17.69	$16.04	$33.72	CP	1
291	4		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
292	4		PASSAGE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.81	$14.34	$30.15	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.97	$6.32	$13.29	$8.84	$8.02	$16.86		
293	4		ROOM			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89	WS	1
294	4		HOLDING			1500	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32		
295	4		HOLDING			1500	3	A2RT8	4' 2L RECESSED FIXTURE W/T8S	177	266	$14.23	$21.50	$35.73	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	117	$6.27	$9.48	$15.75	$7.96	$12.03	$19.99		
296	4		PASSAGE			8760	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	1034	$55.41	$14.34	$69.74	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$24.42	$6.32	$30.73	$30.99	$8.02	$39.01		
297	4		COURT ROOM			2500	33	32CP	32W COMPACT FLUORESCENT	1122	2805	$150.35	$136.31	$286.66	LED25CAN	NEW 25W LED CAN	33	825	2063	$110.55	$100.23	$210.78	$39.80	$36.08	$75.88		
298	4		COURT ROOM			2500	12	A3TT8	4' 3L TROFFER W/ T8S	1116	2790	$149.54	$135.58	$285.12	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	12	468	1170	$62.71	$56.86	$119.57	$86.83	$78.72	$165.56		
299	4	423	CONFERENCE			1500	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	531	$28.46	$43.01	$71.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	234	$12.54	$18.95	$31.49	$15.92	$24.05	$39.97	CP	1
300	4	423	PASSAGE			3500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	207	$11.07	$7.17	$18.24	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	91	$4.88	$3.16	$8.04	$6.19	$4.01	$10.20	WS	1
301	4		TOILET			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78		
302	4		TOILET			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78		
303	4		PASSAGE			3500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	207	$11.07	$7.17	$18.24	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	91	$4.88	$3.16	$8.04	$6.19	$4.01	$10.20		
304	4	424	JUDGE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	CP	1

ENHANCED LIGHTING SURVEY LOG

Project Name: **25 DELAWARE**

Months: 12

Hours: 2500 **Multipliers:** **0.0536** **10.124**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
305	4	424	TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
306	4	424	RECEPTION			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$37.39	$33.90	$71.28	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	3	78	195	$10.45	$9.48	$19.93	$26.93	$24.42	$51.35	WS	1
307	4	424	OFFICE			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$37.39	$33.90	$71.28	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$15.68	$14.21	$29.89	$21.71	$19.68	$41.39	WSDS	1
308	4		ELEVATOR LOBBY			8760	30	18PLL	18W PLL FLUORESCENT	660	5782	$309.89	$80.18	$390.08	N1AS	INSTALL NEW 4' STRIP W/ (1) 4' LED LAMP	16	208	1822	$97.66	$25.27	$122.93	$212.23	$54.91	$267.14		
309	4		ELEVATOR LOBBY			8760	7	32CP	32W COMPACT FLUORESCENT	238	2085	$111.75	$28.91	$140.66	LED25CAN	NEW 25W LED CAN	7	175	1533	$82.17	$21.26	$103.43	$29.58	$7.65	$37.23		
310	4		MENS			1500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32		
311	4		WOMENS			1500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32		
312	4	414	PASSAGE			2500	1	32CP	32W COMPACT FLUORESCENT	34	85	$4.56	$4.13	$8.69	LED25CAN	NEW 25W LED CAN	1	25	63	$3.35	$3.04	$6.39	$1.21	$1.09	$2.30		
313	4	414	COURT ROOM			2500	37	32CP	32W COMPACT FLUORESCENT	1258	3145	$168.57	$152.83	$321.40	LED25CAN	NEW 25W LED CAN	37	925	2313	$123.95	$112.38	$236.33	$44.62	$40.46	$85.08		
314	4	414	COURT ROOM			2500	12	A3TT8	4' 3L TROFFER W/ T8S	1116	2790	$149.54	$135.58	$285.12	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	12	468	1170	$62.71	$56.86	$119.57	$86.83	$78.72	$165.56		
315	4		ELEVATOR LOBBY			8760	1	A2RT8	4' 2L RECESSED FIXTURE W/T8S	59	517	$27.70	$7.17	$34.87	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$12.21	$3.16	$15.37	$15.49	$4.01	$19.50		
316	4		HOLDING			2500	1	A2RT8	4' 2L RECESSED FIXTURE W/T8S	59	148	$7.91	$7.17	$15.07	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.48	$3.16	$6.64	$4.42	$4.01	$8.43		
317	4	415	HALL			4000	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	944	$50.60	$28.67	$79.27	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	416	$22.30	$12.63	$34.93	$28.30	$16.04	$44.34		
318	4	415	ROOM			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89	WS	1
319	4	415	TOILET			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78		
320	4	415	TOILET			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78		
321	4	415	CONFERENCE			1500	5	A3TT8	4' 3L TROFFER W/ T8S	465	698	$37.39	$56.49	$93.88	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	5	130	195	$10.45	$15.79	$26.25	$26.93	$40.70	$67.63	CP	1
322	4		JUDGE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	CP	1
323	4		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
324	4	411	OFFICE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	CP	1
325	4		OFFICE			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$37.39	$33.90	$71.28	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$15.68	$14.21	$29.89	$21.71	$19.68	$41.39	WS	1
326	4	413	TOILET			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78	WS	1
327	4	412	JANATOR			1000	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78	WS	1
328	4		OPEN AREA			3500	40	32CP	32W COMPACT FLUORESCENT	1360	4760	$255.14	$165.22	$420.36	LED25CAN	NEW 25W LED CAN	40	1000	3500	$187.60	$121.49	$309.09	$67.54	$43.74	$111.27		
329	4	410	CONFERENCE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.95	$22.60	$37.55	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$6.27	$9.48	$15.75	$8.68	$13.12	$21.80	WS	1
330	4	409	PASSAGE			2500	1	32CP	32W COMPACT FLUORESCENT	34	85	$4.56	$4.13	$8.69	LED25CAN	NEW 25W LED CAN	1	25	63	$3.35	$3.04	$6.39	$1.21	$1.09	$2.30	WS	1
331	4		CONFERENCE			1500	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	531	$28.46	$43.01	$71.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	234	$12.54	$18.95	$31.49	$15.92	$24.05	$39.97	CP	1
332	4	408	CONFERENCE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.95	$22.60	$37.55	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$6.27	$9.48	$15.75	$8.68	$13.12	$21.80	WS	1
333	4	408	CONFERENCE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.95	$22.60	$37.55	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$6.27	$9.48	$15.75	$8.68	$13.12	$21.80	WS	1
334	4	405	COMMUNICATION			1500	3	A2ST8	4' 2L STRIP FIXTURES W/T8S	177	266	$14.23	$21.50	$35.73	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	117	$6.27	$9.48	$15.75	$7.96	$12.03	$19.99		
335	4	404	CONFERENCE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.95	$22.60	$37.55	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$6.27	$9.48	$15.75	$8.68	$13.12	$21.80		
336	4	407	PASSAGE			3500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	620	$33.21	$21.50	$54.71	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	273	$14.63	$9.48	$24.11	$18.57	$12.03	$30.60		
337	4		COURT ROOM			2500	33	32CP	32W COMPACT FLUORESCENT	1122	2805	$150.35	$136.31	$286.66	LED25CAN	NEW 25W LED CAN	33	825	2063	$110.55	$100.23	$210.78	$39.80	$36.08	$75.88		
338	4		COURT ROOM			2500	12	A3TT8	4' 3L TROFFER W/ T8S	1116	2790	$149.54	$135.58	$285.12	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	12	468	1170	$62.71	$56.86	$119.57	$86.83	$78.72	$165.56		
339	4		PASSAGE			2500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	443	$23.72	$21.50	$45.22	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$10.45	$9.48	$19.93	$13.27	$12.03	$25.29		
340	4		TOILET			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78		
341	4		TOILET			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78		
342	4		STORAGE			500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	59	$3.16	$14.34	$17.50	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.39	$6.32	$7.71	$1.77	$8.02	$9.79		

ENHANCED LIGHTING SURVEY LOG

Project Name: **25 DELAWARE**

Months: 12

Hours: 2500 **Multipliers:** **0.0536** **10.124**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
343	4		HOLDING			1500	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32		
344	4		HOLDING			1500	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32		
345	4		PASSAGE			8760	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	1034	$55.41	$14.34	$69.74	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$24.42	$6.32	$30.73	$30.99	$8.02	$39.01		
346	4		PASSAGE			8760	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	1034	$55.41	$14.34	$69.74	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$24.42	$6.32	$30.73	$30.99	$8.02	$39.01		
347	4		ROOM			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89	WS	1
348	4		CONFERENCE			1500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	266	$14.23	$21.50	$35.73	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	117	$6.27	$9.48	$15.75	$7.96	$12.03	$19.99	CP	1
349	4		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
350	4		COURT ROOM			2500	33	32CP	32W COMPACT FLUORESCENT	1122	2805	$150.35	$136.31	$286.66	LED25CAN	NEW 25W LED CAN	33	825	2063	$110.55	$100.23	$210.78	$39.80	$36.08	$75.88		
351	4		COURT ROOM			2500	12	A3TT8	4' 3L TROFFER W/ T8S	1116	2790	$149.54	$135.58	$285.12	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	12	468	1170	$62.71	$56.86	$119.57	$86.83	$78.72	$165.56		
352	4	401	CONFERENCE			1500	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	531	$28.46	$43.01	$71.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	234	$12.54	$18.95	$31.49	$15.92	$24.05	$39.97	WS	1
353	4	401	PASSAGE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.91	$7.17	$15.07	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.48	$3.16	$6.64	$4.42	$4.01	$8.43		
354	4	401	TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
355	4	401	TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
356	4	400	RECEPTION			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$37.39	$33.90	$71.28	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$15.68	$14.21	$29.89	$21.71	$19.68	$41.39		
357	4	400	RECEPTION			2500	1	32CP	32W COMPACT FLUORESCENT	34	85	$4.56	$4.13	$8.69	LED25CAN	NEW 25W LED CAN	1	25	63	$3.35	$3.04	$6.39	$1.21	$1.09	$2.30		
358	4	400	OFFICE			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$37.39	$33.90	$71.28	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$15.68	$14.21	$29.89	$21.71	$19.68	$41.39	WSDS	1
359	4		JUDGE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	CP	1
360	4		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
361	4		PASSAGE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.91	$7.17	$15.07	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.48	$3.16	$6.64	$4.42	$4.01	$8.43		
362	3	316	CONFERENCE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.95	$22.60	$37.55	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$6.27	$9.48	$15.75	$8.68	$13.12	$21.80	WS	1
363	3	317	PASSAGE			2500	1	32CP	32W COMPACT FLUORESCENT	34	85	$4.56	$4.13	$8.69	LED25CAN	NEW 25W LED CAN	1	25	63	$3.35	$3.04	$6.39	$1.21	$1.09	$2.30	WS	1
364	3	317	CONFERENCE			1500	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	531	$28.46	$43.01	$71.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	234	$12.54	$18.95	$31.49	$15.92	$24.05	$39.97	CP	1
365	3	318	CONFERENCE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.95	$22.60	$37.55	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$6.27	$9.48	$15.75	$8.68	$13.12	$21.80	WS	1
366	3		PASSAGE			2500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	443	$23.72	$21.50	$45.22	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$10.45	$9.48	$19.93	$13.27	$12.03	$25.29		
367	3		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
368	3		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
369	3		STORAGE			500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	59	$3.16	$14.34	$17.50	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.39	$6.32	$7.71	$1.77	$8.02	$9.79		
370	3	319	COURT ROOM			2500	33	32CP	32W COMPACT FLUORESCENT	1122	2805	$150.35	$136.31	$286.66	LED25CAN	NEW 25W LED CAN	33	825	2063	$110.55	$100.23	$210.78	$39.80	$36.08	$75.88		
371	3	319	COURT ROOM			2500	12	A3TT8	4' 3L TROFFER W/ T8S	1116	2790	$149.54	$135.58	$285.12	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	12	468	1170	$62.71	$56.86	$119.57	$86.83	$78.72	$165.56		
372	3	319	PASSAGE			2500	2	32CP	32W COMPACT FLUORESCENT	68	170	$9.11	$8.26	$17.37	LED25CAN	NEW 25W LED CAN	2	50	125	$6.70	$6.07	$12.77	$2.41	$2.19	$4.60		
373	3		PASSAGE			8760	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	1034	$55.41	$14.34	$69.74	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$24.42	$6.32	$30.73	$30.99	$8.02	$39.01		
374	3		HOLDING			1500	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32		
375	3		HOLDING			1500	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32		
376	3		OFFICE			2500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	443	$23.72	$21.50	$45.22	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$10.45	$9.48	$19.93	$13.27	$12.03	$25.29	CP	1
377	3		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
378	3		ROOM			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89	WS	1
379	3	322	COURT ROOM			2500	33	32CP	32W COMPACT FLUORESCENT	1122	2805	$150.35	$136.31	$286.66	LED25CAN	NEW 25W LED CAN	33	825	2063	$110.55	$100.23	$210.78	$39.80	$36.08	$75.88		
380	3	322	COURT ROOM			2500	12	A3TT8	4' 3L TROFFER W/ T8S	1116	2790	$149.54	$135.58	$285.12	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	12	468	1170	$62.71	$56.86	$119.57	$86.83	$78.72	$165.56		

ENHANCED LIGHTING SURVEY LOG

Project Name: **25 DELAWARE**

Months: 12

Hours: 2500 **Multipliers:** **0.0536** **10.124**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
381	3	322	PASSAGE			2500	4	32CP	32W COMPACT FLUORESCENT	136	340	$18.22	$16.52	$34.75	LED25CAN	NEW 25W LED CAN	4	100	250	$13.40	$12.15	$25.55	$4.82	$4.37	$9.20		
382	3	372	CONFERENCE			1500	1	A3TT8	4' 3L TROFFER W/ T8S	93	140	$7.48	$11.30	$18.78	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	59	$3.14	$4.74	$7.87	$4.34	$6.56	$10.90	WS	1
383	3		ELEVATOR LOBBY			8760	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	517	$27.70	$7.17	$34.87	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$12.21	$3.16	$15.37	$15.49	$4.01	$19.50		
384	3		CONFERENCE			1500	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	531	$28.46	$43.01	$71.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	234	$12.54	$18.95	$31.49	$15.92	$24.05	$39.97	CP	1
385	3	373	PASSAGE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.91	$7.17	$15.07	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.48	$3.16	$6.64	$4.42	$4.01	$8.43		
386	3		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
387	3		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
388	3		PASSAGE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.91	$7.17	$15.07	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.48	$3.16	$6.64	$4.42	$4.01	$8.43		
389	3		JUDGE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	CP	1
390	3		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
391	3		OFFICE			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$37.39	$33.90	$71.28	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$15.68	$14.21	$29.89	$21.71	$19.68	$41.39	CP	1
392	3		OFFICE			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$37.39	$33.90	$71.28	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$15.68	$14.21	$29.89	$21.71	$19.68	$41.39	WSDS	1
393	3		HALL			5000	40	32CP	32W COMPACT FLUORESCENT	1360	6800	$364.48	$165.22	$529.70	LED25CAN	NEW 25W LED CAN	40	1000	5000	$268.00	$121.49	$389.49	$96.48	$43.74	$140.22		
394	3	315	HALL			4000	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	944	$50.60	$28.67	$79.27	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	416	$22.30	$12.63	$34.93	$28.30	$16.04	$44.34		
395	3	315	TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
396	3	315	TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
397	3		ROOM			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89	WS	1
398	3	315	CONFERENCE			1500	6	A3TT8	4' 3L TROFFER W/ T8S	558	837	$44.86	$67.79	$112.65	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	6	234	351	$18.81	$28.43	$47.24	$26.05	$39.36	$65.41	CP	1
399	3		COURT ROOM			2500	41	32CP	32W COMPACT FLUORESCENT	1394	3485	$186.80	$169.35	$356.15	LED25CAN	NEW 25W LED CAN	41	1025	2563	$137.35	$124.53	$261.88	$49.45	$44.83	$94.28		
400	3		COURT ROOM			2500	8	A3TT8	4' 3L TROFFER W/ T8S	744	1860	$99.70	$90.39	$190.08	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	8	312	780	$41.81	$37.90	$79.71	$57.89	$52.48	$110.37		
401	3		OFFICE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	CP	1
402	3		TOILET			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.91	$7.17	$15.07	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.48	$3.16	$6.64	$4.42	$4.01	$8.43		
403	3		OFFICE			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$37.39	$33.90	$71.28	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$15.68	$14.21	$29.89	$21.71	$19.68	$41.39	WSDS	1
404	3		ELEVATOR LOBBY			8760	36	18PLL	18W PLL FLUORESCENT	792	6938	$371.87	$96.22	$468.09	N1AS	INSTALL NEW 4' STRIP W/ (1) 4' LED LAMP	16	208	1822	$97.66	$25.27	$122.93	$274.21	$70.95	$345.16		
405	3		ELEVATOR LOBBY			8760	7	32CP	32W COMPACT FLUORESCENT	238	2085	$111.75	$28.91	$140.66	LED25CAN	NEW 25W LED CAN	7	175	1533	$82.17	$21.26	$103.43	$29.58	$7.65	$37.23		
406	3		HALL			5000	40	32CP	32W COMPACT FLUORESCENT	1360	6800	$364.48	$165.22	$529.70	LED25CAN	NEW 25W LED CAN	40	1000	5000	$268.00	$121.49	$389.49	$96.48	$43.74	$140.22		
407	3	310	CONFERENCE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.95	$22.60	$37.55	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$6.27	$9.48	$15.75	$8.68	$13.12	$21.80	WS	1
408	3	309	PASSAGE			2500	1	32CP	32W COMPACT FLUORESCENT	34	85	$4.56	$4.13	$8.69	LED25CAN	NEW 25W LED CAN	1	25	63	$3.35	$3.04	$6.39	$1.21	$1.09	$2.30		
409	3		CONFERENCE			1500	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	531	$28.46	$43.01	$71.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	234	$12.54	$18.95	$31.49	$15.92	$24.05	$39.97	WS	1
410	3	308	CONFERENCE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.95	$22.60	$37.55	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$6.27	$9.48	$15.75	$8.68	$13.12	$21.80	WS	1
411	3	307	PASSAGE			2500	2	32CP	32W COMPACT FLUORESCENT	68	170	$9.11	$8.26	$17.37	LED25CAN	NEW 25W LED CAN	2	50	125	$6.70	$6.07	$12.77	$2.41	$2.19	$4.60		
412	3	307	COURT ROOM			2500	37	32CP	32W COMPACT FLUORESCENT	1258	3145	$168.57	$152.83	$321.40	LED25CAN	NEW 25W LED CAN	37	925	2313	$123.95	$112.38	$236.33	$44.62	$40.46	$85.08		
413	3	307	COURT ROOM			2500	8	A3TT8	4' 3L TROFFER W/ T8S	744	1860	$99.70	$90.39	$190.08	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	8	312	780	$41.81	$37.90	$79.71	$57.89	$52.48	$110.37		
414	3		PASSAGE			2500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	443	$23.72	$21.50	$45.22	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$10.45	$9.48	$19.93	$13.27	$12.03	$25.29		
415	3		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
416	3		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
417	3		STORAGE			500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	59	$3.16	$14.34	$17.50	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.39	$6.32	$7.71	$1.77	$8.02	$9.79		
418	3		PASSAGE			8760	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	1034	$55.41	$14.34	$69.74	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$24.42	$6.32	$30.73	$30.99	$8.02	$39.01		

ENHANCED LIGHTING SURVEY LOG

Project Name: **25 DELAWARE**

Months: 12

Hours: 2500 **Multipliers:** **0.0536** **10.124**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	Existing Watts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
419	3		HOLDING			1500	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32		
420	3		HOLDING			1500	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32		
421	3		PASSAGE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.81	$14.34	$30.15	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.97	$6.32	$13.29	$8.84	$8.02	$16.86		
422	3		JUDGE			2500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	443	$23.72	$21.50	$45.22	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$10.45	$9.48	$19.93	$13.27	$12.03	$25.29	CP	1
423	3		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
424	3		ROOM			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89	WS	1
425	3	303	COURT ROOM			2500	33	32CP	32W COMPACT FLUORESCENT	1122	2805	$150.35	$136.31	$286.66	LED25CAN	NEW 25W LED CAN	33	825	2063	$110.55	$100.23	$210.78	$39.80	$36.08	$75.88		
426	3	303	COURT ROOM			2500	12	A3TT8	4' 3L TROFFER W/ T8S	1116	2790	$149.54	$135.58	$285.12	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	12	468	1170	$62.71	$56.86	$119.57	$86.83	$78.72	$165.56		
427	3	303	CONFERENCE			1500	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	531	$28.46	$43.01	$71.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	234	$12.54	$18.95	$31.49	$15.92	$24.05	$39.97	WS	1
428	3		PASSAGE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.91	$7.17	$15.07	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.48	$3.16	$6.64	$4.42	$4.01	$8.43		
429	3		JUDGE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	CP	1
430	3		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
431	3		OFFICE			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$37.39	$33.90	$71.28	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$15.68	$14.21	$29.89	$21.71	$19.68	$41.39	CP	1
432	3		OFFICE			2500	1	32CP	32W COMPACT FLUORESCENT	34	85	$4.56	$4.13	$8.69	LED25CAN	NEW 25W LED CAN	1	25	63	$3.35	$3.04	$6.39	$1.21	$1.09	$2.30	INCL	1
433	3		OFFICE			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$12.46	$11.30	$23.76	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	98	$5.23	$4.74	$9.96	$7.24	$6.56	$13.80	WS	1
434	2	216	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WS	1
435	2	217	PASSAGE			2500	1	32CP	32W COMPACT FLUORESCENT	34	85	$4.56	$4.13	$8.69	LED25CAN	NEW 25W LED CAN	1	25	63	$3.35	$3.04	$6.39	$1.21	$1.09	$2.30	WS	1
436	2		CONFERENCE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.95	$22.60	$37.55	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$6.27	$9.48	$15.75	$8.68	$13.12	$21.80	WS	1
437	2	218	CONFERENCE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.95	$22.60	$37.55	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$6.27	$9.48	$15.75	$8.68	$13.12	$21.80	WS	1
438	2	219	PASSAGE			2500	2	32CP	32W COMPACT FLUORESCENT	68	170	$9.11	$8.26	$17.37	LED25CAN	NEW 25W LED CAN	2	50	125	$6.70	$6.07	$12.77	$2.41	$2.19	$4.60		
439	2	219	COURT ROOM			2500	33	32CP	32W COMPACT FLUORESCENT	1122	2805	$150.35	$136.31	$286.66	LED25CAN	NEW 25W LED CAN	33	825	2063	$110.55	$100.23	$210.78	$39.80	$36.08	$75.88		
440	2	219	COURT ROOM			2500	12	A3TT8	4' 3L TROFFER W/ T8S	1116	2790	$149.54	$135.58	$285.12	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	12	468	1170	$62.71	$56.86	$119.57	$86.83	$78.72	$165.56		
441	2		HALL			4000	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	708	$37.95	$21.50	$59.45	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	312	$16.72	$9.48	$26.20	$21.23	$12.03	$33.25		
442	2		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
443	2		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
444	2		STORAGE			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89	WS	1
445	2		PASSAGE			8760	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	1034	$55.41	$14.34	$69.74	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$24.42	$6.32	$30.73	$30.99	$8.02	$39.01		
446	2		HOLDING			1500	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32		
447	2		HOLDING			1500	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32		
448	2		PASSAGE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.81	$14.34	$30.15	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.97	$6.32	$13.29	$8.84	$8.02	$16.86		
449	2		ROOM			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89	WS	1
450	2		JUDGE			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$37.39	$33.90	$71.28	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$15.68	$14.21	$29.89	$21.71	$19.68	$41.39	CP	1
451	2		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
452	2	272	COURT ROOM			2500	33	32CP	32W COMPACT FLUORESCENT	1122	2805	$150.35	$136.31	$286.66	LED25CAN	NEW 25W LED CAN	33	825	2063	$110.55	$100.23	$210.78	$39.80	$36.08	$75.88		
453	2	272	COURT ROOM			2500	12	A3TT8	4' 3L TROFFER W/ T8S	1116	2790	$149.54	$135.58	$285.12	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	12	468	1170	$62.71	$56.86	$119.57	$86.83	$78.72	$165.56		
454	2	272	PASSAGE			2500	4	32CP	32W COMPACT FLUORESCENT	136	340	$18.22	$16.52	$34.75	LED25CAN	NEW 25W LED CAN	4	100	250	$13.40	$12.15	$25.55	$4.82	$4.37	$9.20		
455	2	272	ELEVATOR LOBBY			8760	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	517	$27.70	$7.17	$34.87	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$12.21	$3.16	$15.37	$15.49	$4.01	$19.50		
456	2	272	CONFERENCE			1500	1	A3TT8	4' 3L TROFFER W/ T8S	93	140	$7.48	$11.30	$18.78	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	59	$3.14	$4.74	$7.87	$4.34	$6.56	$10.90	WS	1

