ORC004

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Medical Clinic

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Abbreviations

AFUE Annual Fuel Utilization Efficiency

AHU Air Handling Unit

BTU British Thermal Unit

CFM Cubic Feet (per) Minute

CMU Concrete Masonry Unit

CV Constant Volume

DAT Discharge Air Temperature

DDC Direct Digital Control(s)

DegF Degrees Fahrenheit

DOE Department of Energy

DHW Domestic Hot Water

dP Discharge Pressure

dT Delta T (Temperature difference)

DX Direct Expansion

EEM Energy Efficiency Measure

EFLH Estimated Full Load Hours

ETO Energy Trust of Oregon

EUI Energy Use Index

HC Heating Coil

HP Horsepower

Hr Hour

HVAC Heating Ventilating & Air Conditioning

HW Heating Water

HWP Heating Water Pump

IAC Industrial Assessment Center

kBtu 1,000 Btus

kW Kilowatt

kWh Kilowatt-hours

lbs Pounds

LPD Lighting Power Density

MBH kBtu/hr (1,000 BTU/hr)

MAT Mixed Air Temperature

OAT Outside Air Temperature

RAT Return Air Temperature

RF Return Fan

SAT Supply Air Temperature

sf Square Feet

SF Supply Fan

SOO Sequence of Operations

SP Static Pressure

TMY3 Typical Meteorological Year

TU Terminal Unit

VAV Variable Air Volume

VFD Variable Frequency Drive

W Watts

Yr Year

Disclaimer

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The intent of this energy analysis is to estimate energy savings associated with the recommended energy efficiency upgrades. This report is not intended to serve as a detailed engineering design document. Any description of proposed improvements that may be diagrammatic in nature are for the purpose of documenting the basis of cost and savings estimates for potential energy efficiency measures only. Detailed design efforts may be required by the participant to implement measures recommended as part of this energy analysis. While the recommendations in this study have been reviewed for technical accuracy and are believed to be reasonably accurate, all findings listed are estimates only. Actual savings and incentives may vary based on final installed measures and costs, actual operating hours, energy rates and usage.

Preface

The Commercial Building Energy Audit (CBEA) program is funded by the DOE and structured within the framework of its predecessor and parent program, the Industrial Assessment Center (IAC). The purpose of the CBEA is to provide customers with free energy assessments of commercial buildings, thereby increasing energy efficiency while simultaneously expanding the workforce of building efficiency professionals through the application of student participation from partnered colleges and universities. The scope of such audits is limited in nature, for the express purpose of identifying no-cost and low-cost energy savings opportunities, and a general view of potential capital improvements. This is accomplished by means of utility usage and billing evaluation, along with observation and analysis of energy using systems. The findings and recommendations within this report represent the conditions observed at the time of this site survey. Conditions and equipment usage are subject to change, and therefore the conclusions expressed within this report may not be evident in the future. The CBEA audit team has endeavored to meet what it believes is the applicable standard of care ordinarily exercised by others in conducting this energy audit. No other warranty, express or implied, is made regarding the information contained in this report.

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Building Energy Efficiency Measure (EEM) Summary

These energy efficiency measures (EEMs) are suggested for the facility. Cost savings are based on average utility rates for electricity and natural gas. Actual rates and cost savings will differ. Non-energy cost benefits are related to cost-savings due to as-avoided maintenance. Simple payback is estimated using current utility rates and estimated project costs, which may vary over time.

Table 1. EEM Summary

Measure Number	Measure Description	Annual Energy and Cost Savings				Measure Cost and Simple Payback	
		Electricity Savings		Gas Fuel Savings	Total Cost Savings	Measure Cost	Simple Payback
		kWh	kW	Therms			Year
EEM 1	Lighting Upgrade	1394	1	-	$ 126	$ 390	3
EEM 2	Occupancy Sensors	1408	-	-	$ 127	$ 240	2
EEM 3	Smart Thermostat	7870	-	-	$ 710	$ 1,200	2
EEM 4	New Existing Heat Pump	8580	-	-	$ 774	$ 15,000	19
Totals (Recommended Measures)		19252		0	$ 1,737	$ 16,830	10

Building Description

The Community Health Center was built in 2004, and is located in a rural part of the county. The center provides primary medical care focusing on vulnerable populations and is an important component of the local healt care system and a vital member of the community.

The clinic currently has operation hours on Mondays and Tuesdays from 9 am to 6:30 pm and Thursdays from 7 am to 4 pm. The clinic is closed Wednesdays, Fridays and weekends. Staff typically come in earlier and stay after hours.

The health center is shaped like a “U” with the ends facing the street with the entrance of the building on the right of configuration where the receptionist office and waiting room is located. The hall that connects the two wings of the building is where the exam room, office, and restroom are located. The opposite wing from the front desk is where more exam rooms and office spaces are located as well as an additional restroom. The architectural layout of the clinic is shown below. The facility is approximately 2136 sq. ft.

