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Appendix for ECM 8: Demand Controlled Ventilation, Lincoln Park Annex

I. Energy Savings Calculations

ECM 8 Demand Controlled Ventilation Lincoln Park Annex Savings Calculation

Savings Estimate

Date:	29-Aug-12
Project:	City of Greeley Colorado
Location:	LPA
Measure:	ECM 8 Demand Controlled Ventilation

ECM 8 Demand Controlled Ventilation	
Estimated Savings (Therms/Yr):	3,035
Estimated Savings (Peak kW):	-
Estimated Savings (kWh/Yr):	1,907

Savings Estimate
Date: 28-Aug-12
Project: City of Greeley Colorado
Location: LPA (AC-6)
Measure: ECM 8 Demand Controlled Ventilation

AC-6 CFM	12900
Existing Htg Efficiency	0.8
Existing SEER	10.5
Existing EER	8.5
Existing kW/Ton	1.41

			EXISTING							PROPOSED							SAVINGS
	Average BIN Temp	BIN Hours	OSA %	RAT	MAT	SAT	Nominal % Full Load	BTU Required	Therms (kWh)	OSA %	RAT	MAT	SAT	Nominal % Full Load	BTU Required	Therms (kWh)	Therms (kWh)
Heating	-17.5	0	8%	69	62	90	0.80	-	-	2%	69	67	90	0.47	-	-	-
	-12.5	10	8%	69	62	90	0.75	2,892,597	36	2%	69	67	90	0.44	1,410,219	18	19
	-7.5	7	8%	69	63	90	0.70	1,861,840	23	2%	69	67	90	0.41	914,929	11	12
	-2.5	18	8%	69	63	90	0.65	4,378,787	55	2%	69	67	90	0.38	2,168,807	27	28
	2.5	28	8%	69	64	90	0.60	6,191,526	77	2%	69	67	90	0.35	3,090,561	39	39
	7.5	34	8%	69	64	90	0.55	6,784,941	85	2%	69	67	90	0.32	3,412,509	43	42
	12.5	39	8%	69	64	90	0.50	6,963,820	87	2%	69	68	90	0.29	3,527,997	44	43
	17.5	100	8%	69	65	90	0.45	15,813,308	198	2%	69	68	90	0.26	8,065,784	101	97
	22.5	168	8%	69	65	90	0.40	23,230,685	290	2%	69	68	90	0.23	11,920,781	149	141
	27.5	202	8%	69	66	90	0.35	24,036,770	300	2%	69	68	90	0.20	12,394,525	155	146
	32.5	258	8%	69	66	90	0.30	25,872,535	323	2%	69	68	90	0.17	13,380,876	167	156
	37.5	331	8%	69	66	90	0.25	27,188,204	340	2%	69	68	90	0.14	14,058,069	176	164
	42.5	405	8%	69	67	90	0.20	26,150,545	327	2%	69	68	90	0.11	13,438,698	168	159
	47.5	416	8%	69	67	90	0.15	19,789,169	247	2%	69	68	90	0.08	9,982,024	125	123
	52.5	384	8%	69	68	90	0.10	11,958,605	149	2%	69	69	90	0.05	5,725,958	72	78
Subtotal HTG								203,113,330	2,539						103,491,737	1,294	1,245
Cooling	57.5	356	100%	76	58	55	0.33	4,091,828	481	100%	76	58	55	0.33	4,091,828	481	-
	62.5	368	100%	76	63	55	0.43	16,534,498	1,945	100%	76	63	55	0.43	16,534,498	1,945	-
	67.5	354	100%	76	68	55	0.53	32,674,023	3,844	100%	76	68	55	0.53	32,674,023	3,844	-
	72.5	306	100%	76	73	55	0.63	47,001,692	5,530	100%	76	73	55	0.63	47,001,692	5,530	-
	77.5	294	8%	76	76	55	0.73	63,159,583	7,431	5%	76	76	55	0.73	63,020,544	7,414	16
	82.5	280	8%	76	77	55	0.83	69,719,478	8,202	5%	76	76	55	0.83	69,067,062	8,126	77
	87.5	244	8%	76	77	55	0.93	69,371,685	8,161	5%	76	77	55	0.93	68,244,628	8,029	133
	92.5	129	8%	76	77	55	1.03	41,378,641	4,868	5%	76	77	55	1.03	40,431,780	4,757	111
	97.5	11	8%	76	78	55	1.00	3,488,475	410	5%	76	77	55	1.00	3,386,333	398	12
Subtotal CLG		958							40,873							40,524	349