ENHANCED LIGHTING SURVEY LOG

Project Name: **25 DELAWARE**

Months: 12

Hours: 2500 **Multipliers:** **0.0536** **10.124**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
457	2		CONFERENCE			1500	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	531	$28.46	$43.01	$71.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	234	$12.54	$18.95	$31.49	$15.92	$24.05	$39.97	CP	1
458	2		PASSAGE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.91	$7.17	$15.07	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.48	$3.16	$6.64	$4.42	$4.01	$8.43		
459	2		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
460	2		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
461	2	224	OFFICE			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$37.39	$33.90	$71.28	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$15.68	$14.21	$29.89	$21.71	$19.68	$41.39	CP	1
462	2	224	OFFICE			2500	1	32CP	32W COMPACT FLUORESCENT	34	85	$4.56	$4.13	$8.69	LED25CAN	NEW 25W LED CAN	1	25	63	$3.35	$3.04	$6.39	$1.21	$1.09	$2.30	INCL	1
463	2		OFFICE			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$37.39	$33.90	$71.28	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$15.68	$14.21	$29.89	$21.71	$19.68	$41.39	WSDS	1
464	2		JUDGE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	CP	1
465	2		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
466	2		PASSAGE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.91	$7.17	$15.07	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.48	$3.16	$6.64	$4.42	$4.01	$8.43		
467	2		HALL			5000	40	32CP	32W COMPACT FLUORESCENT	1360	6800	$364.48	$165.22	$529.70	LED25CAN	NEW 25W LED CAN	40	1000	5000	$268.00	$121.49	$389.49	$96.48	$43.74	$140.22		
468	2		ELEVATOR LOBBY			8760	7	32CP	32W COMPACT FLUORESCENT	238	2085	$111.75	$28.91	$140.66	LED25CAN	NEW 25W LED CAN	7	175	1533	$82.17	$21.26	$103.43	$29.58	$7.65	$37.23		
469	2		ELEVATOR LOBBY			8760	36	18PLL	18W PLL FLUORESCENT	792	6938	$371.87	$96.22	$468.09	N1AS	INSTALL NEW 4' STRIP W/ (1) 4' LED LAMP	20	260	2278	$122.08	$31.59	$153.67	$249.79	$64.63	$314.42		
470	2		MENS			1500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32		
471	2		WOMENS			1500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32		
472	2	215	PASSAGE			2500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	590	$31.62	$28.67	$60.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$13.94	$12.63	$26.57	$17.69	$16.04	$33.72		
473	2		TOILET			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78	WS	1
474	2		TOILET			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78	WS	1
475	2		ROOM			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89	WS	1
476	2		CONFERENCE			1500	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	531	$28.46	$43.01	$71.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	234	$12.54	$18.95	$31.49	$15.92	$24.05	$39.97	CP	1
477	2		COURT ROOM			2500	37	32CP	32W COMPACT FLUORESCENT	1258	3145	$168.57	$152.83	$321.40	LED25CAN	NEW 25W LED CAN	37	925	2313	$123.95	$112.38	$236.33	$44.62	$40.46	$85.08		
478	2		COURT ROOM			2500	12	A3TT8	4' 3L TROFFER W/ T8S	1116	2790	$149.54	$135.58	$285.12	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	12	468	1170	$62.71	$56.86	$119.57	$86.83	$78.72	$165.56		
479	2		PASSAGE			8760	1	A2RT8	4' 2L RECESSED FIXTURE W/T8S	59	517	$27.70	$7.17	$34.87	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$12.21	$3.16	$15.37	$15.49	$4.01	$19.50		
480	2		HOLDING			1500	1	A2RT8	4' 2L RECESSED FIXTURE W/T8S	59	89	$4.74	$7.17	$11.91	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	39	$2.09	$3.16	$5.25	$2.65	$4.01	$6.66		
481	2		PASSAGE			2500	1	32CP	32W COMPACT FLUORESCENT	34	85	$4.56	$4.13	$8.69	LED25CAN	NEW 25W LED CAN	1	25	63	$3.35	$3.04	$6.39	$1.21	$1.09	$2.30		
482	2	213	TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
483	2	211	OFFICE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	CP	1
484	2	211	TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
485	2		OFFICE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	CP	1
486	2	202	COPY			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.91	$7.17	$15.07	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.48	$3.16	$6.64	$4.42	$4.01	$8.43	WS	1
487	2	204	CONFERENCE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.95	$22.60	$37.55	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$6.27	$9.48	$15.75	$8.68	$13.12	$21.80	WS	1
488	2	205	COMMUNICATION			1000	3	A2ST8	4' 2L STRIP FIXTURES W/T8S	177	177	$9.49	$21.50	$30.99	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	78	$4.18	$9.48	$13.66	$5.31	$12.03	$17.33		
489	2	206	CONFERENCE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.95	$22.60	$37.55	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$6.27	$9.48	$15.75	$8.68	$13.12	$21.80	WS	1
490	2	210	OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WS	1
491	2	209	PASSAGE			2500	1	32CP	32W COMPACT FLUORESCENT	34	85	$4.56	$4.13	$8.69	LED25CAN	NEW 25W LED CAN	1	25	63	$3.35	$3.04	$6.39	$1.21	$1.09	$2.30	WS	1
492	2		CONFERENCE			1500	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	531	$28.46	$43.01	$71.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	234	$12.54	$18.95	$31.49	$15.92	$24.05	$39.97	CP	1
493	2	208	CONFERENCE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.95	$22.60	$37.55	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$6.27	$9.48	$15.75	$8.68	$13.12	$21.80	WS	1
494	2		HALL			5000	40	32CP	32W COMPACT FLUORESCENT	1360	6800	$364.48	$165.22	$529.70	LED25CAN	NEW 25W LED CAN	40	1000	5000	$268.00	$121.49	$389.49	$96.48	$43.74	$140.22		

ENHANCED LIGHTING SURVEY LOG

Project Name: **25 DELAWARE**

Months: 12

Hours: 2500 **Multipliers:** **0.0536** **10.124**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
495	2		PASSAGE			2500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	443	$23.72	$21.50	$45.22	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$10.45	$9.48	$19.93	$13.27	$12.03	$25.29		
496	2		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
497	2		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
498	2		STORAGE			5002	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	590	$31.64	$14.34	$45.97	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	260	$13.94	$6.32	$20.26	$17.70	$8.02	$25.71		
499	2	207	PASSAGE			2500	2	32CP	32W COMPACT FLUORESCENT	68	170	$9.11	$8.26	$17.37	LED25CAN	NEW 25W LED CAN	2	50	125	$6.70	$6.07	$12.77	$2.41	$2.19	$4.60		
500	2	207	COURT ROOM			2500	33	32CP	32W COMPACT FLUORESCENT	1122	2805	$150.35	$136.31	$286.66	LED25CAN	NEW 25W LED CAN	33	825	2063	$110.55	$100.23	$210.78	$39.80	$36.08	$75.88		
501	2	207	COURT ROOM			2500	12	A3TT8	4' 3L TROFFER W/ T8S	1116	2790	$149.54	$135.58	$285.12	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	12	468	1170	$62.71	$56.86	$119.57	$86.83	$78.72	$165.56		
502	2		PASSAGE			8760	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	1034	$55.41	$14.34	$69.74	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$24.42	$6.32	$30.73	$30.99	$8.02	$39.01		
503	2		HOLDING			1500	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32		
504	2		HOLDING			1500	1	A2RT8	4' 2L RECESSED FIXTURE W/T8S	59	89	$4.74	$7.17	$11.91	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	39	$2.09	$3.16	$5.25	$2.65	$4.01	$6.66		
505	2		PASSAGE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.81	$14.34	$30.15	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.97	$6.32	$13.29	$8.84	$8.02	$16.86		
506	2		OFFICE			2500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	443	$23.72	$21.50	$45.22	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$10.45	$9.48	$19.93	$13.27	$12.03	$25.29	CP	1
507	2		TOILET			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78	WS	1
508	2		ROOM			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89	WS	1
509	2	203	PASSAGE			2500	4	32CP	32W COMPACT FLUORESCENT	136	340	$18.22	$16.52	$34.75	LED25CAN	NEW 25W LED CAN	4	100	250	$13.40	$12.15	$25.55	$4.82	$4.37	$9.20		
510	2	203	COURT ROOM			2500	33	32CP	32W COMPACT FLUORESCENT	1122	2805	$150.35	$136.31	$286.66	LED25CAN	NEW 25W LED CAN	33	825	2063	$110.55	$100.23	$210.78	$39.80	$36.08	$75.88		
511	2	203	COURT ROOM			2500	12	A3TT8	4' 3L TROFFER W/ T8S	1116	2790	$149.54	$135.58	$285.12	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	12	468	1170	$62.71	$56.86	$119.57	$86.83	$78.72	$165.56		
512	2	204	CONFERENCE			1500	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	531	$28.46	$43.01	$71.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	234	$12.54	$18.95	$31.49	$15.92	$24.05	$39.97	WS	1
513	2	201	PASSAGE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.91	$7.17	$15.07	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.48	$3.16	$6.64	$4.42	$4.01	$8.43		
514	2		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
515	2		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
516	2		PASSAGE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.91	$7.17	$15.07	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.48	$3.16	$6.64	$4.42	$4.01	$8.43		
517	2		JUDGE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	CP	1
518	2		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
519	2	200	OFFICE			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$37.39	$33.90	$71.28	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$15.68	$14.21	$29.89	$21.71	$19.68	$41.39	CP	1
520	2	200	OFFICE			2500	1	32CP	32W COMPACT FLUORESCENT	34	85	$4.56	$4.13	$8.69	LED25CAN	NEW 25W LED CAN	1	25	63	$3.35	$3.04	$6.39	$1.21	$1.09	$2.30	INCL	1
521	2		OFFICE			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$37.39	$33.90	$71.28	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$15.68	$14.21	$29.89	$21.71	$19.68	$41.39	WS	1
522	1		HALL			5000	30	32CP	32W COMPACT FLUORESCENT	1020	5100	$273.36	$123.92	$397.28	LED25CAN	NEW 25W LED CAN	30	750	3750	$201.00	$91.12	$292.12	$72.36	$32.80	$105.16		
523	1		CONFERENCE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.95	$22.60	$37.55	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$6.27	$9.48	$15.75	$8.68	$13.12	$21.80	WS	1
524	1	116	PASSAGE			2500	1	32CP	32W COMPACT FLUORESCENT	34	85	$4.56	$4.13	$8.69	LED25CAN	NEW 25W LED CAN	1	25	63	$3.35	$3.04	$6.39	$1.21	$1.09	$2.30	WS	1
525	1	116	CONFERENCE			1500	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	531	$28.46	$43.01	$71.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	234	$12.54	$18.95	$31.49	$15.92	$24.05	$39.97	CP	1
526	1	117	CONFERENCE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.95	$22.60	$37.55	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$6.27	$9.48	$15.75	$8.68	$13.12	$21.80	WS	1
527	1		PASSAGE			2500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	443	$23.72	$21.50	$45.22	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$10.45	$9.48	$19.93	$13.27	$12.03	$25.29		
528	1		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
529	1		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
530	1		STORAGE			500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	59	$3.16	$14.34	$17.50	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.39	$6.32	$7.71	$1.77	$8.02	$9.79		
531	1	118	COURT ROOM			2500	30	32CP	32W COMPACT FLUORESCENT	1020	2550	$136.68	$123.92	$260.60	LED25CAN	NEW 25W LED CAN	30	750	1875	$100.50	$91.12	$191.62	$36.18	$32.80	$68.98		
532	1	118	COURT ROOM			2500	12	A3TT8	4' 3L TROFFER W/ T8S	1116	2790	$149.54	$135.58	$285.12	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	12	468	1170	$62.71	$56.86	$119.57	$86.83	$78.72	$165.56		

ENHANCED LIGHTING SURVEY LOG

Project Name: **25 DELAWARE**

Months: 12

Hours: 2500 **Multipliers:** **0.0536** **10.124**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
533	1	118	PASSAGE			2500	2	32CP	32W COMPACT FLUORESCENT	68	170	$9.11	$8.26	$17.37	LED25CAN	NEW 25W LED CAN	2	50	125	$6.70	$6.07	$12.77	$2.41	$2.19	$4.60		
534	1		PASSAGE			8760	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	1034	$55.41	$14.34	$69.74	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$24.42	$6.32	$30.73	$30.99	$8.02	$39.01		
535	1		HOLDING			1500	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32		
536	1		HOLDING			1500	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32		
537	1		PASSAGE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.91	$7.17	$15.07	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.48	$3.16	$6.64	$4.42	$4.01	$8.43		
538	1		OFFICE			2500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	443	$23.72	$21.50	$45.22	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$10.45	$9.48	$19.93	$13.27	$12.03	$25.29		
539	1		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
540	1		ROOM			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89	WS	1
541	1	121	PASSAGE			2500	4	32CP	32W COMPACT FLUORESCENT	136	340	$18.22	$16.52	$34.75	LED25CAN	NEW 25W LED CAN	4	100	250	$13.40	$12.15	$25.55	$4.82	$4.37	$9.20		
542	1	121	COURT ROOM			2500	30	32CP	32W COMPACT FLUORESCENT	1020	2550	$136.68	$123.92	$260.60	LED25CAN	NEW 25W LED CAN	30	750	1875	$100.50	$91.12	$191.62	$36.18	$32.80	$68.98		
543	1	121	COURT ROOM			2500	12	A3TT8	4' 3L TROFFER W/ T8S	1116	2790	$149.54	$135.58	$285.12	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	12	468	1170	$62.71	$56.86	$119.57	$86.83	$78.72	$165.56		
544	1	121	CONFERENCE			1500	1	A3TT8	4' 3L TROFFER W/ T8S	93	140	$7.48	$11.30	$18.78	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	59	$3.14	$4.74	$7.87	$4.34	$6.56	$10.90	WS	1
545	1		ELEVATOR LOBBY			8760	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	517	$27.70	$7.17	$34.87	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$12.21	$3.16	$15.37	$15.49	$4.01	$19.50		
546	1	120	COMMUNICATION			1000	4	A2ST8	4' 2L STRIP FIXTURES W/T8S	236	236	$12.65	$28.67	$41.32	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	104	$5.57	$12.63	$18.21	$7.08	$16.04	$23.11		
547	1	122	CONFERENCE			1500	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	531	$28.46	$43.01	$71.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	234	$12.54	$18.95	$31.49	$15.92	$24.05	$39.97	CP	1
548	1	122	PASSAGE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.91	$7.17	$15.07	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.48	$3.16	$6.64	$4.42	$4.01	$8.43		
549	1	122	TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
550	1	122	TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
551	1	133	OFFICE			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$37.39	$33.90	$71.28	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$15.68	$14.21	$29.89	$21.71	$19.68	$41.39	CP	1
552	1	133	OFFICE			2500	1	32CP	32W COMPACT FLUORESCENT	34	85	$4.56	$4.13	$8.69	LED25CAN	NEW 25W LED CAN	1	25	63	$3.35	$3.04	$6.39	$1.21	$1.09	$2.30	INCL	1
553	1	133	OFFICE			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$37.39	$33.90	$71.28	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$15.68	$14.21	$29.89	$21.71	$19.68	$41.39	WS	1
554	1		JUDGE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	CP	1
555	1		TOILET			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78	WS	1
556	1		PASSAGE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.91	$7.17	$15.07	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.48	$3.16	$6.64	$4.42	$4.01	$8.43		
557	1		ELEVATOR LOBBY			8760	32	18PLL	18W PLL FLUORESCENT	704	6167	$330.55	$85.53	$416.08	N1AS	INSTALL NEW 4' STRIP W/ (1) 4' LED LAMP	20	260	2278	$122.08	$31.59	$153.67	$208.47	$53.94	$262.41		
558	1		ELEVATOR LOBBY			8760	5	32CP	32W COMPACT FLUORESCENT	170	1489	$79.82	$20.65	$100.47	LED25CAN	NEW 25W LED CAN	5	125	1095	$58.69	$15.19	$73.88	$21.13	$5.47	$26.60		
559	1		MENS			1500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32		
560	1		WOMENS			1500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32		
561	1		MAIN LOBBY			5000	24	32CP	32W COMPACT FLUORESCENT	816	4080	$218.69	$99.13	$317.82	LED25CAN	NEW 25W LED CAN	24	600	3000	$160.80	$72.89	$233.69	$57.89	$26.24	$84.13		
562	1	114	PASSAGE			2500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	590	$31.62	$28.67	$60.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$13.94	$12.63	$26.57	$17.69	$16.04	$33.72		
563	1		ROOM			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89	WS	1
564	1		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
565	1		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
566	1		CONFERENCE			1500	6	A3TT8	4' 3L TROFFER W/ T8S	558	837	$44.86	$67.79	$112.65	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	6	234	351	$18.81	$28.43	$47.24	$26.05	$39.36	$65.41	CP	1
567	1	113	PASSAGE			2500	1	32CP	32W COMPACT FLUORESCENT	34	85	$4.56	$4.13	$8.69	LED25CAN	NEW 25W LED CAN	1	25	63	$3.35	$3.04	$6.39	$1.21	$1.09	$2.30		
568	1	113	COURT ROOM			2500	34	32CP	32W COMPACT FLUORESCENT	1156	2890	$154.90	$140.44	$295.34	LED25CAN	NEW 25W LED CAN	34	850	2125	$113.90	$103.26	$217.16	$41.00	$37.18	$78.18		
569	1	113	COURT ROOM			2500	12	A3TT8	4' 3L TROFFER W/ T8S	1116	2790	$149.54	$135.58	$285.12	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	12	468	1170	$62.71	$56.86	$119.57	$86.83	$78.72	$165.56		
570	1		PASSAGE			8760	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	1034	$55.41	$14.34	$69.74	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$24.42	$6.32	$30.73	$30.99	$8.02	$39.01		

ENHANCED LIGHTING SURVEY LOG

Project Name: **25 DELAWARE**

Months: 12

Hours: 2500 **Multipliers:** **0.0536** **10.124**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
571	1		HOLDING			1500	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32		
572	1		HOLDING			1500	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32		
573	1		JUDGE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	CP	1
574	1		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
575	1	110	JUDGE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	CP	1
576	1		CONFERENCE			1500	3	A3TT8	4' 3L TROFFER W/ T8S	279	419	$22.43	$33.90	$56.33	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	176	$9.41	$14.21	$23.62	$13.02	$19.68	$32.71	WSDS	1
577	1	102	COPY			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.91	$7.17	$15.07	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.48	$3.16	$6.64	$4.42	$4.01	$8.43	WS	1
578	1	112	TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
579	1		JANATOR			500	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
580	1		CONFERENCE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.95	$22.60	$37.55	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$6.27	$9.48	$15.75	$8.68	$13.12	$21.80	WS	1
581	1		MECHANICAL			1000	3	A2ST8	4' 2L STRIP FIXTURES W/T8S	177	177	$9.49	$21.50	$30.99	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	78	$4.18	$9.48	$13.66	$5.31	$12.03	$17.33		
582	1		HALL			5000	33	32CP	32W COMPACT FLUORESCENT	1122	5610	$300.70	$136.31	$437.01	LED25CAN	NEW 25W LED CAN	33	825	4125	$221.10	$100.23	$321.33	$79.60	$36.08	$115.68		
583	1		OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WS	1
584	1	109	CONFERENCE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.95	$22.60	$37.55	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$6.27	$9.48	$15.75	$8.68	$13.12	$21.80	WS	1
585	1	108	PASSAGE			2500	1	32CP	32W COMPACT FLUORESCENT	34	85	$4.56	$4.13	$8.69	LED25CAN	NEW 25W LED CAN	1	25	63	$3.35	$3.04	$6.39	$1.21	$1.09	$2.30	WS	1
586	1		OFFICE			2500	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	885	$47.44	$43.01	$90.44	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	390	$20.90	$18.95	$39.86	$26.53	$24.05	$50.59	CP	1
587	1	107	CONFERENCE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.95	$22.60	$37.55	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$6.27	$9.48	$15.75	$8.68	$13.12	$21.80	WS	1
588	1		HALL			4000	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	708	$37.95	$21.50	$59.45	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	312	$16.72	$9.48	$26.20	$21.23	$12.03	$33.25		
589	1		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
590	1		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
591	1		OFFICE			2000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	118	$6.32	$7.17	$13.49	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	52	$2.79	$3.16	$5.95	$3.54	$4.01	$7.55		
592	1		COURT ROOM			2500	30	32CP	32W COMPACT FLUORESCENT	1020	2550	$136.68	$123.92	$260.60	LED25CAN	NEW 25W LED CAN	30	750	1875	$100.50	$91.12	$191.62	$36.18	$32.80	$68.98		
593	1		COURT ROOM			2500	12	A3TT8	4' 3L TROFFER W/ T8S	1116	2790	$149.54	$135.58	$285.12	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	12	468	1170	$62.71	$56.86	$119.57	$86.83	$78.72	$165.56		
594	1		PASSAGE			2500	2	32CP	32W COMPACT FLUORESCENT	68	170	$9.11	$8.26	$17.37	LED25CAN	NEW 25W LED CAN	2	50	125	$6.70	$6.07	$12.77	$2.41	$2.19	$4.60		
595	1		PASSAGE			8760	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	1034	$55.41	$14.34	$69.74	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$24.42	$6.32	$30.73	$30.99	$8.02	$39.01		
596	1		HOLDING			1500	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32		
597	1		HOLDING			1500	2	A2RT8	4' 2L RECESSED FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32		
598	1		PASSAGE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.81	$14.34	$30.15	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.97	$6.32	$13.29	$8.84	$8.02	$16.86		
599	1		OFFICE			2500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	443	$23.72	$21.50	$45.22	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$10.45	$9.48	$19.93	$13.27	$12.03	$25.29	CP	1
600	1		TOILET			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78		
601	1		ROOM			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89	WS	1
602	1	103	COURT ROOM			2500	30	32CP	32W COMPACT FLUORESCENT	1020	2550	$136.68	$123.92	$260.60	LED25CAN	NEW 25W LED CAN	30	750	1875	$100.50	$91.12	$191.62	$36.18	$32.80	$68.98		
603	1	103	COURT ROOM			2500	12	A3TT8	4' 3L TROFFER W/ T8S	1116	2790	$149.54	$135.58	$285.12	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	12	468	1170	$62.71	$56.86	$119.57	$86.83	$78.72	$165.56		
604	1	103	PASSAGE			2500	4	32CP	32W COMPACT FLUORESCENT	136	340	$18.22	$16.52	$34.75	LED25CAN	NEW 25W LED CAN	4	100	250	$13.40	$12.15	$25.55	$4.82	$4.37	$9.20		
605	1		CONFERENCE			1500	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	531	$28.46	$43.01	$71.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	234	$12.54	$18.95	$31.49	$15.92	$24.05	$39.97	CP	1
606	1	101	PASSAGE			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.91	$7.17	$15.07	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.48	$3.16	$6.64	$4.42	$4.01	$8.43		
607	1	101	TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
608	1	101	TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		

