

**ATTACHMENT G (DRAFT)
SCHEDULE OF SAVINGS**

1. Schedule of Savings

The total energy and operational Cost Avoidance over the Term of the contract is equal to or greater than \$291,485 as defined in the table below:

YEAR	ENERGY	OPERATIONAL	TOTAL
1	\$92,456	\$3,035	\$95,492
2	\$95,230	\$1,338	\$96,568
3	\$98,087	\$1,338	\$99,425
TOTALS	\$285,773	\$5,712	\$291,485

or the sum of the Retrofit and Support Costs for such Guarantee Year, whichever is less. Provided further, in no event shall the cost avoidance guarantee provided herein exceed the total installation, maintenance, and financing costs for the Work under this Agreement. Proforma budget neutral or positive cash flows are not guaranteed.

The Term of the Guarantee Performance Period is 3 years, subject to Attachment F.

1.1 Energy Savings. The first year amount of energy savings is the sum of the below listed ECMs. The Cost Avoidance is based on the listed Energy and Operational Cost Avoidance Guarantee Practices contained in Section 1.3 herein.

Att A		Electric	Non-Electric	Water	Total
No. ^[a]	ECM Description	Year 1	Year 1	Year 1	Year 1
Mountain View					
A	ECM 1.1 Boiler Replacement	\$0	\$26,101	\$0	\$26,101
B	ECM 3.1: Control System Upgrade – EMS, Retro-Commissioning, and Demand Control Ventilation at AHU-3	\$0	\$6,449	\$0	\$6,449
C	ECM 4.1 A.2: HVAC Mechanical Option A.2 - Replace AHU-7	\$490	\$4,479	\$0	\$4,969
D	ECM 4.1 B: HVAC Mechanical Option B - Retro-commission AHU-1 - AHU-6	\$1,568	\$16,794	\$0	\$18,362
E	ECM 4.2: HVAC Mechanical Option B - Retro-commission FCs and Uvs	\$925	\$15,519	\$0	\$16,444
F	ECM 5.1: Lighting Retrofit	\$8,429	(\$926)	\$0	\$7,504
G	ECM 6.1: Envelope Upgrade	\$0	\$2,023	\$0	\$2,023
City Hall, Library, Cotton Building, Pope Marine, and WWTP					
H	ECM 3.1: Control System Upgrade – EMS, City Hall	\$0	\$0	\$0	\$0
I	ECM 3.2: Control System Upgrade – Programmable Thermostat, Library Cotton Bldg, Pope Marine	\$0	\$0	\$0	\$0
J	J. ECM 5.1: Lighting Retrofit, City Wide	\$7,652	(\$321)	\$0	\$7,331
K	K. ECM 6.1: Envelope Upgrade, City Hall	\$0	\$3,275	\$0	\$3,275
Totals		\$19,065	\$73,391	\$0	\$92,456

[a] Att A: Attachment A, Scope of Work.

Customer agrees that the baseline for the unit cost of energy will be adjusted each year of the guarantee term. This annually adjusted value of energy unit cost is stipulated as the new baseline in each succeeding year. Customer agrees that baseline adjustment is stipulated to be an escalation of 3% per year for the unit cost of electric utilities and 3% per year for gas utilities used in the determination of cost avoidance each year.

1.2 Operational Cost Savings. The annual guarantee of operational cost avoidance strategies are listed below. The Savings are based on the listed Energy and Operational Cost Avoidance Guarantee Practices contained in Section 1.3 herein. The operational cost savings described below and identified in Section 1 are deemed satisfied upon contract execution. The Customer acknowledges and agrees that, if it did not enter into this agreement, it would have

to take future steps to achieve the same ends as does the work included in Attachment A of this contract, and that, in doing so, it would incur operational costs of at least the amount per year over the life of the performance period as presented below and in the Schedule of Savings. The Customer agrees that, by entering into this agreement, it will avoid future operational costs in at least these amounts.

Further, the Customer acknowledges that operational cost savings categorized as capital cost avoidance are part of, or are causally connected to scope of work specified in Attachment A (i.e., the ECMs being implemented), and are documented by industry standard engineering methodologies acceptable to the Customer.

Customer agrees that the baseline for the unit cost of operations will be adjusted each year of the guarantee term. This annually adjusted value of operational unit cost is stipulated as the new baseline in each succeeding year. Customer agrees that baseline adjustment is stipulated to be an escalation of 0% per year for operational costs used in the determination of operational cost avoidance each year.

OSD#	Operational Savings Description (OSD)	Att. A	Cost Avoidance Category	1 st Year Cost
		Ref.	(O&M, Capital,)	Avoidance
1	Lighting Material Savings	F, J	O&M	\$3,035
			Total	\$3,035

[a] O&M: operations and maintenance.

1.3 **Energy and Operational Cost Avoidance Guarantee Practices:**

1.3.1 BASELINE Operating Parameters are the facility(s) and system(s) operations measured and/or observed before commencement of the Work. The data summarized will be used in the calculation of the baseline energy consumption and/or demand and for calculating baseline adjustments for changes in facility operation that occur during the Guarantee Period. HONEYWELL and CUSTOMER agree that the operating parameters specified in this section are representative of equipment operating characteristics during the Baseline Period specified in this Agreement. The following data was collected with the assistance of facility maintenance team.

The Baseline Period is defined as February 2011 to January 2012.

The Contractual Baseline consists of the Baseline Conditions and Baseline Operating Parameters collected from the Baseline Period and modified by Baseline Adjustments, as necessary, as defined herein and by the Exhibits to Attachment G.

Baseline operating parameters are stipulated in <Baseline Operating Parameters> attached hereto and incorporated herein as Exhibit G-1. See Energy Savings Calculations, attached hereto and incorporated herein as Exhibit G-1 for further information regarding stipulated baseline parameters.

1.3.1.1 Pre-Retrofit Baseline Adjustments: The following describes the adjustments that have been made during the determination of the Baseline, prior to the determination of the projected cost avoidance and the guaranteed cost avoidance. The adjustments are due to those projects included in Attachment A, or other known events, which increase energy use prior to the application of the ECMs.

- A. Outside Air Intake Increase:
- B. Repair of non-operational energy-consuming equipment:

The parameters, methodologies, and/or calculations used in determining the Pre-Retrofit Baseline Adjustments are included in <Pre-Retrofit Baseline Adjustments> attached hereto and incorporated herein as Exhibit G-2.

Routine and non-routine future post-retrofit baseline adjustments are discussed in section 1.4.4.

1.3.2 GUARANTEE PERIOD Operating Parameters of the facility(s) and system(s) after completion of Work. The Customer agrees to operate, or cause to effect the operation of the Work in such manner that is in accordance with the Guaranteed Period Operating Parameters. The data summarized will be used in the calculation of the post-retrofit energy consumption and/or demand. HONEYWELL and CUSTOMER agree that the proposed

operating parameters specified in this section are representative of equipment operating characteristics during the Guarantee Period specified in this Agreement. And, further, that they are agreed to be reasonable and may be used in the calculation of the cost avoidance, as if the site is actually operating per the parameters outlined in this section.

Guarantee Period operating parameters are stipulated in <Guarantee Period Operating Parameters> attached hereto and incorporated herein as Exhibit G-3.

1.3.2.1 Post-Retrofit Baseline Adjustments: The following describes known future events, events not captured in section 1.3.1.1., which generally increase energy use compared to the Baseline Period. This energy use is added to the baseline to determine an adjusted baseline against which the energy and energy cost avoidance will be determined. Energy increases are variable and dependant on the actual use of equipment.

None

1.3.3 Operational Cost Avoidance: The following parameters, methodologies, and/or calculations were used in determining the Operational Costs and/or avoided costs due to the Retrofit and Support Services implementation and are agreed to be reasonable and may be used in the calculation of the cost avoidance.

Operational cost avoidance methodology and/or calculation details are attached hereto and are incorporated herein as the exhibits outlined in the following table.

OSD#	Operational Savings Description	Cost Avoidance Methodology	Exhibit
1	Lighting	Estimated Recycling & Material Cost Savings due to extended material life is calculated based on the existing recycling and material cost, stipulated failure rate of lamps and ballasts, and fixture counts.	G-7
The operational savings measures and which budget line items or invoice categories that are affected, are cross-referenced in each Operational Savings Cost Avoidance Detail in the Exhibits.			

[a] O&M: operations and maintenance.