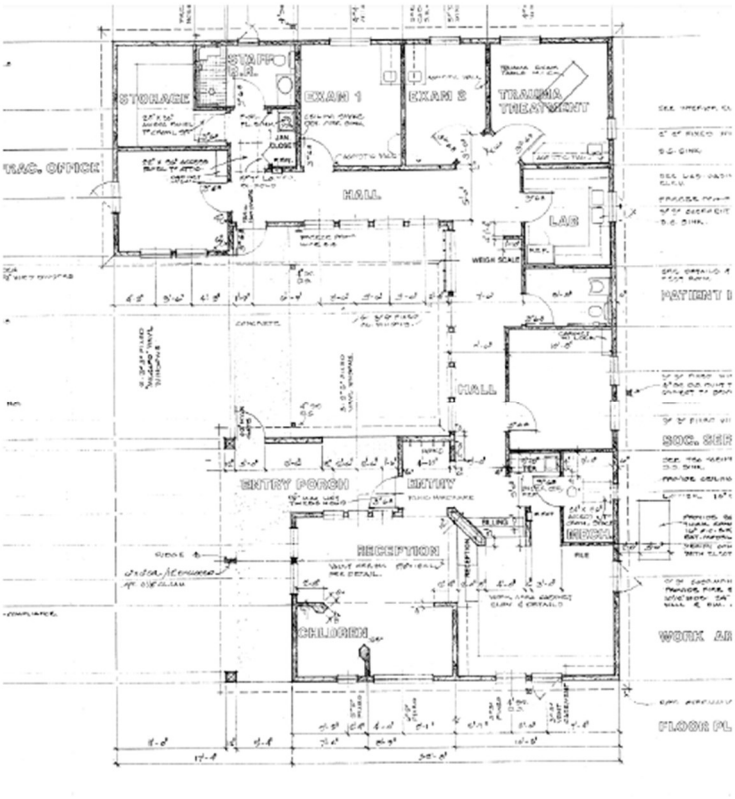


Figure 1 Medical Clinic Floor Plan

The exterior walls are of wood frame construction, R-19 insulation, with gypsum wall board on the interior surfaces and exterior wood siding. The roof is constructed of wood truss with 9:12 slope, and R-30 attic insulation with asphalt shingle roofing. Windows are fixed, double pane, with vinyl frames. The floors are wood with floor joists and R25 insulation over a 24” vented crawl space. There have been no major renovations since the original construction of the facility.

The primary energy source for the clinic is electricity, with propane as a back-up source of fuel. There is no natural gas at the site. The overall Energy Utilization Index for the clinic is 32.5 kBtu/sf.

Best Practices

This audit is per ASHRAE Level 1 requirements. The building's energy cost and efficiency were assessed by analyzing 2021's utility data.

Utility analysis was used to produce reports on the monthly consumption of both electricity and natural gas. The output from these reports was used to benchmark this building against the median EUI for buildings of its size and type in the local vicinity.

The mechanical and lighting schedules were used to generate outlines of energy usage in terms of demand and energy consumption.

A site visit conducted on August 2, 2022 provided a walk-through survey of the facility including its construction, operation, and maintenance, and major energy consuming equipment. Feedback from the customer related to facility performance and comfort was used to inform the survey and the resulting recommendations within this report.

The data was then used to identify no-cost and low-cost measures for improving energy efficiency. Because calculations at this level are minimal, savings and costs are approximate.

Energy Cost Analysis

Table 2. 2021 Energy Use

2021 Electrical Data							
Month	**kWh**	**kWh Charge**	**Charge/kWh**	**kW**	**kW Charge**	**Other Charges**	**Fees**
January	1955	$176.34	$0.09	21.5	$1.94	$25.66	$204
February	2265	$204.30	$0.09	21.39	$1.93	$25.70	$232
March	2331	$210.26	$0.09	17.26	$1.56	$25.74	$238
April	1843	$166.24	$0.09	20.75	$1.87	$25.76	$194
May	1500	$135.30	$0.09	16.89	$1.52	$25.70	$163
June	955	$86.14	$0.09	20.53	$1.85	$25.86	$114
July	1068	$96.33	$0.09	20.53	$1.85	$25.67	$124
August	1106	$99.76	$0.09	10.19	$0.92	$25.24	$126
September	1706	$153.88	$0.09	9.43	$0.85	$25.12	$180
October	1268	$114.37	$0.09	11.01	$0.99	$30.34	$146
November	994	$89.66	$0.09	16.34	$1.47	$30.55	$122
December	1124	$101.38	$0.09	23.27	$2.10	$30.59	$134
TOTALS	18115	$1,633.97	$0.09	209.09	18.86	321.93	$1,975

In additional to electrical use, the facility purchased 81.64 gallons propane for 2021

Total Btu Electricity	61844610	Btu			
Total Btu Propane	7470060	Btu	Propane Fuel Density =	91,500	Btu/gallon
Total Energy	69314670	Btu			
KBtu/sqft	32.5	kBtu/sf EUI			

Floor Area =	2136	sq. ft
Gallons Propane 2021	81.64	Gallons Propane
	7470060	Btu Propane
	747.01	MMBtu Propane
$	209.46	Propane Cost for 2021

Major Energy Consuming Equipment

Mechanical Systems

There is a single split system heat pump with electric resistance back-up heat that conditions the entire clinic. The unit is manufactured by Carrier/ The indoor unit provides conditioned and ventilation air to the spaces with an air distribution system located above the ceiling. The heat pump is located outdoors adjacent to the indoor unit in the mechanical room.

The specifications of the system are as follows:

Indoor Unit
Unit Mfg: Carrier Model FB4ANF060
Cooling Nominal Capacity: 60,000 Btuh (5 Tons)
Supply Fan: ¾ HP
Electric Heat: 25 kW
Outdoor Unit
Unit Mfg: Carrier Model 38YKC060 (5 Ton)

The unit has a rating of 9.0 EER. There is no economizer on the system.
The system is controlled by a wall mounted, programmable thermostat.