ENHANCED LIGHTING SURVEY LOG

Project Name: **25 DELAWARE**

Months: 12

Hours: 2500 **Multipliers:** **0.0536** **10.124**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
609	1	100	OFFICE			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$37.39	$33.90	$71.28	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$15.68	$14.21	$29.89	$21.71	$19.68	$41.39	CP	1
610	1	100	OFFICE			2500	1	32CP	32W COMPACT FLUORESCENT	34	85	$4.56	$4.13	$8.69	LED25CAN	NEW 25W LED CAN	1	25	63	$3.35	$3.04	$6.39	$1.21	$1.09	$2.30	INCL	1
611	1	100	OFFICE			2500	3	A3TT8	4' 3L TROFFER W/ T8S	279	698	$37.39	$33.90	$71.28	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	3	117	293	$15.68	$14.21	$29.89	$21.71	$19.68	$41.39	WSDS	1
612	1		OFFICE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	CP	1
613	1		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
614	1		PASSAGE			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78		
615	G	G05	GRAND JURY			2500	12	A3TT8	4' 3L TROFFER W/ T8S	1116	2790	$149.54	$135.58	$285.12	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	12	468	1170	$62.71	$56.86	$119.57	$86.83	$78.72	$165.56	CP	1
616	G	G04	OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.81	$14.34	$30.15	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.97	$6.32	$13.29	$8.84	$8.02	$16.86		
617	G	G03	GRAND JURY			2500	12	A3TT8	4' 3L TROFFER W/ T8S	1116	2790	$149.54	$135.58	$285.12	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	12	468	1170	$62.71	$56.86	$119.57	$86.83	$78.72	$165.56	CP	1
618	G	G02	PASSAGE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.81	$14.34	$30.15	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.97	$6.32	$13.29	$8.84	$8.02	$16.86		
619	G	G02A	WITNESS			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78	WS	1
620	G		TOILET			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78		
621	G	G02B	WITNESS			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78	WS	1
622	G		HALL			4000	4	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	236	944	$50.60	$28.67	$79.27	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	416	$22.30	$12.63	$34.93	$28.30	$16.04	$44.34		
623	G		PASSAGE			8760	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	517	$27.70	$7.17	$34.87	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$12.21	$3.16	$15.37	$15.49	$4.01	$19.50		
624	G		GARAGE			1000	6	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	354	354	$18.97	$43.01	$61.98	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	156	$8.36	$18.95	$27.31	$10.61	$24.05	$34.67		
625	G		HALL			4000	14	A2TT8	4' 2L TROFFER FIXTURE W/T8S	826	3304	$177.09	$100.35	$277.44	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	14	364	1456	$78.04	$44.22	$122.26	$99.05	$56.13	$155.18		
626	G	G06	LOUNGE			3500	9	A2TT8	4' 2L TROFFER FIXTURE W/T8S	531	1859	$99.62	$64.51	$164.13	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	9	234	819	$43.90	$28.43	$72.33	$55.72	$36.08	$91.80	CP	1
627	G		MENS			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78		
628	G		WOMENS			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78		
629	G	G07	OFFICE			1000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	118	$6.32	$14.34	$20.66	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.79	$6.32	$9.10	$3.54	$8.02	$11.56		
630	G		PASSAGE			3500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	207	$11.07	$7.17	$18.24	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	91	$4.88	$3.16	$8.04	$6.19	$4.01	$10.20		
631	G		STAIRS			8760	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	1034	$55.41	$14.34	$69.74	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$24.42	$6.32	$30.73	$30.99	$8.02	$39.01		
632	G		CLERKS			2500	14	A3TT8	4' 3L TROFFER W/ T8S	1302	3255	$174.47	$158.18	$332.65	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	14	546	1365	$73.16	$66.33	$139.50	$101.30	$91.84	$193.15		
633	G		OFFICE			1500	1	A3TT8	4' 3L TROFFER W/ T8S	93	140	$7.48	$11.30	$18.78	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	59	$3.14	$4.74	$7.87	$4.34	$6.56	$10.90	WSDS	1
634	G		OFFICE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.95	$22.60	$37.55	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$6.27	$9.48	$15.75	$8.68	$13.12	$21.80	WSDS	1
635	G		ELECTRIC			500	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89	WS	1
636	G		BREAK AREA			3500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	826	$44.27	$28.67	$72.94	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	364	$19.51	$12.63	$32.15	$24.76	$16.04	$40.80	CP	1
637	G		OFFICE			2500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	590	$31.62	$28.67	$60.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$13.94	$12.63	$26.57	$17.69	$16.04	$33.72	WS	1
638	G		CLOSET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89	WS	1
639	G		OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.81	$14.34	$30.15	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.97	$6.32	$13.29	$8.84	$8.02	$16.86	WS	1
640	G		OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.81	$14.34	$30.15	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.97	$6.32	$13.29	$8.84	$8.02	$16.86	WS	1
641	G		OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.81	$14.34	$30.15	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.97	$6.32	$13.29	$8.84	$8.02	$16.86	WS	1
642	G		OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.81	$14.34	$30.15	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.97	$6.32	$13.29	$8.84	$8.02	$16.86	WS	1
643	G		CONFERENCE			1500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	354	$18.97	$28.67	$47.65	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	156	$8.36	$12.63	$21.00	$10.61	$16.04	$26.65	WS	1
644	G		HALL			4000	5	A2TT8	4' 2L TROFFER FIXTURE W/T8S	295	1180	$63.25	$35.84	$99.09	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	520	$27.87	$15.79	$43.67	$35.38	$20.05	$55.42		
645	G		TOILET			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78		
646	G		TOILET			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78		

ENHANCED LIGHTING SURVEY LOG

Project Name: **25 DELAWARE**

Months: 12

Hours: 2500 **Multipliers:** **0.0536** **10.124**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	Existing Watts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
647	G		FILES			2500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	443	$23.72	$21.50	$45.22	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	195	$10.45	$9.48	$19.93	$13.27	$12.03	$25.29	WS	1
648	G		LOBBY			8760	43	32CP	32W COMPACT FLUORESCENT	1462	12807	$686.46	$177.62	$864.08	LED25CAN	NEW 25W LED CAN	43	1075	9417	$504.75	$130.60	$635.35	$181.71	$47.02	$228.73		
649	G		SOFFITS			8760	32	18PLL	18W PLL FLUORESCENT	704	6167	$330.55	$85.53	$416.08	N1AS	INSTALL NEW 4' STRIP W/ (1) 4' LED LAMP	12	156	1367	$73.25	$18.95	$92.20	$257.31	$66.58	$323.88		
650	G		MENS			1500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	354	$18.97	$28.67	$47.65	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	156	$8.36	$12.63	$21.00	$10.61	$16.04	$26.65		
651	G		JANATOR			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78	WS	1
652	G		WOMENS			1500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	354	$18.97	$28.67	$47.65	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	156	$8.36	$12.63	$21.00	$10.61	$16.04	$26.65		
653	G		SECURITY			3500	40	32CP	32W COMPACT FLUORESCENT	1360	4760	$255.14	$165.22	$420.36	LED25CAN	NEW 25W LED CAN	40	1000	3500	$187.60	$121.49	$309.09	$67.54	$43.74	$111.27		
654	G	G00	FIRE PANEL			1000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	118	$6.32	$14.34	$20.66	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.79	$6.32	$9.10	$3.54	$8.02	$11.56	WS	1
655	G	G15	OFFICE			1000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	118	$6.32	$14.34	$20.66	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.79	$6.32	$9.10	$3.54	$8.02	$11.56	WS	1
656	G		HALL			5000	14	32CP	32W COMPACT FLUORESCENT	476	2380	$127.57	$57.83	$185.40	LED25CAN	NEW 25W LED CAN	14	350	1750	$93.80	$42.52	$136.32	$33.77	$15.31	$49.08		
657	G		ELEVATOR LOBBY			8760	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	517	$27.70	$7.17	$34.87	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$12.21	$3.16	$15.37	$15.49	$4.01	$19.50		
658	G	G11	OFFICE			1500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32	WS	1
659	G	610	MAIL			3500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	207	$11.07	$7.17	$18.24	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	91	$4.88	$3.16	$8.04	$6.19	$4.01	$10.20	WS	1
660	G	612	COMMISSIONER			2500	14	A3TT8	4' 3L TROFFER W/ T8S	1302	3255	$174.47	$158.18	$332.65	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	14	364	910	$48.78	$44.22	$93.00	$125.69	$113.96	$239.65		
661	G		OFFICE			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.81	$14.34	$30.15	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.97	$6.32	$13.29	$8.84	$8.02	$16.86	WS	1
662	G		OFFICE			2500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	590	$31.62	$28.67	$60.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$13.94	$12.63	$26.57	$17.69	$16.04	$33.72		
663	G		COPY			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$12.46	$11.30	$23.76	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	65	$3.48	$3.16	$6.64	$8.98	$8.14	$17.12	WS	1
664	G		FILES			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.81	$14.34	$30.15	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.97	$6.32	$13.29	$8.84	$8.02	$16.86	WS	1
665	G		OFFICE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	WSDS	1
666	G		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
667	G		PASSAGE			3500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	207	$11.07	$7.17	$18.24	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	91	$4.88	$3.16	$8.04	$6.19	$4.01	$10.20		
668	G	G13	ELECTRIC			500	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89	WS	1
669	G		JUROR CHECK IN			2500	47	A3TT8	4' 3L TROFFER W/ T8S	4371	10928	$585.71	$531.02	$1,116.74	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	47	1833	4583	$245.62	$222.69	$468.31	$340.09	$308.34	$648.43		
670	G		JUROR CHECK IN			2500	6	32CP	32W COMPACT FLUORESCENT	204	510	$27.34	$24.78	$52.12	LED25CAN	NEW 25W LED CAN	6	150	375	$20.10	$18.22	$38.32	$7.24	$6.56	$13.80		
671	G		VENDING			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.91	$7.17	$15.07	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.48	$3.16	$6.64	$4.42	$4.01	$8.43		
672	G		MENS			1500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	354	$18.97	$28.67	$47.65	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	156	$8.36	$12.63	$21.00	$10.61	$16.04	$26.65		
673	G		WOMENS			1500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	354	$18.97	$28.67	$47.65	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	156	$8.36	$12.63	$21.00	$10.61	$16.04	$26.65		
674	G		HALL			4000	14	A2TT8	4' 2L TROFFER FIXTURE W/T8S	826	3304	$177.09	$100.35	$277.44	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	14	364	1456	$78.04	$44.22	$122.26	$99.05	$56.13	$155.18		
675	G		OFFICE			2500	1	A3TT8	4' 3L TROFFER W/ T8S	93	233	$12.46	$11.30	$23.76	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	98	$5.23	$4.74	$9.96	$7.24	$6.56	$13.80	WSDS	1
676	G		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
677	G	1	SELECTION ROOM			3000	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	1062	$56.92	$43.01	$99.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	468	$25.08	$18.95	$44.04	$31.84	$24.05	$55.89	CP	1
678	G	2	SELECTION ROOM			3000	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	1062	$56.92	$43.01	$99.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	468	$25.08	$18.95	$44.04	$31.84	$24.05	$55.89	CP	1
679	G	3	SELECTION ROOM			3000	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	1062	$56.92	$43.01	$99.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	468	$25.08	$18.95	$44.04	$31.84	$24.05	$55.89	CP	1
680	G	4	SELECTION ROOM			3000	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	1062	$56.92	$43.01	$99.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	468	$25.08	$18.95	$44.04	$31.84	$24.05	$55.89	CP	1
681	G	5	SELECTION ROOM			3000	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	1062	$56.92	$43.01	$99.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	468	$25.08	$18.95	$44.04	$31.84	$24.05	$55.89	CP	1
682	G		PASSAGE			3500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	413	$22.14	$14.34	$36.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	182	$9.76	$6.32	$16.07	$12.38	$8.02	$20.40		
683	G		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
684	G		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		

ENHANCED LIGHTING SURVEY LOG

Project Name: **25 DELAWARE**

Months: 12

Hours: 2500 **Multipliers:** **0.0536** **10.124**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
685	G		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
686	G		CONFERENCE			1500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	177	$9.49	$14.34	$23.82	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	78	$4.18	$6.32	$10.50	$5.31	$8.02	$13.32	WS	1
687	G		HALL			4000	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	1416	$75.90	$43.01	$118.90	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	624	$33.45	$18.95	$52.40	$42.45	$24.05	$66.51		
688	G		OFFICE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19		
689	G		OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59		
690	G		OFFICE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19		
691	G		LOUNGE			3500	9	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	531	1859	$99.62	$64.51	$164.13	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	9	234	819	$43.90	$28.43	$72.33	$55.72	$36.08	$91.80	CP	1
692	G		STORAGE			3500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	413	$22.14	$14.34	$36.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	182	$9.76	$6.32	$16.07	$12.38	$8.02	$20.40	WS	1
693	G		STORAGE			3500	2	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	118	413	$22.14	$14.34	$36.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	182	$9.76	$6.32	$16.07	$12.38	$8.02	$20.40	WS	1
694	B		ELEVATOR MACHINE			500	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89	WS	1
695	B		GENERATOR			8760	5	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	295	2584	$138.51	$35.84	$174.35	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	1139	$61.04	$15.79	$76.83	$77.47	$20.05	$97.52		
696	B		CAGE			8760	18	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	1062	9303	$498.65	$129.02	$627.67	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	18	468	4100	$219.74	$56.86	$276.60	$278.90	$72.16	$351.07		
697	B		MECHANICAL			8760	8	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	472	4135	$221.62	$57.34	$278.96	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	1822	$97.66	$25.27	$122.93	$123.96	$32.07	$156.03		
698	B		STAIRS			8760	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	517	$27.70	$7.17	$34.87	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$12.21	$3.16	$15.37	$15.49	$4.01	$19.50		
699	B		HALL			8760	8	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	472	4135	$221.62	$57.34	$278.96	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	1822	$97.66	$25.27	$122.93	$123.96	$32.07	$156.03		
700	B		BREAK AREA			8760	5	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	295	2584	$138.51	$35.84	$174.35	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	1139	$61.04	$15.79	$76.83	$77.47	$20.05	$97.52		
701	B		JANATOR			1000	1	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78	WS	1
702	B		CAGE			8760	6	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	354	3101	$166.22	$43.01	$209.22	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	1367	$73.25	$18.95	$92.20	$92.97	$24.05	$117.02		
703	B		BREAK AREA			8760	5	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	295	2584	$138.51	$35.84	$174.35	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	1139	$61.04	$15.79	$76.83	$77.47	$20.05	$97.52		
704	B		OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	130	$6.97	$6.32	$13.29	$17.96	$16.28	$34.24	WS	1
705	B		CLOSET			2500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	148	$7.91	$7.17	$15.07	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.48	$3.16	$6.64	$4.42	$4.01	$8.43	WS	1
706	B		MENS LOCKER			8760	5	A2TT8	4' 2L TROFFER FIXTURE W/T8S	295	2584	$138.51	$35.84	$174.35	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	1139	$61.04	$15.79	$76.83	$77.47	$20.05	$97.52		
707	B		MENS LOCKER			8760	4	A3TT8	4' 3L TROFFER W/ T8S	372	3259	$174.67	$45.19	$219.86	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	4	104	911	$48.83	$12.63	$61.47	$125.84	$32.56	$158.39		
708	B		WOMENS LOCKER			8760	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	3101	$166.22	$43.01	$209.22	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	1367	$73.25	$18.95	$92.20	$92.97	$24.05	$117.02		
709	B		WOMENS LOCKER			8760	1	2-32CP	(2) 32W COMPACT FLUORESCENT	68	596	$31.93	$8.26	$40.19	LED25CAN	NEW 25W LED CAN	1	25	219	$11.74	$3.04	$14.78	$20.19	$5.22	$25.41		
710	B		BREAK AREA			3500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	826	$44.27	$28.67	$72.94	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	364	$19.51	$12.63	$32.15	$24.76	$16.04	$40.80	WS	1
711	B		ELEVATOR LOBBY			8760	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	517	$27.70	$7.17	$34.87	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$12.21	$3.16	$15.37	$15.49	$4.01	$19.50	WS	1
712	B		HALL			8760	6	A2TT8	4' 2L TROFFER FIXTURE W/T8S	354	3101	$166.22	$43.01	$209.22	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	1367	$73.25	$18.95	$92.20	$92.97	$24.05	$117.02		
713	B		SERVER			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$15.81	$14.34	$30.15	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$6.97	$6.32	$13.29	$8.84	$8.02	$16.86	CP	1
714	B		OFFICE			2500	2	A3TT8	4' 3L TROFFER W/ T8S	186	465	$24.92	$22.60	$47.52	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	195	$10.45	$9.48	$19.93	$14.47	$13.12	$27.59	WSDS	1
715	B		CONTROL			5000	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	885	$47.44	$21.50	$68.94	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	390	$20.90	$9.48	$30.38	$26.53	$12.03	$38.56		
716	B		PASSAGE			8760	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	517	$27.70	$7.17	$34.87	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$12.21	$3.16	$15.37	$15.49	$4.01	$19.50		
717	B		OFFICE			1000	1	A3TT8	4' 3L TROFFER W/ T8S	93	93	$4.98	$11.30	$16.28	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	26	$1.39	$3.16	$4.55	$3.59	$8.14	$11.73	WS	1
718	B		ELEVATOR LOBBY			3500	25	32CP	32W COMPACT FLUORESCENT	850	2975	$159.46	$103.26	$262.72	LED25CAN	NEW 25W LED CAN	25	625	2188	$117.25	$75.93	$193.18	$42.21	$27.33	$69.54		
719	B		MENS			1500	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	266	$14.23	$21.50	$35.73	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	117	$6.27	$9.48	$15.75	$7.96	$12.03	$19.99		
720	B		WOMENS			1500	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	354	$18.97	$28.67	$47.65	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	156	$8.36	$12.63	$21.00	$10.61	$16.04	$26.65		
721	B		HALL			4000	7	A2TT8	4' 2L TROFFER FIXTURE W/T8S	413	1652	$88.55	$50.17	$138.72	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	7	182	728	$39.02	$22.11	$61.13	$49.53	$28.06	$77.59		
722	B		CONFERENCE			1500	6	A3TT8	4' 3L TROFFER W/ T8S	558	837	$44.86	$67.79	$112.65	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	6	234	351	$18.81	$28.43	$47.24	$26.05	$39.36	$65.41	WSDS	1

ENHANCED LIGHTING SURVEY LOG

Project Name: **25 DELAWARE**

Months: 12

Hours: 2500 **Multipliers:** **0.0536** **10.124**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	Existing Watts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
723	B		PASSAGE			3500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	207	$11.07	$7.17	$18.24	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	91	$4.88	$3.16	$8.04	$6.19	$4.01	$10.20		
724	B		CONFERENCE			1000	6	A3TT8	4' 3L TROFFER W/ T8S	558	558	$29.91	$67.79	$97.70	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	6	234	234	$12.54	$28.43	$40.97	$17.37	$39.36	$56.73	WSDS	1
725	B		TOILET			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78	WS	1
726	B		TOILET			1000	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	59	$3.16	$7.17	$10.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.39	$3.16	$4.55	$1.77	$4.01	$5.78	WS	1
727	B		JUDGE			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$49.85	$45.19	$95.04	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$20.90	$18.95	$39.86	$28.94	$26.24	$55.19	CP	1
728	B		JUDGE			2500	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	150	$8.04	$7.29	$15.33	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	45	$2.41	$2.19	$4.60	$5.63	$5.10	$10.73	INCL	1
729	B		TOILET			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89		
730	B		STAIRS			8760	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	517	$27.70	$7.17	$34.87	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$12.21	$3.16	$15.37	$15.49	$4.01	$19.50		
731	B		ELECTRIC			500	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	30	$1.58	$7.17	$8.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.70	$3.16	$3.86	$0.88	$4.01	$4.89	WS	1
732	B		HALL			4000	4	A2TT8	4' 2L TROFFER FIXTURE W/T8S	236	944	$50.60	$28.67	$79.27	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	416	$22.30	$12.63	$34.93	$28.30	$16.04	$44.34		
733	B		HALL			4000	4	A2RT8	4' 2L RECESSED FIXTURE W/T8S	236	944	$50.60	$28.67	$79.27	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	416	$22.30	$12.63	$34.93	$28.30	$16.04	$44.34		
734	B		PASSAGE			8760	2	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	118	1034	$55.41	$14.34	$69.74	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$24.42	$6.32	$30.73	$30.99	$8.02	$39.01		
735	B		STORAGE			8760	6	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	354	3101	$166.22	$43.01	$209.22	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	1367	$73.25	$18.95	$92.20	$92.97	$24.05	$117.02	WS	1
736	B		SERVER			1000	3	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	177	177	$9.49	$21.50	$30.99	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	78	$4.18	$9.48	$13.66	$5.31	$12.03	$17.33		
737	B		ROOM			500	4	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	236	118	$6.32	$28.67	$35.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	52	$2.79	$12.63	$15.42	$3.54	$16.04	$19.57	WS	1
738	B		COURT ROOM			2500	50	32CP	32W COMPACT FLUORESCENT	1700	4250	$227.80	$206.53	$434.33	LED25CAN	NEW 25W LED CAN	50	1250	3125	$167.50	$151.86	$319.36	$60.30	$54.67	$114.97		
739	B		COURT ROOM			2500	20	A3TT8	4' 3L TROFFER W/ T8S	1860	4650	$249.24	$225.97	$475.21	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	20	780	1950	$104.52	$94.76	$199.28	$144.72	$131.21	$275.93		
740	B		CONFERENCE			1500	6	32CP	32W COMPACT FLUORESCENT	204	306	$16.40	$24.78	$41.19	LED25CAN	NEW 25W LED CAN	6	150	225	$12.06	$18.22	$30.28	$4.34	$6.56	$10.90		
741	ALL		STAIRS			8760	44	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	2596	22741	$1,218.92	$315.38	$1,534.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	44	1144	10021	$537.15	$138.98	$676.13	$681.77	$176.40	$858.17		
742	ALL		STAIRS			8760	16	A2TT8	4' 2L TROFFER FIXTURE W/T8S	944	8269	$443.24	$114.68	$557.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	16	416	3644	$195.33	$50.54	$245.87	$247.92	$64.15	$312.06		
743			MISC FIXTURES			2500	40	32CP	32W COMPACT FLUORESCENT	1360	3400	$182.24	$165.22	$347.46	LED25CAN	NEW 25W LED CAN	40	1000	2500	$134.00	$121.49	$255.49	$48.24	$43.74	$91.98		
744			MISC FIXTURES			2500	40	A3TT8	4' 3L TROFFER W/ T8S	3720	9300	$498.48	$451.94	$950.42	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	40	1560	3900	$209.04	$189.52	$398.56	$289.44	$262.41	$551.85		
745			MISC FIXTURES			2500	40	A2TT8	4' 2L TROFFER FIXTURE W/T8S	2360	5900	$316.24	$286.71	$602.95	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	40	1040	2600	$139.36	$126.35	$265.71	$176.88	$160.36	$337.24		
746			MISC FIXTURES			2500	20	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	1180	2950	$158.12	$143.36	$301.48	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	20	520	1300	$69.68	$63.17	$132.85	$88.44	$80.18	$168.62		
							4,010.00	**Totals:**		228538	713060	$38,220.04	$27,764.62	$65,984.66			3,906.00	111637	352174	$18,877	$13,563	$32,439	$19,343	$14,202	$33,546		362
										KW	229							**KW**	112								