1.3.4 Other energy and operating savings measures: The following measures *were* not included in the guarantee but may be used during the term in the determination of realized cost avoidance, or calculation of performance versus the guarantee, or to show value-add to the Customer:

Att A No.	Description of Attachment A Tasks not included in Sections 1.1 or 1.2 above
H	Provide improved operation, providing convenience to the facility operators to change equipment scheduling from remote locations.
I	Provide improved operation, providing convenience to the facility operators to change equipment scheduling from remote locations.

1.4 Guarantee Savings Measurement and Verification Plan

1.4.1 Measurement and Verification Methodology(s):

Energy Conservation Measure	Electric Savings Verification Method	Fuel Savings Verification Method	Other Utility Savings Verification Method
Boiler replacement	N/A	OPTION C	N/A
Control system upgrade	N/A	OPTION B	N/A
HVAC Mechanical	OPTION B	OPTION B	N/A
Lighting	OPTION A w/ Stipulated Burn Hours	N/A	N/A
Building Envelope	N/A	OPTION A	N/A

A description of M&V options applicable to this program are included in the Measurement and Verification Plans, attached hereto and incorporated herein as Exhibit G-6.

1.4.2 Energy Cost Avoidance: The following describes the Measurement and Verification procedures, formulas, and stipulated values which may be used in the calculation of the energy cost avoidance. The calculation of energy cost avoidance is based upon the utility rate paid during the Guarantee Year, or the Baseline Period utility rate, whichever produces the higher cost avoidance and/or as defined heretofore. Energy cost avoidance may also include, but is not limited to, Savings from demand charges, power factor correction, taxes, ratchet charges, rate changes and other utility tariff charges that are reduced as a result of the HONEYWELL involvement. The Customer is responsible for procuring a ratchet reset from the local utility company, as applicable. In case any ratchets are not reset the following adjustment will be made - energy cost avoidance will be calculated as if the ratchet has been reset at the end of the installation of electrical demand reducing ECMs.

1.4.2.1 M&V Approach

ECM 1.1: Boiler Upgrade

Approach

Option C was selected for this ECM because of the simplicity of the ECMs and the fact that the ECM involve reducing the gas consumption of specific equipment, which is difficult to isolate from other savings measures. These ECM have a high success rate and since the baseline utility data is reliable, it is reasonable to track these savings via utility bills. Maintenance staff will be interviewed each year and a sample of equipment will be inspected to ensure the retrofit remains in place.

Monitored Parameters and Variables

The main parameters and variables for this ECM are:

- Current Heating Therm use
- Current boiler efficiency
- Proposed boiler efficiency
- Hours of operation
- Weather (degree days)
- Occupancy

Energy Savings Calculations

The same calculations used to determine the baseline and post installation usage will be used after the installation of the ECM to determine as built energy savings potential. Savings will be monitored with utility bills on an annual basis. Calculation details are contained in Attachment 3.1. The equations used for the energy savings calculations are as follows:

$$\text{Total Saved Therm} = \text{Boiler Load} * (1 - \text{Existing Boiler Combustion Efficiency} / \text{Proposed Boiler Combustion Efficiency})$$

$$\text{Boiler load} = \text{Total Baseline Fuel Load Therm} - \sum(\text{Therm Savings})$$

$$\sum(\text{Therm Savings}) = \text{Therm Savings of ECM 3.1, ECM 4.1, ECM 4.2, and ECM 6.1}$$

$$\text{Total Therm Dollar Saved} = \text{Boiler load} * \text{Fuel oil rate} - (\text{Boiler load} - \text{Total Saved Therm}) * \text{Propane rate}$$

ECM 3.1: Control System Upgrade – EMS, Retro-commissioning, and Demand Control Ventilation

Approach

Option “B – measured” will be used to measure the savings associated with this ECM. The ECM proposes installation of an Energy Management Control System (EMCS), retro-commissioning of existing HVAC equipment, scheduling, and demand control ventilation programming at AHU-3. Implementation of this measure will be performed along with ECM 4.1 and ECM 4.2, HVAC mechanical upgrade. The cost avoidance analysis for this ECM includes the cost avoidance associated with the Demand Control Ventilation. M&V approach for the scheduling savings is included in ECM 4.1 and ECM 4.2. The energy performance baseline was determined based on the TMY3 weather data, mechanical system specifications, and estimated operational hours. The cost avoidance analysis will be based on the weather data, mechanical system specifications, measured ventilation rate, and measured ventilation hours.

Stipulated Parameters

The following parameters will be stipulated for the term of the contract:

- Existing gym minimum outdoor air flowrate (GMOAFR), 2,000 cfm
- AHU-3 Total cfm = 8,000 cfm
- Average occupied room temperature (RT), 70°F
- Air density correction factor (ADCF), 1.0
- Existing boiler combustion efficiency (BCE), 78%
- Existing Sensible ventilation heating load (SVHL), 119.4 kBtu/SCFM – SVHL is calculated based on the TMY3 Bin data during the scheduled hours for existing operation. 4:00AM – 7:00PM Monday through Friday operation is stipulated.

Monitored Parameters

The following parameters will be monitored for 4 weeks following the implementation of this measure, and used throughout the term of the contract:

- Outside air temperature, OAT (°F)
- Mountain View AHU-3 Return air temperature, RAT (°F)
- Mountain View AHU-3 Mixed air temperature, MAT (°F)
- Mountain View AHU-3 Unit On/Off
- Mountain View AHU-3 Return CO2 reading (ppm)

Energy Savings Calculations

The equations below will be used to calculate the savings resulting from this ECM.

$$\text{Total Saved Therm} = \text{Total Existing Therm} - \text{Total Proposed Therm}$$

$$\text{Total Therm Dollars Saved} = \text{Total Saved Therm} * \text{Therm rate}$$

$$\text{Total Existing Therm} = \text{Total Existing Ventilation MMBTU} / \text{Combustion Eff} * 10$$

$$\text{Total Existing Ventilation MMBTU} = \text{GMOAFR} * \text{ADCF} * \text{Existing Total SVHL} / 1,000$$

$$\text{Existing Total SVHL, kBtu/SCFM} = \sum((\text{RT} - \text{TMY3 Bin Temp}) * 1.08 / 1,000 * \text{TMY3 Bin Hrs}) = 119.43$$
 Where TMY3 Bin data for the existing operation (after scheduling, 4:00AM – 7:00PM, Mon – Sun) is

Bin Midpoint	Sensible Load	Sensible Load,
Temp, deg F	Hours	kBTU/SCFM
62.5	729	5.90
57.5	1016	13.72
52.5	1247	23.57
47.5	996	24.20
42.5	977	29.02
37.5	456	16.01
32.5	147	5.95
27.5	22	1.01
22.5	1	0.05
Totals	5,591	119.43

$$\text{Total Proposed Therm} = \text{Total Proposed Ventilation MMBTU} / \text{Combustion Eff} * 10$$

$$\text{Total Existing Ventilation MMBTU} = \text{Measured Vent during occupancy} * \text{ADCF} * \text{Total SVHL} / 1,000$$

$$\text{Measured Vent during occupancy} = 8,000 \text{ cfm} * (\text{MAT} - \text{RAT}) / (\text{OAT} - \text{RAT})$$

$$\text{Total SVHL, kBtu/SCFM} = \sum((\text{RT} - \text{TMY3 Bin Temp}) * 1.08 / 1,000 * \text{TMY3 Bin Hrs})$$
 Where Bin data will be created to reflect the actual unit operation

ECM 4.1 and ECM 4.2: HVAC Mechanical Upgrade

Approach

A combination of Option “A – Stipulated” and Option “B – measured” will be used to measure the savings associated with this ECM. Implementation of this measure will be performed along with ECM 3.1, control system upgrade. The cost avoidance analysis for this ECM includes the cost avoidance associated with the scheduling

savings. The energy performance baseline was determined based on the TMY3 weather data, mechanical system specifications, and estimated operational hours. The cost avoidance analysis will be based on the weather data, mechanical system specifications, and measured operating hours.