Note:
1. Estiamte typical occupancy is 30% of design occupancy

Savings Estimate
Date: 28-Aug-12
Project: City of Greeley Colorado
Location: LPA (AC-7)
Measure: ECM 8 Demand Controlled Ventilation

AC-7 CFM	7500
Existing Htg Efficiency	0.8
Existing SEER	10.5
Existing EER	8.5
Existing kW/Ton	1.41

			EXISTING							PROPOSED							SAVINGS
	Average BIN Temp	BIN Hours	OSA %	RAT	MAT	SAT	Nominal % Full Load	BTU Required	Therms (kWh)	OSA %	RAT	MAT	SAT	Nominal % Full Load	BTU Required	Therms (kWh)	Therms (kWh)
Heating	-17.5	0	17%	69	54	90	0.80	-	-	5%	69	65	90	0.47	-	-	-
	-12.5	10	17%	69	55	90	0.75	2,117,441	26	5%	69	65	90	0.44	896,578	11	15
	-7.5	7	17%	69	56	90	0.70	1,349,658	17	5%	69	65	90	0.41	578,885	7	10
	-2.5	18	17%	69	57	90	0.65	3,142,099	39	5%	69	65	90	0.38	1,365,515	17	22
	2.5	28	17%	69	58	90	0.60	4,396,064	55	5%	69	66	90	0.35	1,936,197	24	31
	7.5	34	17%	69	59	90	0.55	4,764,489	60	5%	69	66	90	0.32	2,127,101	27	33
	12.5	39	17%	69	59	90	0.50	4,834,060	60	5%	69	66	90	0.29	2,187,808	27	33
	17.5	100	17%	69	60	90	0.45	10,845,698	136	5%	69	66	90	0.26	4,975,741	62	73
	22.5	168	17%	69	61	90	0.40	15,733,570	197	5%	69	67	90	0.23	7,314,906	91	105
	27.5	202	17%	69	62	90	0.35	16,066,257	201	5%	69	67	90	0.20	7,564,643	95	106
	32.5	258	17%	69	63	90	0.30	17,055,903	213	5%	69	67	90	0.17	8,121,914	102	112
	37.5	331	17%	69	64	90	0.25	17,665,098	221	5%	69	67	90	0.14	8,485,440	106	115
	42.5	405	17%	69	64	90	0.20	16,733,831	209	5%	69	68	90	0.11	8,065,651	101	108
	47.5	416	17%	69	65	90	0.15	12,461,623	156	5%	69	68	90	0.08	5,956,509	74	81
	52.5	384	17%	69	66	90	0.10	7,404,307	93	5%	69	68	90	0.05	3,396,790	42	50
Subtotal HTG								134,570,097	1,682						62,973,678	787	895
Cooling	57.5	356	100%	76	58	55	0.33	2,378,970	280	100%	76	58	55	0.33	2,378,970	280	-
	62.5	368	100%	76	63	55	0.43	9,613,080	1,131	100%	76	63	55	0.43	9,613,080	1,131	-
	67.5	354	100%	76	68	55	0.53	18,996,525	2,235	100%	76	68	55	0.53	18,996,525	2,235	-
	72.5	306	100%	76	73	55	0.63	27,326,565	3,215	100%	76	73	55	0.63	27,326,565	3,215	-
	77.5	294	17%	76	76	55	0.73	36,950,160	4,347	5%	76	76	55	0.73	36,639,851	4,311	37
	82.5	280	17%	76	77	55	0.83	41,611,336	4,895	5%	76	76	55	0.83	40,155,269	4,724	171
	87.5	244	17%	76	78	55	0.93	42,192,484	4,964	5%	76	77	55	0.93	39,677,109	4,668	296
	92.5	129	17%	76	79	55	1.03	25,620,060	3,014	5%	76	77	55	1.03	23,506,849	2,766	249
	97.5	11	17%	76	80	55	1.00	2,196,761	258	5%	76	77	55	1.00	1,968,798	232	27
Subtotal CLG		958							24,340							23,560	779

Note:
1. Estiamte typical occupancy is 30% of design occupancy

Savings Estimate
Date: 28-Aug-12
Project: City of Greeley Colorado
Location: LPA (AC-8)
Measure: ECM 8 Demand Controlled Ventilation