The restrooms have ceiling mounted exhaust fans, manually controlled.

Lighting Systems

The lighting in the front entrance lobby and corridor consists of recessed type fixtures. These have been upgraded with LED bulbs. The entry lobby lights are controlled by occupancy sensor.

The lighting in offices, lab and exam rooms consists of surface mounted ceiling luminaires with 4 ft T8 lamps. The lights are controlled by wall switches.

Detailed Energy Efficiency Measures

EEM 1

EXISTING CONDITIONS

The lighting in the offices, exam and lab area consist of surface mount, 4 ft., T8 fluorescent bulbs/ Type"A" fixtures have 2 bulbs and Type "B" have 3 bulbs in each luminare.

PROPOSED MEASURE DESCRIPTION

Replace T8 lamps with LED.

SAVINGS METHODOLOGY

Calculation:

Spreadsheet calculations used to determine energy savings.

Energy (kWh) = Fixture wattage x no. of fixture x hrs "ON"

Demand (kW) = Lighting Watt/1000

Existing Conditions

Fixture Type	lamps per Fixtrure	Wall/lamp	Watt/fixture	Qty	Total	
Type "A" Fixture (T8 4 ft)	2	32	64	6	384	
Type "B" Fixture (T8 4 ft)	3	32	96	7	672	
					1056	Watt Existing

Recommended Change

Replace with LED 2 (150 watt/fixture)	1	40	40	13	520	Watt Recommended

Hours "ON" 2600 hrs

Existing Energy =	2745.6	kWh
Existing Energy Cost =	$ 248	
Proposed Energy =	1352	kWh
Proposed Energy Cost =	$ 122	
Existing Demand =	1.056	
Existing Demand Cost =	$ 0.10	
Proposed Demand =	0.52	
Proposed Demand Cost =	0.047	

Calculation

Energy (kWh) = Lighting Fixture Watt X No. of Fixture x "ON Hrs

Demand (kW) = Lighting total Watt/1000

Estimated Cost/Fixture =	$10/tube
Installation	$20/Fixture
Total Fixtures =	13
Total Cost =	$ 390

ESTIMATED COST

Estimated cost per fixture = $10/bulb

Estimated installation = $20/fixture

EEM #1 Estimated Savings			
Annual Energy Usage & Savings Estimate	Baseline Electric Usage (kWh)		2746
	Proposed Electric Usage (kWh)		1352
	Electric Savings (kWh)		1394
	Electric Cost Savings ($)	$	126
	Demand Savings (kW)		1
	Electric Demand Savings ($)	$	0
	Baseline Natural Gas Usage (Therms)	-	
	Proposed Natural Gas Usage (Therms)	-	
	Natural Gas Savings (Therms)	-	
	Natural Gas Savings ($)	-	
	Annual Energy Cost Savings	$	126
Measure Cost & Simple Payback	Project Cost	$	390
	Simple Payback (Cost/Savings)		3.1

EEM 2

EXISTING CONDITIONS

The Exam Rms and Lab lighting is controlled by wall switch.

PROPOSED MEASURE DESCRIPTION

Install occupancy sensors for lighting control

SAVINGS METHODOLOGY

Energy (kWh) = Lighting fixture wattage x no. of fixtures x “ON” hours

Estimated “ON” hours without occupancy sensors = 2600 hours

Estimated “ON: hours by adding occupancy sensor control = 1500 hours

ESTIMATED COST

Cost = $50/sensor

Existing Conditions
Rooms do not have Occupancy Sensors

Fixture Type	Description	Watt/Fixture	Quantity	Total Watt Fixture Type
Type "A"	T8 4 ft 2 lamp	64	6	384
Type "B"	T8 4 ft 4 lamp	128	7	896
				1280 Watt

"ON" Time Existing= 2600 hrs

Proposed reduces "ON" Time from 10 hrs/day 5 days per week to 3 days per week

"ON" Time proposed = 1500 hrs

Existing Energy = 3328 kWh

Existing Energy Cost = $ 300

Proposed Energy = 1920 kWh

Proposed Energy Cost = $ 173

Calculations

Energy (kWh) = Lighting Fixture Watt X No. of Fixture x "ON Hrs

Estimated Cost/Sensor = $50

Total Sensors = 8

Total Cost = $ 240

EEM #2 Estimated Savings			
Annual Energy Usage & Savings Estimate	Baseline Electric Usage (kWh)		3328
	Proposed Electric Usage (kWh)		1920
	Electric Savings (kWh)		1408
	Electric Cost Savings ($)	$	127
	Baseline Natural Gas Usage (Therms)		
	Proposed Natural Gas Usage (Therms)	-	
	Natural Gas Savings (Therms)	-	
	Natural Gas Savings ($)	$	-
	Annual Energy Cost Savings	$	127
Measure Cost & Simple Payback	Project Cost	$	240
	Simple Payback (Cost/Savings)		1.9

EEM 3

EXISTING CONDITIONS

The HVAC system is controlled by a single wall thermostat. The thermostat is programmable, but is not currently configured to match the clinic operation hours.