ENHANCED LIGHTING SURVEY LOG

Project Name: CHESTNUT RIDGE

Months: 12

Hours: 2500

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	Existing Watts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
																							Multipliers:	0.055	10.2	
1	2		BUNKER																							
2	2		STORAGE			2000	2	A1ST8	4' 1L STRIP FIXTURE W/ 32W T8'S	64	128	$7.04	$7.83	$14.87	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	52	$2.86	$3.18	$6.04	$4.18	$4.65	$8.83	
3	2		STORAGE			500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	59	$3.25	$14.44	$17.69	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.43	$6.36	$7.79	$1.82	$8.08	$9.89	
4	2		OFFICE			1000	4	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	236	236	$12.98	$28.89	$41.87	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	104	$5.72	$12.73	$18.45	$7.26	$16.16	$23.42	
5	2		OFFICE			1000	12	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	708	708	$38.94	$86.66	$125.60	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	12	312	312	$17.16	$38.19	$55.35	$21.78	$48.47	$70.25	ESTIMATE NO ACCESS
6	2		FILES			2000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	236	$12.98	$14.44	$27.42	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	104	$5.72	$6.36	$12.08	$7.26	$8.08	$15.34	
7	2		STORAGE			1000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	118	$6.49	$14.44	$20.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.86	$6.36	$9.22	$3.63	$8.08	$11.71	ESTIMATE NO ACCESS
8	2		OFFICE			2000	3	A2TT8	4' 2L TROFFER FIXTURE W/T8S	177	354	$19.47	$21.66	$41.13	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	156	$8.58	$9.55	$18.13	$10.89	$12.12	$23.01	
9	2		ROOF ACCESS			500	1	23CP	23W COMPACT FLUORESCENT	25	13	$0.69	$3.06	$3.75	LED9SI	NEW 9W LED SCREW IN	1	9	5	$0.25	$1.10	$1.35	$0.44	$1.96	$2.40	
10	2		STORAGE			1000	4	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	236	236	$12.98	$28.89	$41.87	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	104	$5.72	$12.73	$18.45	$7.26	$16.16	$23.42	ESTIMATE NO ACCESS
11	2		SERVER			1000	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	118	$6.49	$14.44	$20.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.86	$6.36	$9.22	$3.63	$8.08	$11.71	
12	2		STORAGE			1000	4	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	236	236	$12.98	$28.89	$41.87	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	104	$5.72	$12.73	$18.45	$7.26	$16.16	$23.42	
13	2		STORAGE			1000	6	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	354	354	$19.47	$43.33	$62.80	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	156	$8.58	$19.09	$27.67	$10.89	$24.24	$35.13	
14	2		STORAGE			1000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	118	$6.49	$14.44	$20.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.86	$6.36	$9.22	$3.63	$8.08	$11.71	
15	2		STORAGE			1000	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	118	$6.49	$14.44	$20.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.86	$6.36	$9.22	$3.63	$8.08	$11.71	
16	2		SNOW MOBILES			1000	4	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	236	236	$12.98	$28.89	$41.87	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	104	$5.72	$12.73	$18.45	$7.26	$16.16	$23.42	
17	2		STORAGE			1000	8	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	472	472	$25.96	$57.77	$83.73	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	208	$11.44	$25.46	$36.90	$14.52	$32.31	$46.83	
18	2		CONFERENCE			1000	4	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	236	236	$12.98	$28.89	$41.87	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	104	$5.72	$12.73	$18.45	$7.26	$16.16	$23.42	ESTIMATE NO ACCESS
19	2		OFFICE			1500	8	A4WT8	4' 4L WRAP FIXTURE W/ 32W T8'S	896	1344	$73.92	$109.67	$183.59	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	8	416	624	$34.32	$50.92	$85.24	$39.60	$58.75	$98.35	
20	2		PASSAGE			8760	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	1034	$56.85	$14.44	$71.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$25.05	$6.36	$31.42	$31.80	$8.08	$39.88	
21	2		FILES			2000	2	A3TT8	4' 3L TROFFER W/ T8S	186	372	$20.46	$22.77	$43.23	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	104	$5.72	$6.36	$12.08	$14.74	$16.40	$31.14	
22	2		PASSAGE			8760	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	517	$28.43	$7.22	$35.65	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$12.53	$3.18	$15.71	$15.90	$4.04	$19.94	
23	2		TUNNEL			8760	3	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	177	1551	$85.28	$21.66	$106.94	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	683	$37.58	$9.55	$47.13	$47.70	$12.12	$59.82	
24	2		TUNNEL			8760	1	A1WT8	4' 1L WRAP FIXTURE W/ 32W T8'S	32	280	$15.42	$3.92	$19.33	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	114	$6.26	$1.59	$7.85	$9.15	$2.33	$11.48	
25	2		TOILET			8760	2	A1WT8	4' 1L WRAP FIXTURE W/ 32W T8'S	64	561	$30.84	$7.83	$38.67	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	2	26	228	$12.53	$3.18	$15.71	$18.31	$4.65	$22.96	
26	2		SLOP SINK			1000	1	15CP	15W COMPACT FLUORESCENT	17	17	$0.94	$2.08	$3.02	LED9SI	NEW 9W LED SCREW IN	1	9	9	$0.50	$1.10	$1.60	$0.44	$0.98	$1.42	
27	2		MENS			3500	1	A1ST8	4' 1L STRIP FIXTURE W/ 32W T8'S	32	112	$6.16	$3.92	$10.08	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	46	$2.50	$1.59	$4.09	$3.66	$2.33	$5.98	
28	2		EVIDENCE			2500	16	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	944	2360	$129.80	$115.55	$245.35	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	16	416	1040	$57.20	$50.92	$108.12	$72.60	$64.63	$137.23	
29	2		EVIDENCE			2500	10	A2TT8	4' 2L TROFFER FIXTURE W/T8S	590	1475	$81.13	$72.22	$153.34	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	10	260	650	$35.75	$31.82	$67.57	$45.38	$40.39	$85.77	
30	2		ELECTRIC			1000	6	A1WT8	4' 1L WRAP FIXTURE W/ 32W T8'S	192	192	$10.56	$23.50	$34.06	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	6	78	78	$4.29	$9.55	$13.84	$6.27	$13.95	$20.22	
31	2		PASSAGE			3500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	413	$22.72	$14.44	$37.16	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	182	$10.01	$6.36	$16.37	$12.71	$8.08	$20.78	
32	2		COPY			3500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	207	$11.36	$7.22	$18.58	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	91	$5.01	$3.18	$8.19	$6.35	$4.04	$10.39	
33	2		STORAGE			1000	8	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	472	472	$25.96	$57.77	$83.73	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	208	$11.44	$25.46	$36.90	$14.52	$32.31	$46.83	ESTIMATE NO ACCESS
34	2		HALL			8760	24	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	1416	12404	$682.23	$173.32	$855.55	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	24	624	5466	$300.64	$76.38	$377.02	$381.59	$96.94	$478.53	
35			STAIRS			8760	5	I60	60W INCANDESCENT	300	2628	$144.54	$36.72	$181.26	LED9SI	NEW 9W LED SCREW IN	5	45	394	$21.68	$5.51	$27.19	$122.86	$31.21	$154.07	
36	1		CLOSET			500	2	I60	60W INCANDESCENT	120	60	$3.30	$14.69	$17.99	LED9SI	NEW 9W LED SCREW IN	2	18	9	$0.50	$2.20	$2.70	$2.81	$12.48	$15.29	
37			DARK ROOM			500	3	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	177	89	$4.87	$21.66	$26.53	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	39	$2.15	$9.55	$11.69	$2.72	$12.12	$14.84	
38			FITNESS			1000	4	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	236	236	$12.98	$28.89	$41.87	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	104	$5.72	$12.73	$18.45	$7.26	$16.16	$23.42	
39			OFFICE			3500	9	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	531	1859	$102.22	$64.99	$167.21	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	9	234	819	$45.05	$28.64	$73.69	$57.17	$36.35	$93.53	
40			MENS LOCKER			3500	6	A1WT8	4' 1L WRAP FIXTURE W/ 32W T8'S	192	672	$36.96	$23.50	$60.46	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	6	78	273	$15.02	$9.55	$24.56	$21.95	$13.95	$35.90	
41			SLOP SINK			500	1	15CP	15W COMPACT FLUORESCENT	17	9	$0.47	$2.08	$2.55	LED9SI	NEW 9W LED SCREW IN	1	9	5	$0.25	$1.10	$1.35	$0.22	$0.98	$1.20	
42			CLOSET			500	1	15CP	15W COMPACT FLUORESCENT	17	9	$0.47	$2.08	$2.55	LED9SI	NEW 9W LED SCREW IN	1	9	5	$0.25	$1.10	$1.35	$0.22	$0.98	$1.20	BY STAIRS
43			PASSAGE			8760	1	A2ST8	4' 2L STRIP FIXTURES W/T8S	59	517	$28.43	$7.22	$35.65	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$12.53	$3.18	$15.71	$15.90	$4.04	$19.94	

ENHANCED LIGHTING SURVEY LOG

Project Name: CHESTNUT RIDGE

Months: 12

Hours: 2500

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	Existing Watts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
																							Multipliers:	0.055	10.2	
44			TOILET			3500	3	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	177	620	$34.07	$21.66	$55.74	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	273	$15.02	$9.55	$24.56	$19.06	$12.12	$31.18	
45			DRUGS			500	4	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	236	118	$6.49	$28.89	$35.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	52	$2.86	$12.73	$15.59	$3.63	$16.16	$19.79	ESTIMATE NO ACCESS
46			OPEN AREA			3500	21	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	1239	4337	$238.51	$151.65	$390.16	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	21	546	1911	$105.11	$66.83	$171.94	$133.40	$84.82	$218.23	
47			WEAPONS			500	2	A4TT8	4' 4L RECESSED TROFFER W/T8S	224	112	$6.16	$27.42	$33.58	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	26	$1.43	$6.36	$7.79	$4.73	$21.05	$25.78	
48			ARMORY			1000	11	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	649	649	$35.70	$79.44	$115.13	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	11	286	286	$15.73	$35.01	$50.74	$19.97	$44.43	$64.40	
49			BOILER			3500	6	A2ST8	4' 2L STRIP FIXTURES W/T8S	354	1239	$68.15	$43.33	$111.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	546	$30.03	$19.09	$49.12	$38.12	$24.24	$62.35	
50			BOILER			3500	1	B4S4T8	8' 4L STRIP FIXTURE W/T8 (4' TUBES)	112	392	$21.56	$13.71	$35.27	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	1	52	182	$10.01	$6.36	$16.37	$11.55	$7.34	$18.89	
51			BOILER			3500	3	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	177	620	$34.07	$21.66	$55.74	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	273	$15.02	$9.55	$24.56	$19.06	$12.12	$31.18	
52			BOMB ROOM			1000	2	A4WT8	4' 4L WRAP FIXTURE W/ 32W T8'S	224	224	$12.32	$27.42	$39.74	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	2	104	104	$5.72	$12.73	$18.45	$6.60	$14.69	$21.29	
53			PASSAGE			8760	1	A1WT8	4' 1L WRAP FIXTURE W/ 32W T8'S	32	280	$15.42	$3.92	$19.33	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	114	$6.26	$1.59	$7.85	$9.15	$2.33	$11.48	
54			OFFICE			2500	9	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	531	1328	$73.01	$64.99	$138.01	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	9	234	585	$32.18	$28.64	$60.82	$40.84	$36.35	$77.19	
55			CLOSET			500	1	A1WT8	4' 1L WRAP FIXTURE W/ 32W T8'S	32	16	$0.88	$3.92	$4.80	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	7	$0.36	$1.59	$1.95	$0.52	$2.33	$2.85	ESTIMATE NO ACCESS
56			FILES			2500	5	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	295	738	$40.56	$36.11	$76.67	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	325	$17.88	$15.91	$33.79	$22.69	$20.20	$42.88	
57			HALL			8760	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	517	$28.43	$7.22	$35.65	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$12.53	$3.18	$15.71	$15.90	$4.04	$19.94	
58			ENTRANCE			8760	1	I60	60W INCANDESCENT	60	526	$28.91	$7.34	$36.25	NDR	INSTALL LED DRUM FIX.	1	15	131	$7.23	$1.84	$9.06	$21.68	$5.51	$27.19	
59			HALL			8760	6	A1WT8	4' 1L WRAP FIXTURE W/ 32W T8'S	192	1682	$92.51	$23.50	$116.01	NAW	REMOVE (1) FIX. & INSTALL NEW 4 LED' WRAP FIX.	6	216	1892	$104.07	$26.44	$130.51	-$11.56	-$2.94	-$14.50	
60			MISC FIXTURES			2500	6	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	354	885	$48.68	$43.33	$92.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	390	$21.45	$19.09	$40.54	$27.23	$24.24	$51.46	
61			MISC FIXTURES			2500	4	A1WT8	4' 1L WRAP FIXTURE W/ 32W T8'S	128	320	$17.60	$15.67	$33.27	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	4	52	130	$7.15	$6.36	$13.51	$10.45	$9.30	$19.75	
62			GARAGE			500	6	A2I	4' 2L INDUSTRIAL SHADE	432	216	$11.88	$52.88	$64.76	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	78	$4.29	$19.09	$23.38	$7.59	$33.78	$41.37	T12
63			GARAGE			1000	6	A2I	4' 2L INDUSTRIAL SHADE	432	432	$23.76	$52.88	$76.64	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	156	$8.58	$19.09	$27.67	$15.18	$33.78	$48.96	T12
64			STORAGE			1000	1	A2VTT8	4' 2L VAPOR TIGHT W/ T8 LAMPS	59	59	$3.25	$7.22	$10.47	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.43	$3.18	$4.61	$1.82	$4.04	$5.85	
65			STORAGE			1000	3	A2I	4' 2L INDUSTRIAL SHADE	216	216	$11.88	$26.44	$38.32	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	3	78	78	$4.29	$9.55	$13.84	$7.59	$16.89	$24.48	
66			CASINO			2500																				
67	1		OPEN AREA			3000	17	4-42CP	4-42W COMPACT FLUORESCENT	3264	9792	$538.56	$399.51	$938.07	LED60R	INSTALL 60W RETROFIT KIT	17	1020	3060	$168.30	$124.85	$293.15	$370.26	$274.67	$644.93	
68	1		OPEN AREA			8760	2	MH250	250W METAL HALIDE	590	5168	$284.26	$72.22	$356.48	LED90LB	INSTALL 90W LED LOW BAY	2	180	1577	$86.72	$22.03	$108.76	$197.54	$50.18	$247.72	
69	1		OPEN AREA			2500	5	MH250	250W METAL HALIDE	1475	3688	$202.81	$180.54	$383.35	LED90LB	INSTALL 90W LED LOW BAY	5	450	1125	$61.88	$55.08	$116.96	$140.94	$125.46	$266.40	
70	1		ENTRANCE			2000	1	A2W	4' 2L WRAP FIXTURE	72	144	$7.92	$8.81	$16.73	NAW	REMOVE (1) FIX. & INSTALL NEW 4 LED' WRAP FIX.	1	36	72	$3.96	$4.41	$8.37	$3.96	$4.41	$8.37	
71	1		MENS			2500	8	A2W	4' 2L WRAP FIXTURE	576	1440	$79.20	$70.50	$149.70	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	8	208	520	$28.60	$25.46	$54.06	$50.60	$45.04	$95.64	
72	1		WOMENS			2500	6	A2W	4' 2L WRAP FIXTURE	432	1080	$59.40	$52.88	$112.28	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	390	$21.45	$19.09	$40.54	$37.95	$33.78	$71.73	
73	1		DINING			2500	12	A2BT8	4' 2L BOX FIXTURE W/T8S	708	1770	$97.35	$86.66	$184.01	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	12	312	780	$42.90	$38.19	$81.09	$54.45	$48.47	$102.92	
74	1		DINING			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$8.11	$7.22	$15.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.58	$3.18	$6.76	$4.54	$4.04	$8.58	
75	1		DINING			2500	1	23CP	23W COMPACT FLUORESCENT	25	63	$3.44	$3.06	$6.50	LED9SI	NEW 9W LED SCREW IN	1	9	23	$1.24	$1.10	$2.34	$2.20	$1.96	$4.16	
76	1		KITCHEN			1500	7	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	413	620	$34.07	$50.55	$84.62	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	7	182	273	$15.02	$22.28	$37.29	$19.06	$28.27	$47.33	
77	1		KITCHEN			1500	1	I60	60W INCANDESCENT	60	90	$4.95	$7.34	$12.29	NDW	REMOVE (1) FIX. & INSTALL NEW 2' LED FIX.	1	22	33	$1.82	$2.69	$4.51	$3.14	$4.65	$7.79	
78	1		STAIRS			2500	1	I60	60W INCANDESCENT	60	150	$8.25	$7.34	$15.59	NDW	REMOVE (1) FIX. & INSTALL NEW 2' LED FIX.	1	22	55	$3.03	$2.69	$5.72	$5.23	$4.65	$9.88	
79	B		HALL			1000	1	I60	60W INCANDESCENT	60	60	$3.30	$7.34	$10.64	NDW	REMOVE (1) FIX. & INSTALL NEW 2' LED FIX.	1	22	22	$1.21	$2.69	$3.90	$2.09	$4.65	$6.74	
80			STORAGE			1000	3	I60	60W INCANDESCENT	180	180	$9.90	$22.03	$31.93	NDW	REMOVE (1) FIX. & INSTALL NEW 2' LED FIX.	3	66	66	$3.63	$8.08	$11.71	$6.27	$13.95	$20.22	
81			BOILER			1000	5	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	295	295	$16.23	$36.11	$52.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	5	130	130	$7.15	$15.91	$23.06	$9.08	$20.20	$29.27	
82			STORAGE			500	1	I60	60W INCANDESCENT	60	30	$1.65	$7.34	$8.99	LED9SI	NEW 9W LED SCREW IN	1	9	5	$0.25	$1.10	$1.35	$1.40	$6.24	$7.64	
83			TUNNEL			500	11	I60	60W INCANDESCENT	660	330	$18.15	$80.78	$98.93	LED9SI	NEW 9W LED SCREW IN	11	99	50	$2.72	$12.12	$14.84	$15.43	$68.67	$84.09	
84			MACKINNON LODGE																							
85			OPEN AREA			1500	20	A2W	4' 2L WRAP FIXTURE	1440	2160	$118.80	$176.26	$295.06	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	20	520	780	$42.90	$63.65	$106.55	$75.90	$112.61	$188.51	
86			WOMENS			2500	6	A2W	4' 2L WRAP FIXTURE	432	1080	$59.40	$52.88	$112.28	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	390	$21.45	$19.09	$40.54	$37.95	$33.78	$71.73	