AC-8 CFM	7500
Existing Htg Efficiency	0.8
Existing SEER	10.5
Existing EER	8.5
Existing kW/Ton	1.41

			EXISTING							PROPOSED							SAVINGS
	Average BIN Temp	BIN Hours	OSA %	RAT	MAT	SAT	Nominal % Full Load	BTU Required	Therms (kWh)	OSA %	RAT	MAT	SAT	Nominal % Full Load	BTU Required	Therms (kWh)	Therms (kWh)
Heating	-17.5	0	17%	69	54	90	0.80	-	-	5%	69	65	90	0.47	-	-	-
	-12.5	10	17%	69	55	90	0.75	2,117,441	26	5%	69	65	90	0.44	896,578	11	15
	-7.5	7	17%	69	56	90	0.70	1,349,658	17	5%	69	65	90	0.41	578,885	7	10
	-2.5	18	17%	69	57	90	0.65	3,142,099	39	5%	69	65	90	0.38	1,365,515	17	22
	2.5	28	17%	69	58	90	0.60	4,396,064	55	5%	69	66	90	0.35	1,936,197	24	31
	7.5	34	17%	69	59	90	0.55	4,764,489	60	5%	69	66	90	0.32	2,127,101	27	33
	12.5	39	17%	69	59	90	0.50	4,834,060	60	5%	69	66	90	0.29	2,187,808	27	33
	17.5	100	17%	69	60	90	0.45	10,845,698	136	5%	69	66	90	0.26	4,975,741	62	73
	22.5	168	17%	69	61	90	0.40	15,733,570	197	5%	69	67	90	0.23	7,314,906	91	105
	27.5	202	17%	69	62	90	0.35	16,066,257	201	5%	69	67	90	0.20	7,564,643	95	106
	32.5	258	17%	69	63	90	0.30	17,055,903	213	5%	69	67	90	0.17	8,121,914	102	112
	37.5	331	17%	69	64	90	0.25	17,665,098	221	5%	69	67	90	0.14	8,485,440	106	115
	42.5	405	17%	69	64	90	0.20	16,733,831	209	5%	69	68	90	0.11	8,065,651	101	108
	47.5	416	17%	69	65	90	0.15	12,461,623	156	5%	69	68	90	0.08	5,956,509	74	81
	52.5	384	17%	69	66	90	0.10	7,404,307	93	5%	69	68	90	0.05	3,396,790	42	50
Subtotal HTG								134,570,097	1,682						62,973,678	787	895
Cooling	57.5	356	100%	76	58	55	0.33	2,378,970	280	100%	76	58	55	0.33	2,378,970	280	-
	62.5	368	100%	76	63	55	0.43	9,613,080	1,131	100%	76	63	55	0.43	9,613,080	1,131	-
	67.5	354	100%	76	68	55	0.53	18,996,525	2,235	100%	76	68	55	0.53	18,996,525	2,235	-
	72.5	306	100%	76	73	55	0.63	27,326,565	3,215	100%	76	73	55	0.63	27,326,565	3,215	-
	77.5	294	17%	76	76	55	0.73	36,950,160	4,347	5%	76	76	55	0.73	36,639,851	4,311	37
	82.5	280	17%	76	77	55	0.83	41,611,336	4,895	5%	76	76	55	0.83	40,155,269	4,724	171
	87.5	244	17%	76	78	55	0.93	42,192,484	4,964	5%	76	77	55	0.93	39,677,109	4,668	296
	92.5	129	17%	76	79	55	1.03	25,620,060	3,014	5%	76	77	55	1.03	23,506,849	2,766	249
	97.5	11	17%	76	80	55	1.00	2,196,761	258	5%	76	77	55	1.00	1,968,798	232	27
Subtotal CLG		958							24,340							23,560	779

Note:
1. Estiamte typical occupancy is 30% of design occupancy

Franktown Colorado

Latitude : 39° 23' 32" N
Longitude : 104° 45' 03" W
Elevation : 6158 ft.
Report Generated on: Aug. 3, 2012

Start Date : Jan. 1, 2011
End Date : Dec. 31, 2011
# of Days : 365 of 365
obs : poss : 8755 of 8760

Sub Interval Windows

	Start	End
Date	Jan. 01	Dec. 31
Hour	0	23

Average Air Temperature

Total number of Observations
Greater than or equal to initial interval value and Less than ending interval value.
Hour of day (L.S.T.)