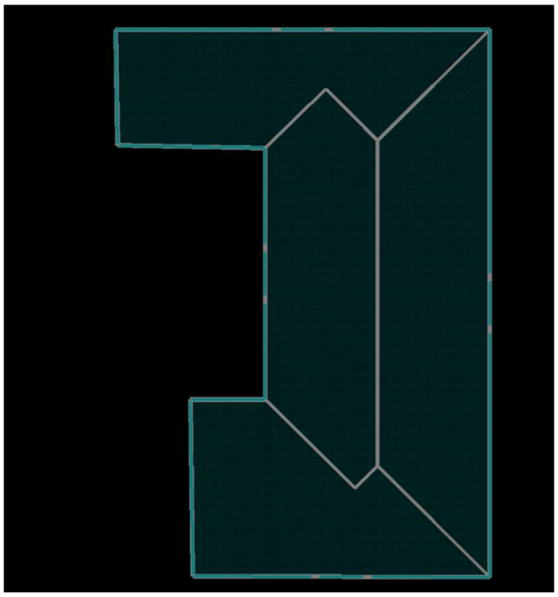
PROPOSED MEASURE DESCRIPTION

Install a new “Smart” thermostat that can be controlled remotely by facilities personnel. The clinic is located in a rural area and control modifications must be done on site.

SAVINGS METHODOLOGY

DOE-2 eQUEST energy modeling simulation was used to estimate the current energy use. Energy savings estimated by revising the facility HVAC system schedule from 5 days per week to 3 days per week to match existing facility operation. In addition, setback was modeled by reducing unoccupied heating temperature from 65 degF to 60 degF.

Figure 2 Medical Clinic eQUEST Floor Plan



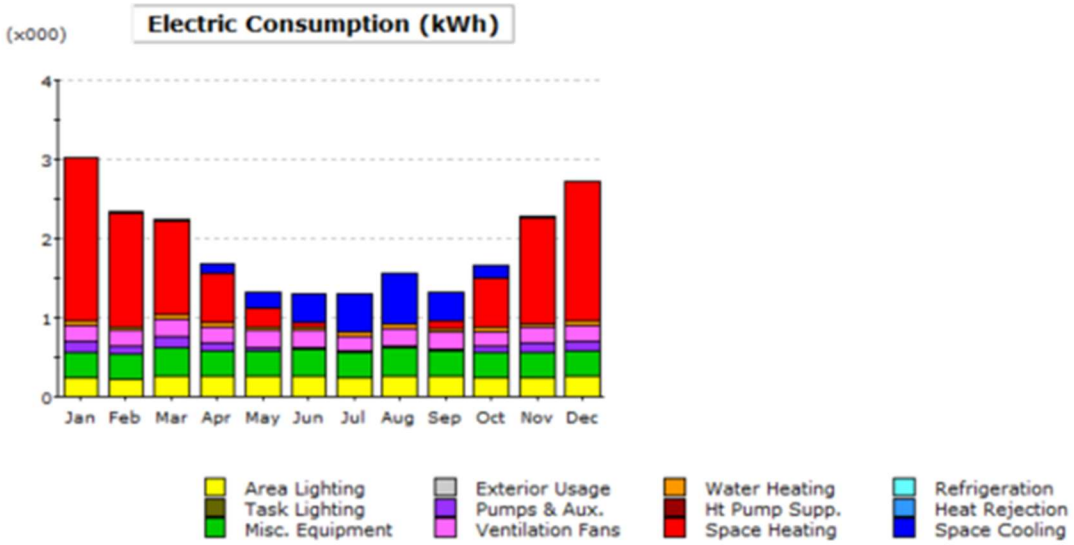
EEM #3

Calculations

Proposed: Turn units off on Wednesday and Fridays
Reduce unoccupied heating temp from 65 deg F to 60 deg F

Elec Cost =	$	0.090	
Baseline Energy Use =		22810	kWh
Proposed Energy Use =		14940	kWh
Energy Savings =		7870	kWh
Energy Cost Savings =	$	709.9	