Stipulated Parameters

The following parameters will be stipulated for the term of the contract:

- Average occupied room temperature (RT), 70°F
- Air density correction factor (ADCF), 1.0
- Existing boiler combustion efficiency (BCE), 78%
- Existing annual fan hours (AFH), 8760 hrs
- Supply fan motor horsepower as specified in below table, hp
- Supply fan total airflow as specified in below table, cfm
- Minimum Outside airflow as specified in below table, cfm
- Fan motor load factor (LF), 60%
- Fan motor efficiency (ME), 80%
- Overall building UA value (UAb), 2,976 Btu/(hr-°F)

Where UAb = Roof area * U-value (roof) + Wall area * U-value (wall) + Window area * U-value (window)

- Roof area = 27,600 Sq.ft.
- U-value (roof) = 0.052 Btu/(hr-sq.ft.- °F)
- Wall area = 11,739 sq.ft.
- U-value (wall) = 0.047 Btu/(hr-sq.ft.- °F)
- Window area = 2,072 sq.ft
- U-value for windows = 0.48 Btu/(hr-sq.ft.- °F)

Specification - mechanical drawings (Modernizations to Mountain View Elementary School Port Townsend School District No.50)				
Unit	Services	Total CFM	Min OA CFM	Motor HP
AHU-1	Library	3,780	1,000	3
AHU-2	Admin (Police dept)	4,600	1,000	3
AHU-3	Gym	8,000	2,000	5
AHU-4	Commons (library)	5,400	1,600	3
AHU-5	Man's locker	2,500	1,000	1
AHU-6	Women's locker	2,500	1,000	1
AHU-7	Pool	8,500	2,000	5
Total		35,280	9,600	21

Specification - mechanical drawings (Modernizations to Mountain View Elementary School Port Townsend School District No.50)				
Unit	Services	Total CFM	Min OA CFM	Motor HP
UV-1	Classroom 1	1,200	400	0.50
UV-2	Classroom 3	1,200	400	0.50
UV-3	Classroom 5	1,200	400	0.50
UV-4	Classroom 2	1,200	400	0.50
UV-5	Classroom 4	1,200	400	0.50
UV-6	Classroom 6	1,200	400	0.50
UV-7	Classroom 9	1,200	400	0.50
UV-8	Classroom 11	1,200	400	0.50
UV-9	Classroom - chapter 1/LAP 13	700	200	0.25
UV-10	Classroom - spec ed 7	1,200	400	0.50
UV-11	Classroom 8	1,200	400	0.50
UV-12	Classroom 10	1,200	400	0.50
UV-13	Classroom 12	1,200	400	0.50
UV-14	Classroom - music	1,500	600	0.50
UV-15	Classroom - cafeteria	1,000	300	0.50
UV-16	Classroom - lobby	700	0	0.25
FC-1	West - girls bathroom	200	0	0.06
FC-2	West - boys bathroom	200	0	0.06
FC-3	West - corridor	600	200	0.13
FC-4	East - timeout 17	300	30	0.03
FC-5	West - corridor 63 (police station)	400	0	0.03
FC-6	West - corridor 61	400	0	0.13
FC-7	East - multi-use 24	600	60	0.13
FC-8	East - special services 22	600	60	0.13
FC-9	East - counselor 23	600	60	0.13
FC-10	East - office 14	400	80	0.13
FC-11	Not used	0	0	0.00
FC-12	East - corridor 60	600	60	0.13
FC-13	East - CDS 21	600	60	0.13
FC-14	East - corridor 60	1,200	400	0.50
FC-15	East - S-500	600	60	0.13
FC-16	Gym - PE office	300	30	0.13
Total		25,900	7,000	9

Monitored Parameters

The following parameters will be monitored for 4 weeks following the implementation of this measure, and used throughout the term of the contract:

- Programmed schedule of each unit: start/stop schedule

Energy Savings Calculations

The equations below will be used to calculate the savings resulting from this ECM.

$$\text{Total Saved Fan kWh} = \text{Total Existing Fan kWh} - \text{Total Proposed Fan kWh}$$

$$\text{Total Existing Fan kWh} = \text{Motor HP} * \text{AFH} * 0.746 * \text{LF} / \text{ME}$$

$$\text{Total Proposed Fan kWh} = \text{Motor HP} * \text{Measured Operating Hrs} * 0.746 * \text{LF} / \text{ME}$$

$$\text{Total kWh Dollars Saved} = \text{Total Saved Fan kWh} * \text{kWh rate}$$

$$\text{Total Saved Therm} = \text{Total Existing Therm} - \text{Total Proposed Therm}$$

$$\text{Total Therm Dollars Saved} = \text{Total Saved Therm} * \text{Therm rate}$$

$$\text{Total Existing Therm} = \text{Ex Ventilation Load} + \text{Ex Heat Loss Load}$$

$$\text{Ex Ventilation Load, Therm} = \text{Min OA flow rate} * \text{ADCF} * \text{SVHL} / \text{BCE} / 100$$

$$\text{Ex SVHL, kBtu} / \text{SCFM} = \sum((\text{RT} - \text{TMY3 Bin Temp}) * 1.08 / 1,000 * \text{TMY3 Bin Hrs}) = 191.05$$

Where TMY3 Bin data for the existing operation (24/7 operation) is

Bin Midpoint Temp, deg F	Sensible Load Hours	Sensible Load, kBTU/SCFM
62.5	771	6.25
57.5	1380	18.63
52.5	2045	38.65
47.5	1590	38.64
42.5	1599	47.49
37.5	800	28.08
32.5	274	11.10
27.5	44	2.02
22.5	4	0.21
Totals	8,507	191.05

$$\text{Ex Heat Loss Load (Therm)} = \sum(\text{UAb} * (\text{RT} - \text{TMY3 Bin Temp}) * \text{TMY3 Bin Hrs} / 1,000,000) / \text{BCE} * 10$$

Total Proposed Therm = Pro Ventilation Load + Pro Heat Loss Load

Pro Ventilation Load, Therm = Min OA flow rate * Measured Op Hrs * SVHL / BCE / 100

Ex SVHL, kBtu / SCFM = $\sum((\text{RT} - \text{Bin Temp}) * 1.08 / 1,000 * \text{Bin Hrs})$

Where operating hr bin data will be created based on the actual unit operation and weather data.

Pro Heat Loss Load (Therm) = $\sum(\text{UAb} * (\text{RT} - \text{Bin Temp}) * \text{Bin Hrs} / 1,000,000) / \text{BCE} * 10$

Where bin data for operating hour and off hour will be created based on the actual unit operation and weather data.

ECM 5.1: Lighting

Approach

Option “A – stipulated” will be used to measure the savings associated with this ECM. The purpose of the ECM is to reduce energy consumption by retrofitting existing lighting fixtures with higher efficiency lamps and ballasts, and occupancy sensors. This ECM is affected by the electrical load of the listed fixtures and the operational hours of the fixtures. This load in Watts is determined from manufacturers’ data. The operating hours are determined by occupant information, sensed data, and type of facility.

Stipulated Parameters

The following parameters will be stipulated for the term of the contract:

- Baseline and proposed runtime hours will be stipulated based on the occupancy information and lighting datalogger results recorded during the Investment Grade Audit. Where occupancy sensors or photocells are installed, proposed runtime hours will be stipulated based on a percentage decrease in baseline hours appropriate to the lighting usage type.
- Demand diversity factors will be stipulated.
- Baseline fixture power draws will be stipulated based on figures published by ANSI (The American National Standards Institute).
- Proposed fixture power draws will be stipulated based on figures published by the lamp and ballast manufacturer(s).

Monitored Parameters

The following parameters will be measured once for the term of the contract:

- Foot candle reading for a random sampling of each pre-retrofit and each post-retrofit fixture-type

Energy Savings Calculations

The equations below will be used to calculate the savings resulting from this ECM.

$$\text{Total Saved kW} = \text{Total Existing kW} - \text{Total Proposed kW}$$

$$\text{Total kW Dollars Saved} =$$

$$\text{Total Saved kW} * \text{kW rate} * 12 \text{ Months}$$

$$\text{Total Saved kWh} = \text{Total Existing kWh} - \text{Total Proposed kWh}$$

Total kWh Dollars Saved = Total Saved kWh * kWh rate

Total Dollars Saved = Total kW Dollars Saved + Total kWh Dollars Saved + O&M Saved

ECM 6.1: Envelope Upgrade

Approach

Option “A – stipulated” will be used to measure the savings associated with this ECM. The purpose of the ECM is to reduce energy consumption by reducing the air leakage area. The energy performance baseline was determined based on the TMY3 weather data, mechanical system specifications, stipulated operating parameters, and engineering calculations. The cost avoidance will be based on the estimated sealed leakage airflow rate.

Stipulated Parameters

The following parameters will be stipulated for the term of the contract:

- Average occupied room temperature (RT1), 70°F
- Average unoccupied room temperature after implementation of ECM 3.1 (RT2), 60°F
- Air density correction factor (ADCF), 1.0
- Existing boiler combustion efficiency (BCE), 78%
- Leakage airflow rate to seal (LAFR) of 439 cfm will be stipulated once proposed installation is verified

Energy Savings Calculations

The equations below will be used to calculate the savings resulting from this ECM.