Range Deg F		1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm	12 am	All Hrs.
-20 to -15	-17.5	0	0	0	0	0																				0
-15 to -10	-12.5	0	0	0	0	0	3	3	2	1	1									0	0	0	0	0	0	10
-10 to -5	-7.5	0	0	0	0	0	1			1		1				1	1	1	1	0	0	0	0	0	0	7
-5 to 0	-2.5	0	0	0	0	0	1	3	4		1	1	1	1	1			1	4	0	0	0	0	0	0	18
0 to 5	2.5	0	0	0	0	0	5	4	3	2	1	1	2	1	1	1	1	4	2	0	0	0	0	0	0	28
5 to 10	7.5	0	0	0	0	0	7	6	1	4	1	1	1	2	2	2	3	1	3	0	0	0	0	0	0	34
10 to 15	12.5	0	0	0	0	0	7	8	7	3	4	2	1				1	4	2	0	0	0	0	0	0	39
15 to 20	17.5	0	0	0	0	0	20	19	10	5	3	3	2	4	4	7	9	5	9	0	0	0	0	0	0	100
20 to 25	22.5	0	0	0	0	0	31	25	21	13	10	7	10	8	8	7	3	9	16	0	0	0	0	0	0	168
25 to 30	27.5	0	0	0	0	0	41	28	23	19	9	9	7	4	4	4	9	19	26	0	0	0	0	0	0	202
30 to 35	32.5	0	0	0	0	0	41	40	31	19	16	7	8	9	8	10	19	30	20	0	0	0	0	0	0	258
35 to 40	37.5	0	0	0	0	0	34	25	30	30	29	25	18	19	20	21	24	20	36	0	0	0	0	0	0	331
40 to 45	42.5	0	0	0	0	0	27	35	29	34	34	32	31	31	25	31	29	33	34	0	0	0	0	0	0	405
45 to 50	47.5	0	0	0	0	0	35	25	27	31	30	35	37	33	37	31	31	33	31	0	0	0	0	0	0	416
50 to 55	52.5	0	0	0	0	0	26	19	26	28	29	27	28	35	35	40	37	26	28	0	0	0	0	0	0	384
55 to 60	57.5	0	0	0	0	0	31	32	24	29	29	31	31	19	30	26	25	27	22	0	0	0	0	0	0	356
60 to 65	62.5	0	0	0	0	0	36	18	24	22	30	27	27	35	31	30	30	24	34	0	0	0	0	0	0	368
65 to 70	67.5	0	0	0	0	0	17	32	25	24	21	30	28	30	32	33	30	29	23	0	0	0	0	0	0	354
70 to 75	72.5	0	0	0	0	0	2	31	31	27	24	24	26	25	25	24	22	25	20	0	0	0	0	0	0	306
75 to 80	77.5	0	0	0	0	0		11	25	26	28	20	20	21	21	24	34	30	34	0	0	0	0	0	0	294
80 to 85	82.5	0	0	0	0	0			19	28	23	30	26	28	30	29	25	27	15	0	0	0	0	0	0	280
85 to 90	87.5	0	0	0	0	0			2	18	34	28	28	32	30	30	23	14	5	0	0	0	0	0	0	244
90 to 95	92.5	0	0	0	0	0				1	7	23	29	25	20	13	9	2		0	0	0	0	0	0	129
95 to 100	97.5	0	0	0	0	0					1	1	4	3	1	1				0	0	0	0	0	0	11
									5%	22%	28%	25%	18%	30%	28%	30%	30%	30%	30%							

Copyright: Western Regional Climate Center - Desert Research Institute - Reno, Nevada.
Data are subject to further review and editing. Please refer any questions to the Western Regional Climate Center.