New Therr $ 1,200

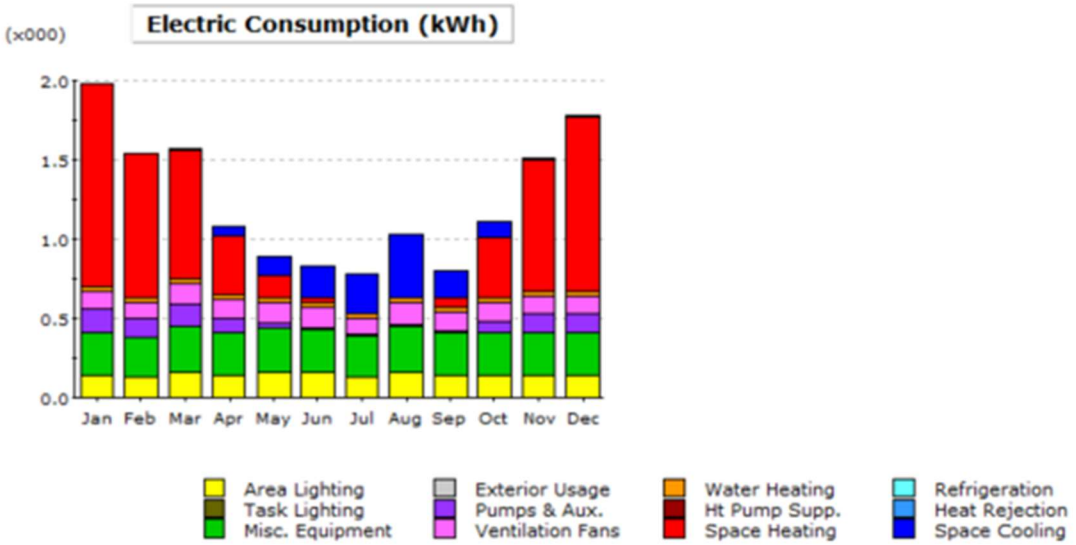


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.00	0.01	0.03	0.10	0.22	0.35	0.47	0.63	0.35	0.16	0.03	0.01	2.37
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	2.05	1.45	1.17	0.63	0.22	0.06	0.01	0.01	0.11	0.61	1.33	1.75	9.41
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.05	0.05	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.61
Vent. Fans	0.19	0.18	0.22	0.20	0.20	0.21	0.19	0.22	0.20	0.19	0.19	0.20	2.44
Pumps & Aux.	0.14	0.12	0.13	0.09	0.04	0.02	0.01	0.01	0.02	0.07	0.12	0.11	0.87
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	0.34	0.31	0.36	0.34	0.35	0.35	0.34	0.36	0.34	0.34	0.33	0.35	4.10
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	0.24	0.23	0.28	0.25	0.25	0.26	0.24	0.28	0.25	0.24	0.24	0.25	3.01
Total	3.02	2.36	2.25	1.67	1.34	1.31	1.30	1.56	1.32	1.66	2.29	2.73	22.81

Figure 3 eQUEST Report EEM #3 Baseline

(Note: Baseline energy use in the energy model is calibrated to 8% of 2021 metered energy use. This is within the acceptable range for this level of analysis).



Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.00	0.01	0.01	0.06	0.12	0.19	0.25	0.40	0.17	0.09	0.01	0.01	1.35
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	1.27	0.91	0.80	0.37	0.14	0.03	0.00	-	0.06	0.39	0.83	1.09	5.90
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.38
Vent. Fans	0.11	0.10	0.13	0.11	0.12	0.12	0.10	0.13	0.11	0.11	0.11	0.11	1.40
Pumps & Aux.	0.14	0.12	0.13	0.09	0.04	0.02	0.01	0.01	0.02	0.07	0.12	0.11	0.87
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	0.27	0.25	0.29	0.27	0.28	0.27	0.26	0.29	0.27	0.27	0.27	0.27	3.25
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	0.15	0.13	0.17	0.15	0.16	0.16	0.13	0.17	0.15	0.15	0.15	0.15	1.80
Total	1.98	1.55	1.58	1.08	0.89	0.83	0.79	1.03	0.80	1.11	1.52	1.78	14.94

Figure 4 eQUEST EEM #3 Report Proposed

ESTIMATED COST

New Smart Thermostat estimated cost = $1200.

EEM #3 Estimated Savings			
	Electric Savings (kWh)		7870
	Electric Cost Savings ($)	$	710
	Baseline Natural Gas Usage (Therms)		0
	Proposed Natural Gas Usage (Therms)		0
	Natural Gas Savings (Therms)		0
	Natural Gas Savings ($)	$	-
	Annual Energy Cost Savings	$	710
Measure Cost & Simple Payback	Project Cost	$	1,200
	Simple Payback (Cost/Savings)		1.7

EEM 4

EXISTING CONDITIONS

The existing split system heat pump is approximately 18 years old. The efficiency of the unit does not meet current code requirements. The unit has a 9.0 EER rating and does not have economizer control. (Current code requires full economizer and a minimum 14 SEER).

PROPOSED MEASURE DESCRIPTION

Replace existing split system heat pump with high efficiency unit that has economizer cooling.

SAVINGS METHODOLOGY

DOE-2 dQUEST energy modeling software was used to estimate energy savings.

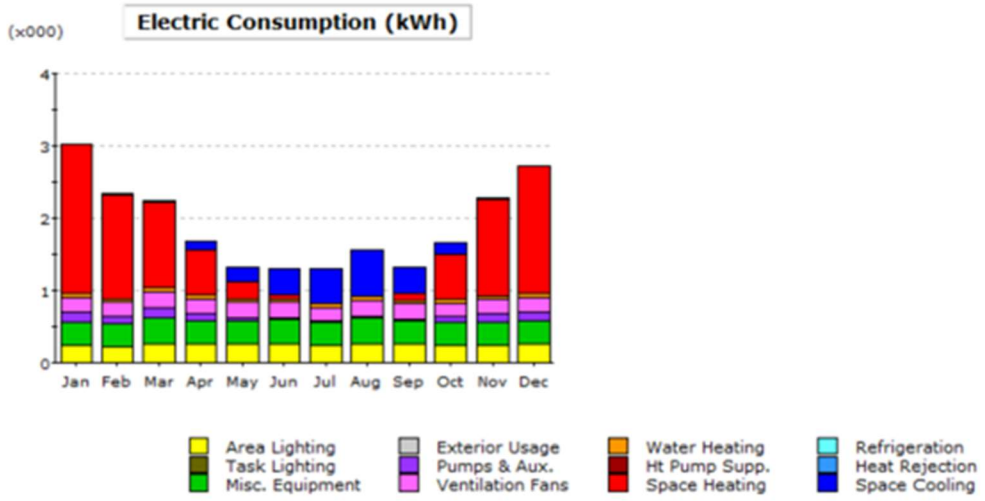
ESTIMATED COST

$12,000 for a nominal 5-Ton split system heat pump system.