Total Saved Therm = LAFR * ADCF * Infiltration Heating Load / 100 / BCE

Infiltration Heating Load, kBtu/SCFM = Occupied Infiltration Load + Unoccupied Infiltration Load

Occupied Infiltration Load, kBtu/SCFM = $\sum((RT1 - TMY3 \text{ Bin Temp}_{Occ}) * 1.08 / 1,000 * TMY3 \text{ Bin Hrs}_{Occ}) = 119.4$

Where TMY3 Bin data for occupied time (4:00AM – 7:00PM, Mon - Sun)

Bin Midpoint Temp, deg F	Sensible Load Hours	Sensible Load, kBTU/SCFM
62.5	729	5.90
57.5	1016	13.72
52.5	1247	23.57
47.5	996	24.20
42.5	977	29.02
37.5	456	16.01
32.5	147	5.95
27.5	22	1.01
22.5	1	0.05
Totals	5,591	119.43

Unoccupied Infiltration Load, kBtu/SCFM = $\sum((RT2 - TMY3 \text{ Bin Temp}_{Unocc}) * 1.08 / 1,000 * TMY3 \text{ Bin Hrs}_{Unocc}) = 119.4$

Where TMY3 Bin data for unoccupied time (7:00PM – 4:00AM, Mon - Sun)

Bin Midpoint Temp, deg F	Sensible Load Hours	Sensible Load, kBTU/SCFM
62.5	42	0.00
57.5	364	0.98
52.5	798	6.46
47.5	594	8.02
42.5	622	11.76
37.5	344	8.36
32.5	127	3.77
27.5	22	0.77
22.5	3	0.12
Totals	2,916	40.25

Total Therm Dollars Saved = Total Saved Therm * Therm rate

Operations and Maintenance and Other Cost Savings

The annual maintenance savings is calculated based on the difference between the average annual existing maintenance and recycling costs and the average annual proposed maintenance and recycling costs for lamps and ballasts only. Labor costs were not included in either the existing or the proposed maintenance costs. Savings are based on a simple actuary type table that takes the current lamp life of the existing system, and compares it to the new lamp life. Failure rate of existing lamps and ballasts were estimated based on the existing lamps and ballasts types. Savings would most likely increase over time, as any existing system would soon be approaching end of life and failure would be increasing.

1.4.3 Specific ECM M&V Plan(s): The following describes the Measurement and Verification procedures, formulas, and stipulated values which may be used in the determination of cost avoidance and/or performance against the Guarantee for this each specific ECM in addition to the general Energy Cost Avoidance procedure outlined in 1.4.2.

1.4.3.1 Table of Specific ECM M&V Plan Exhibits:

ECM	ECM Description	M&V Plan Exhibit
1.1	Boiler replacement	G-6.1
3.1	Control system upgrade	G-6.2
4.1 and 4.2	HVAC Mechanical	G-6.3
5.1	Lighting	G-6.4
6.1	Building Envelope	G-6.5

1.4.4 Constants: The constants and/or stipulated values defined in the Exhibits to Attachment G, or as defined herein, are mutually agreed to by the Customer to be reasonable and may be used in the determination of the cost avoidance.

1.4.5 Exhibits and Schedules: The following Exhibits are attached hereto and are made a part of this Agreement by reference.

1.4.5.1 Exhibits

- Exhibit G-1 Baseline Operating Parameters
- Exhibit G-2 Pre-Retrofit Baseline Adjustments
- Exhibit G-3 Guarantee Period Operating Parameters
- Exhibit G-4 Contractual Baseline Conditions, Utility Use, Utility Unit Costs
- Exhibit G-5 Energy Savings Calculations and Supporting Data
- Exhibit G-6 M&V Plan
- Exhibit G-7 OSD#1: Lighting O&M Operational Cost Avoidance

EXHIBIT G-1 BASELINE Operating Parameters

Space or room measurements for Mountain View Facility:

	General Occupancy Schedule	HVAC Enable Schedule	Operating Temperature During Occupancy	
			Heating	Cooling
Weekdays	6:00AM - 7:00PM	24/7	70°F	N/A
Saturdays	6:00AM - 7:00PM	24/7	70°F	N/A
Sundays	6:00AM - 7:00PM	24/7	70°F	N/A
Holidays	6:00AM - 7:00PM	24/7	70°F	N/A

	General Unoccupancy Schedule	HVAC Disable Schedule	Operating Temperature During Vacancy	
			Heating	Cooling
Weekdays	7:00PM - 6:00AM	-	70°F	N/A
Saturdays	7:00PM - 6:00AM	-	70°F	N/A
Sundays	7:00PM - 6:00AM	-	70°F	N/A
Holidays	7:00PM - 6:00AM	-	70°F	N/A

Supply system measurements:

Air handling units 1-7 have the following observed operational parameters:

Unit	Services	Fan status - trend	General condition	Fan on/off	Operating Fan HP	Estimated % of Min OA CFM	OSA CFM
AHU-1	Library	No communication	AHU has filter, manual operation	1	3	10%	100
AHU-2	Admin (Police dept)	started	AHU has filter, manual control	1	3	10%	100
AHU-3	Gym	started	Manual control, no filter, clogged coil	1	5	10%	200
AHU-4	Commons (library)	started	Manual control, no filter, clogged coil	1	3	10%	160
AHU-5	Man's locker	stopped	Not operational	0	0	0%	0
AHU-6	Women's locker	stopped	Manual control, no filter, clogged coil	1	1	10%	100
AHU-7	Pool	started		1	5	80%	1,600
Total					20		2,260

Fan coils and Unit Ventilators have the following observed operational parameters:

EXHIBIT G-1 BASELINE Operating Parameters, (continued)

Unit	Services	Front-end fan status	Fan on/off	Operating Fan HP	Estimated % of Min OA CFM	OSA CFM
UV-1	Classroom 1	stopped	0	0.0	0%	0
UV-2	Classroom 3	started	1	0.5	80%	320
UV-3	Classroom 5	started	1	0.5	80%	320
UV-4	Classroom 2	no communication	0	0.0	0%	0
UV-5	Classroom 4	stopped	0	0.0	0%	0
UV-6	Classroom 6	started	1	0.5	80%	320
UV-7	Classroom 9	stopped	0	0.0	0%	0
UV-8	Classroom 11	stopped	0	0.0	0%	0
UV-9	Classroom - chapter 1/	started	1	0.3	80%	160
UV-10	Classroom - spec ed 7	started	1	0.5	80%	320
UV-11	Classroom 8	started	1	0.5	80%	320
UV-12	Classroom 10	started	1	0.5	80%	320
UV-13	Classroom 12	stopped	0	0.0	0%	0
UV-14	Classroom - music	started	1	0.5	80%	480
UV-15	Classroom - cafeteria	no communication	0	0.0	0%	0
UV-16	Classroom - lobby	no communication	0	0.0	0%	0
FC-1	West - girls bathroom		1	0.1	0%	0
FC-2	West - boys bathroom		1	0.1	0%	0
FC-3	West - corridor		1	0.1	80%	160
FC-4	East - timeout 17		1	0.0	80%	24
FC-5	West - corridor 63 (police station)		1	0.0	0%	0
FC-6	West - corridor 61		1	0.1	0%	0
FC-7	East - multi-use 24	started	1	0.1	80%	48
FC-8	East - special services	started	1	0.1	80%	48
FC-9	East - counselor 23	started	1	0.1	80%	48
FC-10	East - office 14	started	1	0.1	80%	64
FC-11	Not used	-	0	0.0	0%	0
FC-12	East - corridor 60	started	1%	0.0	80%	48
FC-13	East - CDS 21	started	1	0.1	80%	48
FC-14	East - corridor 60	no communication	0	0.0	0%	0
FC-15	East - S-500		1	0.1	80%	48
FC-16	Gym - PE office	no communication	0	0.0	0%	0
Total				4.9		3,096

EXHIBIT G-1 BASELINE Operating Parameters, (continued)

Lighting: Baseline lighting operating hours by area type are stipulated as follows.