Building: Lincoln Park Annex

CBECS Data

Electricity

Electric Intensity:	15.8 kWh/sqft	

	End-use %	End-use Intensity (kWh/sqft)	% Difference from CBECS data
Lighting	31%	4.96	0.0%
Cooling	19%	3.05	2.0%
Ventilation	17%	2.73	2.0%
Office Equip.	12%	1.94	-4.0%
Other	9%	1.36	0.0%
Heating	6%	0.98	1.9%
Water Heating	2%	0.30	-1.9%
Cooking	2%	0.25	0.0%
Refrigeration	1%	0.22	0.0%
	100.0%	16	

Natural Gas

Natural Gas Intensity:	38.7 kBtu/sqft	

Heating	72%	27.7	0.0%
Water Heating	20%	7.6	4.0%
Cooling	5%	1.9	-5.0%
Other	3%	1.2	0.0%
Cooking	1%	0.2	1.0%
	100.0%	38.7	

Estimated Building End Use

Electricity

Basline Consumption:	1,033,500 kWh/yr

	End-use %	End-use (kWh)
Lighting	31%	324,519
Cooling	21%	220,136
Ventilation	19%	199,466
Office Equip.	8%	85,781
Other	9%	88,881
Heating (pumping)	8%	83,714
Water Heating	0%	0
Cooking	2%	16,536
Refrigeration	1%	14,469
Total	100.0%	1,033,500

Natural Gas

Basline Consumption:	37,705	Therms

Heating	72%	26,997
Water Heating	24%	8,936
Cooling	0%	-
Other	3%	1,207
Cooking	2%	566
Total	100.0%	37,705

AC-4 Load Balance
Date: 28-Aug-12
Project: City of Greeley Colorado
Location: LPA
Measure: ECM 8 Demand Controlled Ventilation

Mark	TONS	kW/TON	kW	Hours/Yr	kWh/yr
AC-1	25	1.4	35.0	958	33,530
AC-2	25	1.4	35.0	958	33,530
AC-3	8	1.4	11.0	958	10,562
AC-4	50	1.4	70.0	958	67,060
AC-5	11	1.4	16.0	958	15,312
AC-6	30	1.4	42.0	958	40,236
AC-7	17.5	1.4	24.5	958	23,471
AC-8	17.5	1.4	24.5	958	23,471
Total					247,172
EUA					220,136

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Appendix for ECM 8:
ECM 8 Demand Controlled Ventilation, Police HQ

I. Energy Savings Calculations

ECM 8 Demand Controlled Ventilation Police HQ Savings Calculation

Savings Estimate

Date:	5-Sep-12
Project:	City of Greeley Colorado
Location:	Police HQ
Measure:	ECM 8 Demand Controlled Ventilation

ECM 8 Demand Controlled Ventilation	
Estimated Savings (Therms/Yr):	3,901
Estimated Savings (Peak kW):	-
Estimated Savings (kWh/Yr):	7,365

Savings Estimate
Date: 5-Sep-12
Project: City of Greeley Colorado
Location: Pollice HQ RTU-1
Measure: ECM 8 Demand Controlled Ventilation

RTU-1 CFM	16000	Design Value
RTU-1 OA CFM	10500	Design Value
RTU-1 OA Fraction	0.66	Design Value
Existing Htg Efficiency	0.8	
Existing EER	8.5	
Existing kW/Ton	1.41	