ENHANCED LIGHTING SURVEY LOG

Project Name: CHESTNUT RIDGE

Months: 12

Hours: 2500

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	ProposedWatts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
																							Multipliers:	0.055	10.2	
87			STORAGE			500	1	I60	60W INCANDESCENT	60	30	$1.65	$7.34	$8.99	LED9SI	NEW 9W LED SCREW IN	1	9	5	$0.25	$1.10	$1.35	$1.40	$6.24	$7.64	
88			ATTIC			500	4	I60	60W INCANDESCENT	240	120	$6.60	$29.38	$35.98	LED9SI	NEW 9W LED SCREW IN	4	36	18	$0.99	$4.41	$5.40	$5.61	$24.97	$30.58	
89			MENS			2500	6	A2W	4' 2L WRAP FIXTURE	432	1080	$59.40	$52.88	$112.28	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	390	$21.45	$19.09	$40.54	$37.95	$33.78	$71.73	
90			MARTIN LODGE			2500																				
91			OPEN AREA			1500	28	A2W	4' 2L WRAP FIXTURE	2016	3024	$166.32	$246.76	$413.08	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	28	728	1092	$60.06	$89.11	$149.17	$106.26	$157.65	$263.91	
92			WOMENS			2500	4	A2W	4' 2L WRAP FIXTURE	288	720	$39.60	$35.25	$74.85	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$14.30	$12.73	$27.03	$25.30	$22.52	$47.82	
93			STORAGE			500	2	A2W	4' 2L WRAP FIXTURE	144	72	$3.96	$17.63	$21.59	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	26	$1.43	$6.36	$7.79	$2.53	$11.26	$13.79	
94			MENS			2500	4	A2W	4' 2L WRAP FIXTURE	288	720	$39.60	$35.25	$74.85	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	260	$14.30	$12.73	$27.03	$25.30	$22.52	$47.82	
95			BOILER			500	4	A2W	4' 2L WRAP FIXTURE	288	144	$7.92	$35.25	$43.17	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	52	$2.86	$12.73	$15.59	$5.06	$22.52	$27.58	
96			LITTLE BARN			500	6	A2I	4' 2L INDUSTRIAL SHADE	432	216	$11.88	$52.88	$64.76	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	78	$4.29	$19.09	$23.38	$7.59	$33.78	$41.37	ESTIMATE NO ACCESS
97			MAINTENANCE BUILDING			3500	8	A2I	4' 2L INDUSTRIAL SHADE	576	2016	$110.88	$70.50	$181.38	N2BWW	REMOVE (1) FIX. & INSTALL NEW 8' WIDE WRAP W/ (2) 4 ' LED LAMPS	4	104	364	$20.02	$12.73	$32.75	$90.86	$57.77	$148.63	
98			BREAK AREA			3500	16	A2I	4' 2L INDUSTRIAL SHADE	1152	4032	$221.76	$141.00	$362.76	N2BWW	REMOVE (1) FIX. & INSTALL NEW 8' WIDE WRAP W/ (2) 4 ' LED LAMPS	16	416	1456	$80.08	$50.92	$131.00	$141.68	$90.09	$231.77	
99			BOILER			1000	2	A2I	4' 2L INDUSTRIAL SHADE	144	144	$7.92	$17.63	$25.55	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.86	$6.36	$9.22	$5.06	$11.26	$16.32	
100			GARAGE			3500	30	A2I	4' 2L INDUSTRIAL SHADE	2160	7560	$415.80	$264.38	$680.18	NBI	REMOVE FIX. & INSTALL NEW 8' LED INDUSTRIAL	15	780	2730	$150.15	$95.47	$245.62	$265.65	$168.91	$434.56	
101			TASK			1000	2	A2I	4' 2L INDUSTRIAL SHADE	144	144	$7.92	$17.63	$25.55	NBI	REMOVE FIX. & INSTALL NEW 8' LED INDUSTRIAL	2	104	104	$5.72	$12.73	$18.45	$2.20	$4.90	$7.10	
102			STORAGE			500	3	I100	100W INCANDESCENT	300	150	$8.25	$36.72	$44.97	LED9SI	NEW 9W LED SCREW IN	3	27	14	$0.74	$3.30	$4.05	$7.51	$33.42	$40.92	
103			GARAGE			3500	2	A2I	4' 2L INDUSTRIAL SHADE	144	504	$27.72	$17.63	$45.35	NBI	REMOVE FIX. & INSTALL NEW 8' LED INDUSTRIAL	1	52	182	$10.01	$6.36	$16.37	$17.71	$11.26	$28.97	
104			GARAGE			3500	1	A2I	4' 2L INDUSTRIAL SHADE	72	252	$13.86	$8.81	$22.67	NAI	REMOVE FIX. & INSTALL NEW 4 LED' INDUSTRIAL	1	36	126	$6.93	$4.41	$11.34	$6.93	$4.41	$11.34	
105			SECRETARY			2500	6	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	354	885	$48.68	$43.33	$92.00	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	390	$21.45	$19.09	$40.54	$27.23	$24.24	$51.46	
106			OFFICE			2500	2	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	118	295	$16.23	$14.44	$30.67	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$7.15	$6.36	$13.51	$9.08	$8.08	$17.15	
107			TOILET			2500	1	I60	60W INCANDESCENT	60	150	$8.25	$7.34	$15.59	NDR	INSTALL LED DRUM FIX.	1	15	38	$2.06	$1.84	$3.90	$6.19	$5.51	$11.70	
108			SUPPLY			2500	2	A2I	4' 2L INDUSTRIAL SHADE	144	360	$19.80	$17.63	$37.43	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$7.15	$6.36	$13.51	$12.65	$11.26	$23.91	
109			LITTLE BARN			500	6	A2I	4' 2L INDUSTRIAL SHADE	432	216	$11.88	$52.88	$64.76	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	6	156	78	$4.29	$19.09	$23.38	$7.59	$33.78	$41.37	ESTIMATE NO ACCESS
110			MECHANICS BUILDING			2500																				
111			GARAGE			4500	6	A2I	4' 2L INDUSTRIAL SHADE	432	1944	$106.92	$52.88	$159.80	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	6	156	702	$38.61	$19.09	$57.70	$68.31	$33.78	$102.09	
112			GARAGE			4500	2	B2I	8' 2L INDUSTRIAL SHADE SLIM LINE LAMPS	246	1107	$60.89	$30.11	$91.00	RR4AB	RETRO (1) FIX. W/ (4) 4' LED LAMPS RELOCATION KIT	2	128	576	$31.68	$15.67	$47.35	$29.21	$14.44	$43.65	
113			GARAGE			4500	25	A2I	4' 2L INDUSTRIAL SHADE	1800	8100	$445.50	$220.32	$665.82	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	25	650	2925	$160.88	$79.56	$240.44	$284.63	$140.76	$425.39	
114			TASK			1000	2	A2I	4' 2L INDUSTRIAL SHADE	144	144	$7.92	$17.63	$25.55	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.86	$6.36	$9.22	$5.06	$11.26	$16.32	
115			MENS			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$8.11	$7.22	$15.33	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.58	$3.18	$6.76	$4.54	$4.04	$8.58	
116			PASSAGE			4500	1	A2I	4' 2L INDUSTRIAL SHADE	72	324	$17.82	$8.81	$26.63	N1AWW	REMOVE (1) FIX. & INSTALL NEW 4' WIDE WRAP W/ (1) 4' LED LAMP	1	16	72	$3.96	$1.96	$5.92	$13.86	$6.85	$20.71	
117			OFFICE			4500	2	A2I	4' 2L INDUSTRIAL SHADE	144	648	$35.64	$17.63	$53.27	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	234	$12.87	$6.36	$19.23	$22.77	$11.26	$34.03	
118			GARAGE			1500	19	A2I	4' 2L INDUSTRIAL SHADE	1368	2052	$112.86	$167.44	$280.30	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	19	494	741	$40.76	$60.47	$101.22	$72.11	$106.98	$179.08	
119			ATTIC			500	16	I60	60W INCANDESCENT	960	480	$26.40	$117.50	$143.90	LED9SI	NEW 9W LED SCREW IN	16	144	72	$3.96	$17.63	$21.59	$22.44	$99.88	$122.32	
120			RADIO REPAIR			2500																				
121			OFFICE			1500	1	I150	150W INCANDESCENT	150	225	$12.38	$18.36	$30.74	N1AWW	REMOVE (1) FIX. & INSTALL NEW 4' WIDE WRAP W/ (1) 4' LED LAMP	1	16	24	$1.32	$1.96	$3.28	$11.06	$16.40	$27.46	
122			OFFICE			1500	1	A2W	4' 2L WRAP FIXTURE	72	108	$5.94	$8.81	$14.75	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	39	$2.15	$3.18	$5.33	$3.80	$5.63	$9.43	
123			HALL			1500	3	I150	150W INCANDESCENT	450	675	$37.13	$55.08	$92.21	NDW	REMOVE (1) FIX. & INSTALL NEW 2' LED FIX.	3	66	99	$5.45	$8.08	$13.52	$31.68	$47.00	$78.68	
124			DESK			1500	1	A2C	4' 2L EGG CRATE FIXTURE	72	108	$5.94	$8.81	$14.75	N1AWW	REMOVE (1) FIX. & INSTALL NEW 4' WIDE WRAP W/ (1) 4' LED LAMP	1	16	24	$1.32	$1.96	$3.28	$4.62	$6.85	$11.47	
125			DESK			100	3	A2C	4' 2L EGG CRATE FIXTURE	216	22	$1.19	$26.44	$27.63	ELIM	REMOVE FIXTURE	3						$1.19	$26.44	$27.63	
126			STORAGE			500	2	A2C	4' 2L EGG CRATE FIXTURE	144	72	$3.96	$17.63	$21.59	N2BWW	REMOVE (1) FIX. & INSTALL NEW 8' WIDE WRAP W/ (2) 4 ' LED LAMPS	1	26	13	$0.72	$3.18	$3.90	$3.25	$14.44	$17.69	
127			PASSAGE			500	1	I60	60W INCANDESCENT	60	30	$1.65	$7.34	$8.99	NDR	INSTALL LED DRUM FIX.	1	15	8	$0.41	$1.84	$2.25	$1.24	$5.51	$6.75	
128			BREAK AREA			1000	2	A4WT8	4' 4L WRAP FIXTURE W/ 32W T8'S	224	224	$12.32	$27.42	$39.74	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	2	104	104	$5.72	$12.73	$18.45	$6.60	$14.69	$21.29	
129			TOILET			1000	1	A1ST8	4' 1L STRIP FIXTURE W/ 32W T8'S	32	32	$1.76	$3.92	$5.68	N1AV	REMOVE FIX. & INSTALL NEW 4' VANITY W/ (1) 4' LED LAMP	1	18	18	$0.99	$2.20	$3.19	$0.77	$1.71	$2.48	

ENHANCED LIGHTING SURVEY LOG

Project Name: CHESTNUT RIDGE

Months: 12

Hours: 2500 **Multipliers:** **0.055** **10.2**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	Existing Watts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
130			TOILET			1000	1	A4B	4' 4L BOX FIXTURE	144	144	$7.92	$17.63	$25.55	NAW	REMOVE (1) FIX. & INSTALL NEW 4 LED' WRAP FIX.	1	36	36	$1.98	$4.41	$6.39	$5.94	$13.22	$19.16	
131			STORAGE			1000	2	I100	100W INCANDESCENT	200	200	$11.00	$24.48	$35.48	NDW	REMOVE (1) FIX. & INSTALL NEW 2' LED FIX.	2	44	44	$2.42	$5.39	$7.81	$8.58	$19.09	$27.67	
132			FURNACE			500	1	I150	150W INCANDESCENT	150	75	$4.13	$18.36	$22.49	NDW	REMOVE (1) FIX. & INSTALL NEW 2' LED FIX.	1	22	11	$0.61	$2.69	$3.30	$3.52	$15.67	$19.19	
133			GARAGE			1000	8	A2I	4' 2L INDUSTRIAL SHADE	576	576	$31.68	$70.50	$102.18	NBI	REMOVE FIX. & INSTALL NEW 8' LED INDUSTRIAL	4	208	208	$11.44	$25.46	$36.90	$20.24	$45.04	$65.28	
134			GARAGE			1000	1	A2I	4' 2L INDUSTRIAL SHADE	72	72	$3.96	$8.81	$12.77	NAI	REMOVE FIX. & INSTALL NEW 4 LED' INDUSTRIAL	1	36	36	$1.98	$4.41	$6.39	$1.98	$4.41	$6.39	
135			GARAGE			1000	8	A2C	4' 2L EGG CRATE FIXTURE	576	576	$31.68	$70.50	$102.18	N2BWW	REMOVE (1) FIX. & INSTALL NEW 8' WIDE WRAP W/ (2) 4 ' LED LAMPS	4	104	104	$5.72	$12.73	$18.45	$25.96	$57.77	$83.73	
136			TASK			1000	1	A4B	4' 4L BOX FIXTURE	144	144	$7.92	$17.63	$25.55	NAI	REMOVE FIX. & INSTALL NEW 4 LED' INDUSTRIAL	1	36	36	$1.98	$4.41	$6.39	$5.94	$13.22	$19.16	
137			REPAIR			1000	4	A2I	4' 2L INDUSTRIAL SHADE	288	288	$15.84	$35.25	$51.09	N2BWW	REMOVE (1) FIX. & INSTALL NEW 8' WIDE WRAP W/ (2) 4 ' LED LAMPS	2	52	52	$2.86	$6.36	$9.22	$12.98	$28.89	$41.87	
138			REPAIR			1000	2	A2I	4' 2L INDUSTRIAL SHADE	144	144	$7.92	$17.63	$25.55	N1AWW	REMOVE (1) FIX. & INSTALL NEW 4' WIDE WRAP W/ (1) 4' LED LAMP	2	32	32	$1.76	$3.92	$5.68	$6.16	$13.71	$19.87	
139			TASK			1000	4	A4B	4' 4L BOX FIXTURE	576	576	$31.68	$70.50	$102.18	N4BW	REMOVE (1) FIX. & INSTALL NEW 8' WRAP FIX. W/ (4) 4' LED LAMPS	4	288	288	$15.84	$35.25	$51.09	$15.84	$35.25	$51.09	
140			SUPPLY			1000	2	A2ST8	4' 2L STRIP FIXTURES W/T8S	118	118	$6.49	$14.44	$20.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	52	$2.86	$6.36	$9.22	$3.63	$8.08	$11.71	
141			STORAGE			1000	4	A2I	4' 2L INDUSTRIAL SHADE	288	288	$15.84	$35.25	$51.09	N2BWW	REMOVE (1) FIX. & INSTALL NEW 8' WIDE WRAP W/ (2) 4 ' LED LAMPS	2	52	52	$2.86	$6.36	$9.22	$12.98	$28.89	$41.87	
142			STORAGE			1000	2	A4B	4' 4L BOX FIXTURE	288	288	$15.84	$35.25	$51.09	N1AWW	REMOVE (1) FIX. & INSTALL NEW 4' WIDE WRAP W/ (1) 4' LED LAMP	2	32	32	$1.76	$3.92	$5.68	$14.08	$31.33	$45.41	
143			PASSAGE			1000	1	A2W	4' 2L WRAP FIXTURE	72	72	$3.96	$8.81	$12.77	N1AWW	REMOVE (1) FIX. & INSTALL NEW 4' WIDE WRAP W/ (1) 4' LED LAMP	1	16	16	$0.88	$1.96	$2.84	$3.08	$6.85	$9.93	
144			STORAGE			1000	4	A2I	4' 2L INDUSTRIAL SHADE	288	288	$15.84	$35.25	$51.09	N2BWW	REMOVE (1) FIX. & INSTALL NEW 8' WIDE WRAP W/ (2) 4 ' LED LAMPS	2	52	52	$2.86	$6.36	$9.22	$12.98	$28.89	$41.87	
145			STORAGE			1000	1	A2I	4' 2L INDUSTRIAL SHADE	72	72	$3.96	$8.81	$12.77	N1AWW	REMOVE (1) FIX. & INSTALL NEW 4' WIDE WRAP W/ (1) 4' LED LAMP	1	16	16	$0.88	$1.96	$2.84	$3.08	$6.85	$9.93	
146			SERVER			1000	11	A3R	4' 3L RECESSED FIXTURE	1265	1265	$69.58	$154.84	$224.41	RR1ANL	RETRO (1) FIX. W/ (1) 4' LED LAMPS RELOCATION KIT	11	176	176	$9.68	$21.54	$31.22	$59.90	$133.29	$193.19	
147			NEW LENSES			2500	50								NL	NEW LENS	50									
148			MISC FIXTURES			2500	30	A2W	4' 2L WRAP FIXTURE	2160	5400	$297.00	$264.38	$561.38	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	30	780	1950	$107.25	$95.47	$202.72	$189.75	$168.91	$358.66	
149			MISC FIXTURES			2500	20	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	1180	2950	$162.25	$144.43	$306.68	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	20	520	1300	$71.50	$63.65	$135.15	$90.75	$80.78	$171.53	
						782.00	**Totals:**			53018	129984	$7,149.10	$6,489.40	$13,638.51			747.00	18933	49268	$2,710	$2,317	$5,027	$4,439	$4,172	$8,611	
										KW	53							**KW**	19							

ENHANCED LIGHTING SURVEY LOG

Project Name: CHESTNUT RIDGE EXTERIOR

Months: 5

Hours: 4200 **Multipliers:** **0.055** **10.2**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	Existing Watts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
1			MEMORIAL			4200	1	MH1000	1000W METAL HALIDE	1075	4515	$248.33	$54.83	$303.15	LED300F	NEW 300W LED FLOOD	1	300	1260	$69.30	$15.30	$84.60	$179.03	$39.53	$218.55	
2			POST TOPS			4200	23	MH150	150W METAL HALIDE	4025	16905	$929.78	$205.28	$1,135.05	LED45SI	NEW 45W LED SCREW IN	23	1035	4347	$239.09	$52.79	$291.87	$690.69	$152.49	$843.18	
3			FLAGS AT CASINO			4200	2	MH150	150W METAL HALIDE	350	1470	$80.85	$17.85	$98.70	LED150F	NEW 150W LED FLOOD	2	300	1260	$69.30	$15.30	$84.60	$11.55	$2.55	$14.10	
4			COBRA HEADS			4200	7	MH150	150W METAL HALIDE	1225	5145	$282.98	$62.48	$345.45	LED93CH	NEW 95W LED COBRA HEAD	7	651	2734	$150.38	$33.20	$183.58	$132.59	$29.27	$161.87	
5			CASINO EXTERIOR			4200	1	MH70	70W METAL HALIDE	95	399	$21.95	$4.85	$26.79	LED17WP	NEW 17W LED WALLPACK FIXTURE	1	17	71	$3.93	$0.87	$4.79	$18.02	$3.98	$22.00	
6			CASINO EXTERIOR			4200	1	HPS150	150W HIGH PRESSURE SODIUM	175	735	$40.43	$8.93	$49.35	LED45WP	NEW 45W LED WALLPACK FIXTURE	1	45	189	$10.40	$2.30	$12.69	$30.03	$6.63	$36.66	
7			CASINO EXTERIOR			4200	1	Q500	500W QUARTZ	500	2100	$115.50	$25.50	$141.00	LED100F	NEW 100W LED FLOOD	1	100	420	$23.10	$5.10	$28.20	$92.40	$20.40	$112.80	
8			CASINO EXTERIOR			4200	7	I60	60W INCANDESCENT	420	1764	$97.02	$21.42	$118.44	LED22CANOPY	NEW 22W LED CANOPY	7	154	647	$35.57	$7.85	$43.43	$61.45	$13.57	$75.01	
9			CASINO EXTERIOR			4200	1	I60	60W INCANDESCENT	60	252	$13.86	$3.06	$16.92	LED9SI	NEW 9W LED SCREW IN	1	9	38	$2.08	$0.46	$2.54	$11.78	$2.60	$14.38	
10			CASINO EXTERIOR			4200	1	Q500	500W QUARTZ	500	2100	$115.50	$25.50	$141.00	LED150F	NEW 150W LED FLOOD	1	150	630	$34.65	$7.65	$42.30	$80.85	$17.85	$98.70	
11			CASINO EXTERIOR			4200	1	HPS150	150W HIGH PRESSURE SODIUM	175	735	$40.43	$8.93	$49.35	LED70WP	NEW 70W LED WALLPACK FIXTURE	1	70	294	$16.17	$3.57	$19.74	$24.26	$5.36	$29.61	
12			BUNKER EXTERIOR			4200	4	HPS400	400W HIGH PRESSURE SODIUM	1832	7694	$423.19	$93.43	$516.62	LED150F	NEW 150W LED FLOOD	4	600	2520	$138.60	$30.60	$169.20	$284.59	$62.83	$347.42	SLIP FITTERS
13			BUNKER EXTERIOR			4200	3	HPS100	250W HIGH PRESSURE SODIUM	375	1575	$86.63	$19.13	$105.75	LED100F	NEW 100W LED FLOOD	3	300	1260	$69.30	$15.30	$84.60	$17.33	$3.83	$21.15	
14			GAS PUMP			4200	1	MV175	175W MERCURY VAPOR	205	861	$47.36	$10.46	$57.81	LEDBARN	NEW 32W LED BARN FIXTURE	1	32	134	$7.39	$1.63	$9.02	$39.96	$8.82	$48.79	
15			MACKINNON LODGE			4200	3	MV175	175W MERCURY VAPOR	615	2583	$142.07	$31.37	$173.43	LEDBARN	NEW 32W LED BARN FIXTURE	3	96	403	$22.18	$4.90	$27.07	$119.89	$26.47	$146.36	
16			MARTIN LODGE			4200	2	I75	75W INCANDESCENT	150	630	$34.65	$7.65	$42.30	LED100F	NEW 100W LED FLOOD	1	100	420	$23.10	$5.10	$28.20	$11.55	$2.55	$14.10	
17			MARTIN LODGE			4200	4	I60	60W INCANDESCENT	240	1008	$55.44	$12.24	$67.68	LED22CANOPY	NEW 22W LED CANOPY	4	88	370	$20.33	$4.49	$24.82	$35.11	$7.75	$42.86	
18			MARTIN LODGE			4200	1	MV175	175W MERCURY VAPOR	205	861	$47.36	$10.46	$57.81	LEDBARN	NEW 32W LED BARN FIXTURE	1	32	134	$7.39	$1.63	$9.02	$39.96	$8.82	$48.79	
19			LITTLE BARN			4200	4	Q500	500W QUARTZ	2000	8400	$462.00	$102.00	$564.00	LED150F	NEW 150W LED FLOOD	4	600	2520	$138.60	$30.60	$169.20	$323.40	$71.40	$394.80	
20			LITTLE BARN			4200	1	MV175	175W MERCURY VAPOR	205	861	$47.36	$10.46	$57.81	LED100F	NEW 100W LED FLOOD	1	100	420	$23.10	$5.10	$28.20	$24.26	$5.36	$29.61	
21			MAINTENANCE			4200	1	MV175	175W MERCURY VAPOR	205	861	$47.36	$10.46	$57.81	LED70WP	NEW 70W LED WALLPACK FIXTURE	1	70	294	$16.17	$3.57	$19.74	$31.19	$6.89	$38.07	
22			MAINTENANCE			4200	2	MV175	175W MERCURY VAPOR	410	1722	$94.71	$20.91	$115.62	LED150F	NEW 150W LED FLOOD	2	300	1260	$69.30	$15.30	$84.60	$25.41	$5.61	$31.02	
23			MAINTENANCE			4200	1	HPS250	250W HIGH PRESSURE SODIUM	295	1239	$68.15	$15.05	$83.19	LED150F	NEW 150W LED FLOOD	1	150	630	$34.65	$7.65	$42.30	$33.50	$7.40	$40.89	
							73.00	**Totals:**		15337	64415	$3,542.85	$782.19	$4,325.03			72.00	5299	22256	$1,224	$270	$1,494	$2,319	$512	$2,831	
										KW	15							**KW**	5							