Codes	Area Type	Current Hours
CL	Classroom	5824
CLS	Classroom-- Sensored	3786
BR	Break room	2340
BRS	Break room-- Sensored	1638
EX	Exits	8736
EXT	Exterior	4368
GYM	Gym	1248
HW	Hallway	5824
PSHW	Police Station Hallway	8736
KN	Kitchen	2912
KNS	Kitchen-- Sensored	2038
LAB	Lab	3640
LABS	Lab-- Sensored	2730
ME	Mechanical Room	2184
MES	Mechanical Room-- Sensored	1420
MR	Meeting Room	2340
MRS	Meeting Room-- Sensored	1638
OO	Open Office	3380
OOS	Open Office-- Sensored	2535
PSOO	Police Station Open Office	8736
PSOOS	Police Station Open Office-- Sensored	6115
PO	Private Office	2600
POS	Private Office-- Sensored	1950
PSPO	Police Station Private Office	5824
PSPOS	Police Station Private Office-- Sensored	4368
RR	Restroom	3120
RRS	Restroom-- Sensored	2028
ST	Storage	2080
STS	Storage-- Sensored	1352
SW	Stairwell	5824
WA	Work Area	2340
WAS	Work Area-- Sensored	1872
NONE	No Hours	0

EXHIBIT G-2 Pre-Retrofit Baseline Adjustments

Baseline operating parameters for the supply system are adjusted for the air handling units, fan coils, and unit ventilators. The adjustments are due to retro-commissioning of HVAC mechanical units, which will correct the following:

- A. Outside Air Intake Increase
- B. Repair of non-operational energy-consuming equipment

Adjusted supply system operating parameters:

Air handling units 1-7 will have the following operational parameters after pre-retrofit baseline adjustments:

Unit	Services	Total CFM	Min OA CFM	Motor HP
AHU-1	Library	3,780	1,000	3
AHU-2	Admin (Police dept)	4,600	1,000	3
AHU-3	Gym	8,000	2,000	5
AHU-4	Commons (library)	5,400	1,600	3
AHU-5	Man's locker	2,500	1,000	1
AHU-6	Women's locker	2,500	1,000	1
AHU-7	Pool	8,500	2,000	5
Total		35,280	9,600	21

EXHIBIT G-2 Pre-Retrofit Baseline Adjustments (continued)

Fan coils and Unit Ventilators will have the following operational parameters after pre-retrofit baseline adjustments:

Unit	Services	Total CFM	Min OA CFM	Motor HP
UV-1	Classroom 1	1,200	400	0.50
UV-2	Classroom 3	1,200	400	0.50
UV-3	Classroom 5	1,200	400	0.50
UV-4	Classroom 2	1,200	400	0.50
UV-5	Classroom 4	1,200	400	0.50
UV-6	Classroom 6	1,200	400	0.50
UV-7	Classroom 9	1,200	400	0.50
UV-8	Classroom 11	1,200	400	0.50
UV-9	Classroom - chapter 1/	700	200	0.25
UV-10	Classroom - spec ed 7	1,200	400	0.50
UV-11	Classroom 8	1,200	400	0.50
UV-12	Classroom 10	1,200	400	0.50
UV-13	Classroom 12	1,200	400	0.50
UV-14	Classroom - music	1,500	600	0.50
UV-15	Classroom - cafeteria	1,000	300	0.50
UV-16	Classroom - lobby	700	0	0.25
FC-1	West - girls bathroom	200	0	0.06
FC-2	West - boys bathroom	200	0	0.06
FC-3	West - corridor	600	200	0.13
FC-4	East - timeout 17	300	30	0.03
FC-5	West - corridor 63 (poli	400	0	0.03
FC-6	West - corridor 61	400	0	0.13
FC-7	East - multi-use 24	600	60	0.13
FC-8	East - special services	600	60	0.13
FC-9	East - counselor 23	600	60	0.13
FC-10	East - office 14	400	80	0.13
FC-11	Not used	0	0	0.00
FC-12	East - corridor 60	600	60	0.13
FC-13	East - CDS 21	600	60	0.13
FC-14	East - corridor 60	1,200	400	0.50
FC-15	East - S-500	600	60	0.13
FC-16	Gym - PE office	300	30	0.13
Total		25,900	7,000	9

EXHIBIT G-3 GUARANTEE PERIOD Operating Parameters

Space or room temperatures for Mountain View Facility:

	General Occupancy Schedule	HVAC Enable Schedule	Operating Temperature During Occupancy	
			Heating	Cooling
Weekdays	6:00AM - 7:00PM	4:00AM - 7:00PM	70°F	N/A
Saturdays	6:00AM - 7:00PM	4:00AM - 7:00PM	70°F	N/A
Sundays	6:00AM - 7:00PM	4:00AM - 7:00PM	70°F	N/A
Holidays	6:00AM - 7:00PM	4:00AM - 7:00PM	70°F	N/A

	General Unoccupancy Schedule	HVAC Disable Schedule	Operating Temperature During Vacancy	
			Heating	Cooling
Weekdays	7:00PM - 6:00AM	7:00PM - 4:00AM	55°F	N/A
Saturdays	7:00PM - 6:00AM	7:00PM - 4:00AM	55°F	N/A
Sundays	7:00PM - 6:00AM	7:00PM - 4:00AM	55°F	N/A
Holidays	7:00PM - 6:00AM	7:00PM - 4:00AM	55°F	N/A

Supply system operating parameters:

Air handling units 1-7 will have the following operational parameters:

Unit	Services	Total CFM	Min OA CFM	Motor HP
AHU-1	Library	3,780	1,000	3
AHU-2	Admin (Police dept)	4,600	1,000	3
AHU-3	Gym	8,000	2,000	5
AHU-4	Commons (library)	5,400	1,600	3
AHU-5	Man's locker	2,500	1,000	1
AHU-6	Women's locker	2,500	1,000	1
AHU-7	Pool	8,500	2,000	5
Total		35,280	9,600	21

EXHIBIT G-3 GUARANTEE PERIOD Operating Parameters (continued)

Fan coils and Unit Ventilators will have the following operational parameters:

Unit	Services	Total CFM	Min OA CFM	Motor HP
UV-1	Classroom 1	1,200	400	0.50
UV-2	Classroom 3	1,200	400	0.50
UV-3	Classroom 5	1,200	400	0.50
UV-4	Classroom 2	1,200	400	0.50
UV-5	Classroom 4	1,200	400	0.50
UV-6	Classroom 6	1,200	400	0.50
UV-7	Classroom 9	1,200	400	0.50
UV-8	Classroom 11	1,200	400	0.50
UV-9	Classroom - chapter 1/	700	200	0.25
UV-10	Classroom - spec ed 7	1,200	400	0.50
UV-11	Classroom 8	1,200	400	0.50
UV-12	Classroom 10	1,200	400	0.50
UV-13	Classroom 12	1,200	400	0.50
UV-14	Classroom - music	1,500	600	0.50
UV-15	Classroom - cafeteria	1,000	300	0.50
UV-16	Classroom - lobby	700	0	0.25
FC-1	West - girls bathroom	200	0	0.06
FC-2	West - boys bathroom	200	0	0.06
FC-3	West - corridor	600	200	0.13
FC-4	East - timeout 17	300	30	0.03
FC-5	West - corridor 63 (poli	400	0	0.03
FC-6	West - corridor 61	400	0	0.13
FC-7	East - multi-use 24	600	60	0.13
FC-8	East - special services	600	60	0.13
FC-9	East - counselor 23	600	60	0.13
FC-10	East - office 14	400	80	0.13
FC-11	Not used	0	0	0.00
FC-12	East - corridor 60	600	60	0.13
FC-13	East - CDS 21	600	60	0.13
FC-14	East - corridor 60	1,200	400	0.50
FC-15	East - S-500	600	60	0.13
FC-16	Gym - PE office	300	30	0.13
Total		25,900	7,000	9

EXHIBIT G-3 GUARANTEE PERIOD Operating Parameters (continued)

Lighting: Guarantee period lighting operating hours by area type are stipulated as follows. Where occupancy sensor installation is proposed, lighting hours will be reduced as specified.

Codes	Area Type	Current Hours	Occupany Sensor Reduction
CL	Classroom	5824	35%
CLS	Classroom-- Sensored	3786	
BR	Break room	2340	30%
BRS	Break room-- Sensored	1638	
EX	Exits	8736	
EXT	Exterior	4368	
GYM	Gym	1248	
HW	Hallway	5824	
PSHW	Police Station Hallway	8736	
KN	Kitchen	2912	30%
KNS	Kitchen-- Sensored	2038	
LAB	Lab	3640	25%
LABS	Lab-- Sensored	2730	
ME	Mechanical Room	2184	35%
MES	Mechanical Room-- Sensored	1420	
MR	Meeting Room	2340	30%
MRS	Meeting Room-- Sensored	1638	
OO	Open Office	3380	25%
OOS	Open Office-- Sensored	2535	
PSOO	Police Station Open Office	8736	30%
PSOOS	Police Station Open Office-- Sensored	6115	
PO	Private Office	2600	25%
POS	Private Office-- Sensored	1950	
PSPO	Police Station Private Office	5824	25%
PSPOS	Police Station Private Office-- Sensored	4368	
RR	Restroom	3120	35%
RRS	Restroom-- Sensored	2028	
ST	Storage	2080	35%
STS	Storage-- Sensored	1352	
SW	Stairwell	5824	
WA	Work Area	2340	20%
WAS	Work Area-- Sensored	1872	
NONE	No Hours	0	

EXHIBIT G-4 Contractual Baseline Conditions, Utility Use, Utility Unit Costs

The table below summarizes the utility rates used to calculate energy savings.