			EXISTING							PROPOSED							SAVINGS
	Average BIN Temp	BIN Hours	OSA %	RAT	MAT	SAT	Nominal % Full Load	BTU Required	Therms (kWh)	OSA %	RAT	MAT	SAT	Nominal % Full Load	BTU Required	Therms (kWh)	Therms (kWh)
Heating	-17.5	5	66%	69	12	90	0.70	4,703,265	59	33%	69	41	90	0.70	2,986,673	37	21
	-12.5	26	66%	69	16	90	0.65	21,751,821	272	33%	69	42	90	0.65	13,942,247	174	98
	-7.5	26	66%	69	19	90	0.60	19,194,084	240	33%	69	44	90	0.60	12,427,506	155	85
	-2.5	48	66%	69	22	90	0.55	30,929,079	387	33%	69	46	90	0.55	20,245,846	253	134
	2.5	70	66%	69	25	90	0.50	38,938,271	487	33%	69	47	90	0.50	25,794,134	322	164
	7.5	88	66%	69	29	90	0.45	41,707,567	521	33%	69	49	90	0.45	27,990,908	350	171
	12.5	104	66%	69	32	90	0.40	41,331,851	517	33%	69	50	90	0.40	28,138,350	352	165
	17.5	264	66%	69	35	90	0.35	86,242,741	1,078	33%	69	52	90	0.35	59,646,926	746	332
	22.5	422	66%	69	38	90	0.29	110,444,093	1,381	33%	69	54	90	0.29	77,732,944	972	409
	27.5	630	66%	69	42	90	0.24	127,598,984	1,595	33%	69	55	90	0.24	91,576,142	1,145	450
	32.5	636	66%	69	45	90	0.19	94,855,380	1,186	33%	69	57	90	0.19	69,583,692	870	316
	37.5	745	66%	69	48	90	0.14	75,641,854	946	33%	69	59	90	0.14	56,880,292	711	235
	42.5	801	66%	69	52	90	0.09	47,823,785	598	33%	69	60	90	0.09	36,991,902	462	135
	47.5	788	66%	69	55	90	0.04	18,644,797	233	33%	69	62	90	0.04	14,898,413	186	47
	52.5	699	66%	69	58	90	0.00	-	-	33%	69	64	90	0.00	-	-	-
Subtotal HTG								759,807,573	9,498						538,835,973	6,735	2,762
Cooling	57.5	737	100%	76	58	55	0.70	22,286,880	2,622	100%	76	58	55	0.70	22,286,880	2,622	-
	62.5	755	100%	76	63	55	0.75	73,386,000	8,634	100%	76	63	55	0.75	73,386,000	8,634	-
	67.5	538	100%	76	68	55	0.80	92,966,400	10,937	100%	76	68	55	0.80	92,966,400	10,937	-
	72.5	390	100%	76	73	55	0.85	100,245,600	11,794	100%	76	73	55	0.85	100,245,600	11,794	-
	77.5	316	66%	76	77	55	0.90	108,068,360	12,714	33%	76	76	55	0.90	105,635,716	12,428	286
	82.5	283	66%	76	80	55	0.95	117,490,461	13,822	33%	76	78	55	0.95	107,525,375	12,650	1,172
	87.5	244	66%	76	84	55	1.00	120,544,589	14,182	33%	76	80	55	1.00	104,543,654	12,299	1,882
	92.5	129	66%	76	87	55	1.00	71,086,637	8,363	33%	76	81	55	1.00	58,949,078	6,935	1,428
	97.5	11	66%	76	90	55	1.00	6,688,915	787	33%	76	83	55	1.00	5,340,298	628	159
Subtotal CLG		983							83,855							78,927	4,928

Reference Only	
9,027.17	1.05

Reference Only	
83,569	1.00

Note:
1. Estimate typical occupancy is 50% of design occupancy
2. Existing BIN Hours assumes 24/7 operation of RTU-1 and 2

Savings Estimate
Date: 5-Sep-12
Project: City of Greeley Colorado
Location: Police HQ RTU-2
Measure: ECM 8 Demand Controlled Ventilation

RTU-2 CFM	30000	Design Value
RTU-2 OA CFM	6000	Design Value
RTU-2 OA Fraction	0.20	Design Value
Existing Htg Efficiency	0.8	
Existing EER	8.5	
Existing kW/Ton	1.41	