ENHANCED LIGHTING SURVEY LOG

Project Name: **HARLEM HIGHWAY**

Months: 12

Hours: 2500 **Multipliers:** **0.0522** **9.32**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	Existing Watts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
1			OFFICE			3500	3	A4T	4' 4L RECESSED TROFFER	432	1512	$78.93	$48.31	$127.24	NAT	REMOVE FIX. & INSTALL NEW LED 4' 2X4 TROFFER	3	108	378	$19.73	$12.08	$31.81	$59.19	$36.24	$95.43	
2			CLOSET			500	1	I60	60W INCANDESCENT	60	30	$1.57	$6.71	$8.28	LED9SI	NEW 9W LED SCREW IN	1	9	5	$0.23	$1.01	$1.24	$1.33	$5.70	$7.03	
3			ENTRANCE			3500	1	A2T	4' 2L RECESSED TROFFER	72	252	$13.15	$8.05	$21.21	NAT	REMOVE FIX. & INSTALL NEW LED 4' 2X4 TROFFER	1	36	126	$6.58	$4.03	$10.60	$6.58	$4.03	$10.60	
4			HIGHBAY			3500	3	B2S	8' 2L STRIP FIXTURE	369	1292	$67.42	$41.27	$108.69	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	3	300	1050	$54.81	$33.55	$88.36	$12.61	$7.72	$20.32	NEEDS WIRING
5			HIGHBAY			3500	1	A3T	4' 3L TROFFER	144	504	$26.31	$16.10	$42.41	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	1	100	350	$18.27	$11.18	$29.45	$8.04	$4.92	$12.96	NEEDS WIRING
6			HIGHBAY			3500	8	A4BLED	4L LED FIXTURE	576	2016	$105.24	$64.42	$169.66	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	8	800	2800	$146.16	$89.47	$235.63	-$40.92	-$25.05	-$65.98	NEEDS WIRING
7			HIGHBAY			3500	2	A2I	4' 2L INDUSTRIAL SHADE	144	504	$26.31	$16.10	$42.41	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	2	200	700	$36.54	$22.37	$58.91	-$10.23	-$6.26	-$16.49	NEEDS WIRING
8			HIGHBAY			3500	9	MH250	250W METAL HALIDE	2655	9293	$485.07	$296.94	$782.00	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	22	2200	7700	$401.94	$246.05	$647.99	$83.13	$50.89	$134.02	NEEDS WIRING
9			TOILET			1500	1	A2I	4' 2L INDUSTRIAL SHADE	72	108	$5.64	$8.05	$13.69	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	39	$2.04	$2.91	$4.94	$3.60	$5.14	$8.75	
10			STORAGE			500	1	A2I	4' 2L INDUSTRIAL SHADE	72	36	$1.88	$8.05	$9.93	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.68	$2.91	$3.59	$1.20	$5.14	$6.35	
11			UPSTAIRS			1000	1	A2I	4' 2L INDUSTRIAL SHADE	72	72	$3.76	$8.05	$11.81	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.36	$2.91	$4.27	$2.40	$5.14	$7.55	
12			BREAK AREA			3500	10	A4T	4' 4L RECESSED TROFFER	1440	5040	$263.09	$161.05	$424.14	NAT	REMOVE FIX. & INSTALL NEW LED 4' 2X4 TROFFER	10	360	1260	$65.77	$40.26	$106.03	$197.32	$120.79	$318.10	
13			OFFICE			3500	3	A4T	4' 4L RECESSED TROFFER	432	1512	$78.93	$48.31	$127.24	NAT	REMOVE FIX. & INSTALL NEW LED 4' 2X4 TROFFER	3	108	378	$19.73	$12.08	$31.81	$59.19	$36.24	$95.43	
14			SIGN SHOP			2500	8	B2I	8' 2L INDUSTRIAL SHADE SLIM LINE LAMPS	984	2460	$128.41	$110.05	$238.46	NBI	REMOVE FIX. & INSTALL NEW 8' LED INDUSTRIAL	8	720	1800	$93.96	$80.52	$174.48	$34.45	$29.53	$63.98	
15			SIGN SHOP			2500	1	B4I4T8	8' 4L INDUSTRIAL FIXTURE (4' TUBES),T8'S	112	280	$14.62	$12.53	$27.14	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	1	52	130	$6.79	$5.82	$12.60	$7.83	$6.71	$14.54	
16			STORAGE			1000	1	A2I	4' 2L INDUSTRIAL SHADE	72	72	$3.76	$8.05	$11.81	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.36	$2.91	$4.27	$2.40	$5.14	$7.55	
17			PASSAGE			1000	1	I60	60W INCANDESCENT	60	60	$3.13	$6.71	$9.84	NDR	INSTALL LED DRUM FIX.	1	15	15	$0.78	$1.68	$2.46	$2.35	$5.03	$7.38	
18			TOILET			1000	1	42CP	42W COMPACT FLUORESCENT	48	48	$2.51	$5.37	$7.87	LED8P	LED 8 PIN LAMP	1	8	8	$0.42	$0.89	$1.31	$2.09	$4.47	$6.56	
19			TRUCK STORAGE			4500	4	MH250	250W METAL HALIDE	1180	5310	$277.18	$131.97	$409.15	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	4	400	1800	$93.96	$44.74	$138.70	$183.22	$87.24	$270.46	
20			TRUCK STORAGE			4500	18	MH250	250W METAL HALIDE	5310	23895	$1,247.32	$593.87	$1,841.19	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	18	1800	8100	$422.82	$201.31	$624.13	$824.50	$392.56	$1,217.06	
21			HVAC BUILDING			2500																				
22			HIGHBAY			2500		NR	NO RETROFIT REQUIRED																	ALREADY LED
23			MECHANICAL			500	1	A3TT8	4' 3L TROFFER W/ T8S	93	47	$2.43	$10.40	$12.83	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	13	$0.68	$2.91	$3.59	$1.75	$7.49	$9.24	
24			PLANS			1500	2	D2TUT8	2' 2L TROFFER WT8/U-TUBES	120	180	$9.40	$13.42	$22.82	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	2	36	54	$2.82	$4.03	$6.85	$6.58	$9.39	$15.97	
25			COMPUTER			1500	3	D2TUT8	2' 2L TROFFER WT8/U-TUBES	180	270	$14.09	$20.13	$34.23	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	3	54	81	$4.23	$6.04	$10.27	$9.87	$14.09	$23.96	
26			OFFICE			500	2	A3TT8	4' 3L TROFFER W/ T8S	186	93	$4.85	$20.80	$25.66	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	26	$1.36	$5.82	$7.17	$3.50	$14.99	$18.48	
27			ENTRANCE			8760	1	A4T	4' 4L RECESSED TROFFER	144	1261	$65.85	$16.10	$81.95	NAT	REMOVE FIX. & INSTALL NEW LED 4' 2X4 TROFFER	1	36	315	$16.46	$4.03	$20.49	$49.39	$12.08	$61.46	
28			OFFICE			1500	2	A3TT8	4' 3L TROFFER W/ T8S	186	279	$14.56	$20.80	$35.37	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	117	$6.11	$8.72	$14.83	$8.46	$12.08	$20.54	
29			BREAK AREA			2000	2	A3TT8	4' 3L TROFFER W/ T8S	186	372	$19.42	$20.80	$40.22	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	2	78	156	$8.14	$8.72	$16.87	$11.28	$12.08	$23.35	
30			SERVER			500	1	A3TT8	4' 3L TROFFER W/ T8S	93	47	$2.43	$10.40	$12.83	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	1	39	20	$1.02	$4.36	$5.38	$1.41	$6.04	$7.45	
31			TOILET			1000	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	60	$3.13	$6.71	$9.84	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	18	$0.94	$2.01	$2.95	$2.19	$4.70	$6.89	
32			TOILET			1000	3	D2TUT8	2' 2L TROFFER WT8/U-TUBES	180	180	$9.40	$20.13	$29.53	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	3	54	54	$2.82	$6.04	$8.86	$6.58	$14.09	$20.67	
33			HALL			2000	1	D2TUT8	2' 2L TROFFER WT8/U-TUBES	60	120	$6.26	$6.71	$12.97	RR2D	RETRO (1) FIX. W/ (2) 2' LED LAMPS, RELOCATOR KIT	1	18	36	$1.88	$2.01	$3.89	$4.38	$4.70	$9.08	
						97.00		**Totals:**		15794	57203	$2,986.02	$1,766.40	$4,752.42			110.00	7809	27593	$1,440	$873	$2,314	$1,546	$893	$2,439	
										KW	16							**KW**	8							

ENHANCED LIGHTING SURVEY LOG

Project Name: **HARLEM HIGHWAY EXTERIOR**

Months: 5

Hours: 4200 **Multipliers:** **0.0522** **9.32**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	ProposedWatts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
1			EXTERIOR			4200	1	HPS70	70W HIGH PRESSURE SODIUM	95	399	$20.83	$4.43	$25.25	LED17WP	NEW 17W LED WALLPACK FIXTURE	1	17	71	$3.73	$0.79	$4.52	$17.10	$3.63	$20.74	
2			EXTERIOR			4200	1	MH175	175W METAL HALIDE	205	861	$44.94	$9.55	$54.50	LED70WP	NEW 70W LED WALLPACK FIXTURE	1	70	294	$15.35	$3.26	$18.61	$29.60	$6.29	$35.89	
3			EXTERIOR			4200	1	MH400	400W METAL HALIDE	458	1924	$100.41	$21.34	$121.75	LED150F	NEW 150W LED FLOOD	1	150	630	$32.89	$6.99	$39.88	$67.53	$14.35	$81.88	
4			EXTERIOR			4200	1	MH175	175W METAL HALIDE	205	861	$44.94	$9.55	$54.50	LED90WP	NEW 90W LED WALLPACK FIXTURE	1	90	378	$19.73	$4.19	$23.93	$25.21	$5.36	$30.57	
							4.00	**Totals:**		963	4045	$211.13	$44.88	$256.00			4.00	327	1373	$72	$15	$87	$139	$30	$169	
										KW	1							**KW**	0							

ENHANCED LIGHTING SURVEY LOG

Project Name: EAST CONCORD HIGHWAY

Months: 12

Hours: 2500 **Multipliers:** **0.0559** **9.263**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
1			OFFICE			1000	4	A4T	4' 4L RECESSED TROFFER	576	576	$32.20	$64.03	$96.22	NAT	REMOVE FIX. & INSTALL NEW LED 4' 2X4 TROFFER W/	4	144	144	$8.05	$16.01	$24.06	$24.15	$48.02	$72.17		
2			STORAGE			1000	5	A2I	4' 2L INDUSTRIAL SHADE	360	360	$20.12	$40.02	$60.14	NAT	REMOVE FIX. & INSTALL NEW LED 4' 2X4 TROFFER W/	5	180	180	$10.06	$20.01	$30.07	$10.06	$20.01	$30.07		
3			TOILET			1000	1	I60	60W INCANDESCENT	60	60	$3.35	$6.67	$10.02	NDR	INSTALL LED DRUM FIX.	1	15	15	$0.84	$1.67	$2.51	$2.52	$5.00	$7.52	WS	1
4			PASSAGE			1000	1	A4W	4' 4L WRAP FIXTURE	144	144	$8.05	$16.01	$24.06	NAW	REMOVE (1) FIX. & INSTALL NEW 4 LED' WRAP FIX.	1	36	36	$2.01	$4.00	$6.01	$6.04	$12.00	$18.04		
5			STORAGE			1000	1	A2S	4' 2L STRIP FIXTURES	72	72	$4.02	$8.00	$12.03	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	26	$1.45	$2.89	$4.34	$2.57	$5.11	$7.68		
6			STORAGE			1000	1	B2IHO	8' 2L INDUSTRIAL SHADE, H.O.. LAMPS	227	227	$12.69	$25.23	$37.92	RR4AB	RETRO (1) FIX. W/ (4) 4' LED LAMPS RELOCATION KIT	1	52	52	$2.91	$5.78	$8.69	$9.78	$19.45	$29.23		
7			PASSAGE			1000	1	A6HB	HIGH BAY FIX. W/ (6) 4' HO T8 LAMPS, HIGH POWER FACTOR EB	224	224	$12.52	$24.90	$37.42	NAW	REMOVE (1) FIX. & INSTALL NEW 4 LED' WRAP FIX.	1	36	36	$2.01	$4.00	$6.01	$10.51	$20.90	$31.41		
8			TOILET			2500	2	A4T	4' 4L RECESSED TROFFER	288	720	$40.25	$32.01	$72.26	NAT	REMOVE FIX. & INSTALL NEW LED 4' 2X4 TROFFER W/	2	72	180	$10.06	$8.00	$18.07	$30.19	$24.01	$54.20	WS	1
9			COMPRESSOR			2500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	148	$8.25	$6.56	$14.80	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.63	$2.89	$6.52	$4.61	$3.67	$8.28		
10			UPSTAIRS			2500	1	A2W	4' 2L WRAP FIXTURE	72	180	$10.06	$8.00	$18.07	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	65	$3.63	$2.89	$6.52	$6.43	$5.11	$11.54		
11			UPSTAIRS			2500	1	A1ST8	4' 1L STRIP FIXTURE W/ 32W T8'S	32	80	$4.47	$3.56	$8.03	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	33	$1.82	$1.45	$3.26	$2.66	$2.11	$4.77		
12			UPSTAIRS			2500	1	D1S	2' 1L STRIP FIXTURE	28	70	$3.91	$3.11	$7.03	R1D	RETRO (1) FIX. W/ (1) 2'LED LAMPS	1	9	23	$1.26	$1.00	$2.26	$2.66	$2.11	$4.77		
13			UPSTAIRS			2500	1	I60	60W INCANDESCENT	60	150	$8.39	$6.67	$15.05	LED9SI	NEW 9W LED SCREW IN	1	9	23	$1.26	$1.00	$2.26	$7.13	$5.67	$12.80		
14			OFFICE			500	3	A2W	4' 2L WRAP FIXTURE	216	108	$6.04	$24.01	$30.05	NAW	REMOVE (1) FIX. & INSTALL NEW 4 LED' WRAP FIX.	3	108	54	$3.02	$12.00	$15.02	$3.02	$12.00	$15.02	WS	1
15			OFFICE			500	2	A2W	4' 2L WRAP FIXTURE	144	72	$4.02	$16.01	$20.03	NAW	REMOVE (1) FIX. & INSTALL NEW 4 LED' WRAP FIX.	2	72	36	$2.01	$8.00	$10.02	$2.01	$8.00	$10.02	WS	1
16			ENTRANCE			500	1	I60	60W INCANDESCENT	60	30	$1.68	$6.67	$8.35	LED9SI	NEW 9W LED SCREW IN	1	9	5	$0.25	$1.00	$1.25	$1.43	$5.67	$7.09		
17			BREAK AREA			2500	4	A3TT8	4' 3L TROFFER W/ T8S	372	930	$51.99	$41.35	$93.34	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	4	156	390	$21.80	$17.34	$39.14	$30.19	$24.01	$54.20	CP	1
18			WORK AREA			2500	2	B2I	8' 2L INDUSTRIAL SHADE SLIM LINE LAMPS	246	615	$34.38	$27.34	$61.72	NBI	REMOVE FIX. & INSTALL NEW 8' LED INDUSTRIAL	2	180	450	$25.16	$20.01	$45.16	$9.22	$7.34	$16.56		
19			WORK AREA			2500	1	AHBT5	HIGH BAY FIX. W/ (4) 4' HO T5 , HIGH POWER FACTOR T5 EB	234	585	$32.70	$26.01	$58.71	NAI	REMOVE FIX. & INSTALL NEW 4 LED' INDUSTRIAL	1	36	90	$5.03	$4.00	$9.03	$27.67	$22.01	$49.68		
20			PIPE STORAGE			500	1	A2S	4' 2L STRIP FIXTURES	72	36	$2.01	$8.00	$10.02	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.73	$2.89	$3.62	$1.29	$5.11	$6.40		
21			STORAGE			500	2	A6HB	HIGH BAY FIX. W/ (6) 4' HO T8 LAMPS, HIGH POWER FACTOR EB	448	224	$12.52	$49.80	$62.32	NAW	REMOVE (1) FIX. & INSTALL NEW 4 LED' WRAP FIX.	2	72	36	$2.01	$8.00	$10.02	$10.51	$41.79	$52.30		
22			STORAGE			1000	10	B2I	8' 2L INDUSTRIAL SHADE SLIM LINE LAMPS	1230	1230	$68.76	$136.72	$205.48	NBI	REMOVE FIX. & INSTALL NEW 8' LED INDUSTRIAL	10	900	900	$50.31	$100.04	$150.35	$18.45	$36.68	$55.13		
23			STORAGE			1000	3	A2I	4' 2L INDUSTRIAL SHADE	216	216	$12.07	$24.01	$36.08	NAI	REMOVE FIX. & INSTALL NEW 4 LED' INDUSTRIAL	3	108	108	$6.04	$12.00	$18.04	$6.04	$12.00	$18.04		
24			TASK LIGHTS			1000	8	B2I	8' 2L INDUSTRIAL SHADE SLIM LINE LAMPS	984	984	$55.01	$109.38	$164.38	NBI	REMOVE FIX. & INSTALL NEW 8' LED INDUSTRIAL	8	720	720	$40.25	$80.03	$120.28	$14.76	$29.35	$44.10		
25			HIGHBAY			3500	9	MH400	400W METAL HALIDE	4122	14427	$806.47	$458.19	$1,264.65	LED200UFO	INSTALL 200 W LED UFO HIGHBAY	9	1800	6300	$352.17	$200.08	$552.25	$454.30	$258.10	$712.40	HBS	9
26			TASK LIGHTS			2500	2	A6HB	HIGH BAY FIX. W/ (6) 4' HO T8 LAMPS, HIGH POWER FACTOR EB	448	1120	$62.61	$49.80	$112.41	NAI	REMOVE FIX. & INSTALL NEW 4 LED' INDUSTRIAL	2	72	180	$10.06	$8.00	$18.07	$52.55	$41.79	$94.34		
27			HIGHBAY			3500	3	A6HB	HIGH BAY FIX. W/ (6) 4' HO T8 LAMPS, HIGH POWER FACTOR EB	672	2352	$131.48	$74.70	$206.17	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	3	300	1050	$58.70	$33.35	$92.04	$72.78	$41.35	$114.13		
28			HIGHBAY			3500	12	AHBT5	HIGH BAY FIX. W/ (4) 4' HO T5 , HIGH POWER FACTOR T5 EB	2808	9828	$549.39	$312.13	$861.51	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	12	1200	4200	$234.78	$133.39	$368.17	$314.61	$178.74	$493.34	HBS	12
29			HIGHBAY			3500	15	B2S	8' 2L STRIP FIXTURE	1845	6458	$360.97	$205.08	$566.06	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	12	1200	4200	$234.78	$133.39	$368.17	$126.19	$71.70	$197.89	HBS	12
30			HIGHBAY			3500	6	A2I	4' 2L INDUSTRIAL SHADE	432	1512	$84.52	$48.02	$132.54	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	3	300	1050	$58.70	$33.35	$92.04	$25.83	$14.67	$40.50	HBS	3
31			TIME CLOCK			2500	1	D2BT8	2' 2L BOX FIXTURE W/T8S	33	83	$4.61	$3.67	$8.28	NAI	REMOVE FIX. & INSTALL NEW 4 LED' INDUSTRIAL	1	36	90	$5.03	$4.00	$9.03	-$0.42	-$0.33	-$0.75		
32			LOWER BUILDING			2000	9	MH250	250W METAL HALIDE	2655	5310	$296.83	$295.12	$591.95	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	9	900	1800	$100.62	$100.04	$200.66	$196.21	$195.08	$391.29	HBS	9
33			LOWER BUILDING			8760	1	MH250	250W METAL HALIDE	295	2584	$144.46	$32.79	$177.25	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	1	100	876	$48.97	$11.12	$60.08	$95.49	$21.68	$117.16		
34			RECEPTION			3000	5	A3TT8	4' 3L TROFFER W/ T8S	465	1395	$77.98	$51.69	$129.67	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	5	130	390	$21.80	$14.45	$36.25	$56.18	$37.24	$93.42		
35			OFFICE			3000	2	A3TT8	4' 3L TROFFER W/ T8S	186	558	$31.19	$20.68	$51.87	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	156	$8.72	$5.78	$14.50	$22.47	$14.89	$37.37	WS	1
36			SUPPLY			1000	1	A3TT8	4' 3L TROFFER W/ T8S	93	93	$5.20	$10.34	$15.54	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	26	$1.45	$2.89	$4.34	$3.75	$7.45	$11.19	WS	1
37			LADIES			500	1	A3TT8	4' 3L TROFFER W/ T8S	93	47	$2.60	$10.34	$12.94	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	1	26	13	$0.73	$2.89	$3.62	$1.87	$7.45	$9.32		
38			OFFICE			3000	2	A3TT8	4' 3L TROFFER W/ T8S	186	558	$31.19	$20.68	$51.87	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	156	$8.72	$5.78	$14.50	$22.47	$14.89	$37.37	WS	1

ENHANCED LIGHTING SURVEY LOG

Project Name: EAST CONCORD HIGHWAY

Months: 12

Hours: 2500 **Multipliers:** **0.0559** **9.263**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
39			MENS			1000	2	A3TT8	4' 3L TROFFER W/ T8S	186	186	$10.40	$20.68	$31.07	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	52	$2.91	$5.78	$8.69	$7.49	$14.89	$22.39		
40			LOCKER			1000	2	A3TT8	4' 3L TROFFER W/ T8S	186	186	$10.40	$20.68	$31.07	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	52	$2.91	$5.78	$8.69	$7.49	$14.89	$22.39		
41			BREAK AREA			3500	4	A3TT8	4' 3L TROFFER W/ T8S	372	1302	$72.78	$41.35	$114.13	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	4	104	364	$20.35	$11.56	$31.91	$52.43	$29.79	$82.22	CP	1
42			FORMAN			2500	2	A2TT8	4' 2L TROFFER FIXTURE W/T8S	118	295	$16.49	$13.12	$29.61	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	130	$7.27	$5.78	$13.05	$9.22	$7.34	$16.56		
43			HIGHBAY			3500	21	AHBT5	HIGH BAY FIX. W/ (4) 4' HO T5 , HIGH POWER FACTOR T5 EB	4914	17199	$961.42	$546.22	$1,507.64	R4AT5HO	RETRO (1) FIX. W/ (4) 4' LED 25W LAMPS, LAMPS	21	2100	7350	$410.87	$233.43	$644.29	$550.56	$312.79	$863.35	HBS	21
44			HIGHBAY			3500	6	AHBT5	HIGH BAY FIX. W/ (4) 4' HO T5 , HIGH POWER FACTOR T5 EB	1404	4914	$274.69	$156.06	$430.76	R4AT5HO	RETRO (1) FIX. W/ (4) 4' LED 25W LAMPS, LAMPS	6	600	2100	$117.39	$66.69	$184.08	$157.30	$89.37	$246.67		
45			UPSTAIRS			500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	30	$1.65	$6.56	$8.21	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.73	$2.89	$3.62	$0.92	$3.67	$4.59		
							165.00	**Totals:**		27996	78476	$4,386.79	$3,111.92	$7,498.72			159.00	12211	34226	$1,913	$1,357	$3,271	$2,474	$1,755	$4,228		75
										KW	28							**KW**	12								

ENHANCED LIGHTING SURVEY LOG

Project Name: **EAST CONCORD HIGHWAY EXTERIOR**

Months: 5

Hours: 4200 **Multipliers:** **0.0559** **9.263**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	ProposedWatts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
1			EXTERIOR			4200	1	42CP	42W COMPACT FLUORESCENT	48	202	$11.27	$2.22	$13.49	LED17WP	NEW 17W LED WALLPACK FIXTURE	1	17	71	$3.99	$0.79	$4.78	$7.28	$1.44	$8.71	
2			EXTERIOR			4200	2	HPS150	150W HIGH PRESSURE SODIUM	350	1470	$82.17	$16.21	$98.38	LED70WP	NEW 70W LED WALLPACK FIXTURE	2	140	588	$32.87	$6.48	$39.35	$49.30	$9.73	$59.03	
3			EXTERIOR			4200	4	MV175	175W MERCURY VAPOR	820	3444	$192.52	$37.98	$230.50	LEDBARN	NEW 32W LED BARN FIXTURE	4	128	538	$30.05	$5.93	$35.98	$162.47	$32.05	$194.52	
4			EXTERIOR			4200	2	HPS250	250W HIGH PRESSURE SODIUM	590	2478	$138.52	$27.33	$165.85	LED70WP	NEW 70W LED WALLPACK FIXTURE	2	140	588	$32.87	$6.48	$39.35	$105.65	$20.84	$126.49	
5			EXTERIOR			4200	5	HPS250	250W HIGH PRESSURE SODIUM	1475	6195	$346.30	$68.31	$414.62	LED90WP	NEW 90W LED WALLPACK FIXTURE	5	450	1890	$105.65	$20.84	$126.49	$240.65	$47.47	$288.12	
6			EXTERIOR			4200	1	I60	60W INCANDESCENT	60	252	$14.09	$2.78	$16.87	LED17WP	NEW 17W LED WALLPACK FIXTURE	1	17	71	$3.99	$0.79	$4.78	$10.10	$1.99	$12.09	
7			EXTERIOR			4200	3	HPS250	250W HIGH PRESSURE SODIUM	885	3717	$207.78	$40.99	$248.77	LED90WP	NEW 90W LED WALLPACK FIXTURE	3	270	1134	$63.39	$12.51	$75.90	$144.39	$28.48	$172.87	
							18.00	**Totals:**		4228	17758	$992.65	$195.82	$1,188.47			18.00	1162	4880	$273	$54	$327	$720	$142	$862	
										KW	4							**KW**	1							