EEM # 4
Calculations

Proposed: High Efficiency Heat Pump with Economizer

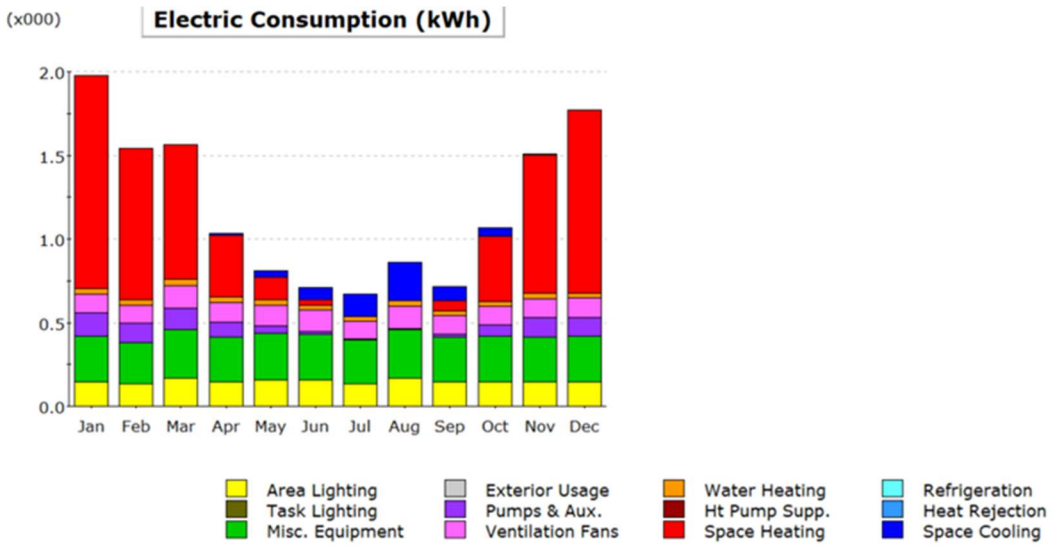
Elec Cost =	$	0.090			
Baseline Energy Use =		22810	kWh		
Proposed Energy Use =		14230	kWh		
Energy Savings =		8580	kWh	New Heat Pump	$ 15,000
Energy Cost Savings =	$	773.9			



Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.00	0.01	0.03	0.10	0.22	0.35	0.47	0.63	0.35	0.16	0.03	0.01	2.37
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	2.05	1.45	1.17	0.63	0.22	0.06	0.01	0.01	0.11	0.61	1.33	1.75	9.41
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.05	0.05	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.61
Vent. Fans	0.19	0.18	0.22	0.20	0.20	0.21	0.19	0.22	0.20	0.19	0.19	0.20	2.44
Pumps & Aux.	0.14	0.12	0.13	0.09	0.04	0.02	0.01	0.01	0.02	0.07	0.12	0.11	0.87
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	0.34	0.31	0.36	0.34	0.35	0.35	0.34	0.36	0.34	0.34	0.33	0.35	4.10
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	0.24	0.23	0.28	0.25	0.25	0.26	0.24	0.28	0.25	0.24	0.24	0.25	3.01
Total	3.02	2.36	2.25	1.67	1.34	1.31	1.30	1.56	1.32	1.66	2.29	2.73	22.81

Figure 5 eQUEST Report EEM #4 Baseline



Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	0.01	0.04	0.07	0.13	0.23	0.09	0.05	0.00	-	0.62
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	1.27	0.91	0.80	0.37	0.14	0.03	0.00	-	0.06	0.39	0.83	1.09	5.90
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.38
Vent. Fans	0.11	0.10	0.13	0.11	0.12	0.12	0.10	0.13	0.11	0.11	0.11	0.11	1.40
Pumps & Aux.	0.14	0.12	0.13	0.09	0.04	0.02	0.01	0.01	0.02	0.07	0.12	0.11	0.87
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	0.27	0.25	0.29	0.27	0.28	0.27	0.26	0.29	0.27	0.27	0.27	0.27	3.25
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	0.15	0.13	0.17	0.15	0.16	0.16	0.13	0.17	0.15	0.15	0.15	0.15	1.80
Total	1.98	1.54	1.56	1.03	0.81	0.71	0.67	0.86	0.72	1.06	1.51	1.77	14.23

Figure 6 eQUEST Report EEM #4 Proposed

EEM #4 Estimated Savings			
	Electric Savings (kWh)		8580
	Electric Cost Savings ($)	$	774
	Baseline Natural Gas Usage (Therms)		0
	Proposed Natural Gas Usage (Therms)		0
	Natural Gas Savings (Therms)		0
	Natural Gas Savings ($)	$	-
	Annual Energy Cost Savings	$	774
	Project Cost	$	15,000
Measure Cost & Simple Payback	Simple Payback (Cost/Savings)		19.4