			EXISTING							PROPOSED							SAVINGS
	Average BIN Temp	BIN Hours	OSA %	RAT	MAT	SAT	Nominal % Full Load	BTU Required	Therms (kWh)	OSA %	RAT	MAT	SAT	Nominal % Full Load	BTU Required	Therms (kWh)	Therms (kWh)
Heating	-17.5	5	20%	69	52	90	0.49	3,040,254	38	10%	69	60	90	0.49	2,353,617	29	9
	-12.5	26	20%	69	53	90	0.46	14,296,792	179	10%	69	61	90	0.46	11,172,962	140	39
	-7.5	26	20%	69	54	90	0.42	12,843,230	161	10%	69	61	90	0.42	10,136,599	127	34
	-2.5	48	20%	69	55	90	0.39	21,135,946	264	10%	69	62	90	0.39	16,854,869	211	54
	2.5	70	20%	69	56	90	0.35	27,227,340	340	10%	69	62	90	0.35	21,948,570	274	66
	7.5	88	20%	69	57	90	0.32	29,907,662	374	10%	69	63	90	0.32	24,384,175	305	69
	12.5	104	20%	69	58	90	0.28	30,474,662	381	10%	69	63	90	0.28	25,143,955	314	67
	17.5	264	20%	69	59	90	0.25	65,593,282	820	10%	69	64	90	0.25	54,800,777	685	135
	22.5	422	20%	69	60	90	0.21	87,000,026	1,088	10%	69	64	90	0.21	73,648,537	921	167
	27.5	630	20%	69	61	90	0.18	104,662,530	1,308	10%	69	65	90	0.18	89,838,315	1,123	185
	32.5	636	20%	69	62	90	0.14	81,642,557	1,021	10%	69	65	90	0.14	71,112,686	889	132
	37.5	745	20%	69	63	90	0.11	69,191,577	865	10%	69	66	90	0.11	61,207,934	765	100
	42.5	801	20%	69	64	90	0.07	47,778,368	597	10%	69	66	90	0.07	42,964,198	537	60
	47.5	788	20%	69	65	90	0.04	22,607,878	283	10%	69	67	90	0.04	20,686,655	259	24
	52.5	699	20%	69	66	90	0.00	-	-	10%	69	67	90	0.00	-	-	-
Subtotal HTG								617,402,104	7,718						526,253,849	6,578	1,139
Cooling	57.5	737	100%	76	58	55	0.42	25,311,528	2,978	100%	76	58	55	0.42	25,311,528	2,978	-
	62.5	755	100%	76	63	55	0.50	90,998,640	10,706	100%	76	63	55	0.50	90,998,640	10,706	-
	67.5	538	100%	76	68	55	0.57	123,761,520	14,560	100%	76	68	55	0.57	123,761,520	14,560	-
	72.5	390	100%	76	73	55	0.64	141,523,200	16,650	100%	76	73	55	0.64	141,523,200	16,650	-
	77.5	316	20%	76	76	55	0.71	155,271,479	18,267	10%	76	76	55	0.71	154,178,018	18,139	129
	82.5	283	20%	76	77	55	0.78	160,306,957	18,860	10%	76	77	55	0.78	155,634,333	18,310	550
	87.5	244	20%	76	78	55	0.86	157,675,611	18,550	10%	76	77	55	0.86	149,893,338	17,635	916
	92.5	129	20%	76	79	55	0.93	94,251,652	11,088	10%	76	78	55	0.93	87,851,848	10,336	753
	97.5	11	20%	76	80	55	1.00	9,016,920	1,061	10%	76	78	55	1.00	8,250,660	971	90
Subtotal CLG		983							112,720							110,283	2,437

Reference Only	
7,431.45	1.04

Reference Only	
109,271	1.03

Note:
1. Estimate typical occupancy is 50% of design occupancy
2. Existing BIN Hours assumes 24/7 operation of RTU-1 and 2

Franktown Colorado

Latitude : 39° 23' 32" N
Longitude : 104° 45' 03" W
Elevation : 6158 ft.
Report Generated on: Aug. 3, 2012

Start Date : Jan. 1, 2011
End Date : Dec. 31, 2011
# of Days : 365 of 365
obs : poss : 8755 of 8760

Sub Interval Windows

	Start	End
Date	Jan. 01	Dec. 31
Hour	0	23

Average Air Temperature

Total number of Observations

Greater than or equal to initial interval value and Less than ending interval value.

Hour of day (L.S.T.)