ENHANCED LIGHTING SURVEY LOG

Project Name: HAMBURG HIGHWAY

Months: 12

Hours: 3500 **Multipliers:** **0.0511** **9.3**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
1	1		HIGH BAY			3500	17	MH250	250W METAL HALIDE	5015	17553	$896.93	$559.67	$1,456.61	LED150UFO	INSTALL 150 W LED UFO HIGHBAY	4	600	2100	$107.31	$66.96	$174.27	$789.62	$492.71	$1,282.34		
2	1		HIGH BAY			3500	17	MH250	250W METAL HALIDE	5015	17553	$896.93	$559.67	$1,456.61	LED150UFO	INSTALL 150 W LED UFO HIGHBAY	13	1950	6825	$348.76	$217.62	$566.38	$548.18	$342.05	$890.23	HBS	13
3	1		HIGH BAY			3500	4	A6HB	HIGH BAY FIX. W/ (6) 4' HO T8 LAMPS, HIGH POWER FACTOR EB	896	3136	$160.25	$99.99	$260.24	LED150UFO	INSTALL 150 W LED UFO HIGHBAY	4	600	2100	$107.31	$66.96	$174.27	$52.94	$33.03	$85.97	HBS	4
4	1		TASK LIGHT			3500	1	B2I	8' 2L INDUSTRIAL SHADE SLIM LINE LAMPS	123	431	$22.00	$13.73	$35.73	RR4AB	RETRO (1) FIX. W/ (4) 4' LED LAMPS RELOCATION KIT	1	52	182	$9.30	$5.80	$15.10	$12.70	$7.92	$20.62		
5	1		TASK LIGHT			3500	1	A1ST8	4' 1L STRIP FIXTURE W/ 32W T8'S	32	112	$5.72	$3.57	$9.29	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	46	$2.33	$1.45	$3.78	$3.40	$2.12	$5.52		
6	1		HALL			3500	1	A1ST8	4' 1L STRIP FIXTURE W/ 32W T8'S	32	112	$5.72	$3.57	$9.29	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	46	$2.33	$1.45	$3.78	$3.40	$2.12	$5.52		
7	1		OFFICE			3500	2	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	118	413	$21.10	$13.17	$34.27	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	182	$9.30	$5.80	$15.10	$11.80	$7.37	$19.17		
8	2		UPPER STORAGE			3500	9	B4S4T8	8' 4L STRIP FIXTURE W/T8 (4' TUBES)	1008	3528	$180.28	$112.49	$292.77	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	9	468	1638	$83.70	$52.23	$135.93	$96.58	$60.26	$156.84		
9	2		UPPER STORAGE			3500	2	B2IHO	8' 2L INDUSTRIAL SHADE, H.O.. LAMPS	454	1589	$81.20	$50.67	$131.86	RR4AB	RETRO (1) FIX. W/ (4) 4' LED LAMPS RELOCATION KIT	2	104	364	$18.60	$11.61	$30.21	$62.60	$39.06	$101.66		
10	2		UPPER STORAGE			1000	1	B2I4T8	8' 2L INDUSTRIAL W/4' T8 LAMPS	59	59	$3.01	$6.58	$9.60	NBI	REMOVE FIX. & INSTALL NEW 8' LED INDUSTRIAL	1	90	90	$4.60	$10.04	$14.64	-$1.58	-$3.46	-$5.04		
11	2		OFFICE			500	1	A2TT8	4' 2L TROFFER FIXTURE W/T8S	59	30	$1.51	$6.58	$8.09	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.66	$2.90	$3.57	$0.84	$3.68	$4.53		
12	1		WORK AREA			3500	2	MH250	250W METAL HALIDE	590	2065	$105.52	$65.84	$171.37	NAI	REMOVE FIX. & INSTALL NEW 4 LED' INDUSTRIAL	2	72	252	$12.88	$8.04	$20.91	$92.64	$57.81	$150.45	WS	1
13			WORK AREA			3500	1	B4I4T8	8' 4L INDUSTRIAL FIXTURE (4' TUBES),T8'S	112	392	$20.03	$12.50	$32.53	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	1	52	182	$9.30	$5.80	$15.10	$10.73	$6.70	$17.43	INCL	1
14			PARTS			3500	1	B2IHO	8' 2L INDUSTRIAL SHADE, H.O.. LAMPS	227	795	$40.60	$25.33	$65.93	RR4AB	RETRO (1) FIX. W/ (4) 4' LED LAMPS RELOCATION KIT	1	52	182	$9.30	$5.80	$15.10	$31.30	$19.53	$50.83		
15			PARTS			3500	1	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	59	207	$10.55	$6.58	$17.14	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	91	$4.65	$2.90	$7.55	$5.90	$3.68	$9.58		
16			TASK LIGHT			3500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	207	$10.55	$6.58	$17.14	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	91	$4.65	$2.90	$7.55	$5.90	$3.68	$9.58		
17			OFFICE			2500	6	A4TT8	4' 4L RECESSED TROFFER W/T8S	672	1680	$85.85	$75.00	$160.84	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	6	156	390	$19.93	$17.41	$37.34	$65.92	$57.59	$123.50	CP	1
18			TOILET			1000	1	I60	60W INCANDESCENT	60	60	$3.07	$6.70	$9.76	NDR	INSTALL LED DRUM FIX.	1	15	15	$0.77	$1.67	$2.44	$2.30	$5.02	$7.32		
19			OFFICE			2500	2	A4TT8	4' 4L RECESSED TROFFER W/T8S	224	560	$28.62	$25.00	$53.61	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	2	52	130	$6.64	$5.80	$12.45	$21.97	$19.20	$41.17	WS	1
20			TRUCK STORAGE			3500																					
21			BAYS			2500	7	B2IT8	8' 2L INDUSTRIAL SHADE W/T8S	763	1908	$97.47	$85.15	$182.62	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	7	700	1750	$89.43	$78.12	$167.55	$8.05	$7.03	$15.08	HBS	7
22			BAYS			2500	2	A6HB	HIGH BAY FIX. W/ (6) 4' HO T8 LAMPS, HIGH POWER FACTOR EB	448	1120	$57.23	$50.00	$107.23	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	2	200	500	$25.55	$22.32	$47.87	$31.68	$27.68	$59.36		
23			STORAGE AREA			500	4	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	236	118	$6.03	$26.34	$32.37	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	52	$2.66	$11.61	$14.26	$3.37	$14.73	$18.10		
24			ENTRANCE			1000	2	I75	75W INCANDESCENT	150	150	$7.67	$16.74	$24.41	LED12SI	NEW 12W LED SCREW IN	2	24	24	$1.23	$2.68	$3.90	$6.44	$14.06	$20.50		
25			TRUCK BUILDING			8760	2	A6HB	HIGH BAY FIX. W/ (6) 4' HO T8 LAMPS, HIGH POWER FACTOR EB	448	3924	$200.54	$50.00	$250.54	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	2	200	1752	$89.53	$22.32	$111.85	$111.01	$27.68	$138.69		
26			TRUCK BUILDING			8760	4	B2I	8' 2L INDUSTRIAL SHADE SLIM LINE LAMPS	492	4310	$220.24	$54.91	$275.14	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	8	800	7008	$358.11	$89.28	$447.39	-$137.87	-$34.37	-$172.24	HBS	8
27			TRUCK BUILDING			8760	2	A2I	4' 2L INDUSTRIAL SHADE	144	1261	$64.46	$16.07	$80.53	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	2	200	1752	$89.53	$22.32	$111.85	-$25.07	-$6.25	-$31.32	HBS	2
28			TRUCK BUILDING			8760	4	MH250	250W METAL HALIDE	1180	10337	$528.21	$131.69	$659.90	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	8	800	7008	$358.11	$89.28	$447.39	$170.10	$42.41	$212.51	HBS	8
							98.00	**Totals:**		18675	73607	$3,761.30	$2,084.13	$5,845.43			89.00	7447	34764	$1,776	$831	$2,608	$1,985	$1,253	$3,238		46
										KW	19							**KW**	7								

ENHANCED LIGHTING SURVEY LOG

Project Name: **HAMBURG HIGHWAY EXTERIOR**

Months: 5

Hours: 4200 **Multipliers:** **0.0522** **9.3**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	ProposedWatts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
1			EXTERIOR			4200	3	MV175	175W MERCURY VAPOR	615	2583	$134.83	$28.60	$163.43	LEDBARN	NEW LED BARN FIXTURE	3	105	441	$23.02	$4.88	$27.90	$111.81	$23.72	$135.53	
2			EXTERIOR			4200	1	MV100	100W MERCURY VAPOR	125	525	$27.41	$5.81	$33.22	LED45WP	NEW 45W LED WALLPACK FIXTURE	1	45	189	$9.87	$2.09	$11.96	$17.54	$3.72	$21.26	
3			EXTERIOR			4200	1	MH250	250W METAL HALIDE	295	1239	$64.68	$13.72	$78.39	LED90WP	NEW 90W LED WALLPACK FIXTURE	1	90	378	$19.73	$4.19	$23.92	$44.94	$9.53	$54.48	
							5.00	**Totals:**		1035	4347	$226.91	$48.13	$275.04			5.00	240	1008	$53	$11	$64	$174	$37	$211	
										KW	1							**KW**	0							

ENHANCED LIGHTING SURVEY LOG

Project Name: ANGOLA HIGHWAY

Months: 12

Hours: 1000 **Multipliers:** **0.0631** **11.53**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	ProposedWatts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
1			ENTRANCE			100	1	A1ST8	4' 1L STRIP FIXTURE W/ 32W T8'S	32	3	$0.20	$4.43	$4.63	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	1	$0.08	$1.80	$1.88	$0.12	$2.63	$2.75	
2			FAN			100	1	I60	60W INCANDESCENT	60	6	$0.38	$8.30	$8.68	LED9SI	NEW 9W LED SCREW IN	1	9	1	$0.06	$1.25	$1.30	$0.32	$7.06	$7.38	
3			CLOSET			100	1	I60	60W INCANDESCENT	60	6	$0.38	$8.30	$8.68	NDR	INSTALL LED DRUM FIX.	1	15	2	$0.09	$2.08	$2.17	$0.28	$6.23	$6.51	
4			BAYS			100	12	B2I	8' 2L INDUSTRIAL SHADE SLIM LINE LAMPS	1476	148	$9.31	$204.22	$213.53	RR4AB	RETRO (1) FIX. W/ (4) 4' LED LAMPS RELOCATION KIT	12	624	62	$3.94	$86.34	$90.27	$5.38	$117.88	$123.26	
5			BAYS			100	5	A2I	4' 2L INDUSTRIAL SHADE	360	36	$2.27	$49.81	$52.08	NAI	REMOVE FIX. & INSTALL NEW 4 LED' INDUSTRIAL	5	180	18	$1.14	$24.90	$26.04	$1.14	$24.90	$26.04	
6			BAYS			100	8	A2I	4' 2L INDUSTRIAL SHADE	576	58	$3.63	$79.70	$83.33	ELIM	REMOVE FIXTURE	8						$3.63	$79.70	$83.33	
7			BAYS			100	1	A1ST8	4' 1L STRIP FIXTURE W/ 32W T8'S	32	3	$0.20	$4.43	$4.63	R1A	RETRO (1) FIX. W/ (1) 4' LED LAMP	1	13	1	$0.08	$1.80	$1.88	$0.12	$2.63	$2.75	
8			TOILET			100	2	I60	60W INCANDESCENT	120	12	$0.76	$16.60	$17.36	NDR	INSTALL LED DRUM FIX.	2	30	3	$0.19	$4.15	$4.34	$0.57	$12.45	$13.02	
9			UPSTAIRS			100	3	A2I	4' 2L INDUSTRIAL SHADE	216	22	$1.36	$29.89	$31.25	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	8	$0.49	$10.79	$11.28	$0.87	$19.09	$19.96	
10			SHERRIF BARN			1000																				
11			BAYS			1000	5	B4VT4T8	8' 4L VAPOR TIGHT FIXTURE (4' TUBES),T8'S	560	560	$35.34	$77.48	$112.82	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	5	260	260	$16.41	$35.97	$52.38	$18.93	$41.51	$60.44	TURRET SOCKETS
12			BAYS			1000	27	B4I4T8	8' 4L INDUSTRIAL FIXTURE (4' TUBES),T8'S	3024	3024	$190.81	$418.40	$609.22	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	27	1404	1404	$88.59	$194.26	$282.85	$102.22	$224.14	$326.37	TURRET SOCKETS
13			BAYS			1000	4	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	236	236	$14.89	$32.65	$47.54	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	4	104	104	$6.56	$14.39	$20.95	$8.33	$18.26	$26.59	TURRET SOCKETS
14			BAYS			1000	20	A3IT8	4' 3L INDUSTRIAL SHADE W/ 32W T8S	1860	1860	$117.37	$257.35	$374.72	R3A	RETRO (1) FIX. W/ (3) 4' LED LAMPS	20	780	780	$49.22	$107.92	$157.14	$68.15	$149.43	$217.58	TURRET SOCKETS
15			OFFICE			8760	2	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	118	1034	$65.23	$16.33	$81.55	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	456	$28.74	$7.19	$35.94	$36.48	$9.13	$45.61	
16			TOILET			8760	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	517	$32.61	$8.16	$40.78	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	228	$14.37	$3.60	$17.97	$18.24	$4.57	$22.81	
17			ELECTRIC			500	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	30	$1.86	$8.16	$10.02	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	13	$0.82	$3.60	$4.42	$1.04	$4.57	$5.61	
							94.00	**Totals:**		8848	7553	$476.61	$1,224.21	$1,700.82			94.00	3614	3340	$211	$500	$711	$266	$724	$990	
										KW	9							**KW**	4							

ENHANCED LIGHTING SURVEY LOG

Project Name: ANGOLA HIGHWAY EXTERIOR

Months: 5

Hours: 4200 **Multipliers:** **0.0631** **11.53**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	ProposedWatts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
1			EXTERIOR			4200	1	HPS70	70W HIGH PRESSURE SODIUM	95	399	$25.18	$5.48	$30.65	LED17WP	NEW 17W LED WALLPACK FIXTURE	1	17	71	$4.51	$0.98	$5.49	$20.67	$4.50	$25.17	
2			EXTERIOR			4200	1	I150	150W INCANDESCENT	150	630	$39.75	$8.65	$48.40	LED50F	NEW 50W LED FLOOD	1	50	210	$13.25	$2.88	$16.13	$26.50	$5.77	$32.27	
3			EXTERIOR			4200	4	MV175	175W MERCURY VAPOR	820	3444	$217.32	$47.27	$264.59	LEDBARN	NEW 32W LED BARN FIXTURE	4	128	538	$33.92	$7.38	$41.30	$183.39	$39.89	$223.29	
4			FUEL PUMPS			4200	2	MH150	150W METAL HALIDE	350	1470	$92.76	$20.18	$112.93	LED100F	NEW 100W LED FLOOD	2	200	840	$53.00	$11.53	$64.53	$39.75	$8.65	$48.40	
5			EXTERIOR			4200	2	HPS150	150W HIGH PRESSURE SODIUM	350	1470	$92.76	$20.18	$112.93	LED70WP	NEW 70W LED WALLPACK FIXTURE	2	140	588	$37.10	$8.07	$45.17	$55.65	$12.11	$67.76	
							10.00	**Totals:**		1765	7413	$467.76	$101.75	$569.51			10.00	535	2247	$142	$31	$173	$326	$71	$397	
										KW	2							**KW**	1							

ENHANCED LIGHTING SURVEY LOG

Project Name: COLLINS HIGHWAY

Months: 12

Hours: 2500 **Multipliers:** 0.0478 11.51

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
1			ENTRANCE			100	1	I60	60W INCANDESCENT	60	6	$0.29	$8.29	$8.57	LED22CANOPY	INSTALL 22 W LED CANOPY FIX	1	22	2	$0.11	$3.04	$3.14	$0.18	$5.25	$5.43		
2			ENTRANCE			100	1	I60	60W INCANDESCENT	60	6	$0.29	$8.29	$8.57	NDR	INSTALL LED DRUM FIX.	1	15	2	$0.07	$2.07	$2.14	$0.22	$6.22	$6.43		
3			OFFICE			100	1	A3IT8	4' 3L INDUSTRIAL SHADE W/ 32W T8S	93	9	$0.44	$12.85	$13.29	NAW	REMOVE (1) FIX. & INSTALL NEW 4 LED' WRAP FIX.	1	36	4	$0.17	$4.97	$5.14	$0.27	$7.87	$8.15		
4			OFFICE			100	2	A2S	4' 2L STRIP FIXTURES	144	14	$0.69	$19.89	$20.58	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	2	52	5	$0.25	$7.18	$7.43	$0.44	$12.71	$13.15		
5			TOILET			8760	1	B2S	8' 2L STRIP FIXTURE	123	1077	$51.50	$16.99	$68.49	RR4AB	RETRO (1) FIX. W/ (4) 4' LED LAMPS RELOCATION KIT	1	64	561	$26.80	$8.84	$35.64	$24.70	$8.15	$32.85		
6			UPSTAIRS			100	6	I60	60W INCANDESCENT	360	36	$1.72	$49.72	$51.44	LED9SI	NEW 9W LED SCREW IN	6	54	5	$0.26	$7.46	$7.72	$1.46	$42.26	$43.73		
7			BREAK AREA			100	3	A2I	4' 2L INDUSTRIAL SHADE	216	22	$1.03	$29.83	$30.87	NAW	REMOVE (1) FIX. & INSTALL NEW 4 LED' WRAP FIX.	3	108	11	$0.52	$14.92	$15.43	$0.52	$14.92	$15.43		
8			TIME CLOCK			100	1	A2W	4' 2L WRAP FIXTURE	72	7	$0.34	$9.94	$10.29	NAW	REMOVE (1) FIX. & INSTALL NEW 4 LED' WRAP FIX.	1	36	4	$0.17	$4.97	$5.14	$0.17	$4.97	$5.14		
9			OPEN			100	1	A2I	4' 2L INDUSTRIAL SHADE	72	7	$0.34	$9.94	$10.29	NAI	REMOVE FIX. & INSTALL NEW 4 LED' INDUSTRIAL	1	36	4	$0.17	$4.97	$5.14	$0.17	$4.97	$5.14		
10			HIGHBAY			100	5	B2I	8' 2L INDUSTRIAL SHADE SLIM LINE LAMPS	615	62	$2.94	$84.94	$87.88	RR4AB	RETRO (1) FIX. W/ (4) 4' LED LAMPS RELOCATION KIT	5	320	32	$1.53	$44.20	$45.73	$1.41	$40.75	$42.16		
11			HIGHBAY			100	2	A2I	4' 2L INDUSTRIAL SHADE	144	14	$0.69	$19.89	$20.58	NAI	REMOVE FIX. & INSTALL NEW 4 LED' INDUSTRIAL	2	72	7	$0.34	$9.94	$10.29	$0.34	$9.94	$10.29		
12			STORAGE			100	2	I60	60W INCANDESCENT	120	12	$0.57	$16.57	$17.15	LED9SI	NEW 9W LED SCREW IN	2	18	2	$0.09	$2.49	$2.57	$0.49	$14.09	$14.58		
13			TASK			100	1	B2I	8' 2L INDUSTRIAL SHADE SLIM LINE LAMPS	123	12	$0.59	$16.99	$17.58	RR4AB	RETRO (1) FIX. W/ (4) 4' LED LAMPS RELOCATION KIT	1	64	6	$0.31	$8.84	$9.15	$0.28	$8.15	$8.43		
14			TASK			100	1	A2I	4' 2L INDUSTRIAL SHADE	72	7	$0.34	$9.94	$10.29	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	3	$0.12	$3.59	$3.72	$0.22	$6.35	$6.57		
15			HIGHBAY			8760	3	B2I	8' 2L INDUSTRIAL SHADE SLIM LINE LAMPS	369	3232	$154.51	$50.97	$205.48	RR4AB	RETRO (1) FIX. W/ (4) 4' LED LAMPS RELOCATION KIT	3	192	1682	$80.40	$26.52	$106.91	$74.11	$24.45	$98.56		
16			HIGHBAY			100	4	B2I	8' 2L INDUSTRIAL SHADE SLIM LINE LAMPS	492	49	$2.35	$67.96	$70.31	RR4AB	RETRO (1) FIX. W/ (4) 4' LED LAMPS RELOCATION KIT	4	256	26	$1.22	$35.36	$36.58	$1.13	$32.60	$33.72		
17			SIDE ROOM			100	1	B2I	8' 2L INDUSTRIAL SHADE SLIM LINE LAMPS	123	12	$0.59	$16.99	$17.58	RR4AB	RETRO (1) FIX. W/ (4) 4' LED LAMPS RELOCATION KIT	1	64	6	$0.31	$8.84	$9.15	$0.28	$8.15	$8.43		
18			BACK AREA			100	1	B2I	8' 2L INDUSTRIAL SHADE SLIM LINE LAMPS	123	12	$0.59	$16.99	$17.58	RR4AB	RETRO (1) FIX. W/ (4) 4' LED LAMPS RELOCATION KIT	1	64	6	$0.31	$8.84	$9.15	$0.28	$8.15	$8.43		
19			UPSTAIRS			100	3	I60	60W INCANDESCENT	180	18	$0.86	$24.86	$25.72	LED9SI	NEW 9W LED SCREW IN	3	27	3	$0.13	$3.73	$3.86	$0.73	$21.13	$21.86		
20			SHED			100	6	I60	60W INCANDESCENT	360	36	$1.72	$49.72	$51.44	LED9SI	NEW 9W LED SCREW IN	6	54	5	$0.26	$7.46	$7.72	$1.46	$42.26	$43.73		
21			STORAGE BUILDING			8760	1	A6HB	HIGH BAY FIX. W/ (6) 4' HO T8 LAMPS, HIGH POWER FACTOR EB	224	1962	$93.80	$30.94	$124.73	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	1	100	876	$41.87	$13.81	$55.68	$51.92	$17.13	$69.05		
22			STORAGE BUILDING			8760	3	B2S	8' 2L STRIP FIXTURE	369	3232	$154.51	$50.97	$205.48	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	3	300	2628	$125.62	$41.44	$167.05	$28.89	$9.53	$38.42		
23			STORAGE BUILDING			8760	4	B2S	8' 2L STRIP FIXTURE	492	4310	$206.01	$67.96	$273.97	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	4	400	3504	$167.49	$55.25	$222.74	$38.52	$12.71	$51.23	HBS	4
24			STORAGE BUILDING			8760	9	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	531	4652	$222.34	$73.34	$295.69	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	9	900	7884	$376.86	$124.31	$501.16	-$154.51	-$50.97	-$205.48	HBS	9
25			STORAGE BUILDING			100	3	A2IT8	4' 2L INDUSTRIAL SHADE W/ 32W T8S	177	18	$0.85	$24.45	$25.29	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	3	300	30	$1.43	$41.44	$42.87	-$0.59	-$16.99	-$17.58	HBS	3
26			STORAGE BUILDING			100	22	A2I	4' 2L INDUSTRIAL SHADE	1584	158	$7.57	$218.78	$226.35	ELIM	REMOVE FIXTURE	22						$7.57	$218.78	$226.35		
27			STORAGE BUILDING			100	1	B2S	8' 2L STRIP FIXTURE	123	12	$0.59	$16.99	$17.58	ELIM	REMOVE FIXTURE	1						$0.59	$16.99	$17.58		
							89.00	**Totals:**		7421	18997	$908.07	$1,024.99	$1,933.06			89.00	3580	17297	$827	$494	$1,321	$81	$531	$612		16
										KW	7							**KW**	4								

ENHANCED LIGHTING SURVEY LOG

Project Name: COLLINS HIGHWAY EXTERIOR

Months: 5

Hours: 4200 **Multipliers:** **0.0478** **11.51**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	ProposedWatts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
1			EXTERIOR			4200	2	MV175	175W MERCURY VAPOR	410	1722	$82.31	$23.60	$105.91	LEDBARN	NEW 32W LED BARN FIXTURE	2	64	269	$12.85	$3.68	$16.53	$69.46	$19.91	$89.38	
2			EXTERIOR			4200	1	MV175	175W MERCURY VAPOR	205	861	$41.16	$11.80	$52.95	LED150F	NEW 150W LED FLOOD	1	150	630	$30.11	$8.63	$38.75	$11.04	$3.17	$14.21	
3			EXTERIOR			4200	2	MV175	175W MERCURY VAPOR	410	1722	$82.31	$23.60	$105.91	LED90WP	NEW 90W LED WALLPACK FIXTURE	2	180	756	$36.14	$10.36	$46.50	$46.17	$13.24	$59.41	
4			EXTERIOR			4200	2	HPS150	150W HIGH PRESSURE SODIUM	350	1470	$70.27	$20.14	$90.41	LED70WP	NEW 70W LED WALLPACK FIXTURE	2	140	588	$28.11	$8.06	$36.16	$42.16	$12.09	$54.25	
5			EXTERIOR			4200	2	HPS150	150W HIGH PRESSURE SODIUM	350	1470	$70.27	$20.14	$90.41	LED100F	NEW 100W LED FLOOD	2	200	840	$40.15	$11.51	$51.66	$30.11	$8.63	$38.75	
							9.00	**Totals:**		1725	7245	$346.31	$99.27	$445.58			9.00	734	3083	$147	$42	$190	$199	$57	$256	
										KW	2							**KW**	1							