Appendix

Light Fixture Photos

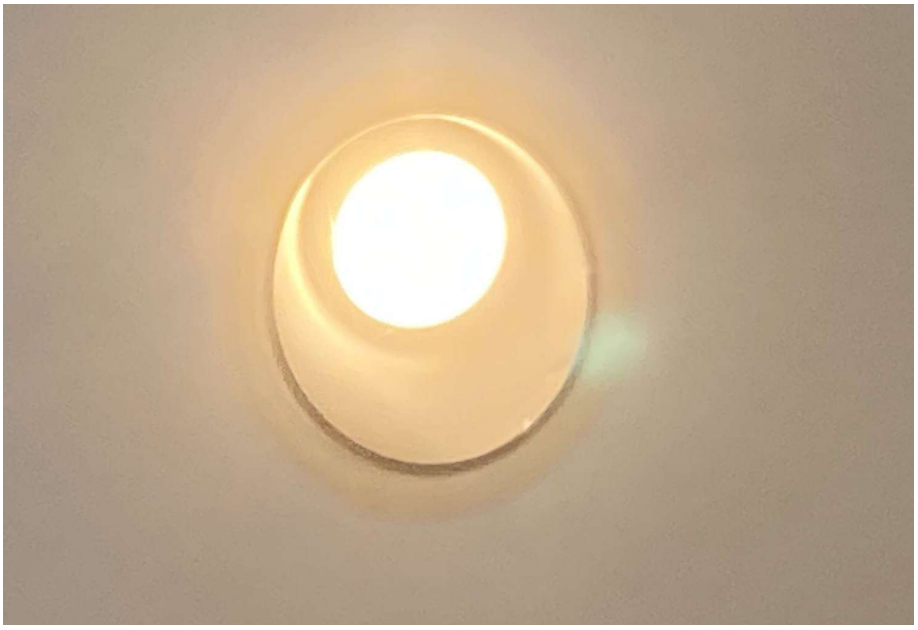


Figure A: Lobby

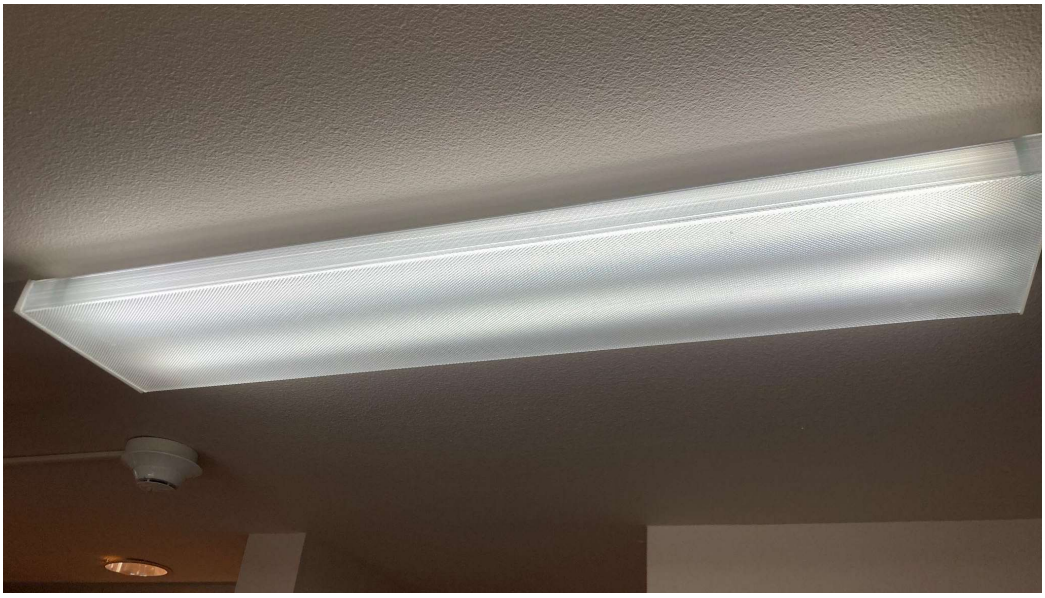


Figure B: Fixture Type “A”

Figure C: Fixture Type “B”

Figure D: Corridor

Figure E: Manual Switch

Mechanical Photos

Figure F: Split System Heat Pump (Outdoor)