Facility name	PSE Elec Sch	Electric Energy Charge (\$/kWh)			Electric Demand (\$/kW)			Fuel	
		Summer	Winter	Annual Average	Summer	Winter	Annual Average	Type	\$/Therm
Mountain View - gym, pool, and offices	25	\$0.06571	\$0.06571	\$0.06571	\$6.01	\$9.01	\$7.51	Fuel Oil	\$2.50
Mountain View - Mod A (KPTZ)	24	\$0.08829	\$0.09139	\$0.08984	-	-	-	-	-
Mountain View - Mod B (YMCA)	24	\$0.08829	\$0.09139	\$0.08984	-	-	-	-	-
WWTP	25	\$0.06571	\$0.06571	\$0.06571	\$6.01	\$9.01	\$7.51	-	-
Pope Marine	24	\$0.08829	\$0.09139	\$0.08984	-	-	-	-	-
Cotton Bldg	24	\$0.08829	\$0.09139	\$0.08984	-	-	-	-	-
City Hall	24	\$0.08829	\$0.09139	\$0.08984	-	-	-	Propane	\$2.17
Library	24	\$0.08829	\$0.09139	\$0.08984	-	-	-	-	-

EXHIBIT G-5 Energy Savings Calculations and Supporting Data

Energy Savings Calculations and Supporting Data are provided in *COPT DRAFT IGAESP Attachment.pdf*.

EXHIBIT G-6 M&V Plan

ECM 1.1 – Boiler Replacement - M&V Plan

1. ECM Savings-and-M&V Objective & Rationale: The objective of this ECM is to reduce the energy consumption by replacing the existing fuel oil boilers with condensing propane boilers. M&V option “C” was selected as a cost-effective method to both (a) verify the potential-to-save and (b) to determine the quantity of energy use avoidance.

2. Baseline Conditions & Adjustments and Boundary of Savings Determination

2.1. Boundary of Energy Use and Savings Determination: The energy cost avoidance determination for this ECM is based on the adjusted baseline fuel load, therm savings of ECM 3.1, 4.1, 4.2, and 6.1, and measured combustion efficiency.

2.2. Baseline Conditions & Baseline Utility/Environmental/Process Data: The energy performance baseline was determined based on the history of utility bills, baseline adjustment due to increased ventilation rate (ECM 4.1 and 4.2), and engineering calculations. Baseline cost is determined from the utility rate schedules presented in Exhibit G-4. This ECM is affected by the increase in the boiler combustion efficiency.

2.3. Planned and Unplanned (Routine and Non-Routine) Baseline Adjustments: All other existing or new equipment directly using electricity and fuel oil are not accounted for in this energy analysis, including new equipment added under this contract or by others.

3. Potential-to-Save Verification Plan: The verification of potential-to-save will be based on completion of the following:

- The Customer’s sign-off of the Delivery & Acceptance certificate
- Inspection of installed boilers including boiler efficiency
- Utility bill data analysis

4. Parameters to be Monitored & Sampling Plan

4.1. Baseline Verification, Installation & Acceptance Period: Following the installation, boiler combustion efficiency will be measured, and the information will be used to calculate the actual savings based on the engineering calculation provided in Exhibit G-1 and Attachment 3.1.

4.2. Performance Period (On-Going): Performance period savings will be calculated based on the boiler combustion efficiency measures during the Baseline Verification, Installation & Acceptance Period, and the engineering calculation provided in Exhibit G-1 and Attachment 3.1. Utility bill data will be monitored.

5. Determination of Energy & Cost Avoidance: Annual savings will be measured with actual gas utility data.

6. Determination of Non-Energy O&M Impact: No O&M savings are being claimed as part of this ECM.

7. Customer Responsibilities and Honeywell-Customer Risk Allocation: By execution of this contract, Customer deems the energy savings calculation, presented in Exhibit G-1 and Attachment 3.1 appropriate for determination of energy avoidance.

7.1. Customer Responsibilities:

- By execution of this contract, Customer deems the energy savings calculation, presented in Exhibit G-1 and Attachment 3.1 appropriate for determination of energy avoidance
- Customer agrees to maintain post retrofit operational use per project specifications as delineated in the Energy Guarantee Special Provisions outlined in Attachment D and Attachments F and G
- Customer agrees to provide Honeywell with notification of changes that would impact the baseline of this ECM

7.2. Risk Allocation: Successful guarantee performance is determined by meeting the avoidance presented in Section 1 of Attachment G, Attachment A, Attachment F, Attachment G, Exhibits to Attachments A and G, and

this M&V plan. Honeywell is allowed to make baseline appropriate modifications to reflect observed changes in usage that impact the energy baseline.

8. Performance Period Definition, On-Going Activities, and Reports

8.1. Performance Period Definition: The performance period term overall is 3 years

8.2. On-going Activities: Each guarantee year Honeywell will verify continued operation of the ECM as shown in Attachments A, D, F and G.

8.3. Reports & Documentation: An annual report will be issued summarizing the guarantee year energy savings and site survey results.

ECM 3.1 – Control System Upgrade - M&V Plan

1. **ECM Savings-and-M&V Objective & Rationale**: The objective of this ECM is to install an Energy Management Control System (EMCS), retro-commission existing HVAC equipment, and implement scheduling and demand control ventilation control strategies. Implementation of this measure will be performed along with ECM 4.1 and 4.2, HVAC mechanical upgrade. M&V option “B – measured” was selected as a cost-effective method to both (a) verify the potential-to-save and (b) to determine the quantity of energy use avoidance.

2. Baseline Conditions & Adjustments and Boundary of Savings Determination

2.1. Boundary of Energy Use and Savings Determination: The energy cost avoidance determination for this ECM is isolated to the individual HVAC equipment (Mountain View AHU-3). The proposed unit’s performance data, measured outside air ventilation rate, and measured unit operating hours will be used to calculate therm energy savings. The energy cost avoidance determination for this ECM is isolated to the specified equipment as shown in Attachment 3.1.

2.2. Baseline Conditions & Baseline Utility/Environmental/Process Data: The energy performance baseline was determined using engineering calculations that utilize Mechanical System Specifications, site observations, estimated occupancy and usage, etc. Baseline cost is determined from the utility rate schedules presented in Exhibit G-4. This ECM is affected by operational run time and reduction of ventilation rate. The cost avoidance analysis will be based on manufacturers’ data, measured ventilation rate, measured operating hours, and engineering calculations.

2.3. Planned and Unplanned (Routine and Non-Routine) Baseline Adjustments: Mountain View YMCA schedule provided by the City of Port Townsend was used to establish the occupancy hours. Occupancy schedule change will be treated as baseline adjustments.

3. **Potential-to-Save Verification Plan**: The verification of potential-to-save will be based on completion of the following:

- The Customer’s sign-off of the Delivery & Acceptance certificate
- Verification of AHU-3 unit operating hours
- Verification of ventilation rate reduction
- Engineering calculations based on measured operating hours, ventilation rate, and mechanical specifications

4. Parameters to be Monitored & Sampling Plan

4.1. Baseline Verification, Installation & Acceptance Period: Trend or data-log the following parameters to verify the operation of Demand Control Ventilation. Take 15-minute interval data for 4 weeks following the installation during the normal operation of the facility.

- Outside air temperature, °F
- AHU-3 Return air temperature, °F
- AHU-3 Mixed air temperature, °F
- AHU-3 Unit on/off

- AHU-3 Return CO2 reading, ppm

Other parameters used for energy savings calculation will be stipulated.

- Existing gym minimum outdoor air flowrate (GMOAFR), 2,000 cfm
- AHU-3 Total cfm = 8,000 cfm
- Average occupied room temperature (RT), 70°F
- Air density correction factor (ADCF), 1.0
- Existing boiler combustion efficiency (BCE), 78%
- Existing Sensible ventilation heating load (SVHL), 119.4 kBtu/SCFM – SVHL is calculated based on the TMY3 Bin data during the scheduled hours for existing operation. 4:00AM – 7:00PM Monday through Friday operation is stipulated.

4.2. Performance Period (On-Going): On an annual basis, occupancy schedule will be verified to calculate energy savings compared against the baseline.