ENHANCED LIGHTING SURVEY LOG

Project Name: CLARENCE HIGHWAY

Months: 12

Hours: 3500 **Multipliers:** **0.056** **6.5**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
1			ENTRANCE			1000	1	I60	60W INCANDESCENT	60	60	$3.36	$4.68	$8.04	NDR	INSTALL LED DRUM FIX.	1	15	15	$0.84	$1.17	$2.01	$2.52	$3.51	$6.03		
2			RECEPTION			2500	6	A4T	4' 4L RECESSED TROFFER	864	2160	$120.96	$67.39	$188.35	NAT	REMOVE FIX. & INSTALL NEW 4' LED 2X4 TROFFER	6	216	540	$30.24	$16.85	$47.09	$90.72	$50.54	$141.26	CP	1
3			RECEPTION			2500	5	A2I	4' 2L INDUSTRIAL SHADE	360	900	$50.40	$28.08	$78.48	NAT	REMOVE FIX. & INSTALL NEW 4' LED 2X4 TROFFER	5	180	450	$25.20	$14.04	$39.24	$25.20	$14.04	$39.24	INCL	1
4			OFFICE			2000	4	A2T	4' 2L RECESSED TROFFER	288	576	$32.26	$22.46	$54.72	NAT	REMOVE FIX. & INSTALL NEW 4' LED 2X4 TROFFER	4	144	288	$16.13	$11.23	$27.36	$16.13	$11.23	$27.36	WS	1
5			OFFICE			2000	4	A4T	4' 4L RECESSED TROFFER	576	1152	$64.51	$44.93	$109.44	NAT	REMOVE FIX. & INSTALL NEW 4' LED 2X4 TROFFER	4	144	288	$16.13	$11.23	$27.36	$48.38	$33.70	$82.08	WS	1
6			MENS			3500	2	A4T	4' 4L RECESSED TROFFER	288	1008	$56.45	$22.46	$78.91	NAT	REMOVE FIX. & INSTALL NEW 4' LED 2X4 TROFFER	2	72	252	$14.11	$5.62	$19.73	$42.34	$16.85	$59.18	CP	1
7			OFFICE			2000	2	A4T	4' 4L RECESSED TROFFER	288	576	$32.26	$22.46	$54.72	NAT	REMOVE FIX. & INSTALL NEW 4' LED 2X4 TROFFER	2	72	144	$8.06	$5.62	$13.68	$24.19	$16.85	$41.04	WS	1
8			BREAK AREA			3500	3	A4T	4' 4L RECESSED TROFFER	432	1512	$84.67	$33.70	$118.37	NAT	REMOVE FIX. & INSTALL NEW 4' LED 2X4 TROFFER	3	108	378	$21.17	$8.42	$29.59	$63.50	$25.27	$88.78	CP	1
9			LOCKER			3500	3	A4T	4' 4L RECESSED TROFFER	432	1512	$84.67	$33.70	$118.37	NAT	REMOVE FIX. & INSTALL NEW 4' LED 2X4 TROFFER	3	108	378	$21.17	$8.42	$29.59	$63.50	$25.27	$88.78	CP	1
10			HALL			3500	4	A4T	4' 4L RECESSED TROFFER	576	2016	$112.90	$44.93	$157.82	NAT	REMOVE FIX. & INSTALL NEW 4' LED 2X4 TROFFER	4	144	504	$28.22	$11.23	$39.46	$84.67	$33.70	$118.37	HS	2
11			EXIT LIGHT			8760	1	X20	20W EXIT SIGN	20	175	$9.81	$1.56	$11.37	NX	NEW EXIT LIGHT	1	3	26	$1.47	$0.23	$1.71	$8.34	$1.33	$9.67		
12			OFFICE			2000	2	B2S	8' 2L STRIP FIXTURE	246	492	$27.55	$19.19	$46.74	RR4AB	RETRO (1) FIX. W/ (4) 4' LED LAMPS RELOCATION KIT	2	104	208	$11.65	$8.11	$19.76	$15.90	$11.08	$26.98		
13			FAN			1000	4	15CP	15W COMPACT FLUORESCENT	68	68	$3.81	$5.30	$9.11	LED9SI	NEW 9W LED SCREW IN	4	36	36	$2.02	$2.81	$4.82	$1.79	$2.50	$4.29		
14			HIGHBAY			3500	4	MH250	250W METAL HALIDE	1180	4130	$231.28	$92.04	$323.32	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	4	400	1400	$78.40	$31.20	$109.60	$152.88	$60.84	$213.72		
15			HIGHBAY			3500	1	A2I	4' 2L INDUSTRIAL SHADE	72	252	$14.11	$5.62	$19.73	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	1	100	350	$19.60	$7.80	$27.40	-$5.49	-$2.18	-$7.67		
16			HIGHBAY			8760	6	AHBT5	HIGH BAY FIX. W/ (4) 4' HO T5 , HIGH POWER FACTOR T5 EB	1404	12299	$688.75	$109.51	$798.26	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	6	600	5256	$294.34	$46.80	$341.14	$394.41	$62.71	$457.12		
17			HIGHBAY			3500	45	AHBT5	HIGH BAY FIX. W/ (4) 4' HO T5 , HIGH POWER FACTOR T5 EB	10530	36855	$2,063.88	$821.34	$2,885.22	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	45	4500	15750	$882.00	$351.00	$1,233.00	$1,181.88	$470.34	$1,652.22	HBS	45
18			TASK			2000	3	B2I	8' 2L INDUSTRIAL SHADE SLIM LINE LAMPS	369	738	$41.33	$28.78	$70.11	RR4AB	RETRO (1) FIX. W/ (4) 4' LED LAMPS RELOCATION KIT	3	156	312	$17.47	$12.17	$29.64	$23.86	$16.61	$40.47		
19			WORK AREA			3500	6	AHBT5	HIGH BAY FIX. W/ (4) 4' HO T5 , HIGH POWER FACTOR T5 EB	1404	4914	$275.18	$109.51	$384.70	R4AT5HP	RETRO (1) FIX. W/ (4) 4' LED 25W LAMPS, LAMPS	6	600	2100	$117.60	$46.80	$164.40	$157.58	$62.71	$220.30		
20			BREAK AREA			3500	4	A4T	4' 4L RECESSED TROFFER	576	2016	$112.90	$44.93	$157.82	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	4	104	364	$20.38	$8.11	$28.50	$92.51	$36.82	$129.33	CP	1
21			PARTS			3500	4	A4T	4' 4L RECESSED TROFFER	576	2016	$112.90	$44.93	$157.82	RR2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS RELOCATION KIT	4	104	364	$20.38	$8.11	$28.50	$92.51	$36.82	$129.33		
22			PARTS			3500	4	B2S	8' 2L STRIP FIXTURE	492	1722	$96.43	$38.38	$134.81	RR4AB	RETRO (1) FIX. W/ (4) 4' LED LAMPS RELOCATION KIT	4	208	728	$40.77	$16.22	$56.99	$55.66	$22.15	$77.82		
23			UPSTAIRS			100	12	A2I	4' 2L INDUSTRIAL SHADE	864	86	$4.84	$67.39	$72.23	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	12	312	31	$1.75	$24.34	$26.08	$3.09	$43.06	$46.15		
24			UPSTAIRS			100	4	I60	60W INCANDESCENT	240	24	$1.34	$18.72	$20.06	LED9SI	NEW 9W LED SCREW IN	4	36	4	$0.20	$2.81	$3.01	$1.14	$15.91	$17.05		
25			TRUCK STORAGE			8760	4	B2I	8' 2L INDUSTRIAL SHADE SLIM LINE LAMPS	492	4310	$241.36	$38.38	$279.73	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	4	400	3504	$196.22	$31.20	$227.42	$45.13	$7.18	$52.31		
26			TRUCK STORAGE			4000	3	B2I	8' 2L INDUSTRIAL SHADE SLIM LINE LAMPS	369	1476	$82.66	$28.78	$111.44	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	3	300	1200	$67.20	$23.40	$90.60	$15.46	$5.38	$20.84	HBS	3
27			TRUCK STORAGE			4000	12	MH250	250W METAL HALIDE	3540	14160	$792.96	$276.12	$1,069.08	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	12	1200	4800	$268.80	$93.60	$362.40	$524.16	$182.52	$706.68	HBS	12
28			TRUCK STORAGE			4000	18	A2I	4' 2L INDUSTRIAL SHADE	1296	5184	$290.30	$101.09	$391.39	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	13	1300	5200	$291.20	$101.40	$392.60	-$0.90	-$0.31	-$1.21	HBS	13
29			SMALL GARAGE			500	4	AHBT5	HIGH BAY FIX. W/ (4) 4' HO T5 , HIGH POWER FACTOR T5 EB	936	468	$26.21	$73.01	$99.22	R4AT5HP	RETRO (1) FIX. W/ (4) 4' LED 25W LAMPS, LAMPS	4	400	200	$11.20	$31.20	$42.40	$15.01	$41.81	$56.82		
							175.00	**Totals:**		28838	102858	$5,760.02	$2,249.36	$8,009.39			170.00	12066	45070	$2,524	$941	$3,465	$3,236	$1,308	$4,544		84
										KW	29							**KW**	12								

ENHANCED LIGHTING SURVEY LOG

Project Name: CLARENCE HIGHWAY

Months: 5

Hours: 4200 **Multipliers:** **0.056** **6.5**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	ProposedWatts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
1			EXTERIOR			4200	1	MV175	175W MERCURY VAPOR	205	861	$48.22	$6.66	$54.88	LED90WP	NEW 90W LED WALLPACK FIXTURE	1	90	378	$21.17	$2.93	$24.09	$27.05	$3.74	$30.79	
2			EXTERIOR			4200	1	MH250	250W METAL HALIDE	295	1239	$69.38	$9.59	$78.97	LED150F	NEW 150W LED FLOOD	1	150	630	$35.28	$4.88	$40.16	$34.10	$4.71	$38.82	
3			EXTERIOR			4200	3	MH100	100W METAL HALIDE	375	1575	$88.20	$12.19	$100.39	LED45WP	NEW 45W LED WALLPACK FIXTURE	3	135	567	$31.75	$4.39	$36.14	$56.45	$7.80	$64.25	
4			EXTERIOR			4200	3	MH250	250W METAL HALIDE	885	3717	$208.15	$28.76	$236.91	LED100SB	NEW 100W LED SHOEBOX FIXTURE	3	300	1260	$70.56	$9.75	$80.31	$137.59	$19.01	$156.60	
5			EXTERIOR			4200	1	MH100	100W METAL HALIDE	125	525	$29.40	$4.06	$33.46	LED70WP	NEW 70W LED WALLPACK FIXTURE	1	70	294	$16.46	$2.28	$18.74	$12.94	$1.79	$14.72	
6			EXTERIOR			4200	1	MV175	175W MERCURY VAPOR	205	861	$48.22	$6.66	$54.88	LEDBARN	NEW 32W LED BARN FIXTURE	1	32	134	$7.53	$1.04	$8.57	$40.69	$5.62	$46.31	
							10.00	**Totals:**		2090	8778	$491.57	$67.93	$559.49			10.00	777	3263	$183	$25	$208	$309	$43	$351	
										KW	2							**KW**	1							

ENHANCED LIGHTING SURVEY LOG

Project Name: **HOLLAND HIGHWAY**

Months: 12

Hours: 100 **Multipliers:** **0.0708** **9.32**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	ProposedWatts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
1			HIGHBAY			8760	2	B2I	8' 2L INDUSTRIAL SHADE SLIM LINE LAMPS	246	2155	$152.57	$27.51	$180.08	RR4AB	RETRO (1) FIX. W/ (4) 4' LED LAMPS RELOCATION KIT	2	128	1121	$79.39	$14.32	$93.70	$73.18	$13.20	$86.38	
2			HIGHBAY			8760	2	B2S	8' 2L STRIP FIXTURE	246	2155	$152.57	$27.51	$180.08	RR4AB	RETRO (1) FIX. W/ (4) 4' LED LAMPS RELOCATION KIT	2	128	1121	$79.39	$14.32	$93.70	$73.18	$13.20	$86.38	
3			HIGHBAY			100	9	B2S	8' 2L STRIP FIXTURE	1107	111	$7.84	$123.81	$131.64	RR4AB	RETRO (1) FIX. W/ (4) 4' LED LAMPS RELOCATION KIT	9	576	58	$4.08	$64.42	$68.50	$3.76	$59.39	$63.15	
4			HIGHBAY			100	3	B2I	8' 2L INDUSTRIAL SHADE SLIM LINE LAMPS	369	37	$2.61	$41.27	$43.88	RR4AB	RETRO (1) FIX. W/ (4) 4' LED LAMPS RELOCATION KIT	3	192	19	$1.36	$21.47	$22.83	$1.25	$19.80	$21.05	BAD WIRING
5			STORAGE			8760	1	A2I	4' 2L INDUSTRIAL SHADE	72	631	$44.65	$8.05	$52.71	NAI	REMOVE FIX. & INSTALL NEW 4 LED' INDUSTRIAL	1	36	315	$22.33	$4.03	$26.35	$22.33	$4.03	$26.35	BAD WIRING
6			BREAK AREA			8760	2	A2I	4' 2L INDUSTRIAL SHADE	144	1261	$89.31	$16.10	$105.41	NAI	REMOVE FIX. & INSTALL NEW 4 LED' INDUSTRIAL	2	72	631	$44.65	$8.05	$52.71	$44.65	$8.05	$52.71	BAD WIRING
7			BREAK AREA			100	1	A2I	4' 2L INDUSTRIAL SHADE	72	7	$0.51	$8.05	$8.56	ELIM	REMOVE FIXTURE	1						$0.51	$8.05	$8.56	BAD WIRING
8			OTHER ROOMS			100	4	A2I	4' 2L INDUSTRIAL SHADE	288	29	$2.04	$32.21	$34.25	NAI	REMOVE FIX. & INSTALL NEW 4 LED' INDUSTRIAL	4	144	14	$1.02	$16.10	$17.12	$1.02	$16.10	$17.12	BAD WIRING
9			CLOSET			100	1	I60	60W INCANDESCENT	60	6	$0.42	$6.71	$7.14	NDR	INSTALL LED DRUM FIX.	1	15	2	$0.11	$1.68	$1.78	$0.32	$5.03	$5.35	BAD WIRING
10			TOILET			8760	2	A2S	4' 2L STRIP FIXTURES	144	1261	$89.31	$16.10	$105.41	NAW	REMOVE (1) FIX. & INSTALL NEW 4 LED' WRAP FIX.	2	72	631	$44.65	$8.05	$52.71	$44.65	$8.05	$52.71	BAD WIRING
11			UPSTAIRS			8760	3	A2S	4' 2L STRIP FIXTURES	216	1892	$133.96	$24.16	$158.12	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	683	$48.38	$8.72	$57.10	$85.59	$15.43	$101.02	
12			UPSTAIRS			100	3	A2S	4' 2L STRIP FIXTURES	216	22	$1.53	$24.16	$25.69	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	3	78	8	$0.55	$8.72	$9.28	$0.98	$15.43	$16.41	
							33.00	**Totals:**		3180	9567	$677.34	$355.65	$1,032.99			33.00	1519	4603	$326	$170	$496	$351	$186	$537	
										KW	3							**KW**	2							

ENHANCED LIGHTING SURVEY LOG

Project Name: **HOLLAND HIGHWAY EXTERIOR**

Months: 5

Hours: 4200 **Multipliers:** **0.0708** **9.32**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	ProposedWatts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
1			EXTERIOR			4200	1	MV175	175W MERCURY VAPOR	205	861	$60.96	$9.55	$70.51	LED150F	NEW 150W LED FLOOD	1	150	630	$44.60	$6.99	$51.59	$16.35	$2.56	$18.92	COBRA HEAD
2			EXTERIOR			4200	2	HPS100	250W HIGH PRESSURE SODIUM	250	1050	$74.34	$11.65	$85.99	LED100F	NEW 100W LED FLOOD	2	200	840	$59.47	$9.32	$68.79	$14.87	$2.33	$17.20	
3			EXTERIOR			4200	1	HPS100	250W HIGH PRESSURE SODIUM	125	525	$37.17	$5.83	$43.00	LED70WP	NEW 70W LED WALLPACK FIXTURE	1	70	294	$20.82	$3.26	$24.08	$16.35	$2.56	$18.92	
4			EXTERIOR			4200	1	MH175	175W METAL HALIDE	205	861	$60.96	$9.55	$70.51	LED150F	NEW 150W LED FLOOD	1	150	630	$44.60	$6.99	$51.59	$16.35	$2.56	$18.92	
5			EXTERIOR			4200	3	MV175	175W MERCURY VAPOR	615	2583	$182.88	$28.66	$211.54	LEDBARN	NEW 32W LED BARN FIXTURE	3	96	403	$28.55	$4.47	$33.02	$154.33	$24.19	$178.52	
							8.00	**Totals:**		1400	5880	$416.30	$65.24	$481.54			8.00	666	2797	$198	$31	$229	$218	$34	$252	
										KW	1							**KW**	1							

ENHANCED LIGHTING SURVEY LOG

Project Name: TONAWANDA HIGHWAY

Months: 12

Hours: 2500 **Multipliers:** **0.0483** **11.534**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	Proposed Watts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	Sensor	Sensor Qnty
1			BREAK AREA			100	1	B4I4T8	8' 4L INDUSTRIAL FIXTURE (4' TUBES),T8'S	112	11	$0.54	$15.50	$16.04	R4A	RETRO (1) FIX. W/ (4) 4' LED LAMPS	1	52	5	$0.25	$7.20	$7.45	$0.29	$8.30	$8.59		
2			HIGHBAY			100	8	MH250	250W METAL HALIDE	2360	236	$11.40	$326.64	$338.04	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	8	800	80	$3.86	$110.73	$114.59	$7.53	$215.92	$223.45	HBS	8
3			HIGHBAY			8760	2	B2S	8' 2L STRIP FIXTURE	246	2155	$104.08	$34.05	$138.13	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	2	200	1752	$84.62	$27.68	$112.30	$19.46	$6.37	$25.83		
4			TASK			100	1	B2I	8' 2L INDUSTRIAL SHADE SLIM LINE LAMPS	123	12	$0.59	$17.02	$17.62	RR4AB	RETRO (1) FIX. W/ (4) 4' LED LAMPS RELOCATION KIT	1	52	5	$0.25	$7.20	$7.45	$0.34	$9.83	$10.17		
5			TASK			100	1	A2I	4' 2L INDUSTRIAL SHADE	72	7	$0.35	$9.97	$10.31	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	3	$0.13	$3.60	$3.72	$0.22	$6.37	$6.59		
6			HIGHBAY			100	5	AHBT5	HIGH BAY FIX. W/ (4) 4' HO T5 , HIGH POWER FACTOR T5 EB	1170	117	$5.65	$161.94	$167.59	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	2	200	20	$0.97	$27.68	$28.65	$4.69	$134.26	$138.94	HBS	2
7			HIGHBAY			100	2	B2I	8' 2L INDUSTRIAL SHADE SLIM LINE LAMPS	246	25	$1.19	$34.05	$35.24	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	2	200	20	$0.97	$27.68	$28.65	$0.22	$6.37	$6.59	HBS	2
8			HIGHBAY			100	2	MH250	250W METAL HALIDE	590	59	$2.85	$81.66	$84.51	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	2	200	20	$0.97	$27.68	$28.65	$1.88	$53.98	$55.86		
9			TASK			100	1	A2I	4' 2L INDUSTRIAL SHADE	72	7	$0.35	$9.97	$10.31	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	3	$0.13	$3.60	$3.72	$0.22	$6.37	$6.59		
10			TOILET			100	1	B2I	8' 2L INDUSTRIAL SHADE SLIM LINE LAMPS	123	12	$0.59	$17.02	$17.62	RR4AB	RETRO (1) FIX. W/ (4) 4' LED LAMPS RELOCATION KIT	1	52	5	$0.25	$7.20	$7.45	$0.34	$9.83	$10.17		
11			UPSTAIRS			100	1	A2WT8	4' 2L WRAP FIXTURE W/ T8 LAMPS	59	6	$0.28	$8.17	$8.45	R2A	RETRO (1) FIX. W/ (2) 4' LED LAMPS	1	26	3	$0.13	$3.60	$3.72	$0.16	$4.57	$4.73		
12			TRUCK STORAGE			8760	6	NR	NO RETROFIT REQUIRED								6										
13			TRUCK STORAGE			8760	1	A2I	4' 2L INDUSTRIAL SHADE	72	631	$30.46	$9.97	$40.43	ELIM	REMOVE FIXTURE	1						$30.46	$9.97	$40.43		
14			TRUCK STORAGE			100	1	A2S	4' 2L STRIP FIXTURES	72	7	$0.35	$9.97	$10.31	ELIM	REMOVE FIXTURE	1						$0.35	$9.97	$10.31		
15			TRUCK STORAGE			100	13	MH100	100W METAL HALIDE	1625	163	$7.85	$224.91	$232.76	LED100UFO	INSTALL 100 W LED UFO HIGHBAY	13	1300	130	$6.28	$179.93	$186.21	$1.57	$44.98	$46.55	HBS	13
16			TRUCK STORAGE			100		NR	NO RETROFIT REQUIRED																		
							46.00	**Totals:**		6942	3448	$166.54	$960.83	$1,127.37			43.00	3134	2045	$99	$434	$533	$68	$527	$595		25
										KW	7							**KW**	3								

ENHANCED LIGHTING SURVEY LOG

Project Name: **TONAWANDA HIGHWAY EXTERIOR**

Months: 5

Hours: 4200 **Multipliers:** **0.0483** **11.534**

Line #	Floor	Rm #	Room Description	Ceiling Height	Ceiling Type	Hours	# of Fix.	Fixture Code	Fixture Type	ExistingWatts	Existing KWH	Existing KWH cost	Existing KW	Existing Cost/year	Retro Code	Retro Description	Retrofit Qnty	ProposedWatts	Proposed KWH	Proposed KWH cost	Proposed KW cost	Proposed Cost/year	KWH Savings	KW Savings	Total Savings	General Comments
1			EXTERIOR			4200	1	HPS150	150W HIGH PRESSURE SODIUM	175	735	$35.50	$10.09	$45.59	LED70WP	NEW 70W LED WALLPACK FIXTURE	1	70	294	$14.20	$4.04	$18.24	$21.30	$6.06	$27.36	
2			EXTERIOR			4200	1	MV175	175W MERCURY VAPOR	205	861	$41.59	$11.82	$53.41	LED100F	NEW 100W LED FLOOD	1	100	420	$20.29	$5.77	$26.05	$21.30	$6.06	$27.36	
3			EXTERIOR			4200	2	MV175	175W MERCURY VAPOR	410	1722	$83.17	$23.64	$106.82	LED150F	NEW 150W LED FLOOD	2	300	1260	$60.86	$17.30	$78.16	$22.31	$6.34	$28.66	
4			EXTERIOR			4200	1	MH175	175W METAL HALIDE	205	861	$41.59	$11.82	$53.41	LED150F	NEW 150W LED FLOOD	1	150	630	$30.43	$8.65	$39.08	$11.16	$3.17	$14.33	
5			GAS PUMPS			4200	2	MH175	175W METAL HALIDE	410	1722	$83.17	$23.64	$106.82	LED100F	NEW 100W LED FLOOD	2	200	840	$40.57	$11.53	$52.11	$42.60	$12.11	$54.71	
							7.00	**Totals:**		1405	5901	$285.02	$81.03	$366.04			7.00	820	3444	$166	$47	$214	$119	$34	$152	
										KW	1							**KW**	1							