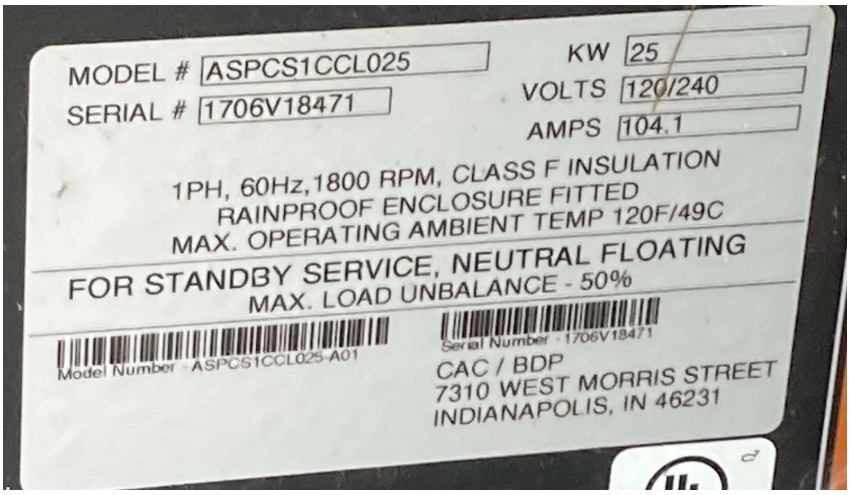


Figure G: Split System Air Handling Unit Nameplate 1

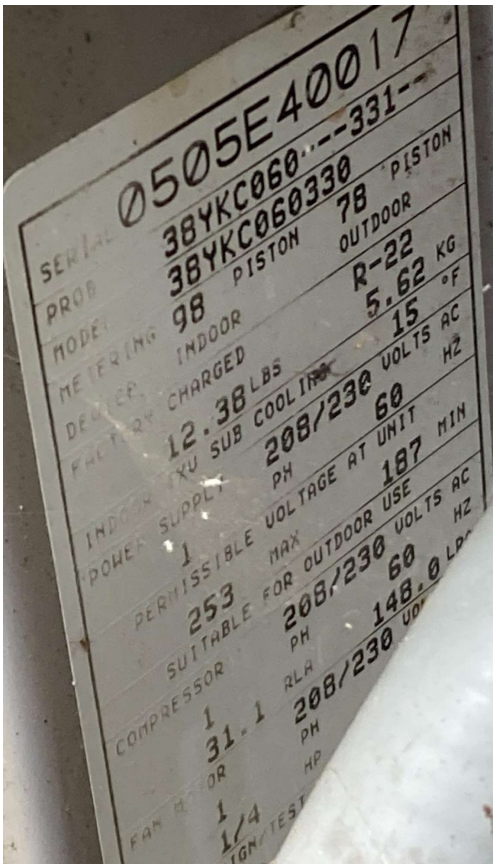


Figure H: Split System Heat Pump (Outdoor) Nameplate

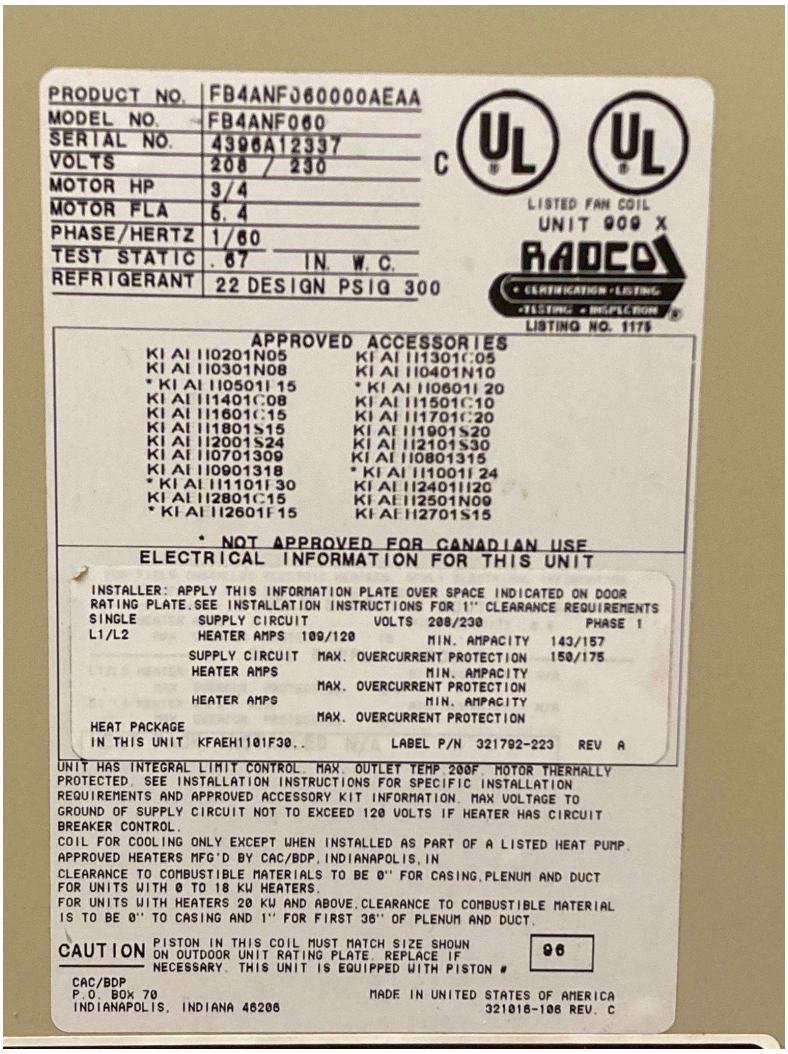


Figure I: Split System Air Handling Unit Nameplate

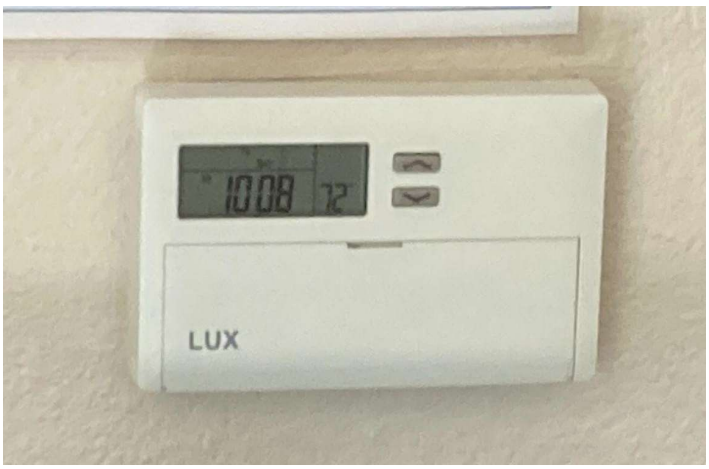


Figure J: Thermostat