Range Deg F		1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm	12 am	All Hrs.
-20 to -15	-17.5		1	2	1	1																				5
-15 to -10	-12.5	2	1	2	2	2	3	3	2	1	1									1	1	1	1	2	1	26
-10 to -5	-7.5	3	2				1			1		1				1	1	1	1	2	2	3	2	2	3	26
-5 to 0	-2.5	2	4	2	3	3	1	3	4		1	1	1	1	1			1	4	2	2	2	3	3	4	48
0 to 5	2.5	5	5	6	6	4	5	4	3	2	1	1	2	1	1	1	1	4	2	2	3	2	4	2	3	70
5 to 10	7.5	6	6	4	5	7	7	6	1	4	1	1	1	2	2	2	3	1	3	3	3	2	3	7	8	88
10 to 15	12.5	4	1	9	8	10	7	8	7	3	4	2	1				1	4	2	8	6	8	5	4	2	104
15 to 20	17.5	15	20	19	20	17	20	19	10	5	3	3	2	4	4	7	9	5	9	6	10	12	14	16	15	264
20 to 25	22.5	26	21	21	29	30	31	25	21	13	10	7	10	8	8	7	3	9	16	16	20	22	23	22	24	422
25 to 30	27.5	43	43	54	44	45	41	28	23	19	9	9	7	4	4	4	9	19	26	35	29	30	32	35	38	630
30 to 35	32.5	34	38	31	29	40	41	40	31	19	16	7	8	9	8	10	19	30	20	20	34	37	34	39	42	636
35 to 40	37.5	35	37	32	38	34	34	25	30	30	29	25	18	19	20	21	24	20	36	42	45	39	42	38	32	745
40 to 45	42.5	36	33	38	36	34	27	35	29	34	34	32	31	31	25	31	29	33	34	39	31	38	36	33	42	801
45 to 50	47.5	30	40	40	47	43	35	25	27	31	30	35	37	33	37	31	31	33	31	24	30	33	31	30	24	788
50 to 55	52.5	35	33	31	22	24	26	19	26	28	29	27	28	35	35	40	37	26	28	28	24	21	27	32	38	699
55 to 60	57.5	39	36	38	40	39	31	32	24	29	29	31	31	19	30	26	25	27	22	24	31	32	37	34	31	737
60 to 65	62.5	36	34	29	32	29	36	18	24	22	30	27	27	35	31	30	30	24	34	35	33	42	39	40	38	755
65 to 70	67.5	14	10	7	2	2	17	32	25	24	21	30	28	30	32	33	30	29	23	26	38	24	20	22	19	538
70 to 75	72.5				1		2	31	31	27	24	24	26	25	25	24	22	25	20	31	19	16	12	4	1	390
75 to 80	77.5							11	25	26	28	20	20	21	21	24	34	30	34	18	4					316
80 to 85	82.5								19	28	23	30	26	28	30	29	25	27	15	3						283
85 to 90	87.5								2	18	34	28	28	32	30	30	23	14	5							244
90 to 95	92.5									1	7	23	29	25	20	13	9	2								129
95 to 100	97.5										1	1	4	3	1	1										11
Total # obs.		365	365	365	365	364	365	364	364	365	365	365	365	365	365	365	365	364	365	365	365	364	365	365	365	8755
Average Deg F		40.9	40.2	39.5	39.1	38.6	39.8	44.1	49.6	54.4	58.1	60.8	62	62.3	61.6	60.6	58.5	54.6	50.9	47.7	45.4	44	43.1	42.2	41.3	49.1

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Data are subject to further review and editing. Please refer any questions to the Western Regional Climate Center.

Building: Police HQ

CBECS Data

Electricity

Electric Intensity:	15.8 kWh/sqft		
	End-use %	End-use Intensity (kWh/sqft)	% Difference from CBECS data
Lighting	31%	5.0	-8.0%
Cooling	19%	3.0	3.7%
Ventilation	17%	2.7	9.3%
Office Equip.	12%	1.9	0.0%
Other	9%	1.4	0.0%
Heating	6%	1.0	-3.1%
Water Heating	2%	0.3	-1.9%
Cooking	2%	0.3	0.0%
Refrigeration	1%	0.2	0.0%
	100.0%	15.8	

Natural Gas

Natural Gas Intensity:	38.7 kBtu/sqft		
Heating	72%	27.7	2.0%
Water Heating	20%	7.6	2.0%
Cooling	5%	1.9	-5.0%
Other	3%	1.2	0.0%
Cooking	1%	0.2	1.0%
	100%	38.7	

Estimated Building End Use

Electricity

Basline Consumption:	955,680 kWh/yr	
	End-use %	End-use (kWh)
Lighting	23%	223,629
Cooling	23%	219,806
Ventilation	27%	254,211
Office Equip.	12%	117,549
Other	9%	82,188
Heating (pumping)	3%	29,626
Water Heating	0%	0
Cooking	2%	15,291
Refrigeration	1%	13,380
Total	100.0%	955,680

Natural Gas

Basline Consumption:	25,336 Therms	
Heating	74%	18,647
Water Heating	22%	5,498
Cooling	0%	-
Other	3%	811
Cooking	2%	380
Total	100.0%	25,336

Unit	Clg Tons	Htg MBH
RTU-1	50	1000
RTU-2	65	812
RTU-3	16	240
TOTAL	130	2045

	Clg Allocation		Htg Allocation	
Unit	% Load	kWh	% Load	Therms
RTU-1	0.38	83,569	0.48	9,027.17
RTU-2	0.5	109,271	0.4	7,431.45
RTU-3	0.12	26,967	0.12	2,188.40
TOTAL	1	219,806	1	18,647.02

Note: Assume mini split systems energy is negligible