5. **Determination of Energy & Cost Avoidance**: Energy savings calculations are as presented in Exhibit G-1 and Attachment 3.1 to determine realized energy avoidance.

6. **Determination of Non-Energy O&M Impact**: No O&M savings are being claimed as part of this ECM.

7. **Customer Responsibilities and Honeywell-Customer Risk Allocation**: By execution of this contract, Customer deems the energy savings calculation, presented in Exhibit G-1 and Attachment 3.1 appropriate for determination of energy avoidance, years 2 through term energy cost avoidance will be equal to the value of year 1 energy cost avoidance.

7.1. Customer Responsibilities:

- By execution of this contract, Customer deems the energy savings calculation, presented in Exhibit G-1 and Attachment 3.1 appropriate for determination of energy avoidance
- Customer agrees to maintain post retrofit operational use per project specifications as delineated in the Energy Guarantee Special Provisions outlined in Attachment D and Attachments F and G
- Customer agrees to provide Honeywell with notification of changes that would impact the baseline of this ECM

7.2. Risk Allocation: Successful guarantee performance is determined by meeting the avoidance presented in Section 1 of Attachment G, Attachment A, Attachment F, Attachment G, Exhibits to Attachments A and G, and this M&V plan. Honeywell is allowed to make baseline appropriate modifications to reflect observed changes in usage that impact the energy baseline.

8. **Performance Period Definition, On-Going Activities, and Reports**

8.1. Performance Period Definition: The performance period term overall is 3 years

8.2. On-going Activities: Each guarantee year Honeywell will verify continued operation of the ECM as shown in Attachments A, D, F and G.

8.3. Reports & Documentation: An annual report will be issued summarizing the guarantee year energy savings and site survey results.

ECM 4.1 and 4.2 – HVAC Mechanical Upgrade - M&V Plan

1. **ECM Savings-and-M&V Objective & Rationale**: The objective of this ECM is to retro-commission or replace existing HVAC mechanical equipment for proper operation. Implementation of this measure will be performed with ECM 3.1 Control System Upgrade. M&V option “B – measured” was selected as a cost-effective method to both (a) verify the potential-to-save and (b) to determine the quantity of energy use avoidance.

2. Baseline Conditions & Adjustments and Boundary of Savings Determination

2.1. Boundary of Energy Use and Savings Determination: The energy cost avoidance determination for this ECM is isolated to the individual HVAC equipment. The proposed units' performance data and measured unit operating hours will be used to calculate energy savings. The energy cost avoidance determination for this ECM is isolated to the specified equipment as shown in Attachment 3.1.

2.2. Baseline Conditions & Baseline Utility/Environmental/Process Data: The energy performance baseline was determined using engineering calculations that utilize Mechanical System Specifications, site observations, estimated occupancy and usage, etc. Baseline cost is determined from the utility rate schedules presented in Exhibit G-4. This ECM is affected by operational run time. The cost avoidance analysis will be based on manufacturers' data, measured operating hours, mechanical specifications, and engineering calculations.

2.3. Planned and Unplanned (Routine and Non-Routine) Baseline Adjustments: All other existing or new equipment directly using electricity and fuel oil are not accounted for in this energy analysis, including new equipment added under this contract or by others.

3. **Potential-to-Save Verification Plan**: The verification of potential-to-save will be based on completion of the following:

- The Customer's sign-off of the Delivery & Acceptance certificate
- Verification of unit operating hours
- Engineering calculations based on measured operating hours and mechanical specifications

4. Parameters to be Monitored & Sampling Plan

4.1. Baseline Verification, Installation & Acceptance Period: Trend or data-log the programmed schedule of each unit: start/stop schedule. Take 15-minute interval data for 4 weeks following the installation during the normal operation of the facility.

Other parameters used for energy savings calculation will be stipulated.

- Average occupied room temperature (RT), 70°F
- Air density correction factor (ADCF), 1.0
- Existing boiler combustion efficiency (BCE), 78%
- Existing annual fan hours (AFH), 8760 hrs
- Supply fan motor horsepower as specified in below table, hp
- Supply fan total airflow as specified in below table, cfm
- Minimum Outside airflow as specified in below table, cfm
- Fan motor load factor (LF), 60%
- Fan motor efficiency (ME), 80%
- Overall building UA value (UAb), 2,976 Btu/(hr-°F)
- Where $UAb = \text{Roof area} * \text{U-value (roof)} + \text{Wall area} * \text{U-value (wall)} + \text{Window area} * \text{U-value (window)}$
 - Roof area = 27,600 Sq.ft.
 - U-value (roof) = 0.052 Btu/(hr-sq.ft.- °F)
 - Wall area = 11,739 sq.ft.
 - U-value (wall) = 0.047 Btu/(hr-sq.ft.- °F)
 - Window area = 2,072 sq.ft
 - U-value for windows = 0.48 Btu/(hr-sq.ft.- °F)

4.2. Performance Period (On-Going): On an annual basis, programmed schedule will be verified to calculate energy savings compared against the baseline.

5. **Determination of Energy & Cost Avoidance**: Energy savings calculations are as presented in Exhibit G-1 and Attachment 3.1 to determine realized energy avoidance.

6. **Determination of Non-Energy O&M Impact**: No O&M savings are being claimed as part of this ECM.

7. Customer Responsibilities and Honeywell-Customer Risk Allocation: By execution of this contract, Customer deems the energy savings calculation, presented in Exhibit G-1 and Attachment 3.1 appropriate for determination of energy avoidance, years 2 through term energy cost avoidance will be equal to the value of year 1 energy cost avoidance.

7.1. Customer Responsibilities:

- By execution of this contract, Customer deems the energy savings calculation, presented in Exhibit G-1 and Attachment 3.1 appropriate for determination of energy avoidance
- Customer agrees to maintain post retrofit operational use per project specifications as delineated in the Energy Guarantee Special Provisions outlined in Attachment D and Attachments F and G
- Customer agrees to provide Honeywell with notification of changes that would impact the baseline of this ECM

7.2. Risk Allocation: Successful guarantee performance is determined by meeting the avoidance presented in Section 1 of Attachment G, Attachment A, Attachment F, Attachment G, Exhibits to Attachments A and G, and this M&V plan. Honeywell is allowed to make baseline appropriate modifications to reflect observed changes in usage that impact the energy baseline.

8. Performance Period Definition, On-Going Activities, and Reports

8.1. Performance Period Definition: The performance period term overall is 3 years

8.2. On-going Activities: Each guarantee year Honeywell will verify continued operation of the ECM as shown in Attachments A, D, F and G.

8.3. Reports & Documentation: An annual report will be issued summarizing the guarantee year energy savings and site survey results.

ECM 5.1 – Lighting Retrofit - M&V Plan:

1. **ECM Savings-and-M&V Objective & Rationale:** Purpose of the ECM is to reduce energy consumption by retrofitting existing lighting fixtures with higher efficiency lamps and ballasts. M&V option “A” was selected as a cost-effective method to both (a) verify the potential-to-save and (b) to determine the quantity of energy use avoidance.

2. Baseline Conditions & Adjustments, and Boundary of Savings Determination

2.1. Boundary of Energy Use and Savings Determination: The energy cost avoidance determination for this ECM is isolated to the specified lighting fixtures as shown in Attachment 1 and Attachment 3.4.

2.2. Baseline Conditions & Baseline Utility/Environmental/Process Data: This ECM is affected by the electrical load of the listed fixtures and the operational hours of the fixtures. This load in Watts is based on the figured published by ANSI (The American National Standards Institute). Baseline costs are determined from current lighting loads, utility rate schedules and billing data. The operating hours are determined by occupant information and logging data. The cost avoidance analysis is based on performance conditions being normalized to baseline values of these parameters.

2.3. Planned and Unplanned (Routine and Non-Routine) Baseline Adjustments: All other existing or new equipment directly using electricity are not accounted for in this energy analysis, including new equipment added under this contract or by others.

3. **Potential-to-Save Verification Plan:** The verification of potential-to-save will be based on completion of the following:

- The Customer’s sign-off of the Delivery & Acceptance certificate
- Verification of pre and post installation energy consumed using ANSI and manufacturer’s specifications respectively.

- Measured volt-amps for a sampling of each pre-retrofit and each post-retrofit fixture-type per utility electric meter
- Stipulated hours of operation
- Verification of utility implemented rate schedules

4. Parameters to be Monitored & Sampling Plan

4.1. **Baseline Verification, Installation & Acceptance Period:** Proposed fixture power draws will be stipulated based on figures published by the lamp and ballast manufacturer(s) and verified by using sampling of per utility electric meter.

- Measured volt-amps for a sampling of each pre-retrofit and each post-retrofit fixture-type
- One Light level reading (in footcandles) shall be taken for each usage type in each building before and after completion of the retrofit. The same room locations will be used for pre- and post-retrofit light level sampling.
- Sampling will occur on existing fixtures before retrofit and on replacement fixtures after retrofit
- The same control locations will be used for pre-retrofit and post-retrofit sampling
- For those fixtures included in the pre/post retrofit categories providing 20% or less lighting energy savings, manufacturers' documented performance data will be used.
- Baseline and proposed fixture and control device counts and types will be verified.

Baseline and proposed runtime hours will be stipulated based on lighting occupant information and datalogger results recorded during the Investment Grade Audit. Where occupancy sensors or photocells are installed, proposed runtime hours will be stipulated based on a percentage decrease in baseline hours appropriate to the lighting usage type. Demand diversity factors will be stipulated based on lighting datalogger result recorded during the Investment Grade Audit. Where occupancy sensors or photocells are installed, proposed demand diversity factors will be stipulated based on a percentage decrease in baseline hours appropriate to the lighting usage type.

4.2. **Performance Period (On-Going):** Performance period fixture power draws will be stipulated based on figures published by Manufacturer's data and the pre and post installation measurements.

5. Determination of Energy & Cost Avoidance: Resulting energy savings calculations are as presented in Exhibit G-3.4 to determine realized energy avoidance.

6. Determination of Non-Energy O&M Impact: Resulting operational savings calculations are as presented in Exhibit G-3.4 to determine realized operational and maintenance cost avoidance.

7. Customer Responsibilities and Honeywell-Customer Risk Allocation:

7.1. Customer Responsibilities:

- By execution of this contract, Customer deems the lighting operational hours as stipulated and agreed-to
- By execution of this contract, Customer deems the energy savings calculation, presented in Exhibit G-3.4 appropriate for determination of energy avoidance
- Energy avoidance is stipulated and agreed upon based on year 1 post retrofit measurements and calculations; years 2 through term energy cost avoidance will be equal to the value of year 1 energy cost avoidance times the escalation factor noted in section 1.1
- Customer agrees to maintain equipment to manufacturer's specifications for the term of the guarantee.
- Customer agrees to maintain post retrofit operational use per project specifications as delineated in the Energy Guarantee Special Provisions outlined in Attachment D and Attachments F and G
- Customer agrees to provide Honeywell with notification of changes that would impact the baseline of this ECM

7.2. **Risk Allocation:** Successful guarantee performance is determined by meeting the avoidance presented in Section 1 of Attachment G, Attachment A, Attachment F, Attachment G, Exhibits to Attachments A and G, and this M&V plan. Honeywell is allowed to make baseline appropriate modifications to reflect observed changes in usage that impact the energy baseline.

8. Performance Period Definition, On-Going Activities, and Reports

- 8.1. Performance Period Definition: The performance period term overall is 3 years
- 8.2. On-going Activities: An annual site survey will be performed towards the end of each guarantee year to verify continued operation of the ECM as shown in Attachments A, D, F and G.
- 8.3. Reports & Documentation: An annual report will be issued summarizing the guarantee year energy savings and site survey results.

ECM 6.1 – Building Envelope - M&V Plan

1. ECM Savings-and-M&V Objective & Rationale: The objective of this ECM is to reduce energy consumption by reducing the air leakage area. M&V option “A” was selected as a cost-effective method to both (a) verify the potential-to-save and (b) to determine the quantity of energy use avoidance.

2. Baseline Conditions & Adjustments and Boundary of Savings Determination

2.1. Boundary of Energy Use and Savings Determination: The energy cost avoidance determination for this ECM is isolated to the specified air leakage areas as shown in Attachment A.

2.2. Baseline Conditions & Baseline Utility/Environmental/Process Data: The energy performance baseline was determined based on the TMY3 weather data, mechanical system specifications, stipulated operating parameters, and engineering calculations. Baseline cost is determined from the utility rate schedules presented in Exhibit G-4. This ECM is affected by leakage airflow rate to seal. The cost avoidance analysis will be based on sealed leakage area data and engineering calculations.

2.3. Planned and Unplanned (Routine and Non-Routine) Baseline Adjustments: All other existing or new equipment directly using electricity and fuel oil are not accounted for in this energy analysis, including new equipment added under this contract or by others.

3. Potential-to-Save Verification Plan: The verification of potential-to-save will be based on completion of the following:

- The Customer’s sign-off of the Delivery & Acceptance certificate
- Verification of sealed leakage area
- Engineering calculations based on sealed leakage area

4. Parameters to be Monitored & Sampling Plan

4.1. Baseline Verification, Installation & Acceptance Period: Following the installation, the actual installation stating the sealed leakage area will be provided, and the information will be used to calculate the actual savings based on the engineering calculation provided in Attachment 3.2

4.2. Performance Period (On-Going): Performance period savings will be stipulated based on the verification of the installation.

5. Determination of Energy & Cost Avoidance: Energy savings calculations are as presented in Exhibit G-1 and Attachment 3.2 to determine realized energy avoidance.

6. Determination of Non-Energy O&M Impact: No O&M savings are being claimed as part of this ECM.

7. Customer Responsibilities and Honeywell-Customer Risk Allocation: By execution of this contract, Customer deems the energy savings calculation, presented in Exhibit G-1 and Attachment 3.2 appropriate for determination of energy avoidance, years 2 through term energy cost avoidance will be equal to the value of year 1 energy cost avoidance.

7.1. Customer Responsibilities:

- By execution of this contract, Customer deems the energy savings calculation, presented in Exhibit G-1 and Attachment 3.2 appropriate for determination of energy avoidance
- Customer agrees to maintain post retrofit operational use per project specifications as delineated in the Energy Guarantee Special Provisions outlined in Attachment D and Attachments F and G
- Customer agrees to provide Honeywell with notification of changes that would impact the baseline of this ECM

7.2. Risk Allocation: Successful guarantee performance is determined by meeting the avoidance presented in Section 1 of Attachment G, Attachment A, Attachment F, Attachment G, Exhibits to Attachments A and G, and this M&V plan. Honeywell is allowed to make baseline appropriate modifications to reflect observed changes in usage that impact the energy baseline.

8. Performance Period Definition, On-Going Activities, and Reports

8.1. Performance Period Definition: The performance period term overall is 3 years

8.2. On-going Activities: Each guarantee year Honeywell will verify continued operation of the ECM as shown in Attachments A, D, F and G.

8.3. Reports & Documentation: An annual report will be issued summarizing the guarantee year energy savings and site survey results.

EXHIBIT G-7 OSD #1: LIGHTING O&M OPERATIONAL COST AVOIDANCE

1. Description and Causal Connection to Scope of Work: Attachment 1, describes Honeywell’s specification for implementing a comprehensive lighting retrofit.

2. Operational Cost Baseline: Lighting related O&M expenditure was determined based on the types and counts of existing lamps and ballasts to be replaced as part of ECM 5.1. The following parameters were estimated to calculate the operational cost baseline:

- Lamp failure rate for each existing lamp type
- Ballast failure type for each existing ballast type
- Lamp unit cost for each existing lamp type
- Ballast unit cost for each existing ballast type
- Lamp recycling cost for each existing lamp type

3. Operational Cost Conservation Methodology: Lighting related material and recycling expenditure will be eliminated completely during the lamp and ballast warranty period. After the warranty period, the new lamps and ballasts being installed have longer material life than the standard lamps and ballasts being replaced. This translates into a longer Mean Time Between Failures (MTBF). In other words, funds will be needed to be spent on labor and material to replace failed lamps and ballasts less often.

4. Determination of Operational Costs Avoided:
Recycling and material costs were calculated for the lamp and ballast warranty period using the following equations:
Lamp recycling cost = (# of fixture) x (# of lamp per fixture) x (lamp failure rate) x (lamp recycling cost)
Lamp material cost = (# of fixture) x (# of lamp per fixture) x (lamp failure rate) x (lamp unit cost)
Ballast material cost = (# of fixture) x (# of ballast per fixture) x (ballast failure rate) x (ballast unit cost)

Calculated Labor and Material Savings based on Existing and Proposed Lamps and Ballasts Recycling and Material Cost
From Attachment 1

Total Annual Lamp Material Savings:	\$1,194
Total Annual Ballast Material Savings:	\$1,338
<u>Total Annual Recycling Savings:</u>	<u>503</u>
Total Annual Maintenance Savings:	\$3,035